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PROJECT PAPER  
FOR  
SMALL RETF GRANT  
US\$3.0 MILLION  
TO THE  
COOPERATIVE REPUBLIC OF GUYANA  
FOR THE  
CUNHA CANAL REHABILITATION PROJECT

MAY 1, 2015

Social, Urban, Rural and Resilience Global Practice  
Latin America and the Caribbean Region

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective April 7, 2014)

Currency Unit = Guyana Dollars  
GY\$194 = US\$1

## FISCAL YEAR

January 1 – December 31

## ABBREVIATIONS AND ACRONYMS

ASDU	Agriculture Sector Development Unit
BCL	Barama Company Limited
CAP	Conservancy Adaptation Project
CAS	Country Assistance Strategy
CQS	Selection Based on Consultant Qualifications
EA	Environmental Assessment
EAP	Environmental Protection Act
EBD	East Bank Demerara
ECLAC	Economic Commission for Latin America and the Caribbean
EDWC	East Demerara Water Conservancy
EIA	Environmental Impact Assessment
EMP	Environment Management Plan
EU	European Union
FBS	Fixed Budget Selection
FMR	Financial Monitoring Report
GD	Guyana Datum
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GoG	Government of the Cooperative Republic of Guyana
GRIF	Guyana REDD+ Investment Fund
GSURR	Social, Urban, Rural and Resilience Global Practice
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
IDA	International Development Association
IDB	Inter-American Development Bank
IFR	Interim Financial Report
JICA	Japanese International Cooperation Agency
LCS	Least-Cost Selection
LCDS	Low Carbon Development Strategy
MoA	Guyana Ministry of Agriculture
MoPWC	Guyana Ministry of Public Works and Communication

MoU	Memorandum of Understanding
NCB	National Competitive Bidding
NDIA	National Drainage and Irrigation Authority
NEAP	National Environmental Action Plan
PAD	Project Appraisal Document
PMO	Project Management Office
QBS	Quality-Based Selection
QCBS	Quality and Cost-Based Selection
REDD+	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (with conservation, sustainable management of forests and enhancement of forest carbon stocks)
SBD	Standard Bidding Document
SCCF	Special Climate Change Fund
SORT	Systematic Operations Risk-Rating Tool
TOR	Terms of Reference
TTL	Task Team Leader
UNFCCC	United Nations Framework Convention on Climate Change

Regional Vice President:	Jorge Familiar
Country Director:	Sophie Sirtaine
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Practice Manager:	Anna Wellenstein
Task Team Leader:	Armando Guzman

**THE COOPERATIVE REPUBLIC OF GUYANA**  
**Cunha Canal Rehabilitation Project**

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## DATA SHEET

*The Cooperative Republic of Guyana*  
Cunha Canal Rehabilitation Project  
**Small RETF Grant Project Paper**

*Latin America and Caribbean*  
*GSURR*

Basic Information				
Date:	May 1, 2015	Sectors:	Flood protection (100%)	
Country Director:	Sophie Sirtaine	Themes:	Natural disaster management	
Practice Manager:	Anna Wellenstein	EA	B (Partial Assessment)	
Project ID:	P132408	Category:		
Instrument:	Investment Project Financing			
Team Leader(s):	Armando E. Guzmán			
Joint IFC:				
.				
Recipient: The Cooperative Republic of Guyana				
Executing Agency: Ministry of Agriculture				
Contact:	George Jervis	Title:	Permanent Secretary	
Telephone No.:	+592 227 5527	Email:	ps.moagy@gmail.com	
.				
Project Implementation Period:	Start Date:	February 24, 2016	End Date:	June 30, 2019
Expected Effectiveness Date:	February 29, 2016			
Expected Closing Date:	June 30, 2019			
.				

Project Financing Data (US\$M)											
<input type="checkbox"/>	Loan	<input checked="" type="checkbox"/>	Grant	<input type="checkbox"/>						Other	
<input type="checkbox"/>	Credit	<input type="checkbox"/>	Guarantee								
<b>For Loans/Credits/Others</b>											
Total Project Cost :		US\$3.27M		GRIF Financing		US\$3.00M					
Total Cofinancing :		US\$0.27M		Financing Gap :		US\$0.0M					
<b>Financing Source</b>											
<b>Financing Source</b>					<b>Amount(US\$M)</b>						
BORROWER/RECIPIENT					US\$ 0.27 M						
IBRD											
IDA: New											
IDA: Recommitted											
Others (GRIF)					US\$ 3.00 M						
Financing Gap					US\$ 0.0 M						
Total					US\$ 3.27 M						
<b>Expected Disbursements (in USD Million)</b>											
Fiscal Year	FY16	FY17	FY18	FY19							
Annual	0.05	1.55	1.15	0.25							
Cumulative	0.05	1.60	2.75	3.00							
<b>Project Development Objective(s)</b>											
The Project Development Objective is to increase the capacity of the Cunha Canal to drain the East Demerara Water Conservancy and local agricultural areas in the Recipient's territory.											
<b>Components</b>											
<b>Component Name</b>					<b>Cost (US\$ Millions)</b>						
1. Cunha Canal Rehabilitation Works					US\$ 1.91 M						
2. Resettlement					US\$ 0.57 M						
3. Project Management					US\$ 0.52 M						

<b>Compliance</b>				
<b>Policy</b>				
Does the project depart from the CAS in content or in other significant respects?		Yes [ ]	No [X]	
Does the project require any waivers of Bank policies?		Yes [ ]	No [X]	
Have these been approved by Bank management?		Yes [ ]	No [ ]	
Is approval for any policy waiver sought from the Board?		Yes [ ]	No [ ]	
Does the project meet the Regional criteria for readiness for implementation?		Yes [X]	No [ ]	
<b>Safeguard Policies Triggered by the Project</b>		<b>Yes</b>	<b>No</b>	
Environmental Assessment OP/BP 4.01		X		
Natural Habitats OP/BP 4.04		X		
Forests OP/BP 4.36			X	
Pest Management OP 4.09			X	
Physical Cultural Resources OP/BP 4.11		X		
Indigenous Peoples OP/BP 4.10			X	
Involuntary Resettlement OP/BP 4.12		X		
Safety of Dams OP/BP 4.37		X		
Projects on International Waterways OP/BP 7.50			X	
Projects in Disputed Areas OP/BP 7.60			X	
<b>Legal Covenants</b>				
<b>Name</b>		<b>Recurrent</b>	<b>Due Date</b>	<b>Frequency</b>
<b>Description of Covenant</b>				
<b>Team Composition</b>				
<b>Bank Staff</b>				
<b>Name</b>	<b>Title</b>	<b>Specialization</b>	<b>Unit</b>	
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Plamen Kirov	Senior Procurement Specialist	Procurement Specialist	GGODR	

Mozammal Hoque	Senior Financial Management Specialist	Financial Management Specialist	GGODR	
M. Yaa Oppong	Senior Social Development Specialist	Social Development Specialist	GSURR	
Noreen Beg	Senior Environment Specialist	Environment Specialist	GENDR	
Claudia Soto	Junior Professional Associate	Disaster Risk Management Analyst	GSURR	

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Name	Title	Office Phone	City
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Ian Marfleet	Construction Management Specialist Consultant		

**Locations**

Country	First Administrative Division	Location	Planned	Actual	Comments
Guyana	Administrative Region 4	EDWC		X	

## I. STRATEGIC CONTEXT

### A. Country Context

1. Guyana is a low-lying country, the third smallest country in South America after Suriname and Uruguay. With a Gross National Income per capita of US\$3,847 in 2013, it is one of the poorest countries in Latin America and the Caribbean. Guyana has achieved significant progress in the reduction of moderate and extreme poverty rates, which fell 14.5 and 17 percent respectively between 1992 and 2006. Guyana's strong macroeconomic performance in the last 8 years has contributed to a reduction in public debt levels and sustained poverty reduction, experiencing uninterrupted growth averaging about 4 percent annually<sup>1</sup>. In 2013, the Guyanese economy recorded a real GDP growth of 5.2 percent. The traditional sectors of sugar, rice and bauxite accounted for 30.4 percent of GDP and 57.7 percent of the country's export earnings. This can be partly explained by the commodity boom, favoring its base of extractive industries along with significant foreign direct investment (FDI). However, growth slowed down in 2014 (3.8 percent) reflecting the softening in global commodity prices – mainly gold and bauxite. The economic outlook for Guyana is broadly positive. Growth is projected to remain strong, averaging about 4 percent per year over the medium-term.

2. Guyana has a land area of approximately 215,000 square kilometers (83,000 square miles) and one of the lowest population densities in the world. Ninety percent of its 800,000<sup>2</sup> inhabitants live on the narrow coastal plain, which represents 7.5 percent (16,125 square kilometers) of the country's area and lies approximately 1.5 meters below sea level<sup>3</sup>. The coastal plain area is crucial to the economy of the country as it supports the majority of the population, including the nation's capital, Georgetown, and agricultural areas that account for approximately 27 percent of the nation's GDP.

3. The coastal plain is flood-prone, making the national economy susceptible to the impacts of the country's high seasonal rainfall and storm events. In January 2005, extreme rainfall caused widespread flooding in the coastal lowlands and resulted in an estimated US\$465 million in damages, which amounted to 59 percent of Guyana's GDP at the time. Other more recent severe rainfall events (e.g. February 2006, December 2008, January 2009, February 2011, and January 2012) have caused economic and livelihood losses, which further highlighted the importance of reducing Guyana's vulnerability to flooding and fostering shared prosperity as an engine for equitable economic growth, job creation and poverty reduction. Present rates of sea level rise associated with global climate change are also problematic: estimates from the 2009 *National Adaptation Strategy to address Climate Change in the Agriculture Sector of Guyana* suggest that the sea level can be expected to reach one meter by the end of the century, which could potentially result in the flooding of about 200,000 hectares, where 70 percent of the population resides, 40 percent of the agricultural land is located and 48 percent of the GDP is produced<sup>4</sup>.

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<sup>1</sup> World Bank Group (Website: Guyana Overview, updated April 01, 2015).

<sup>2</sup> Estimate based on 2013 Guyana Bureau of Statistics data.

<sup>3</sup> Guyana Population & Housing Census 2012 Preliminary Report (Bureau of Statistics).

<sup>4</sup> Development Policy and Management Consultants, Guyana (2009), "National Adaptation Strategy to address Climate Change in the Agriculture Sector of Guyana: Synthesis and Assessment Report", Caribbean Community Climate Change Centre.

## **Guyana Coastal Drainage and Flood Control**

### *Introduction*

4. Guyana's coastal zone consists of a low-lying system of marine and riverine deposits which formerly comprised an extensive network of tidal deltas. Land was reclaimed during the colonial period (Netherlands 1616-1814 and England 1814-1966) and a unique and complex network of drainage and irrigation canals requiring constant monitoring and maintenance was installed to allow for drainage and irrigation and mitigate flood impacts.

5. Georgetown and the majority of the population is located in Guyana's administrative East Demerara Region 4 (1,843 square kilometers) which is bounded to the north by the Atlantic Ocean, to the west by the Demerara River and to the east by the Mahaica River and Region 5. A sea-wall along the Atlantic Ocean protects the population from coastal flooding whilst a large, shallow, inland water reservoir called the East Demerara Water Conservancy (EDWC) lies inland and prevents storm water from the southern inland area from entering the reclaimed coastal lands. The EDWC provides flood control during the wet season and provides irrigation water to agricultural lands during the dry season, especially important for rice and sugar production which represents 4.3 and 3.8 percent of the country's GDP<sup>5</sup> respectively. It also provides drinking water to urban areas. The EDWC covers an area 571 km<sup>2</sup> and stores approximately 250 million cubic meters of water at the maximum safe-operating water level. It is dammed on three sides by a shallow earth embankment 67 km long, lying parallel to the Demerara River, the Atlantic Ocean and Mahaica River (see Annex 8, Figure 8.1). A series of canals controlled by sluices drain water from the EDWC in order to reduce water levels and avoid overtopping or stressing the dams which may increase the risk of structural failure. The 2005 floods left the dam in a weakened state and highlighted vulnerabilities in other flood mitigation infrastructure to adequately drain floodwater away quickly.

6. The East Coast (the area between the Atlantic Ocean and the EDWC) and lands on the East Bank of the Demerara River have separate drainage systems from the EDWC drainage system and consists of a network of drainage and irrigation canals, culverts, sluices and pumps (often augmented by mobile pump units at hotspots along the coastal plains) which drain water from the East Coast and East Bank into the Atlantic Ocean and Demerara River respectively. However, this system is not sufficient to protect the areas from flooding during storm events and many areas, such as the Cunha Canal Project area, are both susceptible to flooding during storms and have soils that are waterlogged, reducing their utility and productivity for agriculture.

7. Region 4 experiences two wet seasons. During the primary wet season, between May and July, it experiences between 250 and 450 mm per month of rainfall and during the secondary wet season, between November and January, it experiences between 150 and 300 mm per month, with annual total rainfall in Georgetown averaging approximately 2300 mm, and varying between 1400 and 3700 mm per year. During rainfall events, flood protection in Region 4 is dependent upon both the integrity of the EDWC dam and effective drainage in the East Coast and East Bank areas. In January 2005, Georgetown experienced over 1100 mm of rain, with 650

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<sup>5</sup> 2013 Guyana Bureau of Statistics.

mm falling in just 5 days. This extreme rainfall was responsible for causing the devastating floods in the coastal regions.

### *Cunha Canal*

8. A key element of both the EDWC and East Bank drainage systems, that is currently not operating efficiently, is the Cunha Canal. It is located on the western side of the EDWC and discharges water from the EDWC and local area into the Demerara River (see Annex 8, Figure 8.2). Located on the edge of the EDWC, the Cunha Canal is intended to serve two purposes. The first is to drain nearby farming areas (Kuru Kururu; Coverden; Pearl and Sarah Johanna) - approximately 810 ha of land. Drainage from these areas flows through tributaries into the Badarima Creek, into the EDWC and through the Cunha Canal, out to the Demerara River (see Annex 8, Figure 8.3). The second purpose is to help manage the water level in the EDWC. During critical rain periods, water from the EDWC needs to be drained to keep it from exceeding the safe operating level of the dam. This reduces the risk of dam breaches caused by the increased stress or overtopping of the dam when water levels are high.

9. Around 1990, the canal was diverted from its original alignment, taking a turning at, and following the East Bank Demerara (EBD) Public Road and joining the Sarah Johanna channel that flows to the Demerara River. This diversion created a hydraulic barrier in the discharge of the Cunha Canal due to the size of the Sarah Johanna channel and restrictions imposed by bridge and culvert structures constructed to accommodate local access and flow under the public road. Moreover, with this additional flow from the Cunha Canal, the Sarah Johanna channel is now overburdened and does not have the capacity to drain both the areas intended to be served by the original Cunha Canal alignment and the agricultural areas intended to be served by the Sarah Johanna channel. Rehabilitation of the canal would remove hydraulic restrictions, allowing these and other farming areas to be drained, and would allow for additional drainage capacity for the EDWC during storm events.

