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Report No: PADHI00422

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT

IN THE AMOUNT OF US\$ 45 MILLION

TO THE

CO-OPERATIVE REPUBLIC OF GUYANA

FOR A

COASTAL ADAPTATION AND RESILIENCE PROJECT

(P503393)

{RVP CLEARANCE DATE}

Urban, Resilience and Land  
Latin America And Caribbean

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective {[date], 2024})

Currency Unit =

= US\$1

## FISCAL YEAR

January 1 - December 31

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ABBREVIATIONS AND ACRONYMS

ASDU	Agriculture Sector Development Unit
CAP	Conservancy Adaptation Project
CARes	Coastal Adaptation and Resilience Project
CPF	Country Partnership Framework
DRM	Disaster Risk Management
E&S	Environmental and Social
FM	Financial Management
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GoG	Government of Guyana
GRIF	Guyana REDD+ Investment Fund
GRID	Green, Resilient, and Inclusive Development
GRM	Grievance Redress Mechanism
GuySuCo	Guyana Sugar Corporation
IA	Implementing Agency
IPF	Investment Project Financing
ISP	Implementation Support Plan
LAC	Latin American and the Caribbean
LCDS	Low Carbon Development Strategy
M&E	Monitoring and Evaluation
MARAD	Maritime Administration Department
MIS	Management Information System
MoA	Ministry of Agriculture
MoF	Ministry of Finance
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NDIA	National Drainage and Irrigation Authority
O&G	Oil and Gas
O&M	Operation and Maintenance
PIU	Project Implementation Unit
POM	Project Operations Manual
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SORT	Systematic Operations Risk-Rating Tool
TT	Task Team
UNFCCC	United Nations Framework Convention on Climate Change



TABLE OF CONTENTS

**DATASHEET ..... 3**

**I. STRATEGIC CONTEXT ..... 8**

A. Country Context ..... 8

B. Sectoral and Institutional Context ..... 9

C. Relevance to Higher Level Objectives ..... 12

**II. PROJECT DESCRIPTION..... 13**

A. Project Development Objective ..... 13

B. Project Components ..... 13

C. Project Beneficiaries ..... 17

D. Results Chain..... 18

E. Rationale for Bank Involvement and Role of Partners..... 18

F. Lessons Learned and Reflected in the Project Design..... 19

**III. IMPLEMENTATION ARRANGEMENTS ..... 20**

A. Institutional and Implementation Arrangements..... 20

B. Results Monitoring and Evaluation Arrangements ..... 20

C. Sustainability ..... 21

**IV. PROJECT APPRAISAL SUMMARY ..... 21**

A. Technical and Economic Analysis..... 21

B. Fiduciary ..... 25

C. Legal Operational Policies ..... 27

D. Environmental and Social ..... 27

**V. GRIEVANCE REDRESS SERVICES ..... 28**

**VI. KEY RISKS..... 28**

**ANNEX 1: Implementation Arrangements and Support Plan ..... 34**

**ANNEX 2: Proposed weighted criteria for Category 2 and 3 prioritization ..... 41**

**ANNEX 3: Economic Analysis..... 42**



**DATASHEET**

**BASIC INFORMATION**

Project Beneficiary(ies) Guyana	Operation Name Guyana Coastal Adaptation and Resilience Project		
Operation ID P503393	Financing Instrument Investment Project Financing (IPF)	Environmental and Social Risk Classification Moderate	

**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 31-May-2024	Expected Closing Date 31-Dec-2026
Bank/IFC Collaboration No	

**Proposed Development Objective(s)**

The project development objective is to enhance climate adaptation and reduce flood risk in urban and rural areas in the coastal plain of Guyana.



**Components**

Component Name	Cost (US\$)
Improving drainage infrastructure	40,000,000.00
Improving flood management and drainage operations	2,500,000.00
Project management	2,500,000.00

**Organizations**

Borrower: Co-operative Republic of Guyana  
 Implementing Agency: Ministry of Agriculture

**PROJECT FINANCING DATA (US\$, Millions)**

**Maximizing Finance for Development**

Is this an MFD-Enabling Project (MFD-EP)? No  
 Is this project Private Capital Enabling (PCE)? No

**SUMMARY**

<b>Total Operation Cost</b>	<b>45.00</b>
<b>Total Financing</b>	<b>45.00</b>
<b>Financing Gap</b>	<b>0.00</b>

**DETAILS**

**Non-World Bank Group Financing**

Trust Funds	45.00
Guyana REDD Plus Investment Fund Program	45.00

**Expected Disbursements (US\$, Millions)**

WB Fiscal Year	2024	2025	2026	2027
Annual	0.00	0.00	0.00	0.00



Cumulative	0.00	0.00	0.00	0.00
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**PRACTICE AREA(S)**

**Practice Area (Lead)**

Urban, Resilience and Land

**Contributing Practice Areas**

**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	● Low
5. Institutional Capacity for Implementation and Sustainability	● Substantial
6. Fiduciary	● Substantial
7. Environment and Social	● Moderate
8. Stakeholders	● Low
9. 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	Not Currently 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**

Project Operations Manual One month after the Effective Date, The Recipient, through the Ministry of Agriculture, shall adopt the Project Operations Manual in form and substance satisfactory to the Bank.

**Conditions**

Type	Citation	Description	Financing Source
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**The World Bank**

Guyana Coastal Adaptation and Resilience Project (P503393)

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## I. STRATEGIC CONTEXT

### A. Country Context

- 1. The Co-operative Republic of Guyana is a small, sparsely populated country endowed with fertile lands along its coast,** and valuable mineral resources (e.g., bauxite, gold, and diamonds) with recent offshore oil discoveries. Extensive tropical forests cover 85 percent of the country, with 90 percent of its approximately 800,000 inhabitants living along the narrow 459 kilometer long coastal plain (only 10 percent of Guyana's land area), where much of the economic activity (including the capital city, Georgetown, in Region 4) are concentrated. Flooding (due to heavy rainfall or high tides) – exacerbated by climate change and associated sea level rise – is an ongoing risk, particularly in the low-lying areas along the Atlantic coast.
- 2. Historically Guyana's GDP per capita was among the lowest in South America, but this has seen rapid increases, and the country's economy has become one of the fastest growing in the world (mostly due to oil production).** This began in 2019 and reached 278,000 barrels per day (bpd) in 2022. Economic growth since 2020 (averaging 42.3 percent per year) brought GDP per capita from US\$6,477 in 2019 to over US\$18,199 in 2022. Real GDP is estimated to have increased by 62.3 percent in 2022,<sup>1</sup> primarily driven by the expansion of oil production, as well as the non-oil economy. The non-oil economy has also expanded by 11.7 percent of real GDP in 2023, largely attributed to the expansion of construction services and the agriculture, fishing and forestry sectors. Guyana is expected to remain one of the fastest growing economies, with a double-digit growth rate in 2024, as additional oil fields start operation. The development of the oil and gas (O&G) sector has enabled a notable scale-up of investment in urban infrastructure.
- 3. Poverty has dropped significantly from close to 61 percent in 2006 to around 48 percent in 2019.**<sup>2</sup> However, inequality increased between 2006 and 2019 as incomes of the bottom 40 percent of the population grew more slowly than average, lagging behind other Latin American and Caribbean Countries.<sup>3</sup> Guyana suffers from spatial disparity in income and multidimensional poverty, particularly in the remote rural areas in the interior (10.3 percent of the population). In 2019, 65.5 percent of the population in the interior lived below US\$ 5.50 a day, compared with 44.5 percent in coastal rural areas, and 49 percent in coastal urban areas. Nationally only 1.7 percent of the population was considered multidimensionally poor between 2019-2020, compared to 11 to 19 percent for the interior population.
- 4. Guyana is among the countries most vulnerable to climate change.** It is at high risk from climate-related hazards, including increases in heavy rainfall leading to pluvial flooding, and coastal flooding from extreme tidal levels exacerbated by sea-level rise. Studies showed that the impact of rising sea levels would already be among the highest in the world, exposing 100 percent of the country's coastal agriculture and 66.4 percent of coastal urban areas to flooding and coastal erosion, with potential GDP losses projected to exceed 46.4 percent (even prior to the O&G discovery). Flooding from rainfall routinely affects residents during two rainy seasons each year, with extreme flooding having severe social and economic impacts particularly for poor and other vulnerable groups. In 2005, extreme rainfall caused widespread flooding in the coastal lowlands, affecting almost 39 percent of the population with damage estimated at 59 percent of GDP. In 2021, similar extreme flooding affected all administrative regions,

<sup>1</sup> Annual Report 2022. Bank of Guyana. <https://bankofguyana.org.gy/bog/images/research/Reports/ANNREP2022.pdf>

<sup>2</sup> Measured as share of the population living below \$5.50 a day (2011 in Purchasing Power Parity (PPP)) and based on World Bank staff estimates based on the 2019 Guyana Labor Force Survey. Guyana was recategorized as upper-middle income in 2015, and as such a poverty line of \$5.50 per day in 2011 PPP, appropriate for countries at this income classification is used to monitor poverty.

<sup>3</sup> World Bank Country Partnership Framework (CPF) for Guyana for the period FY23-26 (2023).



causing a loss of 9.1<sup>4</sup> percent in the agriculture sector, with overall losses totaling 12 percent of GDP,<sup>5</sup> highlighting the need to improve flood risk management capabilities. The economic impacts of flooding due to rainfall are forecast to increase approximately 60 percent by 2050 due to climate change. By mid-century, it is estimated that a tidal flood with a 20 percent chance of happening in any year would cause US\$150 million of economic damage, while a rainstorm that has a 20 percent chance of happening in any year could flood 5,000 households and over 1,000 commercial or industrial buildings in Georgetown alone, causing around US\$30 million of economic damage. Managing these climate risks through sustainable adaptation and development is critical to keeping Guyana on its trajectory of economic growth and to maintain a positive environment for private sector investment.

## B. Sectoral and Institutional Context

5. **As a country that is highly vulnerable to climate change and climate-induced natural disasters, Guyana's national development is anchored in its recently revised Low Carbon Development Strategy 2030 (LCDS).**<sup>6</sup> The LCDS includes a medium-term priority to initiate investment in physical infrastructure (through upgrading of sectors such as water) on a low-carbon, non-polluting trajectory.
6. **Guyana's LCDS will inform, and was informed by, Guyana's Nationally Determined Contribution (NDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2016**<sup>7</sup>. The NDC covers land use, energy, and climate adaptation. It reflects Guyana's position as a high-forest cover, low-deforestation jurisdiction (and therefore a predominant net carbon sink), whilst outlining areas of climate action in land-use and energy, and outlines programs for adapting to climate impacts and vulnerabilities.
7. **An integral element of the LCDS, Guyana's Climate Resilience Strategy and Adaptation Plan sets out a comprehensive and overarching framework for building resilience to climate change impacts**, the key elements of which include: (i) emergency and extreme events/flood control and management, (ii) sea defense enhancement and maintenance, and (iii) strengthening drainage and irrigation systems.
8. **Since the 2005 floods, the Government of Guyana (GoG) has demonstrated its commitment to addressing the country's flood risk and climate resilience needs.** The GoG has taken an active role in coordinating the activities of development partners to maximize efficiency and the World Bank has made a significant contribution in this sector, supporting the Government through various projects (Figure 1).

<sup>4</sup> Government of Guyana Budget Speech 2022 <https://finance.gov.gy/wp-content/uploads/2022/01/Budget%20Speech%202022.pdf>

<sup>5</sup> Guyana Second Voluntary National Review of the SDGs, July 2023. [https://finance.gov.gy/wp-content/uploads/2023/07/Guyana\\_VNR-2023.pdf](https://finance.gov.gy/wp-content/uploads/2023/07/Guyana_VNR-2023.pdf)

<sup>6</sup> Guyana's Low Carbon Development Strategy 2030 (2022), <https://lcds.gov.gy/>

<sup>7</sup> <https://unfccc.int/documents/497557> and <https://unfccc.int/sites/default/files/NDC/2022-06/Guyana%27s%20revised%20NDC%20-%20Final.pdf>