### **Key challenges facing the sector**

10. *Condition of Drainage Infrastructure:* The National Drainage and Irrigation Authority (NDIA) in the Ministry of Agriculture (MoA) is responsible for drainage and irrigation in Guyana, including management of conservancies such as the EDWC. NDIA responsibilities cover strategic planning, investment, operation, maintenance and monitoring. In the decades leading up to the 2005 and 2006 floods, the operational capacities of the EDWC and coastal drainage systems declined due to insufficient physical investments and inadequate disaster preparation and management capacity. Following the floods, the Government of Guyana (GoG) reemphasized the importance of flood risk management to Guyana's economic, social and political well-being, increasing the annual budget allocated to investment and operation and maintenance of the system and investing in tools for medium- and long-term planning.

11. Since 2005, the Government of Guyana (GoG) has been working to improve flood management infrastructure for the EDWC and coastal drainage systems by repairing and maintaining the dam, rehabilitating sluices, canals and water ways, and installing new

infrastructure such as the Hope-Dochfour EDWC relief canal<sup>6</sup>. Additionally, significant investments - a combination of GoG, World Bank, Japanese International Cooperation Agency (JICA) and Inter-American Development (IDB) funds<sup>7</sup> - have been undertaken to improve water flow within the EDWC; rehabilitate several drainage relief canals and sluices; purchase equipment for maintenance and repair, and improve drainage capacity along the coastal areas. These investments have and will continue to improve the stability of the dam and mitigate flooding in the coastal areas.

12. Since the 2005 floods, the GoG has demonstrated its political and financial commitment to address flood risk management needs. At the same time the financial resources from GoG alone are not sufficient to undertake larger investments and long term planning. With the exception of the Hope-Dochfour Northern Relief Channel, activities outside of donor funding have focused on smaller short-term investments and maintenance activities that NDIA can undertake using their existing resources.

13. Financial support from donors such as JICA, IDB, European Union (EU) and the World Bank and other schemes such as the Guyana REDD+ Investment Fund (GRIF), thus provide important sources of financing to implement the larger investments, and knowledge to undertake strategic planning activities that otherwise would not be completed.

14. *Impacts of climate change:* The infrastructure challenges are compounded by the likely influence of climate change on sea-levels and rainfall pattern. Sea level in the region that includes Guyana is increasing at a rate of more than 10 mm/year, or 2 to 5 times faster than the global estimate<sup>8</sup>. As a result, the time period between high tides that the EDWC can effectively drain will reduce, affecting its ability to secure safe operating levels during storm events. Additional drainage capacity will help mitigate this limitation.

## **Strategies to address the sector's challenges**

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<sup>6</sup> The Hope-Dochfour EDWC Northern Drainage Relief Channel, financed by GoG, is due to start operation in 2015. See Annex 7 for modelled impacts of the Northern Hope-Dochfour Drainage Relief Channel.

<sup>7</sup> (a) The US\$ 7.4 million JICA-funded Grant for Rehabilitation of the East Demerara Water Conservancy includes equipment purchase and rehabilitation of drainage canals and sluices in the East Coast Demerara area. The project is expected to be completed in 2014. (b) The US\$ 22.5 million IDB-funded Agriculture Services Support Project focused on public land management policies, drainage and irrigation, and undertook rehabilitation of infrastructure, some of which was linked to the drainage of the East Demerara. (c) The US\$3.8 World Bank Conservancy Adaptation Project (P103539) funded sluice upgrades and equipment as well as a series of technical studies and recommended a series of strategic future flood management investments for the EDWC and East Coast areas totaling US\$ 123 million (see Annex 7 for details). (d) The new World Bank International Development Association US\$ 11.89 million Flood Risk Management Project (P147250), taking recommendations from the CAP into account, will upgrade critical sections of the EDWC dam and carry out priority flood risk reduction investments in the East Coast Demerara System. (e) The EU is also financing a USD25 million project to upgrade sea defenses including those in the East Coast Demerara.

<sup>8</sup> B.C. Douglas (1995) "Global sea level changes: determination and interpretation." *Rev. Geophys.*, Vol. 33, pp. 1425-1432; Government of Guyana (2002) "Guyana Initial National Communication In Response To Its Commitments To The UNFCCC 2002"; Republic of Guyana (2002) "Initial National Communications Report to the UNFCCC"; Government of Guyana, Environmental Protection Agency (2002) "Guyana's National Vulnerability Assessment to Sea Level Rise".

15. *Improving drainage planning and management:* The flood of 2005 highlighted the significance of the risks posed by the weakened containment and drainage capacities of the EDWC and coastal drainage system. With flooding re-occurring the following year, the GoG and the international community recognized flood management to be crucial to Guyana's economic, social and political well-being. In response to these needs, the GoG requested the World Bank to develop the US\$3.8 million Conservancy Adaptation Project (CAP) (October 2007 to August 2014) with financing from the Global Environment Facility (GEF) Special Climate Change Fund (SCCF). The intention was to improve the understanding of the behavior of the EDWC and the coastal drainage systems for the planning of investments and operation. In particular, the GoG improved the baseline monitoring and information system of the EDWC by installing systems to monitor weather, water levels and water flow and collecting topographic and land use data in the coastal area. These systems were used to simulate the behavior of the EDWC and of the coastal drainage system under different storm events. They helped identify priority interventions in the EDWC and the dams, and the coastal drainage system. These interventions are included in the GoG short and mid-term development plans, specifically in the Ministry of Agriculture's Master Drainage and Irrigation Plan for the period 2014-2030, now being finalized and its ongoing 2013-2020 Strategic Plan. The Cunha Canal Project forms part of the GoG Strategic Plan<sup>9</sup>.

16. *Financing:* The GoG has made efforts to establish mechanisms to finance upgrades in the system and reduce vulnerability to climate and disaster risk. In 2009, the GoG launched a Low Carbon Development Strategy (LCDS), outlining how Guyana's economy can be aligned along a low carbon strategy, by investing payments under REDD+ into strategic low carbon sectors. In the same year, Guyana and Norway signed a Memorandum of Understanding (MOU) and a Joint Concept Note in which Norway committed to providing financial support of up to US\$250 million by 2015 (with the expectation to allocate the funds to specific projects before December 31, 2016) for results achieved in Guyana's REDD+ Investment Fund (GRIF), which will support the implementation of Guyana's LCDS (see Annex 5). These initiatives build on earlier components of the country's policy and legislative framework, including the National Environmental Action Plan (NEAP) and the Environmental Protection Act (EPA) and include projects to reduce their vulnerability to climate change and disaster risk management. The GRIF steering committee in 2011 began approving projects under the LCDS and approved the preparation of the Cunha Canal Project, in June 2012.

17. In addition, the GoG requested in September 2013 the preparation of an US\$11.98 million IDA credit Flood Risk Management Project (P147250), approved in June 2014, to support investments in the EDWC and coastal drainage systems. The project includes the following components: (i) Upgrading the EDWC Dam and Drainage System; (ii) Upgrading the East Coast Drainage System; and (iii) Management and Planning Support. The proposed Cunha Canal Project will complement this work by improving drainage in and around the EDWC and locally.

## **Rationale for Bank Involvement**

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<sup>9</sup> Ministry of Agriculture National strategy for agriculture in Guyana 2013-2020.

18. *The Bank has been centrally involved with planning improvements in the EDWC and coastal drainage systems through needs-assessments after the 2005 flood, implementation of the CAP and the preparation of the Flood Risk Management Project.* The CAP was conceived as part of a needs-assessment after the 2005 flood and represents the most technically sophisticated and comprehensive planning study for the EDWC and east coast drainage system. It is now being used as the basis for identifying future investments in the area. The Bank's technical input into the design and execution of this methodology was important for establishing this future vision of infrastructure improvement and operation of the EDWC and establishing a data-driven decision-making approach to drainage and irrigation. The IDA Flood Risk Management Project is focused on implementing the priority investments identified under the CAP and this Cunha Canal Project complements the investments under the project.

19. *The proposed project would be the first project financed by the GRIF with the World Bank as a partner entity, providing a proof of concept of the use of this financing mechanism.* The successful implementation of the Project could pave the way for a longer term partnership for the World Bank to act as a partner entity in the financing of a larger set of investment under the US\$250 million GRIF fund.

## **B. Higher Level Objectives to which the Project Contributes**

20. *Country Assistance Strategy.* The project is fully consistent with the World Bank Group's Country Assistance Strategy (CAS) FY2009-12 (Report No. 47983-GY), discussed by the Executive Directors on May 26, 2009, and with the expected focus areas of the upcoming Country Engagement Note (CEN). In the meantime, the CAS continues to guide the Bank's assistance to Guyana, as the Bank moves towards more analytical work and the development of a new strategic engagement framework. The CAS focuses on:

- a. Environmental resilience and sustainability, focusing on helping the country establish pilot forest areas that are protected and sustainably managed by local communities, and strengthening the country's ability to reduce its exposure to natural disasters and global climate risk.
- b. Education quality and social safety nets through teacher training reform and better service delivery, while bolstering the Government's efforts to deliver an enhanced social protection program.

21. *Promoting Shared Prosperity and Ending Extreme Poverty.* This project would contribute to the Bank's dual objective of reducing poverty and boosting shared prosperity. Catastrophic climate risk is absorbed by the Government and agriculture producers at great cost, restricting their ability to exit from poverty and inhibiting growth and agricultural competitiveness. Climate change and natural disasters have the greatest impact on the poorest populations who generally live in higher-risk areas. In the case of Guyana, flooding from rainfall events can have crippling and cumulative effects on livelihoods<sup>10</sup>.

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<sup>10</sup> The ECLAC 2006 "Socio-Economic Assessment of the Damage caused by the January-February 2005-2006 Flooding" supported the fact that severe rainfall events impact welfare significantly in Guyana. Although the poverty impacts were not specifically quantified, a recent detailed study of the effects of natural disasters in

22. *The 2005 Guyana Poverty Reduction Strategy Paper Progress Report*<sup>11</sup> indicates that Region 4 has the largest number of people living in poverty. The report also states that the January 2005 flood was the most serious shock that the country has experienced recently and that it has possible long-term implications. The impact on poverty was evident in depleted productive capacity due to damages in road and other infrastructure networks, affecting key economic activities such as agriculture, manufacturing, retail trade and distribution. Many subsistence farmers, small business operators and vendors were affected directly and encountered severe liquidity constraints due to the closure of their operations and needed to divert resources to maintain adequate consumption during the flood. By investing in infrastructure and planning that would reduce the vulnerability of the population to similar catastrophic impacts, the project will make an important contribution to shared prosperity and ending extreme poverty.

## **II. PROJECT DEVELOPMENT OBJECTIVES**

### **A. PDO**

23. The Project Development Objective is to increase the capacity of the Cunha Canal to drain the East Demerara Water Conservancy and local agricultural areas in the Recipient's territory.

### **Project Beneficiaries**

24. Rehabilitating the Cunha Canal will improve its discharge capacity, thereby improving the drainage capacity of the EDWC system. The EDWC is currently drained through only five outlets: the Lama and Maduni outlets draining into the Mahaica River to the east, and through the five-door Land of Canaan, Kofi and currently poorly-operational Cunha canals draining into the Demerara River to the west. Once operational, the Hope-Dochfour relief channel will allow further drainage into the Atlantic Ocean to the north. Rehabilitation of the Cunha Canal will allow additional discharge capacity into the Demerara River, helping to reduce the risk of water levels exceeding the safe operating level of the EDWC dam, which would stress the dam and potentially lead to catastrophic breaching and flooding. The beneficiaries in this case are principally the citizens of Georgetown (estimated population of 118,363 people, including the City and suburbs<sup>12</sup>), and residents, commercial and industrial establishments and farmers in the Region 4 area.

25. The Cunha Canal Rehabilitation will also improve drainage in local agricultural areas. The project will benefit both the communities along the Badarima Creek and tributaries south of the EDWC who depend on drainage through the Cunha Canal, and villages skirting the East Bank Demerara River who depend directly on drainage through the Sarah Johanna channel. In particular, the project will directly benefit the residents and farmers in the communities of Kuru

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Guatemala on poverty provides quantitative evidence that rainfall events can cause sizable and persistent deterioration on human welfare. In Guatemala's case, it was concluded that rainfall impacts from Hurricane Agatha in urban areas could be responsible for up to 20% of the increase in poverty that occurred in affected areas between 2006 and 2011.

<sup>11</sup> International Monetary Fund (IMF) Country Report No. 06/364, October 2006.

<sup>12</sup> Guyana Population & Housing Census 2012 Preliminary Report (Bureau of Statistics).

Kururu, Coverden, Sarah Johanna and Pearl. This area was historically known for its quality eddo crops<sup>13</sup>. Before the alignment of the Cunha canal was diverted, the eddoes grown in this area were of high quality with an export market. After the realignment of the canal, which reduced drainage from the creeks that led to the Badarima creek and the Sarah Johanna channel, agricultural fields became inundated and now have standing water which interferes with or prevents the growth of eddoes. Eddo, as a root crop, tends to rot and misshape in soil that is saturated with water for extended periods. This has led to substantially lower productivity, loss of income (both to farmers and related businesses), migration of the local labor force, the abandonment of farms and the need to supplement farming livelihoods with labor-related employment. It also increases the vulnerability of this area in terms of flooding as the area is regularly flooded during rain events causing damage to those crops being produced. Rehabilitation of the Cunha Canal will improve drainage and allow farmers to re-establish crops such as eddoes. Improving local drainage will also have the added impact of allowing other tributary creeks to be cleared, further improving soil quality and productivity in the area.

### **PDO Level Results Indicators**

26. Outcome indicators include:
- (a) Increase in discharge capacity of the conservancy measured as the maximum discharge capacity increase of the Cunha Canal (m<sup>3</sup>/s)
  - (b) Agricultural area with improved drainage (ha).

## **III. PROJECT DESCRIPTION**

### **A. Project Components**

27. The proposed project is composed of three components including carrying out civil works to rehabilitate the Cunha Canal; compensation under the resettlement plan; and project management. Full details are listed in Annex 2.

28. **Component 1. Cunha Canal Rehabilitation Works (US\$ 1.91 million from GRIF; US\$ 0.27 million as counterpart funds from GoG, total US\$ 2.18 million).**

29. This consists of three main activities:
- (a) *Rehabilitation of the drainage channel.* The channel will be re-routed along its original alignment, widened and excavated to remove the earth fill and weeds and allow for a straight flow into the Demerara River that eliminates hydraulic restrictions. This will be undertaken by the GoG through counterpart funds.
  - (b) *Rehabilitation of sluices.* This would cover rehabilitation of: (i) sluice at the outlet of the EDWC to fix the gate and upgrade the sluice; and (ii) the rehabilitation of the

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<sup>13</sup> Eddo is a root/tuber crop grown in the tropics, primarily for its edible root and secondarily for its leaf vegetable.

sluice at the outlet of the Cunha Canal at the Demerara. The first sluice will serve as a regulator for water releases from the conservancy and the second will control the discharge of water and to prevent water from the Demerara River from entering the canal during high tide.

- (c) *Construction of a bridge on the EBD Public Road.* A new bridge will be constructed at the point where the canal will intercept the EBD Public Road to allow vehicular traffic to traverse the area.

30. **Component 2. Resettlement (US\$ 0.57 million from GRIF).** The proposed civil works require the use of a portion of land (approximately 5.3 acres) currently occupied by the Barama Company Limited (BCL) and the relocation of certain assets. Compensation will be paid to Barama for the fair market value of: (i) relocation of assets, and (ii) provision of other resettlement assistance. Assets to be relocated include a log bridge, a steel bridge, a moulding shed, a saw-dust pen, equipment, a fence and two guard huts. During the relocation period operations will be affected. Compensation for this cost will be provided by the Project under this Component.

31. **Component 3. Project Management (US\$ 0.52 million from GRIF).** The Project will finance consultancies and operational costs to manage the project including procurement, financial management and technical staff. It will also fund consultancies for supervision of the project works including safeguards related supervision. It will also fund monitoring equipment to better understand the impacts of the works on the water flows in the Badarima Creek, Cunha Canal and Sarah Johanna Canal and drainage of the Conservancy and the nearby agricultural areas.

## **B. Project Financing**

### **Instrument**

32. The financing instrument is Investment Project Financing. The source of financing is a grant from the GRIF with the World Bank as a partner entity. The GRIF was established in October 2010, following the signing in November 2009 of a Memorandum of Understanding (MoU) between Guyana and Norway, in which Norway committed to providing financial support of up to US\$250 million by 2015 (to be allocated before December 31, 2016) for results achieved by Guyana in limiting emissions from deforestation and forest degradation. Under the MoU, contributions from Norway are channeled towards priority projects identified in the LCDS through the GRIF.

33. The GRIF represents an effort to create an innovative climate finance mechanism which balances national sovereignty and ensures that REDD+ funds adhere to the Partner Entities' financial, environmental and social safeguards. The GRIF is also designed to support global efforts to devise a United Nations Framework Convention on Climate Change (UNFCCC) REDD+ mechanism. In the absence of a UNFCCC mechanism for REDD+, the Guyanese and Norwegian Governments have invited the IDB, the World Bank and members of the United Nations Development Group to act as GRIF Partner Entities, and the World Bank to act as Trustee.



## Project Cost and Financing

34. The Cunha Canal rehabilitation will be financed 100 percent by a Project grant from the GRIF with the World Bank as a partner entity (US\$3.00 million). The GoG will also provide counterpart funds of US\$0.27 million. GRIF funds will finance the cost of the physical works (US\$1.91 million) resettlement (US\$ 0.57 million) and project management (US\$0.52 million) while the GoG counterpart funds (US\$0.27 million) will cover other related physical works.

<b>Project Components</b>	<b>Project cost (including GoG counterpart funds outside the Grant)</b>	<b>GRIF Financing (representing 100% of costs under the Grant)</b>	<b>% Financing of costs under the Grant</b>
1. Cunha Canal Rehabilitation Works	US\$ 2.18 million	US\$ 1.91 million	88%
Rehabilitation of drainage channel	US\$ 0.27 million	-	0%
Rehabilitation of head regulator	US\$ 0.17 million	US\$ 0.17 million	100%
Construction of bridge	US\$ 1.50 million	US\$ 1.50 million	100%
Rehabilitation of sluice at Cunha	US\$ 0.21 million	US\$ 0.21 million	100%
Unallocated	US\$ 0.03 million	US\$ 0.03 million	100%
2. Resettlement	US\$ 0.57 million	US\$ 0.57 million	100%
3. Project Management	US\$ 0.52 million	US\$ 0.52 million	100%
<b>Total Project Costs</b>	<b>US\$ 3.27 million</b>	<b>US\$ 3.00 million</b>	<b>100%</b>

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

35. The project design benefits from the results of the CAP (see Annex 7 for details) and lessons from regional initiatives in disaster risk management.

36. **Project Procurement and Disbursement Arrangements:** The key challenges faced by the CAP, especially at its onset, were related to procurement and disbursement. The experiences learned from the CAP are incorporated into this project. To support project management, budget will be made available through a designated account to finance the ASDU staff and its operations; to support more timely procurement, procurement planning and training will be emphasized as part of implementation; and to avoid overwhelming the limited procurement capacity, the number of contracts will be minimized as is appropriate.

37. **Technical Support:** The technical supervision and quality control provided through consultants for the CAP proved instrumental to the satisfactory completion of the project. At the same time, gaps in this supervision caused delays in project implementation. Here, technical supervision contracts, including quality control, will be included with a contract period that adequately covers the period of the works and studies; and technical trainings will be incorporated throughout the life-span of the Project.

38. *Knowledge Exchange:* The processes of the GRIF are designed to allow for input from the public including NGOs active in REDD+. Input from these groups will be incorporated into the project as needed. Disaster risk management activities in the Caribbean have benefitted from regional exchanges. Sharing the knowledge from the Project can be mutually beneficial for Guyana and other Caribbean or Latin American countries. As part of the Bank supervision and the regional program on disaster risk management, these opportunities will be pursued. Improving donor coordination was found to be one of the cornerstones of implementation success of the CAP. Donor coordination is incorporated into the design and supervision of the Project.

39. *Monitoring and Planning:* The CAS and CAP respectively highlighted the need for better systems for monitoring of social and poverty indicators and the utility of establishing a technical baseline for hydrologic systems. Dependable data on socio-economic conditions in the country has limited project impact assessments. At the same time, data on hydrology established under the CAP has been useful in understanding the risks of flooding in Region 4. The Project will expand the use of the hydrologic data under the CAP.

#### **IV. IMPLEMENTATION**

##### **A. Institutional and Implementation Arrangements**

40. The project implementing arrangements are as follows:

41. *Ministry of Agriculture:* The implementing agency is the Agriculture Sector Development Unit (ASDU) within the Ministry of Agriculture (MoA). The ASDU will also 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, and making payments to contractors. The rehabilitation of the canal including, the intake and outlet sluice and construction of a new bridge on the public road will fall under the responsibility of the ASDU and will be financed by the project. They will also manage the supervision contract for the project works. The National Drainage and Irrigation Authority (NDIA), the national authority responsible for management and maintenance of drainage and irrigation canals under the MoA, will implement the construction of the drainage canal through counterpart funds provided by GoG. Once works on the Cunha canal are complete, the NDIA will take over operations and maintenance in accordance with their mandate. Operation and maintenance costs will be funded through regular government appropriations for these types of activities. Hydromet, the Ministry of Agriculture Hydro-meteorological service, will take over ownership and will maintain the hydrologic monitoring equipment purchased as part of the project.

42. *Ministry of Public Works and Communications:* Similarly, the ASDU will manage the construction and related fiduciary, procurement and contract management responsibilities for the bridge, while the Ministry of Public Works and Communications (MoPWC) will assume management and maintenance responsibility of the completed structure. The MoA and the MoPWC have signed a MoU outlining the arrangements for the construction design approval and supervision, maintenance and operation of the proposed works. Responsibilities in terms of design, bid preparation, firm selection, contracting, technical supervision, operation, routine maintenance and repair of the works involved are also outlined in this MoU. The MoPWC will

be responsible for providing approvals for the final design of the bridge works to assure it is consistent with national requirements. Upon completion of the works, the ownership of the bridge will be transferred to MoPWC who will maintain the bridge after construction is complete, through funding from regular government appropriations for these types of activities. While performance can be improved, these appropriations are adequate for basic maintenance of the system. With the increased emphasis on flood issues in Guyana, the Government's capacity and attention to operating the system properly has steadily increased in the past few years.

43. *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. Project implementation will be led by an implementing agency, which in this case is the MoA's ASDU with strategic guidance and oversight from the PMO. Under the GRIF arrangement, the World Bank (as a GRIF partner entity) enters into a grant agreement with the GoG for the Cunha Canal Rehabilitation Project.

## **B. Results Monitoring and Evaluation**

44. The overall results and monitoring framework for the project are summarized in Annex 1. ASDU will have overall responsibility for monitoring and evaluation of the Project and will consolidate all reports and report to the Bank on the Project's performance indicators, on the Project's progress and execution, quality control and environmental and social safeguards (see Annex 3 for details). Project monitoring will be undertaken by ASDU as part of their daily activities and maintenance of records. They will provide quarterly financial reporting, semi-annual project progress reporting and annual audits.

45. The GoG's monitoring and evaluation capacity for this sector is deemed to be relatively high, given the relevant MoA, NDIA and MoPWC history of engagement with the sector and donor financed projects, and due to the institutional strengthening work currently being carried out under the Flood Risk Management Project. The indicators specific to the Project are objective and measurable (agricultural area with improved discharge, and increases in drainage capacity of the Cunha Canal will be reported based on work completed).

46. As partner entity to the GRIF, the World Bank will comply with reporting requirements set out in the GRIF Operational Manual, notably to report annually to the Steering Committee, through the Secretariat: (i) on the progress of implementation of its activities and results achieved compared to planned results, and (ii) on its contribution to the achievement of the planned results of the GRIF as such and the financial status of Project activities under its responsibility. The Bank will provide the Steering Committee with a final report within six months of the Project's completion date. The Secretariat will post progress reports, annual reports and non-audit quality reports on financial disbursements and results of audits on the

GRIF website, as they are received.

### C. Sustainability

47. *Ownership:* The GoG has already signalled its strong commitment to and ownership of the Cunha Canal rehabilitation activity, as reflected by the prominence of environmental sustainability and flood control strategies in its policy framework and government budget<sup>14</sup>, and as reinforced by the World Bank Group’s Country Assistance Strategy 2009-2012 (Report No. 47983-GY), discussed by the Executive Directors on May 26, 2009. GoG is also updating its National Irrigation and Drainage Plan which includes the Cunha Canal Rehabilitation. The GoG has also elaborated a National Sector Policy for Sea and River Defense. Moreover, the investment for Cunha Canal rehabilitation was proposed to the World Bank at the initiative of the Office of the President (OP), which represents the GoG on the GRIF Secretariat.

48. *Operations and Maintenance:* It is expected that the operations and maintenance of the rehabilitated Cunha Canal will be managed by the relevant entities within the GoG (MoA and MoWPC). Assurances that the GoG would allocate sufficient resources to maintain the improvements carried out under that project will be included in agreements with the Bank and further strengthening is planned to be included as part of the proposed Flood Risk Management Project.

## V. KEY RISKS AND EXPLANATION

<b>Risk category</b>	<b>Rating</b>
<b>1. Political and Governance</b>	Moderate
<b>2. Macroeconomic</b>	Moderate
<b>3. Sector Strategies and Policies</b>	Low
<b>4. Technical Design of Project or Program</b>	Moderate
<b>5. Institutional Capacity for Implementation and Sustainability</b>	Substantial
<b>6. Fiduciary</b>	Moderate
<b>7. Environment and Social</b>	Low
<b>8. Stakeholders</b>	Moderate
<b>OVERALL</b>	Moderate

49. *Overall Risk Rating Explanation.* The overall risk rating was developed based on the experience under the CAP project and other operations in Guyana as well as the particular

<sup>14</sup> Government budget allocations for drainage and irrigation ranged from GYD6-8 billion between 2010 and 2014, a two fold increase of the allocation in 2007. The Master Drainage and Irrigation Plan is being finalized in 2014 and drainage and flood protection are important elements of the country’s Low Carbon Development Strategy update (2013) and Integrated Disaster Risk Management Plan (2013).

context of the Project works. The implementing agency risks are relatively higher than the risks of the Project, as the works are technically straightforward and have manageable safeguards issues. Institutional capacity for implementation and sustainability risk is most significantly related to capacity constraints in the ASDU, particularly related to fiduciary responsibilities. This will be mitigated by providing funding to ASDU staff within the Project. Under the CAP, ASDU's capacity for financial management was built but to a lesser extent, for procurement. The inclusion of qualified financial management and procurement specialists that are familiar with Bank financial management and procurement rules in the ASDU under the Project, along with Bank trainings will help to reduce this risk.

## VI. APPRAISAL SUMMARY

### A. Economic and Financial Analyses

50. A comprehensive cost-benefit analysis was carried out for the Cunha Canal rehabilitation project, comparing benefits and costs. Benefits to local farmers will result from: (i) increase in productivity on land currently cultivated; (ii) increase of land to be cultivated; and (iii) additional earnings on the eddo processing center. Furthermore, the project will benefit the coastal population of Region 4, as the enhanced discharge capacity of the Cunha Canal will reduce the risk of water overflowing the EDWC. This benefit was not quantified, but will have a huge impact, beyond the farmer's benefits. The January 2005 floods caused damages amounting to US\$465 million or 59 percent of the country's Gross Domestic Product (GDP)<sup>15</sup>. The January 2006 floods caused damages amounting to US\$30 million in Region 5<sup>16</sup> and local flooding by the Mahaica and Mahaicony rivers resulted in losses of a significant portion of the region's agricultural production. Severe damages were also experienced by local households and businesses. The EDWC dam was structurally weakened by both flood events, but the integrity of the system remained intact. Based on the partial flooding of Region 4 in 2005, it is estimated that the economic loss resulting from a system breach could range between three and four times Guyana's annual GDP whilst replacement costs for the EDWC dam are estimated between US\$200-300 million<sup>15</sup>. The project will impact positively on socio-economic development as it will generate economic benefits 2.3 times higher than its costs. Net benefits are projected to be as high as US\$3.6 million with a return of 29 percent. Benefits from the recovered land generate 79 percent of total benefits, enough to pay for the whole cost of the project. Benefits from the existing cultivated area correspond to 19 percent of the total benefits; and the processing center adds 2 percent to the total benefits. Please refer to Annex 6 for full details of the Economic Analysis.

### ECONOMIC RESULTS

	NPV* of flows	
	000 GD\$	000 US\$
Total Benefits	1,335,414	6,489

<sup>15</sup> UNDP-ECLAC (2007) Subregional Headquarters for the Caribbean. *Guyana. Macro-Socioeconomic Assessment of the Damage and Losses Caused by the January-February 2005 Flooding*.

<sup>16</sup> UNDP-ECLAC. *Guyana. The impact on Sustainable Livelihoods Caused by the December 2005-February 2006 Flooding*. October 2006.

Costs (Investment and maintenance)	583,660	2,836
Net Benefit	751,754	3,653
Benefits/Costs	2.3	2.3
Internal Rate of Return (IRR)	29%	29%

\*Net Present Value

51. **Rationale for public sector provision/financing.** Given the country’s vulnerability to climate change and natural hazards, the GoG has undertaken a number of initiatives to respond and mitigate the potential impacts of disaster risk through public investments. These investments are crucial to strengthen, reconstruct, and rehabilitate key economic and social infrastructure and facilities, following disasters; and also to strengthen the country’s institutional capacities to prepare and respond to disasters in an efficient and effective manner.