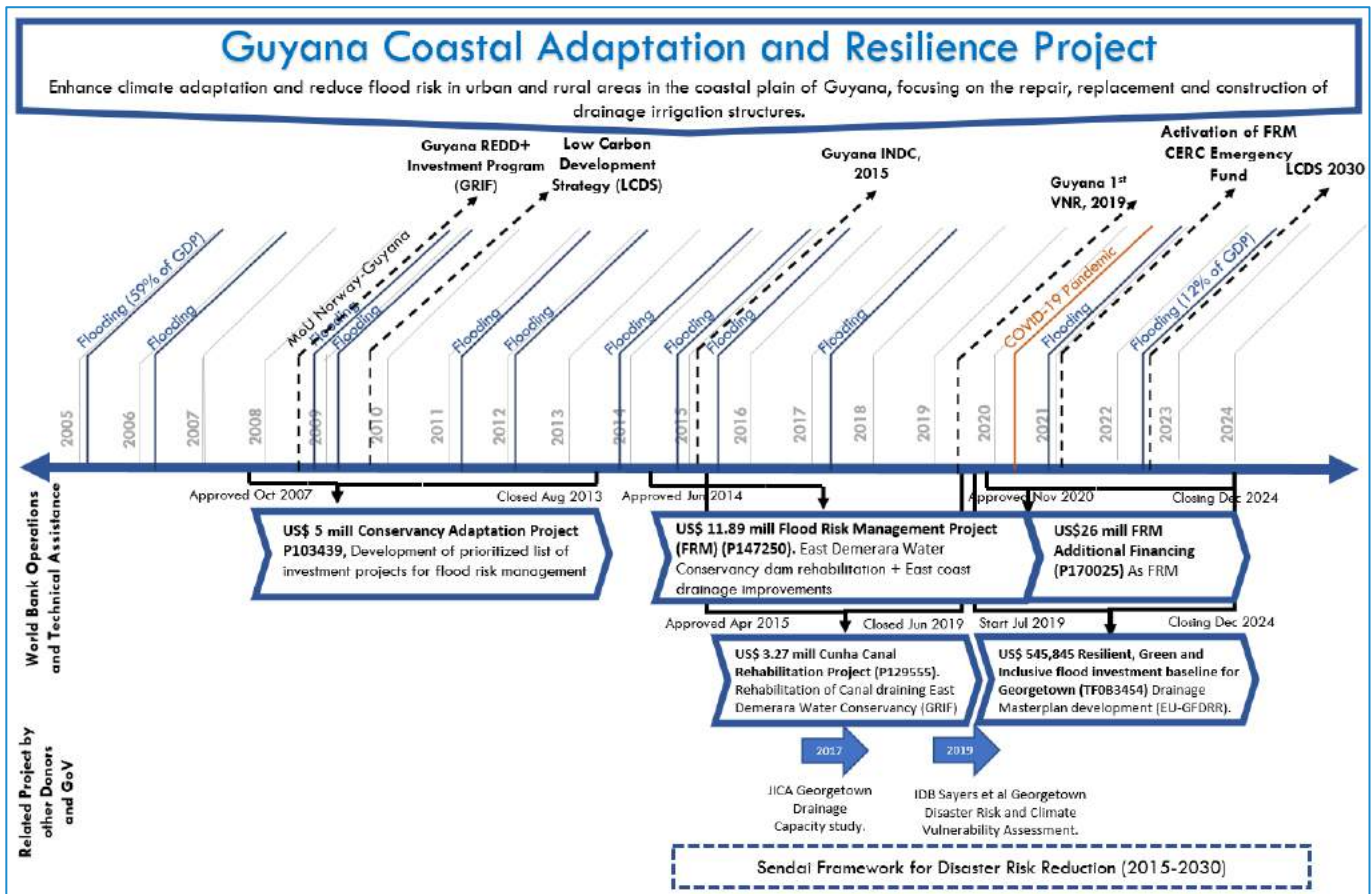


Figure 1. Guyana’s climate resilience and flood risk management initiatives

9. **Guyana has been investing payments received from avoided deforestation into strategic low carbon sectors, including climate change adaptation.** In 2009, the Governments of Guyana and Norway established the Guyana REDD+ Investment Fund (GRIF), through which Guyana earned US\$212.6 million dollars (US\$224 million including investment income) in payments for forest climate services (limiting emissions from deforestation and forest degradation) from Norway. The GRIF: (i) receives payments for forest climate services; and (ii) transfers these payments (and any investment income earned on these payments) into projects and activities that support the implementation of Guyana's LCDS, including this Project.
10. **On October 16, 2023, the GoG invited the World Bank to act as Partner Entity, under the GRIF framework, to support the development and implementation of this project.** The invitation was extended to the World Bank due to its extensive experience working in Guyana on flood risk management and adaptation, including the successful implementation of the US\$3.27 million GRIF-financed Cunha Canal Rehabilitation Project (P103539) from 2015 to 2019. The GRIF Steering Committee approved the World Bank to act as a Partner Entity, with the Ministry of Agriculture (MoA) as Implementing Agency.
11. **Guyana’s coastal drainage system, installed during Dutch and English colonial periods, consists of a unique, complex network of drainage and irrigation canals, culverts, sluices, and pumps** (often augmented by mobile pump units). The system allows discharge of inland waters into the Atlantic Ocean or rivers for flood mitigation purposes, and for irrigation of agricultural land. A seawall or dyke along the Atlantic Ocean protects the low lying coastal populations from coastal flooding. However, in the decades leading up to the 2005 and 2006 floods, the operational capacities of the coastal drainage systems declined due to insufficient physical investments and inadequate



emergency preparedness and disaster risk management (DRM) capacity. Following the floods, the GoG re-emphasized the importance of flood risk management to Guyana’s economic and social well-being, increasing the budget for the National Drainage and Irrigation Authority (NDIA) in the Ministry of Agriculture. The NDIA is responsible for the management, improvement, extension and provision of drainage, irrigation, and flood control infrastructure and services in Guyana.

12. **Drainage sluices (known locally as ‘kokers’)<sup>8</sup>, and other auxiliary infrastructure (e.g., pumps), are critical nodes in the coastal plain’s flood management system.** Sluices were originally constructed along the coast and riverine areas to upgrade and expand the drainage systems and to expand acreage of agricultural activities, with rehabilitated sluices able to support more than 2.5 inches of rainfall (compared to 1.5 previously) in 24 hours. Sluices are integrated in the coastal seawall and river embankments at the end of drainage canals and form the outlets to drain inland water to the adjacent river or Atlantic Ocean. Due to a gravity-based drainage system, sluices (mostly (re-)built in the 1960s/1970s) are opened manually during low tide conditions to discharge inland water and are closed during high tides to prevent ocean saltwater from entering the freshwater canals. As these structures form part of the embankment or seawall along the coast or river, they also function as flood defenses during more extreme high tide or high river-level flood events. Finally, a few drainage sluices are also used inland, mainly for irrigation services, and are opened during the dry season to irrigate agricultural lands using fresh water from the rivers. Non-functioning sluices severely exacerbate flood risk as flood waters cannot be discharged away from the land in a timely manner (or at all). Where connected with other drainage systems, damaged sluices transfer flood risk to other areas, which then also become over-burdened.

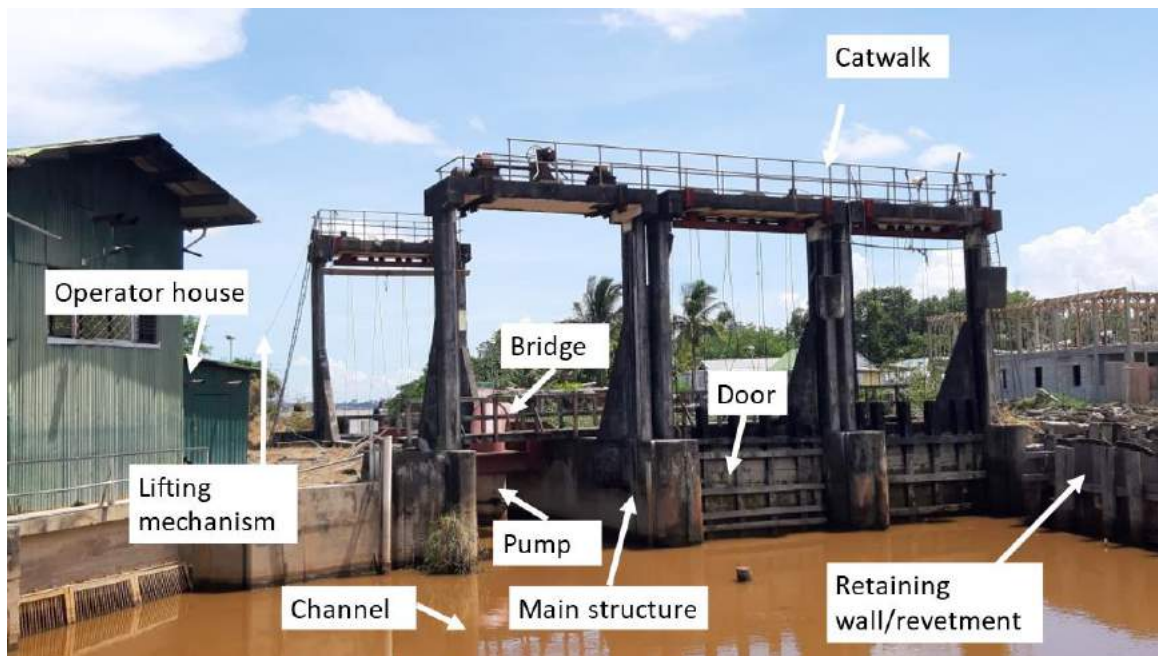


Figure 2. Main Sluice Elements

<sup>8</sup> A sluice typically consists of a concrete ‘Π’ shaped monolith structure with a single or multiple (wooden/steel) vertically (or sometimes radially) opening door(s) and a lifting mechanism for manually opening and closing the sluice. Inlet and outlet channels exist on both sides of the structure with revetments (along rivers) and retaining walls (along the sea) to keep these channels open and reduce siltation. A catwalk for maintenance and a bridge to cross the structure from one side of the canal to the other are also characteristic features. The sluice can be surrounded by open agricultural land, semi-urban areas, or an urbanized area.



### C. Relevance to Higher Level Objectives

13. **The Project is fully aligned with the Guyana Country Partnership Framework (CPF)** for the Period FY23-26<sup>9</sup> [Report Number 168273-GY], which supports Guyana's economic transformation by contributing to green, resilient, and inclusive development (GRID). The CPF aims to contribute to: (i) improved human capital, (ii) more and better jobs, and (iii) enhanced climate and environmental resilience, and therefore aligns with the LCDS 2030. This Coastal Adaptation and Resilience (CAREs) Project contributes directly to the CPF's objective to strengthen flood resilience and climate change adaptation.
14. **The Project is fully consistent with the country's Nationally Determined Contribution.** In the 2016 NDC, the country commits to lower its emissions<sup>10</sup> from deforestation, forest degradation and the energy sector on mitigation, and to become resilient to climate change on adaptation. The NDC reiterates Guyana's vulnerability to sea level rise and the other adverse effects of climate change, including floods and droughts, and commits Guyana to pursue a resilient, low-carbon, socially-inclusive economy through its LCDS, including upgrading infrastructure and other assets to protect against flooding, protecting water conservancies and their watersheds, and expanding mangrove restoration programs along the coast.<sup>11</sup> The Government of Guyana has dedicated significant resources towards implementation of the LCDS, including funds earned under its bi-lateral partnership with Norway for Guyana's forest ecosystem services and more recently from revenues generated from the sale of carbon credits on the voluntary carbon market. Guyana is the first country in the world to have carbon credits certified under the Architecture for REDD+ Transactions: The REDD+ Environmental Excellence Standards (ART:TREES) and the first in the world to sell these credits at the jurisdictional level. Guyana is also the first country in the world to issue carbon credits that are eligible for use by airlines in Phase 1 of CORSIA – the United Nations' International Civil Aviation Organization's (ICAO) global emissions reduction programme.
15. **The Project contributes to the NDC through risk reduction measures to address current and future climate hazards** such as pluvial floods and sea level rise causing coastal flooding. Specifically, the Project will contribute directly to Guyana's NDC on Adaptation by upgrading infrastructure and other assets to protect against flooding. It will do this through the rehabilitation or reconstruction of sluices to allow better operation and hence drainage of flood waters whilst protecting water quality in watersheds through reducing salt-water intrusion, and contributing to healthy mangrove systems by allowing freshwater from inland areas to reach ocean-side forest stands. The Project will also contribute to flood risk reduction through: (i) the upgrading of the NDIA's asset management system, necessary for understanding the number, type, location and condition of assets such as flood control infrastructure and equipment, and (ii) trialing automated sluice control systems which will allow greater efficiency in flood control. The Project will also contribute to LCDS 2030 Objective 3 to *Protect against climate change*, through the strengthening of the drainage and irrigation systems (which are considered low-carbon development infrastructure) to mitigate flood risk, whilst considering future adaptation needs. Protection against flooding and improved irrigation services will also boost associated economic activities in high-potential, low-carbon sectors (such as agriculture) and will protect communities and enhance livelihoods.
16. **The Project is consistent with Guyana's Climate Resilience Strategy and Adaptation Plan**, including: (i) contributing to the management of emergency and extreme flood events, (ii) maintenance and enhancement of sluices acting as sea defenses, and (iii) strengthening of coastal drainage and irrigation systems in support of agriculture. The Project

<sup>9</sup> World Bank. *Guyana - Country Partnership Framework for the Period FY23-26 (English)*. Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/099042423133024404/BOSIB06956cef807809aae0687fa5b9d08f>

<sup>10</sup> Guyana pledges to lower emissions using policy-based measures including reducing the normative "business as usual" growth in emissions.

<sup>11</sup> Guyana's revised Intended Nationally Determined Contribution (INDC), updated January 2023 (<https://www.fao.org/faolex/results/details/en/c/LEX-FAOC186383/>)



is also aligned with Guyana's second voluntary review of the Sustainable Development Goals (SDGs), committing to invest in Adaptation and Climate Resilience strategies.

## II. PROJECT DESCRIPTION

### A. Project Development Objective

#### PDO Statement

The project development objective is to enhance climate adaptation and reduce flood risk in urban and rural areas in the coastal plain of Guyana.

#### PDO Level Indicators

The PDO will be measured by the following outcome-level indicators:

- a. People with enhanced resilience to climate risks (disaggregated by gender) [number]
- b. People provided with improved urban living conditions (disaggregated by gender) [number]
- c. Area provided with improved drainage/irrigation services [ha]
- d. Staff with enhanced capacity (NDIA and relevant agencies) to manage/operate/maintain drainage infrastructure [number]

### B. Project Components

17. Guyana's coastal Regions 4, 5, 6, and the part of Region 3 east of the centerline of the Essequibo river are the geographic focus of this project. Characterized by a relatively densely populated strip of land, largely built from alluvial mud from the Amazon River, the four regions account for approximately 27 percent of GDP. An extensive network of over 1500 kilometers of drainage canals, over 300 sluices, and 182 pumps, combined with a 450-kilometer-long seawall have been built over the past centuries to protect these regions from pluvial flooding, saltwater intrusion, and coastal flooding.