52. **World Bank Value Added.** The Bank has been working with the GoG to reduce vulnerability of the country to climate change and adverse natural events. Since the devastating 2005 flood, the WB has been working with the GoG and other donor agencies to develop a comprehensive strategy to increase the drainage capacity of the EDWC and coastal drainage systems. The Conservancy Adaptation Project (CAP) for example provided a comprehensive hydrological and topographical datasets and pre-investment studies to help the GoG identifying future interventions and provide the donor community with key investments to reduce flood risk. The rehabilitation of the Cunha Canal complements those investments.

## B. Technical

53. The technical design of the Cunha Canal rehabilitation works was originally completed in 2010 and has been updated to incorporate adjustments, for example the size of the bridge. In addition, the modelling results under that CAP pointed out the need to upgrade the inlet sluice from the EDWC and to adjust the bed depth of the canal. These have been incorporated into the design. The proposed alignment is shown in Annex 8, Figure 8.2.

54. Technical due diligence of the Cunha Canal with regard to its role in drainage was undertaken through a socioeconomic assessment of the impacted agricultural area and through the results of the technical evaluation of the status of EDWC structures. Hydraulic modelling of behavior of the conservancy under extreme storm events also provided complementary information.

55. The Cunha Canal as currently configured is constrained hydraulically primarily because it has been diverted to a smaller channel known as the Sarah Johanna which is designed to serve as agricultural drainage. The current flow from the Cunha and the Sarah Johanna canals cannot be accommodated. The rehabilitated Cunha Canal would allow the Sarah Johanna sluice to operate with its original flow and drain the agricultural areas it intends to serve. In addition, the rehabilitated Cunha Canal can then accommodate flows from agricultural areas that drain the Badarima Creek. The design has been reviewed to ensure these goals can be met.

56. The technical analysis under the CAP highlighted that the outlet sluice of the Cunha Canal at the EDWC needed to be upgraded. Because of its status, the flow into the canal does not increase significantly with rising water levels during storm events. This reduces its ability to drain water under these circumstances and its utility in preventing dam breaches. The modelling

also highlighted that although water levels in the vicinity of the Cunha and Land of Canaan outlets are the lowest in the EDWC, better internal channeling in the EDWC from east to west, would improve drainage on the eastern side of the conservancy by channeling water to the western side where the Cunha Canal is located. This activity is being planned along with further modelling to optimize the operation of the drainage canals that drain to the Demerara and should further enhance the utility of the Cunha Canal. Furthermore, the modeling highlighted the connectivity which exists between the Cunha and Land of Canaan canals and reinforced the importance of the Cunha Canal should the Land of Canaan sluice become inoperable.

### **C. Financial Management**

57. The Financial management (FM) of the Project will be undertaken by the ASDU based in the Ministry of Agriculture, which had a satisfactory rating for its FM responsibilities, with a Project Accountant responsible for the day to day management. The ASDU has considerable experience in implementing the CAP, which had a satisfactory rating for financial management. An additional 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 for implementation of the program. The assessment concluded that the ASDU has adequate staff with experience in implementing Bank-financed projects and also has 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. Designated accounts (DA) denominated in United States and Guyanese Dollars are to be opened and managed by the ASDU. The operation of these account are captured in more detail in the Operations Manual.

58. To help manage residual risks, financial management supervision of the Project activities will be undertaken twice 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.

### **D. Procurement**

59. The ASDU will be responsible for managing the procurement aspect of the Project. A Procurement Associate hired under the Project Management component will be responsible for all procurement activities, and will also perform the procurement activities for all ministries participating in the Project. The Procurement Associate will be an Engineer or a staff member working with an Engineer on all civil works for this Project.

60. The ASDU has gained increasing capacity and familiarity with Bank procurement procedures during implementation of the CAP project. The main procurement challenges remaining relate to delays in procurement due to processing time and capacity constraints in the ASDU and the limited number of qualified firms or contractors working in Guyana. Over the period of CAP supervision, close oversight by Bank procurement management staff and training has improved capacity and timing of procurement processes. Additionally, the Project Management component will fund qualified staff familiar with World Bank procedures and

training will be provided by the World Bank periodically. A procurement plan for the first 18 months of the Project was agreed by ASDU.

#### **E. Social (including Safeguards)**

61. The primary stakeholders that will benefit from the project include the communities in the area that will directly benefit from the Project through an improved ability to drain the agricultural areas and the majority of the population of Region 4 who will benefit from improved management of the EDWC for flood protection.

62. The stakeholders directly impacted by the Cunha Canal Rehabilitation works under the proposed Project are the Barama Company Limited through whose property the canal will traverse, and the users of the public road that may experience delays during construction.

63. As a result of the impacts on the BCL, the rehabilitation of the Cunha Canal under the proposed Project triggers the Involuntary Resettlement (OP/BP 4.12) policy. The works for the Canal have been assessed for involuntary resettlement impacts per OP 4.12, and it has been determined that the case of BCL is the only case of involuntary resettlement. Compensation will be provided from GRIF funds under Component 2 of the Project based on the Abbreviated Resettlement Plan. The Abbreviated Resettlement Plan was disclosed on the GRIF and Bank's websites on April 2, 2015.

#### **F. Environment (including Safeguards)**

64. The Project is categorized as a category B investment under World Bank Environmental Assessment Policy (OP/BP 4.01). Impacts for the type of work anticipated under the project are expected to be moderate in nature and will be managed through the application of appropriate engineering and management measures. The GoG has developed an EA for the Cunha Canal Rehabilitation works (part of the Environmental and Social Assessment Report). This was completed in January 2015 and includes a detailed evaluation of the impacts and mitigation measures, as well as an Environmental Management Plan (EMP) to be applied to the Cunha Canal rehabilitation. Consultations on the EA were undertaken in January 2014 and are included in the updated analysis. The EA was disclosed on the GRIF website on April 2, 2015 and on the Bank website on March 30, 2015.

65. Impacts to the biophysical and socio-economic environments are expected to be minimal, as the canal is in an area that has already been subjected to significant human interventions, and there are no endangered species within the project area. Any additional habitat destruction will be minimized and proposed works will be undertaken in a manner that allows natural regeneration/resuscitation of habitats. Re-vegetation will be undertaken along embankments and contiguous areas after works are completed.

66. Water quality within the Cunha Canal changes from time to time, depending on the activity being undertaken in the Canal. When water is being discharged, the entire Canal is usually filled with dark brown water. Closer to the public road and the Demerara River, discoloration was observed due to the presence of sediments from runoff. Water quality analysis confirms that the pH level, total suspended and dissolved solids, and dissolved oxygen are all

within accepted levels. Canal maintenance is largely focused on vegetation control which is managed by mechanical removal and does not involve the use of pesticides.

67. Other environmental impacts expected from the rehabilitation of the canal are erosion and sedimentation from the excavation activities and impacts related to construction activities (noise, waste management, health and safety and construction site management). An environmental management plan and monitoring program has been developed to address these issues including measures to minimize sedimentation, reuse excavation materials, and construction management practices. Disruption of traffic during construction of the bridge will be addressed through traffic diversion and road safety measures.

### G. Other Safeguard Policies Triggered

<b>Safeguard Policies Triggered by the Project</b>	<b>Yes</b>	<b>No</b>
Environmental Assessment (OP/BP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[X]	[ ]
Pest Management (OP 4.09)	[ ]	[X]
Indigenous Peoples (OP/BP 4.10)	[ ]	[X]
Physical Cultural Resources (OP/BP 4.11)	[X]	[ ]
Involuntary Resettlement (OP/BP 4.12)	[X]	[ ]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[X]	[ ]
Projects on International Waterways (OP/BP 7.50)	[ ]	[X]
Projects in Disputed Areas (OP/BP 7.60) *	[ ]	[X]

\* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas.

The Project also triggers the following safeguard policies (also see table above):

68. *Natural Habitats (OP/BP 4.04)*: A portion of the Project activities takes place within the EDWC. Although the EDWC dam is a man-made structure, it serves as a habitat to caiman, giant otters, and bats. Numerous species of birds nest in or migrate through the conservancy, including Muscovy Ducks, Blue-winged Teal, Pied-billed Grebes, Cormorants, Stripe-backed Bitterns, Egrets, Vultures, Snail Kites, and Great Kisskadees. Given the vast area of the uninhabited conservancy, the localized and short-term works proposed will not affect fauna and avi-fauna. All construction sites will be rehabilitated and re-vegetated with native shrubs and trees. The Project will not result in significant degradation or conversion of natural habitats, given that the works are limited to the upgrade and rehabilitation of existing structures. The Guyana Amazon Tropical Birds Society and the EPA confirmed that the conservancy dam has been sustainably managed. By improving the drainage capacity of the EDWC, the works aim to ensure that this natural habitat remains intact with operational changes considered insignificant in the context of the EDWC habitat. Rehabilitation works for the Cunha Canal will be confined entirely to lands already disturbed by human activity. The construction site is defined as an old field and is currently used as a disposal area for lumber operations waste (chips and wood debris). The local areas drained by the canal are water logged agricultural areas.

69. *Physical Cultural Resources (OP/BP 4.11)*: While activities to be carried out under the Project are not expected to impact any known cultural heritage sites, technical specifications for works will include "chance find procedures" to be followed in the event that culturally significant materials are discovered during the execution of civil works.

70. *Safety of Dams (OP/BP 4.37)*: The EDWC is bordered by a 67 km long earthen dam constructed some 150 years ago. As defined under Bank policy, this is an existing small dam (under 15 meters height). However, as the EDWC has an extensive surface area; provides water and protects a significant population from flooding; is adjacent to natural habitats along the adjoining rivers; and there is a risk of significant adverse impacts due to potential failure of the dam on local communities and assets, the policy was triggered under this project as it was under the IDA Flood Risk Management Project. A detailed engineering assessment of the dam and its associated drainage structures were completed under the CAP, covering the safety status, performance history and operation and maintenance procedures. Necessary remedial work and safety-related measures were identified in order to upgrade the safety status of the dam including immediate priority works on the northeast section of the dam, which will be carried out within the IDA Flood Risk Management Project (effective since November 25, 2014) and by the GoG. The results of the CAP have provided the engineering and safety guidance to the GoG for the design and development of dam strengthening programs.

71. The Pest Management Policy (OP/BP 4.09) is not triggered for the Cunha Canal Rehabilitation works as neither the construction or the maintenance of the canal will necessitate the use of pesticides.

## Annex 1: Results Framework and Monitoring

### THE COOPERATIVE REPUBLIC OF GUYANA: Cunha Canal Rehabilitation Project

<b>Project Development Objective (PDO):</b> The Project Development Objective is to increase the capacity of the Cunha Canal to drain the East Demerara Water Conservancy and local agricultural areas in the Recipient's territory.										
PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**			Frequency	Data Source/ Methodology	Responsible for Data Collection	Description (indicator definition, etc.)
				YR 1	YR 2	YR3				
<b>Indicator One:</b> Increase in discharge capacity of the conservancy measured as the maximum discharge capacity increase of the Cunha Canal.	<input type="checkbox"/>	m <sup>3</sup> /s	0	0	0	30	once	Based on designed maximum discharge capacity of the Cunha Canal.	ASDU	The design-flow of the completed Cunha Canal is 39.8 m <sup>3</sup> /s. Under current conditions (with diverted channel and broken inlet sluice) flow has been measured at 10 m <sup>3</sup> /s. Total increase in discharge capacity will therefore be approximately 30 m <sup>3</sup> /s
<b>Indicator Two:</b> Area provided with improved irrigation and drainage services	<input checked="" type="checkbox"/>	ha	0	0	0	810	once	Agricultural area with improved drainage based on observed areas having improved agricultural production after canal is operational.	ASDU	The current waterlogged agricultural areas are approximately 433 ha (1070 acres) but once rehabilitated, drainage will improve a total of 810 ha (2000 acres) including surrounding land and areas next to Sarah Johanna canal.

<b>Indicator Three:</b> Direct project beneficiaries	<input checked="" type="checkbox"/>	number	0	0	0	12,000	once	Census (to be updated 2012)	ASDU	Total population of approx. 12500 in Land of Canaan Community <sup>17</sup>
<b>Indicator Four:</b> Female project beneficiaries	<input checked="" type="checkbox"/>	%	0	0	0	51	once	Preliminary 2012 census data	ASDU	
<b>INTERMEDIATE RESULTS</b>										
<b>Intermediate Result (Component 1): Carrying out of civil works to rehabilitate the Cunha Canal</b>										
<i>1.1:</i> Completion of rehabilitated drainage channel.	<input type="checkbox"/>	Action completed	Not completed	Not completed	Not completed	completed	once	Based on construction progress reports.	ASDU	
<i>1.2:</i> Rehabilitation and reinforcement of sluices.	<input type="checkbox"/>	Action completed	Not completed	Not completed	Not completed	completed	once	Based on construction progress reports	ASDU	
<i>1.3:</i> Construction of bridge over EBD road.	<input type="checkbox"/>	Action completed	Not completed	Not completed	Not completed	completed	once	Based on construction progress reports.	ASDU	
<b>Intermediate Result (Component 2): Implementation of Abbreviated Resettlement Plan</b>										
<i>2.1:</i> Payment of compensation under the resettlement plan.	<input type="checkbox"/>	Action completed	Not completed	completed	completed	completed	once	Based on project progress reports.	ASDU	

<sup>17</sup> based on approx. 2500 houses with approx. 5 people per household - sourced from Caledonia-Good Success Neighbourhood Democratic Council (Environmental and Social Assessment Report Revised – Rehabilitation of Cunha Relief Channel and Structures, Nov 2014)

Intermediate Result (Component 3): Project Management and Monitoring										
3.1: Installation of hydrologic monitoring equipment.	<input type="checkbox"/>	Action completed	Not completed	Not completed	Not completed	completed	once	Based on project progress reports.	ASDU	

## **Annex 2: Detailed Project Description**

### **THE COOPERATIVE REPUBLIC OF GUYANA: Cunha Canal Rehabilitation Project**

#### *Project Area Overview*

72. The Cunha Canal Rehabilitation Project provides investments to improve local drainage whilst benefitting agricultural areas, and to increase discharge from the EDWC thereby helping to keep water levels below the safe-operating level.

73. The Project works are located within Guyana's coastal plain in Guyana's Administrative Region 4 and form part of the drainage and irrigation infrastructure of the East Demerara Water Conservancy (see Annex 8, Figure 8.1). More specifically, the Cunha Canal is located on the East Bank of the Demerara River, just south of the large 5-door Land of Canaan sluice and drainage canal on the western flank of the EDWC (see Annex 8, Figure 8.2). The canal drains water from the EDWC into the Demerara River approximately 20 kilometers upstream from the Atlantic Ocean.

74. The Cunha Canal is intended to serve two purposes. The first is to drain nearby farming areas (Kuru Kururu; Coverden; Pearl and Sarah Johanna) - approximately 810 ha of land. Drainage from these areas flows through tributaries into the Badarima Creek, into the EDWC and through the Cunha Canal, out to the Demerara River (see Annex 8, Figure 8.3). The second purpose is to help manage the water level in the EDWC. During critical rain periods, water from the EDWC needs to be drained to keep it from exceeding the safe operating level of the dam. This reduces the risk of dam breaches caused by the increased stress or overtopping of the dam when water levels are high.

75. The 2.8km Cunha Canal originally had a straight alignment from the EDWC to the Demerara River, but around 1990, the canal was diverted along a section of the East Bank Demerara (EBD) Public Road, joining the Sarah Johanna channel to flow into the Demerara River (see Annex 8, Figure 8.2). This diversion created a hydraulic barrier in the discharge of the Cunha Canal due to the size of the Sarah Johanna channel and restrictions imposed by bridge and culvert structures constructed to accommodate local access and flow under the public road. Moreover, with this additional flow from the Cunha Canal, the Sarah Johanna channel is now overburdened and does not have the capacity to drain both the areas intended to be served by the original Cunha Canal alignment and the agricultural areas intended to be served by the Sarah Johanna channel. Rehabilitation of the canal would remove hydraulic restrictions, allowing these and other farming areas to be drained, and would allow for additional drainage capacity for the EDWC during storm events.

76. The land immediately north and south of the portion of the Canal west of the public road draining into the Demerara River is owned by the Barama Company Limited (BCL) and includes a sawmill operation with kiln dryers and moulders to produce finished lumber, a corporate office and a jetty. Housing facilities for the employees of BCL, as well as a plywood retailing outlet, are located in close proximity to the East Bank Demerara (EBD) Public Road. North of the Canal and closer to the conservancy are lands covered with vegetation followed by a private residential

housing scheme. Rehabilitation of the original Cunha Canal alignment would therefore require the use of a portion of land currently occupied by BCL and relocation of certain assets.

*Project Development Objective*

77. The Project Development Objective is to increase the capacity of the Cunha Canal to drain the East Demerara Water Conservancy and local agricultural areas in the Recipient's territory.

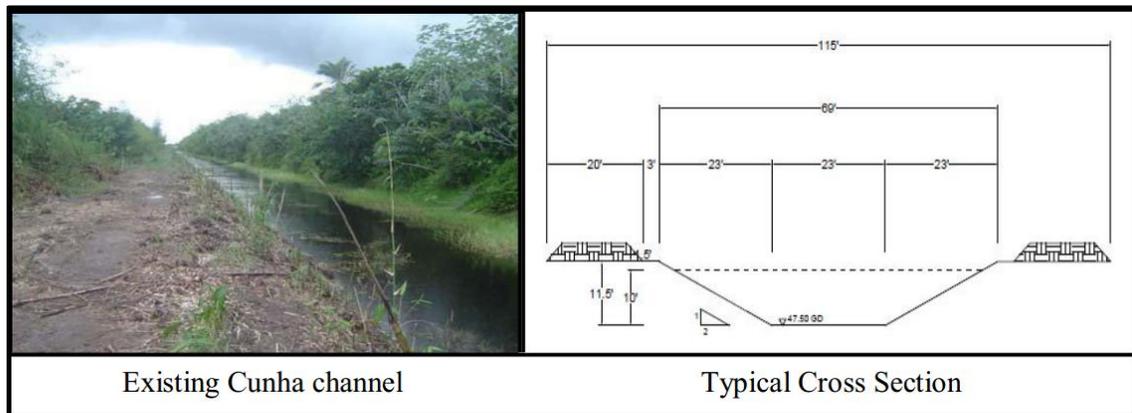
*Detailed Description of Project Components*

78. **Component 1. Cunha Canal Rehabilitation Works (US\$ 1.91 million from GRIF; US\$ 0.27 million as counterpart funds from GoG, total US\$ 2.18 million).**

79. The Project will finance the following activities:

- (a) *Rehabilitation of the drainage channel.* The channel will be re-routed along its original (straight) alignment. The section from the public road to the Demerara River will be widened and excavated to remove the earth fill and weeds and allow for a straight flow into the Demerara River that eliminates hydraulic restrictions. It is proposed to rehabilitate the canal to a bed width of 23ft and a total wayleave of 115ft (see Figure 2.1 below). This will be undertaken by the GoG through counterpart funds.

**Figure 2.1: Cunha Canal and Typical Cross Section**



- (b) *Rehabilitation of sluices.* Currently the Canal has a poorly functioning, reinforced concrete river sluice with a single timber door (head regulator) located on the EDWC embankment, operated by a manual lifting mechanism, whilst a defunct river sluice is located along the original channel alignment and formerly discharged into the Demerara River via an outfall channel. This activity would therefore cover the rehabilitation of: (i) the sluice at the outlet of the EDWC to fix the gate and upgrade the sluice (head regulator) for water releases from the conservancy; and (ii) the rehabilitation of the sluice at the outlet of the Cunha Canal at the Demerara, which will control the discharge of water and to prevent river water from the Demerara River from entering the canal during high tide.

- (c) *Construction of a bridge on the EBD Public Road.* A new, pre-stressed, concrete bridge will be constructed at the point where the canal will intercept the EBD Public Road to allow vehicular traffic to traverse the area. The bridge will consist of three spans of 39'1'' and a width of 48'4''.

The agency responsible for public roads is the Ministry of Public Works and Communications (MoPWC). A Memorandum of Understanding was signed between the MoA and MoPWC governing the design, construction, supervision and maintenance of the public road bridge across the Cunha channel. Subsequently, the proposed design of the bridge was reviewed and approved by this agency. A copy of the Memorandum of Understanding between MoA and MoPWC, and the No Objection on bridge design from the MoPWC are provided in the Abbreviated Resettlement Plan, Appendix 1 and 2 respectively. The construction of the public road bridge can potentially disrupt traffic along the East Bank corridor if adequate provisions are not in place during project execution. The estimates for this component of the schedule of works allows for the construction of a diversion of equal or greater transit capacity and the relocation of utilities.

80. **Component 2. Resettlement** (US\$ 0.57 million from GRIF).

81. The proposed civil works require the use of a portion of land (approximately 5.3 acres) currently occupied by the Barama Company Limited (BCL) and the relocation of certain assets. As the GoG will acquire the land from BCL for a token payment based on prior agreements, compensation will be paid to Barama for the *fair market value* of:

- (a) Relocation of assets. Assets to be relocated include a log bridge, a steel bridge, a moulding shed, a saw dust pen, equipment, a fence, two guard huts, fuel storage, and utilities. Full details are given in the Abbreviated Resettlement Plan. To ensure it does not affect construction schedules, BCL will be responsible for resettlement of their displaced assets within an agreed period of three months from the payment of the settlement sum.
- (b) Provision of other resettlement assistance. During the relocation period operations will be affected. Compensation for this cost will be provided by the Project under this Component.

The project will finance the settlement amount except the cost of land acquisition

82. **Component 3. Project Management** (US\$ 0.52 million from GRIF).

83. The Project will finance consultancies and operational costs to manage the project including procurement, financial management and technical staff. It will also fund consultancies for supervision of the project works including safeguards related supervision. It will also fund monitoring equipment and consultancies to better understand the impacts of the works on the water flows in the Badarima Creek, Cunha Canal and Sarah Johanna Canal, and drainage of the Conservancy and the nearby agricultural areas.



### **Annex 3: Implementation Arrangements**

#### **THE COOPERATIVE REPUBLIC OF GUYANA: Cunha Canal Rehabilitation Project**

##### **Project Institutional and Implementation Arrangements**

###### *Project Administration Mechanisms*

84. *Ministry of Agriculture:* The implementing agency is the Agriculture Sector Development Unit (ASDU) within the Ministry of Agriculture (MoA). The ASDU will also 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, and making payments to contractors. The rehabilitation of the canal including, the intake and outlet sluice and construction of a new bridge on the public road will fall under the responsibility of the ASDU and will be financed by the project. They will also manage the supervision contract for the project works. The National Drainage and Irrigation Authority (NDIA), the national authority responsible for management and maintenance of drainage and irrigation canals which is under the MoA will implement the construction of the drainage canal through counterpart funds provided by the GoG. Once works on the Cunha Canal and sluice are complete, the NDIA will take over operations and maintenance in accordance with their mandate. Operation and maintenance costs will be funded through regular government appropriations for these types of activities. Hydromet, the national hydro-meteorological centre within the Ministry of Agriculture will take over ownership and will maintain the hydrologic monitoring equipment purchased as part of the project.

85. *Ministry of Public Works and Communications:* Similarly, the ASDU will manage the construction and related fiduciary, procurement and contract management responsibilities for the bridge, while the Ministry of Public Works and Communications (MoPWC) will assume management and maintenance responsibility of the completed structure. The MoA and the MoPWC have signed a MoU outlining the arrangements for the construction design approval and supervision, maintenance and operation of the proposed works (see the Abbreviated Resettlement Plan). Responsibilities in terms of design, bid preparation, firm selection, contracting, technical supervision, operation, routine maintenance and repair of the works involved are also outlined in this MoU. The MoPWC will be responsible for providing approvals for the final design of the bridge works to assure it is consistent with national requirements. Upon completion of the works, the ownership of the bridge will be transferred to MoPWC who will maintain the bridge after construction is complete, through funding from regular government appropriations for these types of activities. While performance can be improved, these appropriations are adequate for basic maintenance of the system and with the increased emphasis on flood issues in Guyana, the Government's capacity and attention to operating the system properly has steadily increased in the past few years.

86. *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. Project implementation will be led by an implementing agency, here the MoA's ASDU, with strategic guidance and oversight from the PMO. Under the GRIF arrangement, the World Bank (as a GRIF partner entity) enters into a grant agreement with the implementing agency (MoA) for the Cunha Canal Rehabilitation Project.

## **Financial Management, Disbursements and Procurement**

### *Financial Management*

87. *Financial Management Responsibilities:* The Financial management (FM) of the Project will be undertaken by the ASDU which will be staffed by a Project Accountant who will be responsible for the day to day management. The ASDU has considerable experience in implementing the CAP, which had a satisfactory rating for financial management. 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.

88. *Staffing:* Currently, ASDU have a single designated staff responsible for accounting of the Flood Risk Management projects. In addition, ASDU is planning to hire a finance/administrative analyst, a team leader and a procurement associate. Training will be provided by the Bank's financial management and procurement specialists as needed. The Bank team will also support strengthening financial management capacity to adequately support the project implementation process.

89. *Budgeting Process.* An annual budget would be prepared by the ASDU on the basis of a consolidated annual investment plan developed by the ASDU.

90. *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.

91. *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.

92. *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.

93. *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).

#### *Disbursements*

94. *Disbursement arrangements and flow of funds.* The following disbursement methods will be available under the Grant: (a) direct payment, (b) reimbursements, and (c) advances. Given the number of contracts involved, it is expected that the prevailing disbursement method will be Direct Payments for those eligible expenditures for contract for works, goods and consultant services. Operating Expenses will be reimbursed to the recipient upon request to the Bank. Supporting documentation should be provided with each application for withdrawal as set out below:

- (a) For requests for reimbursement: Interim Financial report; and
- (b) For requests for direct payment: records evidencing eligible expenditures, e.g., copies of receipts, suppliers/contractors' invoices.

- (c) For reporting eligible expenditures paid from the Designated Account: Interim financial report

95. As all direct payments will be for contracts subject to prior review by the Bank, it is expected that at the time of payment request, the contracts would have been reviewed by the Bank and the No Objection issued prior to the request for payment. A segregated designated account (DA) denominated in United States Dollars and managed by the ASDU will be opened at a Commercial Bank and a segregated designated account (DA) denominated in Guyanese Dollars will be opened at the Central Bank of Guyana. The ceiling of the DA will be variable based on the forecast for two quarters as provided in the quarterly Interim Financial Report. The Minimum Application Size for Direct Payments and Reimbursements will be US\$100,000 equivalent. Subsidiary, another account denominated in Guyanese Dollars (GYD) will be opened and will also be managed by the ASDU to process payments. Both Local currency account and USD account should be segregated accounts holding only the project funds. The exchange losses arising on account of funds transfers and conversion are not eligible for bank financing.

96. *Supervision Arrangements:* The World Bank will conduct risk-based financial management supervisions, at appropriate intervals. It is expected that in the first year of implementation there will be at least two supervision missions. These will pay particular attention to: (i) project accounting and internal control systems; (ii) budgeting and financial planning arrangements; (iii) review of the Interim Financial Reports; (iv) review of audit reports, including financial statements and the remedial actions recommended in the auditor's Management Letters; and (v) disbursement management and financial flows. The PMO in its oversight and management capacity will provide strategic guidance as appropriate. The project lead will interface directly with the PMO to facilitate this process.

### *Procurement*

97. *Procurement Responsibilities:* Procurement for the Project would be carried out in accordance with the "World Bank's Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers, January 2011, revised July 2014"; "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers, January 2011, revised July 2014;" and the provisions stipulated in the Project's Legal Agreements. The various items under different expenditure categories are described in general below. For each contract to be financed by the Project, the different procurement methods or consultant selection methods, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The Procurement Plan would be updated at least annually or as required to reflect the actual Project implementation needs and improvements in institutional capacity. A General Procurement Notice (GPN) in United Nations Development Business (UNDB) and Specific Procurement Notices (SPN) will be published for all international competitive bidding (ICB) procurement and consulting contracts as per Guidelines as the corresponding bidding documents and Requests for Proposal (RFPs) become ready and available.

### *Procurement Arrangements*

98. Procurement of Works. Works procured under the Project would consist in carrying out civil works to rehabilitate the Cunha Canal, including, inter alia: (i) The rehabilitation of its drainage channel; (ii) The rehabilitation of the regulator sluice at the outlet of the EDWC, and rehabilitation of the sluice at the outlet of the Cunha Canal to prevent inflow of river water during high tides; and (iii) The construction of a bridge on the EDB Public Road.

99. Procurement would be carried out using the World Bank’s standard bidding documents (SBDs) following International competitive bidding (ICB), and shopping for small value contracts (if needed) as agreed with the World Bank.

100. Procurement of Goods and non-consulting services (NCS) under this Project would be done using the Bank’s SBD for all ICB and Shopping (Request for Quotations) documents agreed with and satisfactory to the Bank.

101. Selection of Consultants. Consulting services would be contracted for the supervision of the civil works following Quality and Cost Based Selection (QCBS). Short lists of consultants for services estimated to cost less than \$100,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

*Procurement Plan*

102. The procurement plan for implementation of the proposed Project for the first 18 months was agreed between the Borrower and the Bank team on March 24, 2015 and is included below in Table 3.1. The plan shall be available at web address <http://worldbank.org/procure> within 30 days of the signature of the Financing Agreement. It would be updated annually and the updated procurement plan shall be disclosed at this site after clearance by the Bank.