#### Component 1: Improving drainage infrastructure (~US\$ 40 million)

18. This component will finance civil works for the repair, rehabilitation, and replacement of approximately 45 existing eligible<sup>12</sup> drainage infrastructure, particularly sluices. In line with the project's focus on asset management (Component 2) and sustainability of investments, this Component may also finance goods and equipment for maintenance of drainage infrastructure. These investments will consider both existing and projected future land uses (rural, semi-urban, urban), population growth and urbanization, exposed assets, and relevant climate change impacts to support climate adaptation. The structural measures to be financed under this component will improve the functionality of the drainage sluices to: (i) discharge rainfall runoff efficiently, (ii) enhance protection against coastal/riverine flooding, and (iii) improve general drainage and irrigation services. Following a selection and prioritization process (Figure 3), sluices deemed to be eligible for financing under the project will be categorized into those requiring repairs (Category 1), significant rehabilitation (Category 2), and complete replacement (Category 3). The process will be based on a Rapid Visual Screening (RVS) completed by NDIA to identify the condition, functionality, benefits, and environmental and social (E&S) impacts associated with 'Candidate' sluices. An initial categorization for the scope of the repairs, rehabilitation, and replacement of eligible drainage infrastructure is shown in Table 1.

<sup>12</sup> Low or Moderate E&S risk.

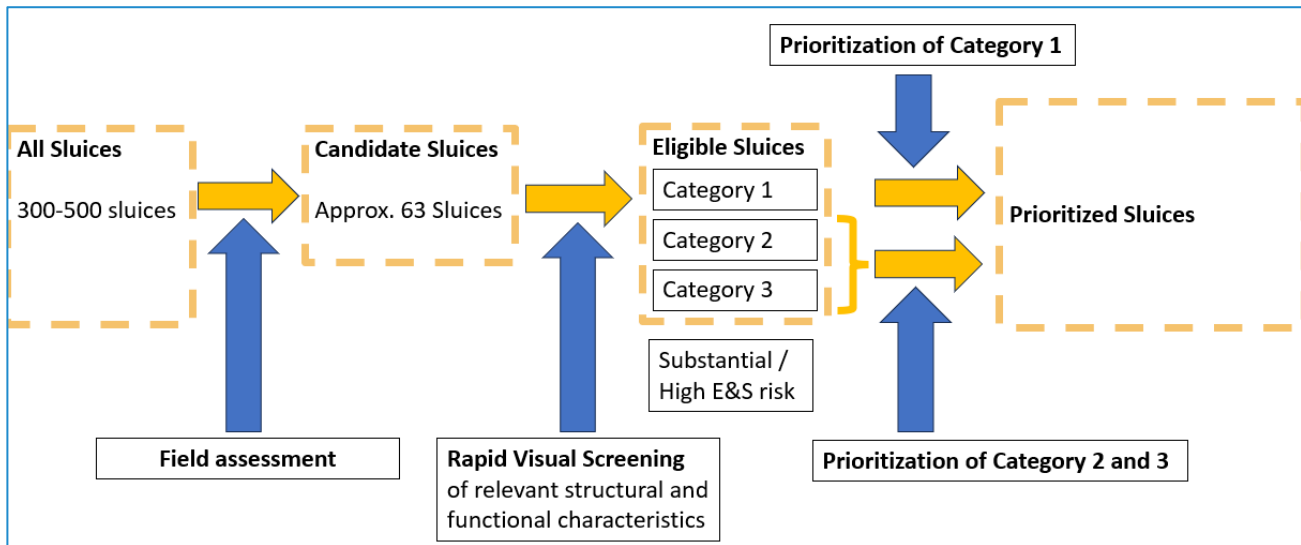


Figure 3. Selection and Prioritization process

Category	E&S impacts	Structural Condition		Functionality (drainage, flood protection, irrigation) with respect to Catchment	Cost (% full replacement)
1	Moderate risk* or less	Limited repairs needed to Sluice elements; remaining superstructure lifetime at least 10 years	AND	Sluice can perform functions adequately for approx. 10 years (after repairs)	< ~15%
2	Moderate risk* or less	Major repairs/rehabilitation needed to Sluice elements; remaining superstructure lifetime at least 20 years	AND	Sluice can perform functions adequately for approx. 20-25 years (after rehabilitation)	< ~60%
3	Moderate risk* or less	Superstructure has a short remaining lifetime (< ~15 years)	OR	Sluice does not/cannot perform functions adequately (e.g., due to substantial land use changes or rapid ongoing urbanization)	100%
Not eligible	Substantial / High Risk	N/A		N/A	N/A

\* The following characteristics must be satisfied according to Revised ES Directive issued October 26, 2023: The potential adverse risks and impacts on human populations and/or the environment are not likely to be significant. This is because the Project is not complex and/or large, does not involve activities that have a high potential for harming people or the environment, and is located away from environmentally or socially sensitive areas; impacts are predictable and expected to be temporary and/or reversible; low in magnitude; site-specific, without likelihood of impacts beyond the actual footprint of the Project; and low probability of serious adverse effects to human health and/or the environment (e.g., do not involve use or disposal of toxic materials, routine safety precautions are expected to be sufficient to prevent accidents); the Project's risks and impacts can be easily mitigated in a predictable manner.

Table 1. Categorization of Eligible Sluices

(a) *Sub-component 1.1 Repairs to existing sluices.* Category 1 drainage sluices are defined as needing repairs, within the existing footprint, with relatively small costs (e.g., less than 15 percent of full replacement). Repairs





could include, for instance, a portion of the revetment surrounding the inlet/outlet channel to prevent progressive soil erosion/embankment instability, or replacement of the pulley system to lift the sluice doors. While small, these repairs are critical in that they enable the drainage functionality and/or safe operation of the sluice under current conditions. The condition of the main elements (main structure, doors, etc.) should be such that the remaining lifetime of the sluice can be extended via repairs for at least 10 years.

- (b) *Sub-component 1.2 Rehabilitation or replacement of drainage infrastructure.* This sub-component will finance *in situ* rehabilitation (Category 2) and complete replacement (Category 3) of sluices, requiring more detailed field investigation and studies (including the impacts of climate change) prior to design (Figure 4). Category 2 sluices would need significant rehabilitation, but not complete replacement as the main structure has sufficient design life (at least 20 years) and the functionality (i.e., drainage capacity) remains adequate for the relevant catchment area and land use. Interventions may include the replacement of entire revetments/retaining walls or new sluice doors. Combinations of interventions may also be considered, although the total cost should not exceed a threshold (provisionally, 60% of full replacement). Should total rehabilitation costs exceed this threshold, complete replacement of the sluice (Category 3) would be considered to ensure cost-effectiveness, particularly with respect to design life and adapting to longer-term climate impacts. Category 3 structures would need to be completely replaced because: (i) the main structure can no longer be rehabilitated, (ii) the required functionality has changed significantly (e.g., due to urbanization of agricultural land), (iii) persistent overtopping by ocean waves requires vertical extension of the structure to better protect against sea-level rise, or (iv) coastal erosion has shifted the coastline inland and a sluice would be better protected and more functional farther inland. The footprint of the drainage structures will not be increased. For Category 3, the project will also trial the automation of a limited number of sluices (and associated pumps) for better monitoring and operation. Sites will be selected to minimize E&S impacts (low to moderate). New drainage and/or flood management works that replace existing structures will not be located on the Essequibo or Corentyne rivers, their tributaries, or connected canals. Proposed weighted criteria for prioritization under this sub-component are shown in Annex 2.

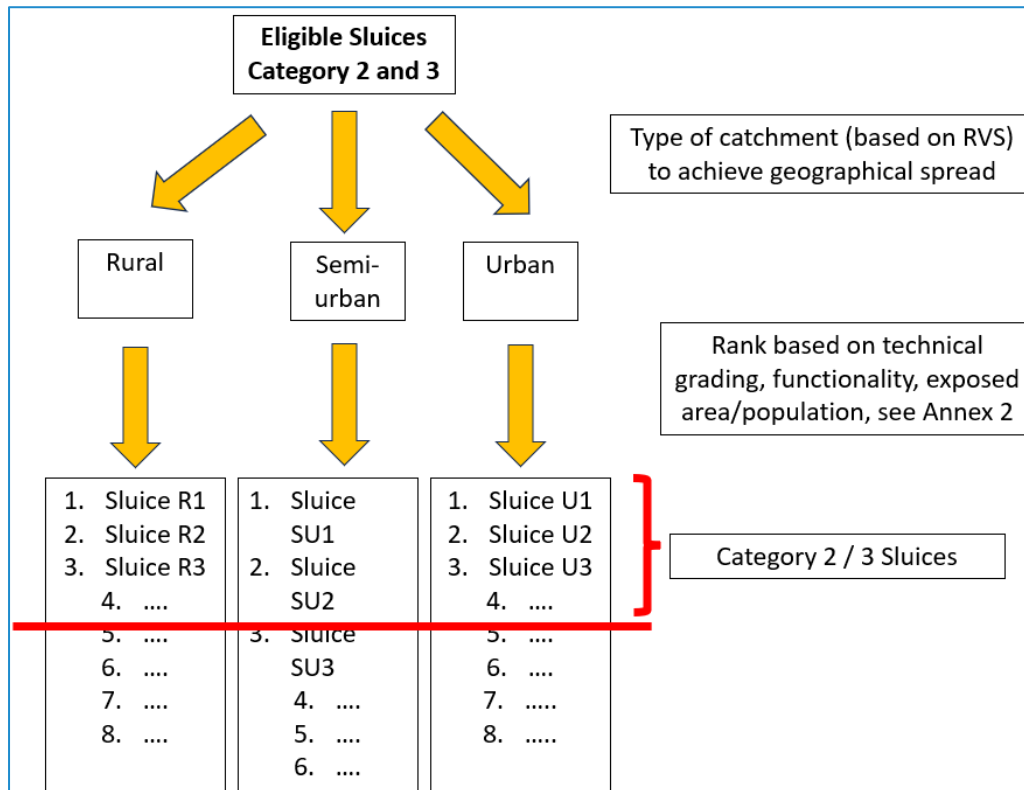


Figure 4. Category 2 and 3 sluice prioritization

(c) *Sub-component 1.3 Design and Construction Supervision.* Consulting services for condition assessments, geotechnical/site investigations, feasibility studies, climate-informed detailed engineering designs, E&S assessments, procurement support, and construction supervision for Sub-component 1.1 and 1.2 activities will be financed under this sub-component. For Category 3 sluices, a detailed assessment of alternatives and additional climatological/hydrological/hydraulic analysis will be conducted to define the functional requirements and design approaches for climate adaptation.

**Component 2: Improving flood management and drainage operations (~US\$ 2.5 million)**

19. This component will finance non-structural measures to strengthen the capacity of the MoA to manage and efficiently operate the drainage system, and thus reduce flood risk and support climate adaptation. This includes providing support for: (i) developing and upgrading the NDIA’s asset management system and protocols/procedures, and the associated training; (ii) developing, updating, and harmonizing technical standards and guidelines for flood risk management in new urban developments; and (iii) guidelines, protocols, and training to build NDIA’s and relevant agencies’ personnel capacity to operate and maintain the drainage system.

(a) *Asset management system and capacity building.* Although NDIA has an existing asset management system and procedures (e.g., annual inspection reports), further modernization and training are required to better monitor current investments and plan for future needs (including climate change impacts and regular maintenance). This activity will therefore upgrade (potentially including the development of a management information system (MIS) database) and ensure that the asset management system is fit-for-purpose, and allows easier and more regular data collection, data storage and back-up systems, better data-sharing, and use of climate hazard and risk information for investment planning.



- (b) *Guidelines for improving flood management in new urban developments.* Following economic growth in the country due to O&G revenue, urbanization is occurring at a rapid pace in the coastal plains, converting agricultural land into new housing developments or commercial/industrial areas. Improvements in spatial planning and enforcement of guidelines to ensure sufficient space for both retention and drainage (including nature-based solutions) will be essential to ensure that the future costs of drainage interventions will not be excessive. This activity will therefore develop technical standards and guidelines for policymakers and developers on implementing flood risk management solutions (considering climate change impacts) in new urban development.
- (c) *Training and capacity building for drainage operators.* This activity will develop guidance for optimizing the protocols for operation (manual or automated opening and closing) of drainage sluices under different hydrological conditions (e.g., in advance of a rainstorm to create more retention). Improved protocols for combined sluice-pump operation, and the associated training, will also be financed. This training is particularly needed as it is expected that, to a limited extent, automatic operation of sluices will be introduced through this project. The introduction of such automation will require the retraining of operators.

### **Component 3: Project management (~US\$ 2.5 million)**

- 20. This component will finance specialist consulting services, goods, and equipment for the Project Implementation Unit (PIU) to effectively manage key functions, including planning, coordination, financial management (FM), procurement, and E&S throughout the implementation period. Specifically, this component will enable the PIU to provide technical and operational support for: (i) project management and coordination, including financial management and disbursement, procurement, contract administration, E&S risk and impact management, grievance redress mechanisms, training, and monitoring, reporting and evaluation; (ii) carrying out citizen engagement and social awareness activities; and (iii) incremental project operating costs.

### **C. Project Beneficiaries**

- 21. The estimated project beneficiaries are as follows:
  - (a) Under Component 1, approximately 45 drainage structures will be structurally and functionally repaired/rehabilitated/upgraded, serving an estimated population of 320,000, and protecting approximately 130 sq. km. of urbanized area and 1270 sq. km. of agricultural land in the connected catchments.
  - (b) Under Component 2, the investments will enhance NDIA's capacity and capability to better manage and operate their drainage infrastructure assets and to better include flood risk management principles in spatial planning of new developments. Direct beneficiaries under Component 2 include approximately 100 staff at national and regional levels from NDIA and other agencies (e.g., GuySuCo, Regional Democratic Councils) who will participate in the capacity building and training activities to better operate and maintain the drainage infrastructure.



### D. Results Chain

#### Theory of Change

**Problem Statement:** Flooding is causing significant damage to public/private assets and agriculture, as well as harm to residents in the coastal areas of Guyana, with commensurate disruptions and economic loss.

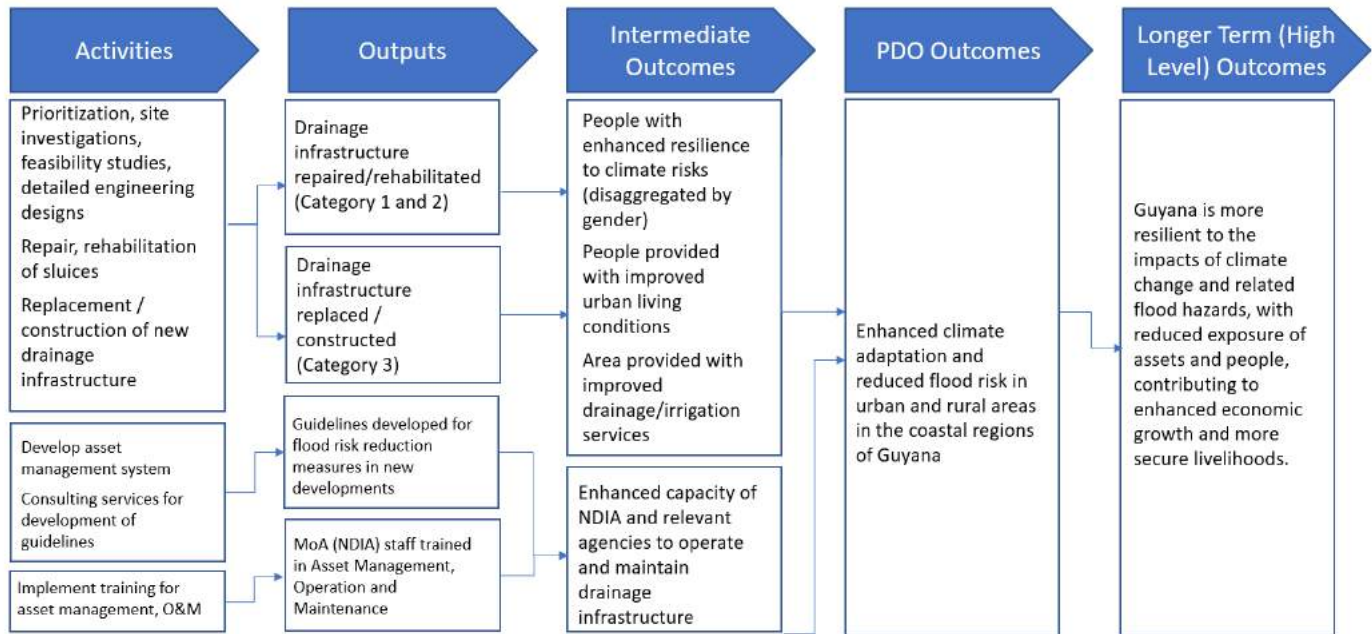


Figure 5. Project Theory Of Change

Critical assumptions are:

- Adequate operation and maintenance (O&M) budget is allocated by the relevant agencies to maintain investments in drainage infrastructure.
- NDIA provides ongoing support to sustain timely and adequate training for asset management and O&M.

### E. Rationale for Bank Involvement and Role of Partners

22. The GoG currently bears the contingent liability for the impacts of flooding, at high direct and indirect costs (e.g., business interruption). Increasing the country’s resilience to flooding and strengthening institutional capabilities to manage risks is an effective and efficient use of public funds. Public financing will help strengthen and rehabilitate infrastructure that is crucial to improve the economic and social welfare of the population in the coastal plains of Guyana. As owner and operator of the drainage infrastructure, the government is responsible for the safety of the population in the respective catchments. Given the nature of the operation’s support to repair, rehabilitate, and replace public assets and enhance NDIA’s capabilities in flood management, public sector financing is the most appropriate intervention.
23. The World Bank has supported the GoG in the area of climate adaptation and flood risk management since the Conservancy Adaptation Project (approved in 2007). Investments in the East Demerara Water Conservancy and East Coast are being implemented under the Guyana Flood Risk Management Project (P147350), focusing on Region 4. In parallel, Bank-executed trust funds have been mobilized to provide targeted technical support to the MoA and relevant agencies in the development of a flood investment strategy for Greater Georgetown. Furthermore, the World Bank has experience in more than 55 countries supporting national governments in the reduction of disaster and climate risks, with lessons learnt and approaches refined through experiences gained in the last two decades.



The Bank can share good practices in flood management and institutional strengthening from similar projects, covering rehabilitation of drainage infrastructure in neighboring countries (e.g., Suriname), and flood risk management in Africa and Asia (e.g., Tanzania, the Philippines, Sri Lanka, Bangladesh, Vietnam). The Bank will provide in-depth technical support during implementation on: (i) selection and prioritization of flood management investments, (ii) ensuring climate risk-informed designs, (iii) consideration of the impacts of rapid urbanization, and (iv) an appropriate balance of structural and nonstructural measures, including asset management and O&M.

24. In terms of nature-based solutions for flood risk management, the protection, sustainable management and restoration of mangroves has been articulated in the LCDS 2030 and the GoG's National Mangrove Action Plan, and the GoG has invested US\$2.3 million over the past 3 years in several mangrove restoration projects across the coastline, with the European Union (EU) delegation being the main partner. Given the GoG's active involvement on this topic and engagement of the EU, the Project will seek complementarity and opportunities for consideration of nature-based solutions under Component 2.

#### F. Lessons Learned and Reflected in the Project Design

25. **The project design reflects lessons from previous operations (including Implementation Completion and Results reports, IEG evaluations), analytical work, and international good practice.** It incorporates lessons learned from flood risk management investments in Georgetown, Guyana; Metro Colombo, Sri Lanka; and Dar es Salaam, Tanzania, Bangladesh, among others. Repair/rehabilitation of gravity-based drainage sluices is often a component of flood risk management projects since this type of drainage structure was commonly built in the past century as part of flood protection infrastructure systems in low-lying areas globally.
26. **Previous projects have shown that it is beneficial to package consulting services into one contract** to maximize efficiency during implementation and leverage lessons learned and innovations during project design and implementation. The choice of consulting firm is critical in this process, and successful projects using international firms normally include local counterparts. In this case, it is envisioned that one main consulting service contract will be issued for detailed design and construction supervision services.
27. **Many flood risk management projects focus only on infrastructure; however, infrastructure alone is insufficient to reduce risk and adapt to climate change in a sustainable manner.** Global experience with similar infrastructure projects shows that detailed attention to O&M during design and construction phases is essential to maximize sustainability of the capital investments and reduce the risk of a "build-neglect-repair" cycle. Hence, the Project includes a component to address various non-structural measures to improve: (i) asset management including improved IT systems and a detailed assessment of funding and human capacity for the O&M phase, (ii) implementation of standards and guidelines for new land use developments, and (iii) training and capacity building for optimizing the operation of the drainage system.
28. **Good communication and stakeholder engagement are crucial for disaster risk management.** Coordination and communication between relevant Government bodies is essential for ensuring that the planned works are carried out in a timely and efficient manner (for instance, between NDIA and the Ministry of Public Works (in charge of transport infrastructure) or the Maritime Administration Department (for coastal protection), etc.). The PIU have experience of managing similar projects and will ensure relevant agencies are kept informed through regular channels. Likewise, public awareness of the Project activities and transparency can lead to strong public support and can contribute to smooth working relations amongst the Government ministries, development partners, communities and other stakeholders. Consultations will be held with local communities to manage expectations and inform of project activities and timelines, as set forth in the Stakeholder Engagement Plan (SEP). Consultations under the SEP will focus on explaining the project, its impact and mitigating measures, and the Grievance Redress Mechanism (GRM), and will pose opportunities for stakeholders to raise concerns.



### III. IMPLEMENTATION ARRANGEMENTS

#### A. Institutional and Implementation Arrangements

29. The Ministry of Agriculture will be the Implementing Agency (IA) for the project, with overall responsibility for reporting on fiduciary matters and project progress to the Office of the President, Ministry of Finance, the GRIF Secretariat, and the World Bank (Figure 6). The MoA (particularly its Agriculture Sector Development Unit, ASDU, which implements major donor-financed capital projects) has been satisfactorily applying the World Bank’s Procurement Regulations for IPF Borrowers dated July 1, 2016 (revised in November 2017, July 2018, and November 2020). The MoA will carry out: (i) monitoring, coordination, and supervision of project activities; and (ii) fiduciary, procurement, E&S, and administrative aspects of the project. The NDIA will provide technical oversight of the activities and will take over O&M of the drainage infrastructure. In cases where the works will affect or require upgrading of sea defenses that are integral to the drainage infrastructure, the Ministry of Public Works, the Maritime Administration Department (MARAD), or other relevant agencies will provide technical oversight, including construction design approval. The MoA (through ASDU) is the IA of the ongoing Guyana Flood Risk Management Project (P147250), has performed satisfactorily in carrying out similar activities, and has been consistently compliant with all E&S, FM, procurement, and project management requirements.

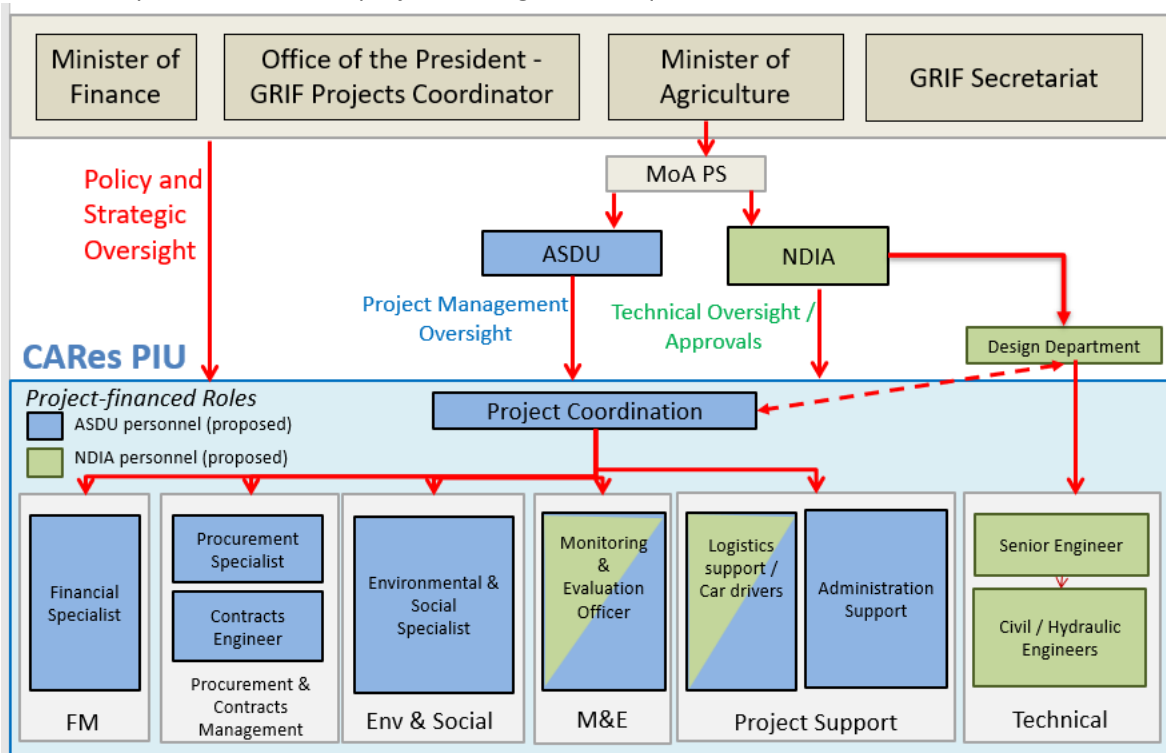


Figure 6. Institutional and Implementation Arrangements

#### B. Results Monitoring and Evaluation Arrangements

30. The PIU will have overall responsibility for monitoring and evaluation of the Project and report to the World Bank on the Project’s performance indicators, progress and execution, quality control, and environmental and social risk management. Project monitoring will be undertaken by the PIU as part of their daily activities and maintenance of records, including quarterly financial reporting, semi-annual progress reporting, and facilitation of annual audits.



31. The GoG's monitoring and evaluation capacity for this sector is high, given the relevant MoA history of engagement with the sector and donor-financed projects, and due to the institutional strengthening ongoing under the Flood Risk Management Project. The indicators specific to the Project are objective and measurable.
32. As Partner Entity under the GRIF framework, the World Bank will comply with reporting requirements set out in the GRIF Administration Agreement, i.e., to report annually to the GRIF Steering Committee (through the Secretariat) on: (i) the progress of implementation of its activities and results achieved compared to planned results, (ii) its contribution to the achievement of the planned results of the GRIF, and (iii) the financial status of Project activities under its responsibility. The World Bank will provide the Steering Committee with a final report within six months of the Project's completion date.

### C. Sustainability

33. The Project's use of a transparent, risk-informed decision-making process for Component 1 will promote scalability and sustainability. Instead of a case-by-case approach, this portfolio approach ensures that the resilience of beneficiaries is maximized for the project Regions, within available resources. Furthermore, Component 1 will contribute to establishing a prioritization framework that could be adapted for future rehabilitation interventions in other Regions of Guyana. Overall, the experience from the Project will assist the GoG with a stronger and more transparent technical and operational platform through which to leverage further investments.
34. Long-term sustainability of Project interventions will require: (i) ensuring infrastructure maintenance by the NDIA, and (ii) adequate planning and budget for continuous capacity building programs related to operation and maintenance – both of which will be supported through Component 2.