103. The recommended thresholds for the use of the procurement methods specified in the Financing Agreement are identified in Table 3.2 of this Annex as the basis for the agreed procurement plan.

104. Supervision of procurement would be carried out through prior review supplemented by supervision missions with post review at least once a year.

**Table 3.1: Summary Procurement Plan**

<b>Contract Type</b>	<b>Contract Name</b>	<b>Estimated Cost (US\$)</b>	<b>Procurement Method</b>	<b>Review by Bank (Prior / Post)</b>	<b>Estimated date of award</b>
<b>Consulting Services</b>	Provision of supervision services for Lots 1-3: Lot 1 Rehabilitation of head regulator at EDWC, Lot 2	100,000	QCBS	Prior	3 Sep 2015

<b>Contract Type</b>	<b>Contract Name</b>	<b>Estimated Cost (US\$)</b>	<b>Procurement Method</b>	<b>Review by Bank (Prior / Post)</b>	<b>Estimated date of award</b>
	Construction of access bridge at Cunha, Lot 3 Rehabilitation of existing drainage sluice at Cunha				
<b>Consulting Services</b>	Team Leader-CCRP	141,300	IC	Prior	24 Jun 2015
<b>Consulting Services</b>	Procurement Associate	70,650	IC	Prior	24 Jun 2015
<b>Consulting Services</b>	Finance/Admin Analyst	70,650	IC	Prior	24 Jun 2015
<b>Consulting Services</b>	Audit Services	25,000	LCS	Prior	15 Nov 2015
<b>Civil Works</b>	<b>Rehabilitation of the Cunha Canal:</b>	1,878,000	ICB	Prior	24 April 2015
	Lot 1: Rehabilitation of Head Regulator at EDWC	172,000			
	Lot 2: Construction of Public Road Bridge at Cunha Canal, Land of Canaan	1,500,00			
	Lot 3: Rehabilitation of Existing Drainage Sluice at Cunha Canal, Land of Canaan	206,000			
<b>Goods</b>	Purchase of Computers and office Equipment for the ASDU	10,000	SH	Post	18 April 2015
<b>Goods</b>	Procurement of motor vehicle for implementation of project	40,000	NCB	Prior	2 May 2015
<b>Goods</b>	Procurement of hydrologic monitoring equipment.	10,000	SH	Post	2 May 2015
	Vehicle Operation and Maintenance (supply of fuel and lubricants)	21,000	OC		

<b>Contract Type</b>	<b>Contract Name</b>	<b>Estimated Cost (US\$)</b>	<b>Procurement Method</b>	<b>Review by Bank (Prior / Post)</b>	<b>Estimated date of award</b>
	Office Maintenance and Overheads (Stationary, Office Supplies & Consumables)	36,000	OC		
	Unallocated	28,102	OC		

**Table 3.2: Thresholds for Procurement Methods and Prior Review**

<b>Expenditure Category</b>	<b>Contract Value (Threshold) US \$ thousands</b>	<b>Procurement Method</b>	<b>Contracts Subject to Prior Review</b>
<b>1. Works</b>	>1,500	ICB	All
	100-1,500	NCB	The first contract
	<100	Shopping	None
	Regardless of value	Direct Contracting	All
<b>2. Goods</b>	>150	ICB	All
	25-150	NCB	The first contract
	<25	Shopping	None
	Regardless of value	Direct Contracting	All
<b>3. Consulting Services</b>			
<b>-3.A Firms</b>	≥100	QCBS,QBS,FBS, LCS	All
	<100	QCBS,QBS,FBS,LCS, and CQS	The first contract
	Regardless of value	Single Source	All
<b>-3.B Individuals</b>	Regardless of value	Comparison of 3 CVs in accordance with Chapter V of the Guidelines	The first contract

Note: ICB = International Competitive Bidding; NCB = National Competitive Bidding; SH – Shopping; QCBS = Quality- and Cost-Based Selection; QBS = Quality-Based Selection; FBS = Fixed Budget Selection; LCS = Least-Cost Selection; CQS = Selection Based on Consultants' Qualifications

***Environmental and Social (including safeguards)***

105. *Overall safeguards responsibilities:* The agency responsible for the overall implementation of the Project is the ASDU within the MoA; consequently, management and/or mitigation of the potential environmental and social impacts will be implemented by the MoA by the contractors and monitored by the MoA.

*Safeguard Instruments:*

106. *Environmental and Social Assessment Report:* The GoG developed an Environmental and Social Assessment report for the Cunha Canal Rehabilitation works. A draft was completed in March 2010 and included a detailed evaluation of the impacts and mitigation measures, as well as an Environmental Management Plan (EMP) to be applied to the Cunha Canal rehabilitation. The draft was disclosed on the GRIF and WB websites in July 2012. This assessment was updated in January 2015 and was disclosed on the Bank's website on March 30, 2015 and in country on April 2, 2015.

107. *Resettlement Action Plan:* The GoG has developed an Abbreviated Resettlement Plan (ARP) which includes a legal framework, census of displaced persons and valuations of assets, description of compensation and resettlement assistance to be provided, consultations with displaced people about acceptable alternatives, arrangements for implementation and monitoring and procedures for grievance redress. The Abbreviated Resettlement Plan was completed in July 2012 and disclosed on the GRIF and WB websites in July 2012. The Abbreviated Resettlement Plan was updated in March 2015 to reflect the Settlement Agreement reached between the GoG and BCL and disclosed on the Bank and the GRIF's websites on April 2, 2015.

108. *Anticipated Impacts:* Impacts for the type of work anticipated under the project are expected to be moderate in nature and will be managed through the application of appropriate engineering and management measures.

109. Of particular importance is that impacts to the biophysical and socio-economic environments are expected to be limited in nature, as the canal is in an area that has already been subjected to significant human interventions, and there are no endangered species within the project area. Moreover, the proposed project will not result in significant degradation or conversion of natural habitats, given that the works are limited to the upgrade and rehabilitation of existing structures. Any additional habitat destruction will be minimized and proposed works will be undertaken in a manner that allows natural regeneration/resuscitation of habitats. Re-vegetation will be undertaken along embankments and contiguous areas after works are completed.

110. Water quality within the Cunha Canal changes from time to time, depending on the activity being undertaken in the Canal. When water is being discharged, the entire Canal is usually filled with dark brown. Closer to the public road and the Demerara River, discoloration was observed due to the presence of sediments from runoff. Water quality analysis confirms that the pH level, total suspended and dissolved solids, and dissolved oxygen are all within accepted

levels. Canal maintenance is largely focused on vegetation control which is managed by mechanical removal and does not involve the use of pesticides.

111. Other environmental impacts expected from the rehabilitation of the canal are erosion and sedimentation from the excavation activities, and impacts related to construction activities (noise, waste management, health and safety and construction site management). An environmental management plan and monitoring program has been developed to address these issues including measures to minimize sedimentation, reuse of excavation materials, and construction management practices. Given that the project will affect roads and bridges, road safety measures and traffic diversion plans will be adopted, and any construction waste will be disposed of appropriately. Disruption of traffic during construction of the bridge will be addressed through traffic diversion and road safety measures.

112. Rehabilitation of the Canal will involve compensation of the BCL which will be addressed in accordance with the Abbreviated Resettlement Plan.

113. Applicable Safeguard Policies: The following World Bank safeguard policies are triggered:

- a. *Environmental Assessment (OP/BP 4.01)*; The Project is a Category B rating – Partial Assessment - assigned to projects that are likely to have impacts that are site-specific, limited in number, and for which mitigation measures are readily identifiable.
- b. *Natural Habitats (OP/BP 4.04)*; A portion of the Project activities takes place within the East Demerara Water Conservancy. Although the EDWC Dam is a man-made structure, it serves as a habitat to caiman, giant otters, and bats. Numerous species of birds nest in or migrate through the Conservancy, including Muscovy Ducks, Blue-winged Teal, Pied-billed Grebes, Cormorants, Stripe-backed Bitterns, Egrets, Vultures, Snail Kites, and Great Kisskadees. Given the vast area of the uninhabited Conservancy, the localized and short-term works proposed will not affect fauna and avi-fauna. All construction sites will be rehabilitated and re-vegetated with native shrubs and trees. The proposed Project will not result in significant degradation or conversion of natural habitats, given that the works are limited to the upgrade and rehabilitation of existing structures. The Guyana Amazon Tropical Birds Society and the EPA confirm that the conservancy dam has been sustainably managed. By improving the drainage capacity of the EDWC, the works aim to ensure that this natural habitat remains intact with operational changes considered insignificant in the context of the Conservancy habitat. Rehabilitation works for the Cunha Canal will be confined entirely to lands already disturbed by human activity. The construction site is defined as an old field and is currently used as a disposal area for lumber operations waste (chips and wood debris). The local areas drained by the canal are water logged agricultural areas.
- c. *Involuntary Resettlement (OP/BP 4.10)*: The proposed civil works require the use of a portion of land currently occupied by the Barama Company Limited (BCL) and the relocation of certain assets. As a result of impacts on the BCL, the Involuntary Resettlement policy is triggered. Compensation will be paid to BCL for the fair market

value of: (i) *Relocation of assets* (which include a log bridge, a steel bridge, a large lumber shed, a saw dust pen, equipment, a fence, two guard huts, fuel storage, and utilities), and (ii) *Provision of other resettlement assistance* due to impacts on the operations during the relocation period. An updated Abbreviated Resettlement Plan has been developed and disclosed which takes into consideration the agreements reached between the GoG and BCL.

- d. *Physical Cultural Resources (IP/BP 4.11)*: While activities to be carried out under the Project are not expected to impact any known cultural heritage sites, technical specifications for works will include "chance find procedures" to be followed in the event that culturally significant materials are discovered during the execution of civil works.
- e. *Safety of Dams (OP/BP 4.37)*: The EDWC is bordered by a 67 km long earthen dam constructed some 150 years ago. As defined under Bank policy, this is an existing small dam (under 15 meters height), however, as the EDWC has an extensive surface area; provides water and protects a significant population from flooding; is adjacent to natural habitats along the adjoining rivers; and there is a risk of significant adverse impacts due to potential failure of the dam on local communities and assets, the policy was triggered under the project. A detailed engineering assessment of the dam and its associated drainage structures has been completed under the CAP, covering the safety status, performance history and operation and maintenance procedures. Necessary remedial work and safety-related measures were identified in order to upgrade the safety status of the dam including immediate priority works on the northeast section of the dam, which will be carried out within the Flood Risk Management Project and by the GoG. The results of the CAP have provided the engineering and safety guidance to the GoG for the design and development of dam strengthening programs.

<b>Safeguard Policies Triggered by the Project</b>	<b>Yes</b>	<b>No</b>
<a href="#">Environmental Assessment (OP/BP 4.01)</a>	[X]	[ ]
Natural Habitats ( <a href="#">OP/BP 4.04</a> )	[X]	[ ]
Pest Management ( <a href="#">OP 4.09</a> )	[ ]	[X]
Indigenous Peoples ( <a href="#">OP/BP 4.10</a> )	[ ]	[X]
Physical Cultural Resources ( <a href="#">OP/BP 4.11</a> )	[X]	[ ]
Involuntary Resettlement ( <a href="#">OP/BP 4.12</a> )	[X]	[ ]
Forests ( <a href="#">OP/BP 4.36</a> )	[ ]	[X]
Safety of Dams ( <a href="#">OP/BP 4.37</a> )	[X]	[ ]
Projects on International Waterways ( <a href="#">OP/BP 7.50</a> )	[ ]	[X]
Projects in Disputed Areas ( <a href="#">OP/BP 7.60</a> )*	[ ]	[X]

114. *Borrower's Capacity to Implement Safeguards*: The agency responsible for the overall implementation of the Project is the ASDU within the MoA; consequently, management and/or

\* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas.

mitigation of the potential environmental and social impacts will be implemented by the MoA by the contractors and monitored by the MoA. Technical staff from the NDIA and ASDU will be assigned to the Project to oversee the implementation of the resettlement plan and to supervise activities carried out during preparation and implementation of the civil works. Quarterly reports will be prepared on all aspects of land acquisition, consultation, compensation and resettlement activities and operations and circulated and later discussed with all stakeholders during routinely scheduled conferences. Grievances will be addressed first through discussions between the affected persons and the implementing agency, if consensus is not agreed a mediator will be appointed from an agreed list of suitable persons, and finally if parties fail to concur through the courts. These measures are detailed in the Environmental Management Plan (EMP) (part of the Environmental and Social Assessment Report) and Abbreviated Resettlement Plan (ARP). The World Bank team will supervise implementation of the agreed plans during regular missions to Guyana twice a year.

115. There is an acknowledged dearth of in-house capacity to prepare safeguard documentation and adequately report on safeguards implementation. However, in the implementation of safeguards (such as re-vegetation and rehabilitation of riverbanks, disposal of construction waste) surveys of ongoing works in late 2013/early 2014 indicate that appropriate environmental mitigation measures are largely followed, especially taking into account that the project area is already subject to a high level of human intervention. The Guyana Amazon Tropical Birds Society and the Environmental Protection Agency confirmed in late 2013 that, in their opinion, the Conservancy Dam has been sustainably managed.

116. *Disclosure of safeguard documents:* An updated Social and Environmental Assessment Report and Abbreviated Resettlement Plan were disclosed on the GRIF and World Bank websites before appraisal completion. Consultations on the updated documents were undertaken in January 2014 and included in the updated analysis.

### *Monitoring & Evaluation*

117. The results framework in Annex 1 will be used to monitor and evaluate the achievement of the PDO and the outcome indicators. Project monitoring will be undertaken by ASDU as part of their daily activities and maintenance of records. They will provide quarterly financial reporting, bi-annual project progress reporting and annual audits.

118. The capacity of the GoG's monitoring and evaluation for this sector is deemed to be relatively high, given the relevant MoA, NDIA and MoPWC history of engagement with World Bank projects, and owing to the institutional strengthening work carried out under the CAP. The Project indicators are objective and measurable and the project has incorporated the incremental costs of these M&E arrangements in the financing.

119. Thematic areas that would be supervised, monitored and evaluated include the following: (i) Social and Environmental safeguards monitoring and evaluation; (ii) monitoring and quality assurance of construction contracts; and (iii) physical and financial progress monitoring.

120. (i) *Social and Environmental Safeguard Monitoring and Evaluation:* This would comprise monitoring compliance with environmental and social safeguards including the

Environmental and Social Assessment report, and Abbreviated Resettlement Plan. This will be undertaken by the ASDU based on their internal processes and inputs from construction supervision.

121. *(ii) Monitoring and Quality Assurance of Construction Contracts:* As the works will involve the rehabilitation of the Cunha Canal, two sluices and construction of a new bridge, supervision will need to be undertaken to ensure quality and timeliness of the works. Consultants qualified in construction of this type will be hired to review design, qualifications and the implementation of construction. The supervision of the works will cover all works undertaken during the project period both using project financing and those undertaken using other resources. They will report regularly to NDIA and ASDU on the status of the works, results of their review, and changes made.