## IV. PROJECT APPRAISAL SUMMARY

### A. Technical and Economic Analysis

#### Technical analysis

35. **The proposed investments in flood risk management infrastructure build on earlier studies and detailed technical surveys developed by the GoG, with support from the World Bank.** The NDIA's annual asset survey reports substantiate the need for rehabilitation/upgrading of the drainage sluices. These surveys provide detailed characteristics of each individual sluice, and the elements that need repair. In addition, during Project preparation, a Rapid Visual Screening was conducted to complement the annual survey reports, and provide the information necessary to implement the prioritization process. The recent Bank-executed technical assistance (Green, Resilient, and Inclusive Flood Investment Baseline for the Georgetown Metropolitan Area, TF0B3454) has also provided a detailed hydrological and hydraulic analysis of the entire flood management system. One of the key findings of this analysis is that rehabilitation of the sluices are clear no-regret interventions, as they are essential infrastructure elements in the drainage system. Malfunctioning of these sluices significantly exacerbates flood risk, since they are the only outlets to drain a rainfall event and prevent flooding from the hinterland. The Flood Investment Baseline study has highlighted that these sluices remain functional to drain rainfall to the sea, despite predicted sea level rise.
36. **Sluices can fail in a number of ways:** (i) doors could be broken (stuck open or closed, contributing to flood risk) or damaged (potentially allowing salt water contamination of freshwater inland systems), (ii) lifting mechanisms could fail (requiring heaving machinery to operate them, causing delays), (iii) the superstructure could fail (meaning that any operation could lead to total collapse of the unit), (iv) the revetments may be unstable or siltation of the channel inlet/outlet could increase erosion and flood risk due to reduced channel capacity (also affecting fisherfolk who cannot bring their boats to land), or (v) the catwalk, stairs or other associated elements need repair (creating unsafe conditions for operators and the public). Where inland sluices have failed, temporary repairs could be prone to



sudden failure. Finally, due to changing environmental conditions, some sluices may no longer be fit for purpose (e.g., too low for rising sea levels, or need increased capacity due to urbanization).

37. **The Project will improve the reliability of drainage and improve flood protection in the low coastal plain of Guyana.** The total drainage area of the sluices identified for rehabilitation/reconstruction under this project is approximately 2000 sq.km. Most of this area lies within the so-called Low Coastal Plain of Guyana, the narrow belt of low-lying land bordering the Atlantic Ocean. Although this area is relatively small, the catchments of these drainage sluices are home to more than 40 percent of the entire population of Guyana (320,000). Moreover, the majority of this area (1200 sq.km) is agricultural comprising 30 percent of the total arable land in the country (4200 sq.km). Agricultural activities depend, amongst other things, on good management of the water levels for irrigation. The drainage sluices provide a triple function in that they drain excess rainfall, prevent salt water from the ocean and tidal rivers from intruding into fertile lands, and provide water for irrigation.
38. **The project will support Guyana to adapt to climate change and make the country more climate resilient and thus generate climate co-benefits.** The repair and rehabilitation of sluices provides an opportunity to directly lower current and anticipated vulnerabilities posed by climate change. Climate change adaptation considerations are explicitly integrated in all activities of the project, which will contribute significantly to climate co-benefits. Rehabilitating the drainage sluices based on well-informed future rainfall projections will make the infrastructure more resilient to increasingly extreme rainfall events. In addition, adaptation of the structures to prevent (future) flooding as a consequence of strong waves, increased sea levels along the coast, or elevated river levels will make the infrastructure more resilient to sea level rise. Activities such as strengthening the asset management system and O&M of the structures will also critically and directly contribute to improving resilience and achieving adaptation to climate change. The GoG will thus be better positioned to manage existing and future flood events.
39. **Paris Alignment Assessment: the operation is aligned<sup>13</sup> with the goals of the Paris Agreement on both mitigation and adaptation.** In terms of assessment and reduction of adaptation risks, climate change and disaster risks have been identified as pluvial and coastal flooding. The investments financed under this project aim to: (i) increase community resilience against flood risk by repairing, rehabilitating or reconstructing critical drainage infrastructure to withstand climate hazards, and (ii) strengthen the institutional capacity to manage flood risk and climate events. Building climate resilience through enhancing climate adaptation and reducing flood risk is embedded into the Project design and operation so that physical climate risks are reduced to an acceptable level. The Project takes into consideration the climate change and disaster risks (mentioned above) that threaten the outcomes and has incorporated the following measures to strengthen the capacity of project beneficiaries to better reduce or manage the aforementioned risks.
40. **Assessment and reduction of adaptation risks:**
- (a) **Component 1:** The structural activities financed under this component aim to decrease the vulnerability of exposed populations to coastal and pluvial flood risk by improving drainage infrastructure, and are specifically intended to address climate risks and increase resilience. The design of investments will be informed by climate and disaster risk information, i.e., for Category 1 and 2 sluices, rehabilitation will match or enhance existing climate change design standards. Where Category 3 sluices are reconstructed, new designs will consider existing and future land uses, population growth and urbanization, exposed assets and relevant climate change impacts, as well as options to incorporate nature-based solutions to support resilient climate change adaptation.
  - (b) **Component 2:** The non-structural measures financed under this component, including asset management system improvements, guidelines for improving flood management in new developments, and training and

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<sup>13</sup> Flood management and protection, coastal protection, urban drainage are on the PA Universally Aligned list, and the physical works will not include expansion of asset footprints.





capacity building have no direct exposure and are designed to help strengthen flood management operations and good practice; therefore, the risks from climate hazards are not likely to have a material impact on these activities. All activities contribute towards flood risk reduction, therefore there is low overall inherent risk from climate hazards on the operation.

41. **Assessment and reduction of mitigation risks:** The project does not pose a risk to Guyana’s transition to a low-carbon development pathway (as articulated in the LCDS) and will likely have a positive contribution by financing interventions that are considered universally aligned with the Paris Agreement or that are not expected to result in significant increases in GHG emissions.

- (a) **Component 1** will finance the repair, rehabilitation (Category 1 and 2), or reconstruction (Category 3) of infrastructure for pluvial flooding and coastal flood management protection. Category 1 and 2 works will not have any capacity increases, which is universally aligned. For Category 3 works, some sluices may need to be repositioned farther inland to better enhance flood protection. However, no extension of the asset footprint is envisioned, and any reconstruction will remain within the boundaries of the existing canal and margins. The works will not expand nor promote expansion into areas of high carbon stocks or high biodiversity areas, lead to significant conversion of natural habitat, nor will involve land use change that is likely to reduce carbon stocks.
- (b) The infrastructure works undertaken by the Project to reduce risk do not have technically feasible alternatives that can deliver the same development objectives with lower GHG emissions. During the works, small amounts of GHG emissions are expected but these are temporary and time bound. Once rehabilitated/reconstructed, sluices are operated manually with no impact on GHG emissions. However, for one or two reconstructed Category 3 sluices, the Project aims to investigate and trial the use of fully automated systems for better operation (raising or lowering of the sluice gate according to specific water level triggers or rules) and monitoring of water levels, to enhance flood management capabilities, build resilience, and for use within possible future flood-forecasting systems. Most power use would be for raising and lowering the sluice doors twice a day in line with the rainfall or tidal conditions, with a small amount of power needed for sensors and communication devices. Power can be supplied through the local electricity network and would not lock in carbon-intensive patterns if green energy is supplied in the future. In addition, this Project will seek to trial the use of clean energy solutions such as wind for operation, monitoring and communication to power the system fully or partially, where possible. The Project will also seek opportunities to reduce GHG emissions through the incorporation of nature-based solutions to enhance climate adaptation and reduce flood risk where feasible and ensure all new infrastructure designs consider potential future technical, environmental and social conditions. The Project is therefore still economically viable after accounting for transition risk.
- (c) **Component 2** deals with non-structural project components that are universally aligned including: (i) improvements to the drainage and flood risk infrastructure asset management system (information and digital technologies); (ii) guidelines for improving flood management in new urban developments; and (iii) training and capacity building for flood-drainage operators (flood management and protection, urban drainage). The Project therefore has a low risk of locking in carbon-intensive patterns as GHG emissions are low, and the transition risk to the operation’s economic viability is therefore also low.

## Economic Analysis

42. **The project will have a positive impact on economic development in the low-lying plains of Guyana bordering the tidal rivers and the Atlantic Ocean.** The development impact of this project can broadly be classified according to



the World Bank’s Triple Dividend of Resilience Framework,<sup>14</sup> namely: (i) avoided losses, (ii) unlocked development potential arising from stimulated innovation and bolstered economic activity in a context of reduced disaster-related background risk for investment, and (iii) enhanced synergies of the social, environment and economic co-benefits of disaster risk management investments (even if a disaster does not take place for many years). Without proper functionality of the key elements of the drainage system, Guyana’s coastal areas will face increased flooding and resulting damage/losses (first dividend). Rehabilitation and replacement of existing structures also provide the opportunity to ensure that they are appropriate for changing climatic and socio-economic conditions. The second dividend from these investments is the unlocking of short- and long-term economic potential of flood-prone regions in urban and rural areas by providing a higher sense of baseline safety and resilience. This is likely to have a positive impact on private sector investment and further economic growth. The third dividend is that the investments may generate important livelihood co-benefits (e.g., agriculture, anchorage/landing spots for local fisherfolk).

- 43. **The quantitative economic analysis focused primarily on the first dividend, i.e., avoided losses related to Component 1.** A cost-benefit analysis has been carried out to measure the benefits and the net impact on the economic development in the catchments under consideration. The analysis compared with-project and without-project scenarios. The flow of costs and benefits was discounted for a period of 20 years at a 6 percent discount rate. The primary sources of information were the Flood Investment Baseline study for the Georgetown Metropolitan Area, local data provided by NDIA on agricultural production values and asset values in the area of interest, and lessons learned from relevant disaster risk reduction projects supported by the World Bank globally.
- 44. **The results of the economic analysis (Annex 3) show that the project would generate benefits of about US\$108 million, which is approximately twice the estimated cost.** The net benefit is expected to be US\$54 million, with an economic rate of return of 20 percent for the entire project (Table 2). There is some spatial variation, but for all regions under consideration the project shows net benefits and an economic rate of return well above the hurdle rate. The sensitivity analysis of potential adverse effects such as higher capital costs, lower benefits or a lower probability of failure of the existing drainage sluices would lower these numbers, but the project remains economically viable. Furthermore, the results are conservative, as the analysis did not quantify additional project benefits that cannot easily be monetized, such as indirect benefits associated with agricultural production, improved public health, and improved living conditions.

Table 2. Summary of Cost-Benefit Analysis

Component 1: Improving drainage infrastructure			
Area	Economic Internal Rate of Return (EIRR), %	Net Present Value (NPV), US\$ million	Benefit/Cost ratio (BCR) (-)
Region 3	16%	8	1.8
Region 4	23%	32	2.3
Region 5	29%	11	2.8
Region 6	11%	4	1.4
Total	20%	54	2.0

- 45. A sensitivity analysis was applied to the base case model to determine the value of relevant variables that would result in the Project exactly breaking even (i.e., NPV = 0, IRR = 6%). The variables tested are: (i) increase in costs, (ii) reduction in avoided damages, and (iii) overestimation of current failure probability.

<sup>14</sup> <https://www.gfdrr.org/sites/default/files/publication/The Triple Dividend of Resilience.pdf>



**Table 3.** Summary of Sensitivity Analysis

	Base scenario	Sensitivity	Change (%)
Cost overrun (million US\$)	53	108	104%
Lower damages (million US\$)	108	53	-51%
Lower failure probability (%)	10	4.5	-55%
Lower area flooded (%)	See Annex 3, Table 2 for different return periods		-50%
Lower flood depths (m)	See Annex 3, Table 2 for different return periods		-30%
Shorter lifetime (yrs.)	20	6	-70%

**Corporate Commitments**

- 46. **Gender.** Gender gaps persist in representation in planning processes for infrastructure design and investments. Women’s voice and participation in community consultations are limited, with women rarely having roles in decision-making and technical matters. This results in lack of consideration of gender-sensitive needs in design. In community consultations, women may hesitate to raise issues such as gender dimensions of flooding and water use, which may be overshadowed by apparently more complex technical matters. Flooding often disproportionately affects women, children, and the elderly. Female-headed households face greater challenges after flood events, and are more vulnerable to impacts on food security and income. The proposed Project will specifically integrate gender issues in planning, implementation, and M&E. Opportunities will be sought for the active participation of women in the identification and management of structural and nonstructural investments to protect against floods in urban areas and agricultural lands. To directly encourage gender-sensitive considerations in design, gender specific criteria in the Terms of Reference for consultants developing technical designs will include: (i) raising awareness of contractors on gender-sensitive employment practices and the prevention of gender-based violence in their workforce; and (ii) encouraging the active participation of women in planning, identifying and managing investments. In order to create an enabling environment for women’s participation, the project will support gender equality in all events involving the beneficiary communities during project implementation, in particular in the execution of civil works. Actions to increase female participation in technical training and community consultations will include conducting community consultations and training sessions separately between female and male groups, with female facilitators, to help women feel more comfortable.
- 47. **Climate co-benefits.** The Project aims to help Guyana adapt to climate change impacts — both sea level rise and increases in rainfall intensity and duration — by reducing the risk of coastal and pluvial flooding in the low-lying coastal areas. The Project will rehabilitate, replace (where needed), and ensure that flood management infrastructure are fit-for-purpose in light of the country’s risk profile and climate change projections. The Project also aims to improve flood management by strengthening institutional capacity for asset management and O&M of drainage infrastructure.
- 48. **Citizen engagement** will be measured through relevant indicators in the Results Framework and a satisfaction survey before and after key project activities are implemented. Community and stakeholder consultations will be undertaken: (i) during design, with beneficiary feedback to be used for design modifications; (ii) during implementation, where the feedback is used for quality enhancement; and (iii) through a grievance redress mechanism.

**B. Fiduciary**

**(i) Financial Management**

- 49. The financial management (FM) responsibilities under the Project will be undertaken by the MoA through the ASDU, which has considerable experience in implementing the Guyana Flood Risk Management Project (FRMP), the FM



performance of which is currently rated Satisfactory. The FM arrangements of the FRMP (for planning and budgeting, funds flow, disbursements, accounting, reporting, internal controls, and external auditing) are expected to be utilized for the CAREs Project. Under this Project, the ASDU will be submitting quarterly interim unaudited financial reports (IFRs) to the World Bank 45 days after the end of each quarter, to account for the project expenditures. The MoA will open a USD currency denominated Designated Account (DA) at the Bank of Guyana, into which the World Bank will disburse the Advances to the project. Using the IFRs, the project will document the DA expenditures in the World Bank Client Connection System, at least quarterly. Other disbursement methods to be available to the project include Reimbursement, Direct Payment, and Special Commitment. The disbursement methods will be included in the Disbursement and Financial Information Letter (DFIL) and be issued to the GoG upon project Effectiveness. The DA expenditures and the project activities will be audited by the external auditors, on annual basis, and the annual audited financial statements will be submitted to the World Bank, within 6 months after the fiscal year to which the audited accounts relate.

50. Although the FRMP is performing well, some residual risk remains for the CAREs project. These include: (i) the risk of the funds not accounted for due to a possible delay in appointing the project accountant, (ii) the risk of ineligible expenditures due to delays in the approval of the annual work plan and budget (AWPB), and unauthorized expenditures being paid from the project funds, and (iii) the risk of DA expenditures not audited due to delays in preparing the financial statements, or due to potential delays in appointing the external auditors. As mitigation measures for the CAREs Project, the MoA will: (i) utilize the current FM arrangements and project accountant under the FRMP, (ii) submit the AWPB to the Bank for approval, sixty days before the beginning of the ensuing Fiscal Year to which the budget relates, and (iii) within 4 months after Effectiveness, the Audit Office of Guyana will be appointed as the auditor of the project, based on Terms of Reference acceptable to the Bank, and (iv) the IFRs and the audited accounts will be submitted to the Bank in line with the Financing Agreement of the project. The FM arrangements and the risk mitigation measures are adequate to provide, with reasonable assurance, accurate and timely financial information of the Project. The agreed FM arrangements for the project will be updated in the FRMP's Project Operations Manual (POM) and be adopted under the CAREs project. The FM arrangements satisfy the Bank's minimum FM requirements under OP/BP10.00. Based on the identified risks and the mitigation measures, the FM risk is assessed as Substantial.

**(ii) Procurement**

51. The ASDU will be responsible for managing procurement for the Project, with specialist positions (including procurement, engineering, and technical) shown in Section III.A (Institutional and Implementation Arrangements) to be hired to provide technical assistance in the process of procurement and contract management. Under this Project, ASDU will include a qualified procurement specialist with experience in World Bank procurement procedures and/or equivalent international-donor procurement experience. The Bank will provide training on procurement and on-the-job training for procurement and other MoA staff involved in the procurement process. Similar to FM, the POM will specify procurement implementation arrangements building on those used under FRMP, including detailed steps and the respective stakeholders' responsibilities in the procurement process.
52. *Applicable Procurement Framework.* All procurement of goods, works, non-consulting services and consulting services under the Project shall be carried out in accordance with the "World Bank Procurement Regulations for IPF Borrowers" fifth edition, September 2023 ("Procurement Regulations") and the provisions of the Grant Agreement. The World Bank's Anticorruption Guidelines dated October 15, 2006 (revised January 2011 and July 1, 2016) shall also be observed and applied. The project will use the Systematic Tracking of Exchanges in Procurement (STEP) to plan, record and track procurement transactions, and complaints. The PIU shall input all procurement and contract details and documents into the STEP system. This information will be utilized to create a comprehensive compilation of all contracts financed by the project.



53. *Summary of Project Procurement Strategy for Development (PPSD) and Procurement Plan (PP)*. The PPSD has been developed by MoA, and it identifies the appropriate procurement approaches under the Project. Based on the PPSD findings, the MoA has prepared a PP for the entire project implementation period. The PPSD and PP will be updated, as required, during project implementation to reflect and justify any substantial changes in procurement approaches and methods to meet the actual implementation needs, market fluctuations, and improvements in institutional capacity. The updated PP will be subject to the Bank’s prior review and approval. The PPSD includes detailed assessments of the markets for goods, works, and services required for project implementation, procurement approaches, and procurement risk analysis, along with corresponding proposed risk mitigation measures. Prior review contracts will be determined based on the Procurement risk rating for the Project. In terms of project oversight, contracts subject to post review will be reviewed by the World Bank once a year.
54. **Procurement risk.** Overall, the procurement risk is rated substantial, due to the growing number of infrastructure projects in the country, which may result in reduced competition for contracts under this Project. This is compounded by challenges such as procurement timelines, and potential capacity constraints, particularly if assigned procurement staff lack experience with the Bank’s rules and procedures. There is a sufficient number of qualified engineering firms and contractors in this technical domain working in Guyana, including those from the region (and internationally, in the case of the envisioned consulting services). As described in Section III.A, ASDU will be staffed with a dedicated procurement specialist with experience in World Bank Procurement Regulations. A Construction Supervision firm will be contracted to support the PIU in procurement and the contract management process. To further mitigate identified risks, the PIU will benefit from close support from the World Bank through prior review of main contracts and will only use standard Bank documents and contract templates for procurement. The World Bank will also carry out procurement support missions on a semiannual basis. The risk rating will be adjusted periodically during project implementation based on the implementing agency’s performance.

**C. Legal Operational Policies**

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

**D. Environmental and Social**

The Environmental and Social Risk Classification of the Project is Moderate. The activities of the Project are expected to contribute to positive environmental and social outcomes by financing structural and nonstructural measures to improve the resilience against flooding and enhance climate adaptation in urban, semi-urban, and rural areas in Guyana, enhance resilience against flooding, and improve local drainage and irrigation.

The Project's Environmental risk rating is Moderate. The key environmental risks are risks to air, water, soil, and noise pollution; if not properly done, increased local-level water logging; generation and disposal of waste; and during construction stage risks such as occupational health and safety (OHS). These risks are likely to be temporary, predictable, reversible, located away from environmentally or socially sensitive areas, and can be managed through routine measures and known technologies.



The Project's social risk rating is Moderate. Social risks are related to safety and health at work; low-moderate risk of labor influx; possible disruptions when works are ongoing that could affect community safety (increased traffic, noise, etc.); weak capacity of contractors to manage environmental and social risks and impacts, and low SEASH risks and impacts. At this stage, there are no identified risks of exclusion of vulnerable groups from the benefits of the Project.

To avoid, minimize or mitigate the identified E&S risks and impacts; the project will develop mitigation measures Prior to appraisal, the Borrower will have prepared, consulted, and disclosed: (i) a draft Stakeholder Engagement Plan (SEP) with its Grievance Mechanism (GM); (ii) draft terms of reference (ToRs) for the E&S assessments/ESMPs for Component 1 activities; and (iii) a draft Environmental and Social Commitment Plan (ESCP). The ESCP will be finalized during negotiations. The outcome of the E&S assessments will be considered in the design and implementation of project activities, and no activities will commence before the appropriate assessments and mitigation measures are in place. Also, consultations will be carried throughout the life of the Project with vulnerable groups - women, local communities, persons with disabilities, at-risk youth, groups vulnerable to disasters due to their geographical location, etc., to ensure that their concerns are considered into the design phase and construction of the work. The ESRC will be reviewed regularly during preparation and implementation to reflect the project's risk level.

## V. GRIEVANCE REDRESS SERVICES

**Grievance Redress.** 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

The Overall Risk is rated Moderate, based on Low risk for all categories except Substantial fiduciary risk (as described in Section IV.B), and Moderate E&S risk. The risk related to Institutional Capacity for Implementation and Sustainability is rated Substantial, as the World Bank's Trusteeship of the GRIF will only be in place until the end of calendar year 2026. The pressure this would place on the Project implementation period will be mitigated by: (i) developing an appropriate project scope focusing on rehabilitation/replacement of existing drainage structures, as these are technically relatively straightforward, (ii) balancing the Categories of interventions and component activities to enable completion by December 2026, (iii) selection of sluices with low to moderate E&S risks, (iv) utilizing the existing MoA PIU with experience implementing similar projects financed by the World Bank and other development partners, and (v) utilizing the existing Project Operations Manual for the Flood Risk Management Project, with relevant updates incorporated, no later than one month after effectiveness.

*Residual Risk from Climate Hazards:* There is low overall inherent risk from climate hazards to the operation as flood infrastructure is designed to mitigate flood risk, therefore the PDO is likely to be achieved.



**The World Bank**

Guyana Coastal Adaptation and Resilience Project (P503393)

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PDO Indicators by PDO Outcomes

Baseline	Period 1	Period 2	Closing Period
<b>Enhance climate adaptation and reduce flood risk in urban and rural areas in the coastal plain of Guyana</b>			
<b>Area provided with new/improved irrigation or drainage services (Hectare(Ha))</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	50000	110000	140000
<b>People provided with improved urban living conditions (Number)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	5000	15000	45000
➤ People provided with improved urban living conditions - Female (RMS requirement) (Number)			
0	2500	7500	22500
<b>People with enhanced resilience to climate risks (Number of people) <sup>CRI</sup></b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	50000	110000	320,000
➤ People with enhanced resilience to climate risks – Youth (Number of people) <sup>CRI</sup>			
Apr/2024			Dec/2026
0			55000
➤ People with enhanced resilience to climate risks – Female (Number of people) <sup>CRI</sup>			
Apr/2024			Dec/2026
0			160000
<b>Staff with enhanced capacity (NDIA and relevant agencies) to manage/operate/maintain drainage infrastructure (Number)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	10	75	105

Intermediate Indicators by Components

Baseline	Period 1	Period 2	Closing Period
<b>Improving drainage infrastructure</b>			
<b>Detailed engineering designs incorporating relevant climate adaptation measures (Number)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026





0	20	45	45
<b>Drainage infrastructure repaired / rehabilitated / reconstructed (Number)</b>			
Apr/2024	Jun/2025	Jun/2025	Dec/2026
0	15	30	45
<b>Citizens reached in project catchment areas with climate adaptation information (Number)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	5000	10000	16000
<b>Citizens with enhanced awareness of the flood risk reduction interventions as reflected in the survey assessment (Number)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	2500	7000	11200
<b>Improving flood management and drainage operations</b>			
<b>Upgraded asset management system operational (Yes/No)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
No	No	Yes	Yes
<b>Guidelines developed for flood risk management in new development areas (Yes/No)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
No	Yes	Yes	Yes
<b>Asset management / O&amp;M training sessions for NDIA / relevant agencies (Number)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	2	4	5
<b>Project management</b>			
<b>Consultations/Information meetings on flood risk reduction interventions completed (Number)</b>			
Apr/2024	Jun/2025	Jun/2026	Dec/2026
0	2	7	8



**Monitoring & Evaluation Plan: PDO Indicators by PDO Outcomes**

<b>Reducing Flood Risk</b>	
<b>Area provided with new/improved irrigation or drainage services (Hectare(Ha)) <sup>CRI</sup></b>	
Description	This indicator measures the total area of land provided with irrigation and drainage services under the project, including in (i) the area provided with new irrigation and drainage services, and (ii) the area provided with improved irrigation and drainage services, expressed in hectare (ha).
Frequency	
Data source	
Methodology for Data Collection	
Responsibility for Data Collection	
<b>Area provided with new irrigation or drainage services (Hectare(Ha)) <sup>CRI</sup></b>	
Description	Measures in hectares the total area of land provided with new or improved irrigation or drainage services in operations supported by the World Bank.
Frequency	
Data source	
Methodology for Data Collection	
Responsibility for Data Collection	
<b>Area provided with improved irrigation or drainage services (Hectare(Ha)) <sup>CRI</sup></b>	
Description	Measures in hectares the total area of land provided with new or improved irrigation or drainage services in operations supported by the World Bank.
Frequency	
Data source	
Methodology for Data Collection	
Responsibility for Data Collection	
<b>Area provided with improved drainage/irrigation services</b>	
<b>Enhanced staff capacity of NDIA, relevant agencies to operate and maintain drainage infrastructure</b>	



**Monitoring & Evaluation Plan: Intermediate Results Indicators by Components**

Improving drainage infrastructure
Improving flood management and drainage operations
Project management



## ANNEX 1: Implementation Arrangements and Support Plan

### A. Project Institutional and Implementation Arrangements

#### Project Administration Mechanisms

*GRIF Oversight:* The Project Management Office (PMO), within the Office of the President, is the Government of Guyana body responsible for managing the development and overseeing the implementation of all Guyana REDD+ Investment Fund (GRIF) funded projects. The PMO will have an oversight role in all areas of project implementation, including but not limited to recruitment, budgeting, and procurement and monitoring of deliverables against planned timelines. In addition, the PMO manages the approval process for GRIF projects through coordination with the GRIF Secretariat and the GRIF Steering Committee. The approval by the GRIF Steering Committee clears the way for project implementation and the release of GRIF funds to the Partner Entity. The works under the Project will receive strategic direction and guidance from the PMO.

*National Drainage and Irrigation Authority Oversight:* The NDIA, the national authority responsible for management and maintenance of drainage and irrigation infrastructure under the MoA, will provide the technical oversight of the activities and will take over O&M of the drainage infrastructure in accordance with their mandate. Operation and maintenance costs will be funded through regular government appropriations for these types of activities.

*Technical oversight:* In cases where the works will affect or require upgrading of sea defences that are integral to the drainage infrastructure, the Ministry of Public Works, the Maritime Administration Department (MARAD) or other relevant agencies will provide technical oversight, including construction design approval.

*Ministry of Agriculture:* As implementing agency for the Project, the MoA will have overall responsibility to manage the fiduciary, safeguards and administrative aspects of the Project and the procurement process, including issuance of the tenders, undertaking financial reporting for the Project, making payments to contractors, as well as managing the supervision contract for the project works. A Project Implementation Unit will perform the day-to-day implementation activities including contract management, procurement, financial management, social and environmental management, training, citizen engagement and communications, and monitoring and evaluation. The PIU will be staffed from members of the MoA's (i) Agriculture Sector Development Unit (ASDU), which implements major donor-financed capital projects, including the Guyana Flood Risk Management Project, and (ii) technical staff from the NDIA. External specialists may be engaged as needed.