122. *(iii) Periodic Physical and Financial Progress Monitoring:* Physical progress monitoring would be carried out by the ASDU supervisors on a monthly basis. ASDU would in turn share the reports on a monthly basis with the World Bank. Financial progress would be reported by the ASDU through the quarterly IFRs.

123. Overall responsibility for monitoring and evaluation of the Project would lie with ASDU that would consolidate all reports and report to the Bank on performance indicators defined for the Project, on the Project's progress and execution, quality control and environmental and social safeguards. The Project's OM would provide specific details regarding monitoring and evaluation responsibilities, including data collection requirements, timing, and use of the information.

## Annex 4: Implementation Support Plan

### THE COOPERATIVE REPUBLIC OF GUYANA: Cunha Canal Rehabilitation Project

#### Strategy and Approach for Implementation Support

124. The purpose of this Implementation Support Plan (ISP) is to elaborate the inputs and actions required to facilitate timeliness, quality of outputs and increased institutional development, while ensuring compliance with the Bank’s fiduciary, safeguards and other obligations under the financing agreement. In particular, emphasis is placed on monitoring and evaluation results on the ground, facilitating the timely implementation of risk mitigation measures identified in the SORT, and providing the necessary technical advice to the MoA to ensure quality of works, build capacity and promote project implementation. In particular, because of the importance of international dam safety practices and complexity of the civil works and water resources planning tools, experts in this field, unless they are residents of Guyana, they will need to make frequent trips to Guyana. The ISP described below would be reviewed on an annual basis as part of Implementation Supervision Missions, and revised as necessary to ensure that it continues to meet the implementation support needs of the project.

#### Implementation Support Plan

125. Table 4.1 below indicates the main areas of implementation support during different phases of the project.

**Table 4.1: ISP Matrix**

<b>Time</b>	<b>Focus</b>	<b>Skills Needed</b>	<b>Resource Estimate</b>
First twelve months	Project start-up, execution of Procurement Plan, hiring of auditors, bidding for implementation of civil works and associated technical assistance, Donor coordination.	Task team leader Procurement Specialist FM Specialist Environmental Specialist. Social specialist Civil Engineer Flood Risk Management specialist	10 weeks 2 weeks 2 week 2 weeks 2 weeks 4 week 7 weeks
12-24 months	Project implementation	Task team leader Procurement Specialist FM Specialist Environmental Specialist. Social specialist Civil Engineer Flood Risk Management specialist	9 weeks 2 weeks 2 week 2 weeks 2 week 3 week 6 weeks
24-36	Implementation &	Task team leader	9 weeks/yr

months	dissemination of results	Procurement Specialist FM Specialist Environmental Specialist. Civil Engineer Social specialist Flood Risk Management specialist	2 week/yr 2 weeks/yr 2 weeks/yr 2 weeks/yr 3 weeks/yr 6 week/yr
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*Skills Mix Required*

<i>Skills Needed</i>	<i>Number of Staff Weeks</i>	<i>Number of Trips</i>
Task Team Leader	28	10
Procurement Specialist	6	10
FM Specialist	6	6
Environ. Specialist	6	6
Social specialist	6	6
Civil Engineer	10	10
Flood Risk Management Specialist	20	6

*Partners*

<i>Institution/Country</i>	<i>Role</i>
IDB	Donor Coordination
European Union	Donor Coordination
JICA	Donor Coordination

## **Annex 5: Background on the Guyana REDD+ Investment Fund (GRIF)**

### **THE COOPERATIVE REPUBLIC OF GUYANA: Cunha Canal Rehabilitation Project**

126. In June 2009 the GoG set out Guyana's approach for transitioning to a green economy through the launch of its Low Carbon Development Strategy (LCDS). The LCDS' stated aim is to combat climate change while simultaneously promoting economic growth and development. The key focus areas of the LCDS are in investments in low carbon economic infrastructure, high potential low carbon sectors, climate change adaptation, and creating economic opportunities for all Guyanese.

127. In November 2009, Guyana and Norway signed a Memorandum of Understanding (MoU) and a Joint Concept Note in which Norway committed to providing financial support of up to US\$250 million by 2015 for results achieved by Guyana in limiting emissions from deforestation and forest degradation. Under the MoU, contributions from Norway are channeled towards priority projects identified in the LCDS through the Guyana REDD+ Investment Fund (GRIF), which was established in October 2010.

128. The GRIF represents an effort to create an innovative climate finance mechanism which balances national sovereignty over investment priorities, and ensures that REDD+ funds adhere to the Partner Entities' financial, environmental and social safeguards. The objective of the GRIF is to support activities and investments within Guyana's LCDS, and to bolster Guyana's efforts in building capacity to improve overall REDD+ and LCDS efforts.

129. The GRIF receives payments for forest climate services provided by Guyana, and transfers these payments to be invested in projects and activities that support LCDS implementation. Specifically, the GRIF provides grant financing for goods, works or services for investment, technical assistance or capacity building activities identified in the LCDS, such as investment in low carbon economic infrastructure, investment in human capital and institutional strengthening, or investment in high value, low carbon economic sectors. The level of financial support from contributors to the GRIF will depend on Guyana's delivery of results as measured against performance indicators related to forest-based greenhouse gas emissions, and indicators related to compliance with policies and safeguards (including continuous multi-stakeholder consultation, development of a transparent forest governance system, protection of the rights of local forest communities, and use of multiple monitoring and reporting mechanisms).

130. The GRIF is also designed to support global efforts to devise a UNFCCC REDD+ mechanism. The GRIF is intended to be a model for REDD+ payments, and to learn lessons about the nature of the REDD+ climate finance fund that will be needed to support a UNFCCC REDD+ mechanism and as part of this effort. In the absence of a UNFCCC mechanism for REDD+, the Guyanese and Norwegian Governments have invited the IDB, the World Bank and members of the United Nations Development Group to act as GRIF Partner Entities, and the World Bank to act as Trustee.

## Annex 6: Economic Analysis

### THE COOPERATIVE REPUBLIC OF GUYANA: Cunha Canal Rehabilitation Project

#### Summary

131. This annex presents in detail the economic analysis carried out for the Cunha Canal rehabilitation project. The economic evaluation used cost-benefit analysis, comparing benefits and costs of the impact that the project will bring to the farmers in the nearby areas. Benefits to the farmers will result from: (i) increase in productivity on land currently cultivated; (ii) increase of land to be cultivated; and (iii) additional earnings on the eddo processing center.

132. The project will also enhance the outlet capacity of the EDWC, helping to reduce the risk of overflowing the areas nearby (Region 4 and 5). These areas have been severely damaged by floods in previous events. In 2005 damages amounted to US\$465 million or 59 percent of the country's Gross Domestic Product (GDP) according to the Economic Commission for Latin America and the Caribbean (ECLAC)<sup>18</sup>. In Region 4, the most densely populated area in the country, 71 percent of residents were affected, while 20 percent of those in neighboring Region 5 were impacted. The following year, the January 2006 floods took a heavy toll on the inhabitants of Region 5 resulting in damages amounting to US\$30 million<sup>19</sup>. While many in Region 4 were spared from floodwaters, local flooding caused by the Mahaica and Mahaicony rivers resulted in losses of a significant portion of the region's agricultural production. Severe damages were also experienced by local households and businesses. The EDWC dam was structurally weakened by both flood events, but the integrity of the system remained intact. Since 2005, significant efforts have been made by the GoG (through EDWC staff) to improve critical sections of the dam. Should similar rains occur in the future, it is increasingly likely that the dam will suffer failures and contribute to flooding, particularly in Region 4, which includes Georgetown, Guyana's capital. Based on the partial flooding of Region 4 in 2005, it is estimated that the economic loss resulting from a system breach could range between three and four times Guyana's annual GDP. In addition, replacement costs for the EDWC are estimated between US\$200-300 million<sup>18</sup>.

133. The project **will impact positively on socio-economic development** as it will generate economic benefits 2.3 times the costs. Net benefits are projected to be as high as US\$3.6 million with a return of 29 percent. Benefits generated from the recovered land reap 79 percent of total benefits, enough to pay for the whole cost of the project. Benefits from the existing cultivated area correspond to 19 percent of the total benefits; and the processing center adds 2 percent to the total benefits.

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<sup>18</sup> UNDP-ECLAC (2007) Subregional Headquarters for the Caribbean. *Guyana. Macro-Socioeconomic Assessment of the Damage and Losses Caused by the January-February 2005 Flooding*.

<sup>19</sup> UNDP-ECLAC. *Guyana. The impact on Sustainable Livelihoods Caused by the December 2005-February 2006 Flooding*. October 2006.

**Table 6.1: Economic Results - Summary**

Description	<i>NPV* of flows</i>	
	000 GD\$	000US\$
Total Benefits	1,335,414	6,489
Costs (Investment and maintenance)	583,660	2,836
Net Benefit	751,754	3,653
Benefits/Costs	2.3	2.3
Internal Rate of Return (IRR)	29%	29%

\*Net Present Value

134. **Rationale for public sector provision/financing.** Given the country's vulnerability to climatic change and natural hazards, the GoG has undertaken a number of initiatives to respond and mitigate the potential impacts of disaster risk through public investments. These investments are crucial to strengthen, reconstruct, and rehabilitate key economic and social infrastructure and facilities, following disasters; and also to strengthen the country's institutional capacities to prepare and respond to disaster in an efficient and effective manner

135. **World Bank Value Added.** The Bank has been working with the GoG to reduce vulnerability of the country to climate change and adverse natural events. Since the devastating 2005 flood, the WB has been working with the GoG and other donor agencies to develop a comprehensive strategy to increase the drainage capacity of the EDWC and coastal drainage systems. The Conservancy Adaptation Project (CAP) for example provided a comprehensive hydrological and topographical datasets and pre-investment studies to help the GoG identifying future interventions and provide the donor community with key investments to reduce flood risk. The rehabilitation of the Cunha Canal complements those investments.

### Objective

136. The project is intended to serve two purposes. The first is to drain nearby farming areas (Kuru Kururu; Coverden; Pearl and Sarah Johanna). The second is to increase drainage capacity for the EDWC during rain events. On the basis of this objective, the economic analysis assesses the expected benefits and compares them with the expected cost of the project. The analysis also helps to identify the variables that carry the higher risk for the project.

### Methodology

137. Cost-Benefit Analysis was carried out to measure net benefits generated from the project. Expected benefits and costs attributable to the project were measured by comparing two scenarios: with and without the Project. Net benefits corresponded to the difference between incremental benefits of each scenario. The evaluation was complemented with sensitivity and risk analyses.

138. The rehabilitation of the Cunha Canal will enhance the outlet capacity for the EDWC; and will also restore its capacity to drain the areas along the Badarima Creek, and other creeks (Sand Creek, Kuru Kururu, and Second and Third Creeks (see Annex 8, Figure 8.3) and through

the Sarah Johanna canal, which are used mostly for farming, and currently become waterlogged during rainy periods. The cost-benefit analysis was carried out to measure the benefits for the farmers in the Cunha Canal area. The benefits of enhancing the outlet capacity for the EDWC were not quantified but are of great significance as mentioned later in the annex.

139. The communities in the project area are Kuru Kururu, Coverden, Sarah Johanna and Pearl, which consist mostly of farmers. The area depends predominantly on the production of eddo (a root crop) and a small portion of cash crops, plantain and ground provisions (cassava, sweet potatoes, etc.). The majority of eddoes harvested are supplied to the local market whilst a very small portion goes to foreign markets (Canada and the Caribbean).

140. Before drainage was reduced in 1980, when the Cunha Canal was realigned, the area was known for its quality of eddo crops. The cultivated area was higher and more productive, and important quantities of eddoes were supplied to Suriname and England. Following the realignment, the farms have gradually become inundated with stagnant pools of water due to the clogging of the local creeks, a situation that leads to severe flooding during heavy rains. Eddo is produced in clay soil which has a high water retention capacity and so when the land is flooded for long periods of time, the eddoes rot and misshape. As a consequence many farms have been abandoned and farmers have had to change to labor jobs.

141. According to the Guyana Marketing Corporation<sup>20</sup>, eddo is among the 10 major export commodities in Guyana and as a non-traditional agricultural commodity, the Government has been given priority for enhancing its production and decreasing its high vulnerability to rain events. The project will aid this aim as it will help to increase production and to recover land that has been abandoned and make it suitable again for eddo crops.

142. At present in the Cunha Canal area, there are over 150 farmers cultivating eddo as their main crop in an estimated area of about 70 ha. During the rainy seasons they face difficulties draining the area. According to the Ministry of Agriculture<sup>21</sup>, losses caused by flooding in the eddo crops are about 60 percent or more, creating economic hardship in the livelihood of the communities. The MoA estimates that the project will increase the area available for eddo production to 190 ha, or 120 ha more than the current area being cultivated. Moreover, it estimates that productivity of area currently being cultivated will increase by 40 percent.

143. Besides the increase in productivity, the farmers will have additional benefits through their newly created business by the farmers' association, to process eddo and its leaves. The farmers will sell their eddo crops to the association for processing and to sell as tubers (often times broiled, fried, roasted, sliced, grated, or mashed) or as leaves which has similar uses as spinach.

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<sup>20</sup> Guyana Marketing Corporation. (2011) Marketing non-traditional Agricultural Commodities. *Facilitation and Coordinating the Development of Quality Non-Traditional Agricultural Produce and Products for Export. Annual Report*

<sup>21</sup> Crops Development Support Service from the Ministry of Agriculture.

144. For this evaluation, the benefits were estimated for eddo crops, as well as, for eddo processing. The MoA Crops Development Support Service provided information related to eddo crops whilst the farmer’s association provided information related to eddo processing.

145. *Benefits of Eddo Crops.* The following assumptions were used to estimate the benefits of eddo production for both scenarios *with* and *without* the Project.

**Table 6.2: Assumptions**

Description	<i>Without Project</i>	<i>With project</i>
Area cultivated with eddoes	70 ha	190 ha
Total production per year per ha (Tonnes/year)	37.5	52.5
Sale Price per kg (GD\$/kg)	70	70
Production cost (GD\$/kg)	35	35
Costs required to prepare the land recovered (GD\$)	-	100,000

146. The price used corresponds to the minimum wholesale price given by the Guyana Marketing Corporation in its annual report (2011). The farmers sell the produce at distribution centers, where it is sold to customers at a higher price. The production costs include labor, seeds, nutrients, land (renting price), transportation, and equipment required for production. Once the project is implemented, the land that is recovered for agriculture purposes would have an additional cost of GD\$100 thousand to make it suitable for production.

147. Results show that for farmers, eddo production is profitable with a return of about GD\$1.3 million per hectare year. When the project is implemented, returns are expected to increase 40%. Similar profits will be obtained in the new area that will be drained and recovered for agriculture.