The PIU will implement the project in accordance with a Project Operations Manual (POM), which will be prepared in consultation with the World Bank and will set forth the guidelines and specific procedures for carrying out the project. The POM will include, among other things: (i) the detailed description of all project activities supported under the Grant Agreement, (ii) the sequencing of activities, and a planned timetable for the activities, (iii) the prioritization framework, (iv) the Environmental and Social Management Framework, (v) the procurement and financial management arrangements for the Project, (vi) coordination arrangements governing the day-to-day execution of the project, and (vii) M&E data collection and reporting arrangements.

### B. Financial Management

The Financial Management assessment for the project was carried out in accordance with the "Financial Management Practices in World Bank-Financed Investment Operations" issued by the Financial Management Sector Board on November 3, 2005, and as further rationalized in the "Principles Based Financial Management Practice Manual" issued by the Board on March 1, 2010. Under the Bank's OP/BP 10.0 with respect to projects financed by the Bank, the Recipient



and the project implementing agency are required to maintain financial management systems — including budgeting, internal control, accounting, financial reporting, and auditing systems — adequate to provide the Bank with assurance that funds will be used in an efficient and economical way to enable project development objectives to be met. The conclusion of the assessment is that the financial management systems at the MoA meet the Bank’s requirements.

*FM implementation arrangements.*

*Financial Management Responsibilities:* The Financial management (FM) of the Project will be undertaken by the PIU which will be staffed by a Project Accountant who will be responsible for the day to day management. The PIU has considerable experience in implementing the Guyana Flood Risk Management Project, which has a satisfactory FM rating. A financial management capacity assessment of the ASDU was carried out during preparation of the Flood Risk Management Project to ensure that the systems to be used to manage the funds satisfy the Bank’s minimum FM requirements, and that they are adequate to provide, with reasonable assurance, accurate and timely information on the progress of implementation of the Project. The assessment concluded that the ASDU has adequate staff with experience in implementing Bank-financed projects and adequate control of environmental rules, procedures and systems. The ASDU is also maintaining a computerized accounting system, which will be able to generate reliable and timely financial reports. To help manage any residual risks, financial management supervision of the Project activities will be undertaken twice in a year. In addition to annual external audit of Project accounts, the internal auditors of the Government will conduct annual internal audits of Project expenditures and share the report with the Bank and external auditors.

*Budgeting arrangements.* The project shall prepare an Annual Work and Financial Plan together with disbursement projection to be submitted to the Bank before the start of each fiscal year.

*Accounting Policies and Procedures:* The ASDU uses a cash basis of accounting, and its financial statements are prepared in accordance with International Financial Reporting Standards. ASDU uses Quick Books accounting software for recording transactions, maintaining the books of accounts and producing financial statements. The system allows for the tracking of inflows by sources of funding, and outflows by project component, sources of funding and disbursement category. The same software is being successfully used to support other World Bank finance projects.

*Internal control and Internal Audit.* The internal auditors of MoA will conduct internal audit of the project activities and submit internal audit report to the ASDU, the external auditors and also share the report with the World Bank. Since all transactions are recorded in the Quick Books accounting system, the internal controls associated with that software package are also applied.

*Reporting Arrangements:* The ASDU will be responsible for producing the Interim Financial Reports (IFR) on a semi-annual basis to be submitted to the Bank for review. The IFRs will provide required information for monitoring and include a narrative outlining the major achievements of the project for the six-month period, the sources and uses of funds, and necessary procurement tables. IFRs will be submitted to the Bank no later than 45 days after the end of each reporting period. The annual financial statements will include the project’s sources and uses of funds; a detailed analysis of expenditures; a schedule of withdrawal applications presented during the year, a reconciliation of the Designated Account; the notes to the financial information; and a management representation letter. These reports will be prepared by ASDU and made available to the auditors after the end of each fiscal year.

*Auditing arrangements.* Project financial statements will be audited annually in accordance with International Standards on Auditing and the World Bank’s guidelines on auditing. A qualified independent audit firm acceptable to the World Bank will be hired to conduct project audits. The auditors’ terms of reference (ToRs) will be prepared by the project and cleared by the World Bank before engagement of the auditor. The ToRs will include an audit of financial transactions; a review of the internal control structure and mechanisms; and a review of the project’s compliance with the terms of the



financing agreement(s). The annual audit reports will be prepared in a format that is in accordance with International Standards of Auditing (ISA) and World Bank guidelines, and will include an opinion on the project financial statements, including Designated Account Reconciliation, review of the internal controls, review of the project’s compliance with the terms of the financing agreement(s) and a management letter. The project’s annual audit report will be submitted to the World Bank for review no later than six months following the end of the fiscal year (January-December).

- . *Fund flow arrangements.*
- . *Financial reporting arrangements.*
- . *External audit arrangements.*

**C: Disbursements**

- . Disbursements under the project shall comply with the Bank policies and procedures on disbursements and financial management as reflected in the Bank’s Disbursements Handbook and Financial Monitoring Report Guidelines. All replenishments to the DA shall only be for eligible expenditures based on the agreed eligibility/financing percentage in the Grant Agreement and shall have adequate supporting documents. The frequency for reporting eligible expenditures paid from the DA will be quarterly or as need arises.
- . To allow the submission of Withdrawal Applications and supporting documentation, for expenditures incurred on or before the Closing Date, the project will be granted a four-month grace period to report these eligible expenditures.
- . FM implementation support missions will be conducted twice a year focusing on the adequacy of the FM system to ensure that funds are used for the intended purposes with due regard to economy and efficiency. Based on the level of FM risks at time of FM supervision, the reviews may include any or all of the following: (i) review and verification of specific transactions, (ii) review of bank reconciliations, (iii) analysis of the financial statements in relation to the funds disbursed by the Bank, and (iv) physical verification of structures as to existence. Desk reviews will also be conducted on a regular basis and upon submission of the annual external audit of the project and the IFR. Issues arising from these reports will be used to review and adjust the scope of the planned FM implementation support.
- . The Grant shall be disbursed over a period of 2.5 years based on the following categories of expenditures.

Category	Amount of the Grant Allocated (expressed in USD)	Percentage of Expenditures to be financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, consulting services, Operating Costs, and Training for the Project	45,000,000	100%
TOTAL AMOUNT	45,000,000	

**D: Procurement**

- . The Ministry of Agriculture will be responsible for project procurement activities, through the ASDU, which is currently the Project Implementation Unit for the ongoing Guyana Flood Risk Management Project.
- . All procurement of goods, works, non-consulting services and consulting services under the project shall be carried out in accordance with and governed by the World Bank Procurement Regulations for IPF Borrowers (dated September 2023) and the provisions stipulated in the Grant Agreement and in the Procurement Plan. The Project will be subject to the World Bank’s Anticorruption Guidelines, dated October 15, 2006, revised in January 2011, and as of July 1, 2016. The



Project will use the Systematic Tracking of Exchanges in Procurement (STEP) to plan, record and track procurement transactions. The general description of various items under different expenditure categories, as assessed in the PPSD, and to be financed by the Bank are described below.

- (a) *Works*. Repair, rehabilitation, and reconstruction of approximately 45 priority drainage sluices, and ancillary improvements (e.g., dredging of channels), as appropriate.
- (b) *Goods*. Equipment for maintenance of drainage infrastructure; asset management equipment.
- (d) *Consulting Services*. Consulting firms may be required for capacity building activities (e.g., training on operation and maintenance of drainage infrastructure); feasibility studies, geotechnical investigations, detailed engineering designs, and construction supervision. Individual consultants will also be hired as technical specialists to support the Implementing Agency.
- (e) *Non-consulting Services*. Outreach programs, citizen engagement and social awareness activities may be needed to support project implementation.

. The applicable method of procurement for each specific contract and the Bank’s review requirements (prior or post review) will depend on the nature, value, and risk of each contract and are specified in the Procurement Plan approved by the Bank.

. *Procurement Manual*. The procurement arrangements and procedures will be detailed and fully documented in the Procurement Section of the POM, based on the provisions of the Grant Agreement and as agreed between the MoA and the World Bank. The manual will also detail the processing timelines, and the hierarchy of approval within the MoA.

. *Procurement Plan*. Contracts eligible for financing shall be procured in accordance with the Procurement Plan, which defines the applicable procurement methods, estimated costs, prior review requirements and time frame. A draft Procurement Plan for the project implementation period was agreed at negotiations, and will be published through the STEP system. The Procurement Plan will be updated annually, or as may be required, to reflect project implementation needs and improvements in institutional capacity and procurement risk.

### **E: Strategy and approach for implementation support**

. *Overall approach to Implementation Support*. Implementation support will be provided by the World Bank Task Team (TT), consisting of staff with relevant competencies in project operations, procurement, finance, monitoring and evaluation, safeguards, disaster/flood risk management, hydrology/hydraulic engineering, and climate adaptation. The TT will conduct implementation support missions every six months (at a minimum) throughout the project’s implementation period. Implementation support missions will include field visits to verify physical implementation and compliance with the processes as stated in the Project Operations Manual. Additional support will include frequent coordination with the PIU for updates on implementation performance and progress. The TT will monitor progress of the following: (i) achievement of results indicators; (ii) overall and component-specific project implementation progress; (iii) proper fiduciary management of all activities carried out by the PIU; (iv) safeguards compliance; (v) reconciliation of payments with contracts; and (vi) monitoring of key legal covenants. The TT will also mobilize staff and consultants that will directly support project implementation with specialized technical assistance, as needed.

. The TT will work closely with the PIU to ensure the project’s compliance with the Bank’s fiduciary and safeguards policies and frameworks, and to monitor progress in achieving project outcomes. The PIU will prepare and transmit to the Bank progress reports, workplans, and financial reports, as well as reports on implementation issues, among others.

### Financial Management



. The World Bank’s FM specialist will provide timely and effective support to the PIU. The project will be monitored through: (i) desk reviews of audit reports, interim financial reports, and status of action plans agreed with the counterparts following visits or audit findings, if any; and (ii) on-site reviews of the continuous adequacy of the project FM arrangements. These will include monitoring and reviewing the status of implementation of any agreed actions and issues identified by the auditors, including other issues related to project accounting, reporting, budgeting, internal controls, and flow of funds. A review of a sample of transactions will be also conducted during supervision missions or on- site monitoring reviews.

#### Procurement

. Support for procurement management will focus on effective implementation of the various project components in line with the World Bank Procurement Regulations. The following activities will be carried out by World Bank procurement staff: (i) training as needed (i.e., application of the Procurement Regulations, use of STEP, etc.) for staff of the PIU prior to grant effectiveness and during project implementation; (ii) review of procurement documents prepared by the ASDU; and (iii) monitoring of progress against the Procurement Plan. In addition to the prior review of procurement transactions, the World Bank’s procurement specialist will join the two implementation support missions scheduled per year to assess the progress of the procurement activities under the project. Procurement post reviews will be conducted during these missions. The post review sample size will not be less than 20 percent of the contracts that were not subject to the Bank’s prior review. Additional support will include clarification and advice on procurement related matters as requested by the client.

#### Environment and Social (E&S)

. The World Bank’s E&S specialists will provide technical support and oversight throughout project implementation, including guidance in the preparation of required E&S instruments. Semi-annual assessments of E&S compliance will be conducted through the implementation support missions and field visits. The PIU will receive support from the Bank to prepare relevant environmental and social documents and instruments, conduct due diligence processes, and monitor the timely preparation of environmental and social assessments and management instruments, which must be completed before any physical activity can commence. During project implementation the Bank will monitor the project’s E&S performance, provide timely advice and work closely with the PIU on areas for improvement on a continuing basis. The Bank will also provide capacity building support to the PIU, beneficiary institutions and partner agencies. The PIU will ensure that a functioning grievance redress mechanism is in place.

#### Mid-Term Review

. A Mid-Term Review (MTR) will be carried out halfway through project implementation to review the Results Framework and achievement of targets, SORT ratings, Financial Management Reports, procurement activities, E&S compliance, disbursement status, and other relevant items. In preparation for the MTR, an independent review of implementation progress will be carried out, including beneficiary assessments, as appropriate. The MTR will provide recommendations as to any potential changes or restructuring necessary to improve the project’s relevance, efficacy, or efficiency.

#### Implementation Completion and Results (ICR) Report

. To evaluate project outcomes, an ICR will be drafted by the World Bank and the Recipient within six months of project completion. Impact evaluations and beneficiary assessments may be conducted as part of the ICR process. ICRs are tailored to enhance development effectiveness through a continuous process of self-evaluation, lesson learning and application, knowledge sharing, and accountability for results. The lessons learned from ICRs improve the quality and





effectiveness of World Bank operations, while Recipient/stakeholder participation in the ICR process informs the design, preparation, and implementation of potential follow-on projects.

The following ISP is based on the preliminary estimates of the skill requirements, timing, and resource requirements throughout the project implementation period. As the needs of the PIU evolve over time, the ISP will be reviewed annually to ensure that it provides the required support. The tables below indicate the level of inputs that will be needed from the World Bank to provide implementation support for the project.

<b>Time</b>	<b>Focus</b>	<b>Skills Needed</b>	<b>Partner Role</b>
First 12 months	Provide support for start-up activities <ul style="list-style-type: none"> <li>• set-up PIU office by assigning staff and hire consultant specialists/analysts as needed</li> <li>• Procurement and Financial Management Systems in place</li> <li>• Environmental and Social Safeguards monitoring system in place</li> <li>• Establish the Monitoring and Evaluation system</li> <li>• Procurement of Consultant Service for Component 1</li> <li>• Procurement of civil works contracts for Component 1</li> <li>• Procurement of goods contract for Component 1</li> <li>• Procurement of goods contract for Component 2</li> <li>• Procurement of consultancy services for Component 3</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Task Team Leader</li> <li>• DRM Specialist</li> <li>• Technical Specialists</li> <li>• Procurement Specialist</li> <li>• FM Specialist</li> <li>• Environmental Specialist</li> <li>• Social Safeguards Specialist</li> <li>• Monitoring &amp; Evaluation Specialist</li> <li>• Training Consultant</li> <li>• Communications Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Task Team to provide support to ensure smooth commencement of project activities</li> </ul>
12-48 months	<ul style="list-style-type: none"> <li>• Continued implementation support to all aspects of project activities</li> <li>• Implementation support missions and field visits to monitor progress of activities and achievement of PDOs</li> <li>• Mid-term Review of project</li> <li>• Preparation of ICR</li> </ul>	All skills (same as above)	<ul style="list-style-type: none"> <li>• Task Team to provide support to PIU including technical assistance in Procurement, FM, Safeguards and M&amp;E</li> <li>• Ensure safeguards are on track</li> <li>• Ensure compliance with Bank fiduciary requirements</li> </ul>

Skills Mix Required

<b>Skills Needed</b>	<b>Number of Staff Weeks</b>	<b>Number of Trips</b>
Task Team Leader	50	10
Technical Specialist or Consultant	35	10
Procurement Specialist	15	5
Financial Management Specialist	15	5
Environmental Specialist	15	5
Social Specialist	15	5





ANNEX 2: Proposed weighted criteria for Category 2 and 3 prioritization

<b>Technical grading (2.3 RVS)</b>		<b>Scoring</b>	<b>Max score</b>
Superstructure+wing walls		0-4	4
Doors		0-4	4
Lifting mechanism		0-4	4
Revetments		0-4	4
Catwalk/stairs		0-4	4
Outlet channel depth and width		1-3	3
Inlet channel depth and width		1-3	3
<b>Max score</b>			<b>26</b>
<b>Functioning (1.3 RVS)</b>			
Drainage through koker is malfunctioning?		yes/no	6 (if yes)
Overtopping at koker during high tides?		yes/no	6 (if yes)
Stability/integrity of koker is at risk?		yes/no	6 (if yes)
Interior flooding in the catchment due to insufficient drainage?		yes/no	6 (if yes)
<b>Max score</b>			<b>24</b>
<b>Impacted area (1.2 RVS)</b>			
Catchment size*		Small (5)/medium (15)/large (25)	<b>25</b>
Population*		Low (5)/medium (15)/high (25)	<b>25</b>
<b>Total maximum score</b>			<b>100</b>
* Boundaries to be defined based on RVS results			



### ANNEX 3: Economic Analysis

#### Introduction

The economic evaluation of the CAREs project focuses on the structural investments in the drainage infrastructure in Guyana (Component 1). The works will repair, rehabilitate, and replace existing drainage infrastructure to ensure the serviceability in the coming decades. This evaluation examines if the works are justified, that is, if the expected economic benefits are higher than expected costs. The methodology used follows a cost-benefit analysis in which the benefits are measured through avoided damages. Costs and benefits are in 2024 prices, and a discount rate of 6% has been adopted. Expected benefits and costs attributable to the AF were measured by comparing two scenarios: with and without project. Net benefits corresponded to the difference between incremental benefits of each scenario. Benefits were estimated using the avoided cost method. The evaluation was complemented with sensitivity analysis.

The proposed works included in this economic analysis are the 63 drainage sluices identified by the NDIA. The initial cost estimate shows that the necessary works to these drainage sluices fit within the budget allocated for the works, see below. The drainage sluices are located in Region 3 (east of Essequibo River), Region 4, 5 and 6 and these drain a mixed urban/agricultural area of almost 200,000 ha hosting around 450,000 people. Currently, these sluices show leakages through doors, issues with opening/closing mechanisms, overtopping during high coastal and riverine flood levels, and degraded main structures. If no action is taken, the reliability of these structures will further deteriorate causing increasing flooding problems in the adjacent catchments and negatively affecting livelihoods and communities.

This Annex provides a detailed overview of the methodology and results of the economic analysis. First, the methodology adopted to perform the economic analysis and the input data are presented in Section B. Key inputs for the analysis are estimates of the capital and the annual O&M costs of the repair/rehabilitation as well as an estimate of the recurring benefits of these investments. The latter is estimated by comparing the situation with and without intervention and make an estimate of the avoided damages due to the intervention. The results of the economic analysis are presented in Section C. This section shows key indicators such as the economic rate of return (ERR), the net present value (NPV). Also, the results of the sensitivity analysis are presented to show the robustness of the results.

#### Methodology

An initial cost estimate for each drainage sluice has been prepared based on unit prices. A recent World Bank study provided cost estimates for complete replacement of 1-door and 2-door sluices (US\$ 750k and 1.1 million, respectively). This includes also contingency and the costs for works preparation and supervision. Based on the rapid visual screening by NDIA, it has been estimated which percentage of the replacement costs must be invested to provide a lifetime of (at least) 30 years to each drainage sluice. Following this procedure, the total investment for repair, rehabilitation and replacement is estimated at US\$ 43 million for the 63 drainage sluices. For annual operation and maintenance costs, 3% of the total replacement costs has been adopted herein.

Benefits of drainage works were measured in the form of direct damage that are averted when risk of flooding is reduced. Investment in reliable drainage sluices will result in less damage to agricultural production and also residential buildings. If the drainage sluices function well, these are able to drain 2.5 inch (or ~ 63 mm) per 24 hours (current design norm) from the catchments. Roughly up to rainfall events with a return period of once every year, there will be no flooding in the catchment. For more extreme rainfall events, there will be flooding. Since the land elevation is relatively flat in the catchments, the flood depths will remain shallow (up to say 1 meter in large areas in very extreme events). Indirectly, the project will eliminate or significant reduction of disruption of daily activities and cost savings of maintaining public infrastructure in the area, like roads and buildings. However, these indirect benefits are difficult to quantify. To err on the



side of cautiousness, these indirect benefits have not been included herein, thus the resulting economic indicators (NPV, ERR) can be considered as conservative estimates.

The quantification of the direct damage caused by flooding has used the local data provided by the NDIA in combination with global data sources. For each catchment connected to a drainage sluice, local estimates for urban and agricultural land use has been provided in combination with spatially varying land use values for the urban footprint. Land prices are higher in and around the capital whereas Regions 3 and 6 have lower land use values. The agricultural production value has been taken constant throughout the area as per NDIA guidance. The input values have been summarized in Table 1. For the current conditions, flood depths and percentages of area flooded during rainfall events (1yr, 10yr, 100yr) have been retrieved from a global flood data set, see Table 2.

Table 1. Characteristics of the drainage catchments in the regions in Guyana.						
Area	Size (x 1000ha)	Population (x 1000)	%Agriculture**	Agricultural production (US\$/ha/yr)	%Urban**	Urban land use (US\$/m2)
Region 3	16	25	79	4000	21	47
Region 4	47	286	44	4000	56	129 (GT) / 71 (rest)*
Region 5	83	82	96	4000	4	35
Region 6	52	59	83	4000	17	35
Total	198	452	65	4000	35	66

\* Georgetown Area, rest of the area refers to East Bank and East Coast in Region 4.  
 \*\* These are averages over all 63 catchments (not weighted by area size).

Table 2. Flood characteristics during rainfall events.				
Return Period (yrs.)	Total rainfall depth (mm)*	Percentage area flooded (%)**	Average inundation depth (m)**	Effect of improving functioning drainage sluice on inundation depth (%)***
1	91	5	0.2	-18%
10	153	20	0.3	-6%
100	223	50	0.4	-2%

\* World Bank study, 2023 Strategic Urban Flood Risk Management Plan, Georgetown  
 \*\* Estimates based on Global Data Set with flood inundation maps from Fathom  
 \*\*\* See explanation in the text

A critical assumption in this economic analysis is the failure probability of the drainage sluice during a rainfall event for the scenario ‘without intervention’ and ‘with intervention.’ The investment within this project results in lowering substantially the failure probability of the drainage sluice. An assumption has therefore to be made regarding the current and future failure probability given a rainfall event. If well-designed and well-maintained, the failure probability of a hydraulic structure is typically extremely low (< 1% in any given event). In the current situation, this failure probability is much higher based on observations in the field (e.g., leakage, temporary overtopping, structural and operational issues



with closing/opening mechanisms, etc.) but (still far) away from total failure (i.e., 100%). Based on this, a failure probability of 10% is adopted herein as starting point and the sensitivity of this assumption is further checked in the analysis.

This failure probability of the drainage sluices has been translated into an effect on the flood depths in the areas of interest as follows. The current design norm for the drainage sluices is to drain 63 mm (2.5 inch) per 24 hours. In case of an intense rainfall event (e.g., 1 year with 91mm in 24 hours), there is an excess of rainfall (i.e., 91-63 mm = 28mm) which results in flooding. When the drainage sluice does not function properly, there will be extra rainfall resulting in flooding due to malfunctioning. This has been approximated by combining two possibilities during this event: failure (10% x 91mm = 9 mm) and no failure (90% x (91-63) = 25mm) resulting in a combined excess rainfall depth of 34 mm. The ratio between the excess rainfall depths with intervention (28mm) and without intervention (34mm) provides a proxy for the effect of the intervention (-18%) for this 1yr rainfall event. For more intense rainfall events, this effect is obviously less since the system receives much more rainfall than the design norm and malfunctioning has less of an effect. The resulting effects are listed in Table 2 (right-hand column) and these percentages have been applied to the inundation depths to generate a situation with and without intervention.

The resulting flood depths for the scenarios with and without intervention have been combined with the vulnerability of urban and agricultural land uses to define the total damage in each catchment, see Table 3. A vulnerability curve generally describes the relationship between the percentage of direct damage and one or more flood characteristics. Most often, the water depth is taken as a single parameter, and this is also applied herein. Since locally calibrated vulnerability functions do not exist, information from the European Commission’s Joint Research Council has been taken which provides vulnerability curves for different continents based on a review of many studies. Based on this study, a threshold water depth of 0.1 meter at which no damage occurs has been adopted together with a 50% damage at 1 meter water depth and a linear function in between these two data points. The direct damages for different return periods and the scenarios without and with intervention have been summarized in Table 3.

Table 3. Calculated direct damages without and with intervention (in millions US\$) for rainfall events with different return periods.						
	Without intervention			With intervention		
Area	1yr	10yr	100yr	1yr	10yr	100yr
Region 3	4	32	121	3	30	117
Region 4	13	104	390	11	97	376
Region 5	4	31	115	3	29	111
Region 6	4	29	110	3	27	106
Total	25	196	737	20	184	709

To estimate the expected benefits of the drainage intervention, the difference in annual expected damage has been calculated based on the numbers presented in Table 3. For this purpose, the damages for each return period have been integrated to estimate the annual expected damage for the situation without and with intervention. The annual expected damages are US\$ 148 and 138 million / year, respectively. These numbers can be interpreted as the residual risk on average per year in the very long term (everything else constant). The highest annual damage is in Region 4. The expected benefits of the intervention are thus US\$ 10 million (=148 – 138) per year for the entire project.



Finally, the net benefit was calculated as the difference between expected benefits minus expected costs on an annual basis. It has been assumed that the capital investment happens in year 1 of the project. Thereafter, the operation and maintenance generate costs (3% of total replacement costs, see above), but the investment also generates a benefit every year in the form of averted damage costs. Herein, a time horizon of 20 years has been used for which these benefits and costs are accounted for in the cost-benefit analysis. The net benefit in any given year is the difference between the total costs and the expected benefit. Using the predicted net benefit for this period of 20 years, the economic indicators such as ERR and NPV have been evaluated for each drainage sluice and also for the project as a whole.

**Results**

The results of the economic analysis show that the intervention in this project is economically sound for all regions. The key economic indicators are summarized in Table 4 for the individual regions and also for the entire project. For the overall project, the IRR is 16% with a net benefit of US\$ 8 million. It is evident from this result that all regions show a positive net benefit and also a good rate of return well above the threshold rate. These results are very reassuring as many other benefits that will come along were not quantified, such as reduction or elimination of disruption of traffic and urban activities, reduction of disruption of the agricultural food production chain, reduction of other nuisances that come along with floods, etcetera.

Table 4. Net present value of total costs, total benefits and net benefits (in millions US\$) and internal rate of return (%).				
Area	Total Costs	Total Benefits	Net Benefit	Internal Rate of Return
Region 3	10	18	8	16%
Region 4	25	57	32	23%
Region 5	6	17	11	29%
Region 6	12	16	4	11%
Total	53	108	54	20%

The economic analysis also shows that there is spatial variation in economic efficiency of the investments. For example, the investments in Regions 4 and 5 are economically more beneficial than the other two regions. This is partly a result of the higher land values and also the higher urbanization in these areas. This automatically results in a higher IRR since the avoided damages are larger. This also suggests that possibly a higher design norm for some areas could be interesting to look at if a complete replacement of the drainage sluice is considered. It may well be that a stricter design norm for highly urbanized areas is economically justifiable. This can be further evaluated in the Feasibility and Design Studies.

**Sensitivity analysis**

Since various parameters are uncertain, a sensitivity analysis has been carried out to test the robustness of the results. Such an analysis allows comparison of the base case scenario to other scenarios in response to a change in a given variable. Herein, a break-even analysis has been carried out to identify the value of the chosen variable that makes the intervention to exactly break even (i.e., NPV = 0, IRR = 6%). The variables to evaluate the impact on the project’s outcome are cost overrun, reduction of damage costs, overestimation of current failure probability, The results are shown in Table 5.



Table 5. Sensitivity analysis results with base scenario setting, sensitivity setting, and change of variable to result in break-even project.			
	Base scenario	Sensitivity	Change (%)
Cost overrun (million US\$)	53	108	104%
Lower damages (million US\$)	108	53	-51%
Lower failure probability (%)	10	4.5	-55%
Lower area flooded (%)	See Table 2 for different return periods		-50%
Lower flood depths (m)	See Table 2 for different return periods		-30%
Shorter lifetime (yrs.)	20	6	-70%

The sensitivity analysis show that the results from the economic analysis are robust. For example, the current failure probability of the drainage sluices can be lower with more than a factor 2 and still the project remains viable. The same is true for the predicted expected damages. If the damages are too optimistic with a factor 2, then the project still would yield a positive return. The large variations without jeopardizing the economic viability of the project show the robustness of the planned drainage interventions.