**Table 6.3: Net Benefit per ha per year**

	<i>Net benefit per year (000 GD\$)</i>	
	Without project	With project
Current cultivated area	1,292	1,871
Additional area to be cultivated	-	1,854

148. *Benefit of Eddo Processing.* The business of processing eddoes is run by the farmers’ association with the goal of optimizing the use of eddo and selling it in different ways, for example as snacks, or processed to facilitate its use for cooking, or sold as leaves. The benefits were estimated based on the business plan prepared by the farmers’ association. The business plan assumes that the farmers reserve a portion of the eddoes produced for processing and the remainder is sold to the distribution centers. When the project is implemented more eddoes will be available for processing as productivity will have increased and so will the cultivated area.



## Results

149. *Total Benefits* of the project were estimated for the whole cultivated area for both eddo crops and eddo processing. Costs included investment and operating costs<sup>22</sup>. The net benefit of the project corresponds to the difference between incremental benefits and costs.

150. Results show that the project is economically sound as benefits are 2.3 times higher than its costs. Net benefits are as high as US\$3.6 million with a return of 29 percent. Benefits generated from the recovered land account for 79 percent of total benefits and are enough to pay for the whole cost of the project. Benefits from the existing cultivated area correspond to 19 percent of the total benefits; and the processing center adds 2 percent to the total benefits.

**Table 6.4: Economic Results**

	<i>NPV of flows</i>	
	000 GD\$	000 US\$
Benefits for farmers		
Present cultivated area	248,963	1,210
Incremental cultivated area	1,061,023	5,156
Total benefit for farmers	1,309,986	6,365
Benefits for Processing Eddo		
From present cultivated area	9,128	44
From incremental cultivated area	16,300	79
Total benefit for farmers	25,428	124
Total Benefits	1,335,414	6,489
Costs of the project		
Investment	516,558	2,510
Maintenance	67,102	326
Total costs	583,660	2,836
Net Benefit	751,754	3,653
Benefits/Costs	2.3	2.3
Internal Rate of Return (IRR)	29%	29%

\*Net Present Value

151. The results are reassuring as the benefits to the farmers are only a fraction of the benefits expected with the project. Another very important benefit is its role in enhancing the outlet capacity for the EDWC, which will reduce the risk of dam slips and breaches due to high water levels overtopping or stressing the dam. The impact for Guyana of a dam breach is huge and reducing this risk is of great importance. Past events have caused severe damages affecting much of the population and economy of the country. In 2005 and 2006 when severe flooding affected

<sup>22</sup> Operating costs are assumed to be 2 percent of investment cost.

the area, damages amounted to US\$465<sup>23</sup> million and US\$30 million<sup>24</sup> respectively, according to the Economic Commission for Latin America and the Caribbean (ECLAC).

### Sensitivity Analysis

152. The sensitivity analysis allows comparison of the base case scenario to other scenarios in response to a change in a given variable. A break-even analysis allows the identification of the value of the chosen variables that makes the Project to exactly break even. The variables tested to evaluate their impact on the project's outcome are: (i) overruns in investment and operating costs; (ii) decrease in expected productivity gains; (iii) decrease in incremental arable land; (iv) decrease in sale price; and (v) increase in eddo production cost.

153. Results of the sensitivity analysis show that variables under control of the MoA convey a low to medium risk: (i) cost overruns can be up to 140 percent and the project would still show positive results; (ii) productivity gains and increases in the area of arable land can decrease by half, which means that the productivity has to increase at least 20 percent to make the project viable, or that the additional area to be cultivated has to be at least 50 hectares to make the project viable. The MoA through training, technical assistance, and supervision can help to attain the expected results for these two variables. Other variables are beyond control of the MoA, such as sale price of eddo, which cannot decrease by more than 28 percent. A decrease of this magnitude has not occurred in recent years, and if historical tendency continues, a very stable price is expected. Cost of eddo production can increase as much as 58 percent and the project would still show positive results.

**Table 6.5: Sensitivity Analysis**

Variable	Break-even point
Project cost overrun	141%
Decrease in expected productivity increase	50%
Decrease on incremental arable land	45%
Decrease on sale price	28%
Increase on eddo production cost	58%

<sup>23</sup> UNDP-ECLAC Subregional Headquarters for the Caribbean. *Guyana. Macro-Socioeconomic Assessment of the Damage and Losses Caused by the January-February 2005 Flooding.*

<sup>24</sup> UNDP-ECLAC. *Guyana. The impact on Sustainable Livelihoods Caused by the December 2005-February 2006 Flooding.* October 2006.

## Annex 7: Results of the CAP

### THE COOPERATIVE REPUBLIC OF GUYANA: Cunha Canal Rehabilitation Project

154. The Conservancy Adaptation Project (CAP) was designed to help Guyana adapt to climate change by reducing the vulnerability of the low-lying coastal areas to catastrophic flooding. The CAP, a Global Environment Facility-Special Climate Change Fund grant of US\$ 3.8 million that was developed after the devastating 2005 flood and implemented from 2007 until 2013. The fundamental focus of the project was to reduce flood disaster risk and responded to the need to develop a technical baseline as a basis for making rational investment decisions. On this basis, the project design emphasized understanding the hydrological behavior of the EDWC and East Coast Demerara drainage systems, and the technical stability of the EDWC dams in order to identify investment options. It also undertook some priority works and purchased equipment to reduce vulnerability of the system to catastrophic flooding.

#### I. PROJECT COMPONENTS

155. *Pre-investment studies for engineering works:* This component aimed to strengthen understanding of the EDWC and coastal plain drainage systems and identify key areas for follow-on intervention. A hydrological engineering foundation was created using a combination of state of the art aerial surveys and *in-situ* monitoring techniques.

- a. Detailed aerial surveys of the area using LiDAR technology and ortho-photography have been used to produce a high-resolution topographic map suitable for understanding water flow over the relatively flat terrain. These aerial surveys have been accompanied by extensive ground-based surveys to establish channel profiles and water depths.
- b. A new hydro-meteorological monitoring system has been installed in and around the EDWC, and flow measurements have been carried out to help understand the hydrological behavior of the EDWC system.
- c. Computer models of the EDWC system and East Coast Demerara drainage areas have been set up to help understand how the hydrological system varies under extreme weather scenarios and for testing the impact of various proposed interventions.

156. The CAP modelling studies have identified strategic key areas where interventions would provide improvements to the EDWC discharge capacity and East Coast Demerara drainage systems. A set of prioritized investments were identified that would significantly reduce the vulnerability of the system to sea level rise and extreme rainfall.

157. *Investments in specific adaptation measures:* The CAP funded specific infrastructure investments aimed at helping manage water levels in the EDWC and increase drainage capacity. In particular the two sluices at Lama, on the eastern side of the EDWC, were rehabilitated helping to lower water levels in times of need, and a pontoon and hydraulic excavator were

purchased under the project, to make it easier and faster to reach areas of the dam in need of repair.

158. *Institutional strengthening:* Training has been provided in hydro-meteorological monitoring, use and application of LiDAR datasets, data management and computer-based hydrological modelling. Furthermore, a series of workshops have brought together various government agencies involved in the management of the complex drainage system, as well as stakeholders, donors, practitioners and others, to ensure broader consensus and coordination on future action.

## II. KEY TECHNICAL ACHIEVEMENTS

159. *Hydrological Data Collection:* To thoroughly understand the hydrological behavior of the drainage system, an extensive network of automatic hydro-meteorological instrumentation has been installed at several locations in and around the EDWC. Instrumentation is programmed to send data regularly to an online central database using a telemetry system, making it easier and more efficient to manage water levels in the EDWC on a near real-time basis. Text message warnings can also be sent to mobile phones when the water levels are too high. The instrumentation is composed of rain gauges, water-level sensors and a current profiler.

160. *LiDAR and Bathymetric Surveys:* Detailed topographic and land-use maps are needed in addition to hydro-meteorological data in order to better define the drainage areas, storage capacity and depth of the EDWC more accurately. In the CAP, these were obtained using a combination of LiDAR, bathymetry and aerial photography.

- a. LiDAR (Light Detection And Ranging) is an airborne laser mapping and altimetry system which produces accurate and spatially geo-referenced land elevation data. It works by sending a laser light signal to the ground and measuring how long the pulse takes to return. For the CAP, LiDAR was flown over the EDWC, East Coast Demerara and Georgetown area, covering 1100 km<sup>2</sup>. A vertical accuracy of  $<\pm 9$  cm at the 95% confidence limit was achieved. A DEM was produced using the LiDAR data and was supplemented by aerial photography, collected at the same time as the LiDAR data.
- b. Bathymetric surveys: The LiDAR beam does not penetrate water surfaces, so to understand the depths in different parts of the EDWC, LiDAR data was supplemented with extensive bathymetric surveys. Bathymetry is the measurement of underwater relief (depth). In the CAP, depths of areas of standing water were measured manually from a boat, along a 500 m grid across the whole of the EDWC and with a portable echo-sounder.

161. These datasets provide essential baseline information and have many uses, e.g. topographic data is necessary for land-use and drainage planning, preliminary designs for infrastructure projects and flood risk management, and will help decision makers to manage Guyana's water-resources.

162. *Modelling of the EDWC:* Computer models were developed to test how the system works under different climate or land-use scenarios. A hydrological model was used to provide the inputs necessary for running a hydraulic model which gave a two-dimensional representation of the EDWC system. To set up the models, data on topography, land use, soil types and properties, water-ways and infrastructure was provided from LiDAR and other surveys. To run and calibrate the models, inputs such as rainfall, climate data, and river flow, were obtained from the hydro-meteorological monitoring system and existing tidal datasets. The models were run for rainfall return periods of 50, 100, 1000 and 10,000 years, with storm-durations of up to 40 days. The models were calibrated and validated using historical data collected during the 2005 floods and new data collected during the CAP. The calibrated models were used to undertake the following simulations:

- a. Under 2005 conditions, where only the Land of Canaan sluice was the only relief channel that could drain water into the Demerara river;
- b. Under current conditions, with the Cunha and Kofi sluices operational; and
- c. Under near-future conditions with the new Northern Drainage Relief Channel operational, draining into the Atlantic Ocean.

163. The results of the models show that in 2005, even a 50-year rainfall event would have meant that water-levels throughout most of the EDWC would have been above the safe operating level of the dam. However, the improvements made since 2005 have reduced this risk, except along parts of the northern perimeter dam. The models also showed that with the Northern Drainage Relief Channel drainage from the EDWC will be able to avoid overtopping even in extreme 10,000 year rainfall event (an event much more severe than in 2005). It will also allow water levels in the EDWC will also be maintained below safe operating levels for less severe events, however will remain above safe operating levels for events more severe than a 50 year storm event.

164. The models were also able to test the impact of potential new interventions aimed at improving drainage capacity in the EDWC. The models show that water levels in the EDWC are generally shallowest in the vicinity of Land of Canaan. Increasing the conveyance of internal channels combined with increasing the discharge capacity to the Demerara River will therefore help lower water levels in the rest of the EDWC even further.

165. *Modelling East Coast Demerara Drainage System:* Hydraulic modeling of the coastal lowlands of Region 4 was carried out to assess the drainage capacity and to test options for improving the system. Several drainage areas along the East Coast Demerara were identified as being vulnerable to flooding following a series of site visits and stakeholder discussions. To select priority areas for detailed modeling, a multi criteria analysis was used which considered the frequency of flooding, rate of dissipation, population, affected agricultural areas and key areas of infrastructure and agricultural significance. Following the analysis, 6 priority drainage areas were identified. These drainage areas include: Liliendaal; Ogle; Montrose-Spendaam; Mon Repos-Annandale; Strathspey Enterprise Paradise; and Beehive Clonbrook all of which are located east of Georgetown along the coast. The modeling prioritized the modeling of the main drainage network above the secondary and tertiary drainage systems. Walkover surveys and LiDAR surveys were used to identify the complex network of drains, inter-linkages, flow

directions and other characteristics of the drainage regime needed for building the models. Six models were set-up, one for each drainage area; however as canal water levels have not been recorded or monitored, the models are necessarily uncalibrated. The models were used to test a number of interventions which would improve drainage and reduce the area prone to flooding.

166. Options considered for interventions included increased pump capacities, increased culvert widths, adding water storage areas, channel improvements and separating urban and agricultural drainage systems. Recommendations included additional pumping capacity in many areas, and resizing of outlet systems and culverts. In addition, it became evident during the modeling that many of the key components of existing drainage facilities were designed for agricultural drainage and not for the mixed urban and agricultural land uses that now exists in many areas. The results indicated that in many cases, separation of urban and agricultural drainage areas, providing different levels of service to both, is an important intervention.

167. *Evaluation of dam safety status, performance history and operation and maintenance procedures:* The study conducted geotechnical investigations and provided a comprehensive evaluation of the structural integrity of the EDWC dams, their performance history and operation and maintenance procedures. It also assessed the condition of the relief structures and irrigation offtakes associated with the dams. The existing EDWC dams are over 130 years old. The performance history of the dam highlights the fact that it operates above safe operating levels almost every year and has had many minor slope failures, which have generally been repaired without substantial consequences. For most of the dams, the study supports the historical evidence which suggests that under design operation conditions the stability of certain dam sections becomes marginal, as evidenced by the historical incidence of localized instability. The operation and maintenance procedures were evaluated and found to lack formalization, leading to the development of an operations manual that included formal monitoring and inspection practices.

168. *Necessary remedial work and safety-related measures:* The results of the study show that the northeast dam is the most fragile dam and in need of rehabilitation. Its foundation is comprised of pegasse (peat), and the dam itself is made of very soft clays with a high pegasse content. The north dam and the northeast dam have also been found to have marginal stability. The west dam on the east bank of the Demerara River is built on and constructed of better clays, however the side slopes are steep, the crest is narrow and the vegetation is overgrown. It therefore does not meet international standards, but it is still considered stable. The water control and offtake structures were found to need some work on the reconstruction of the downstream revetments and upgrading of the support infrastructure to allow for a safe operating environment for the workers. In order to meet an acceptable standard of safety, a set of works and measures were recommended. These included: (i) immediate term works to rehabilitate the weak sections of the northeast and north dams; (ii) safety improvements to existing water control structures and offtakes; and (iii) medium term works to rehabilitate the east and west dams to upgrade them to international standards.

169. *Construction methodology and program:* The study also detailed the approach to the remedial works identified above including the necessary equipment, materials sourcing, labor, phasing of works, costs and schedule. It also includes the necessary technical specifications and

constructing procedures to ensure quality of the work, the safety of the structures and safety during construction. These can be used in the bidding documents and as a basis for supervision of the works.

170. *Operations and Maintenance Manual:* The study developed a manual for operation and maintenance of the EDWC system. It included operational procedures for flood management operation; water supply operation; maintenance of the waterways, dam, control structures, and monitoring. It covered the organizational structure, staffing, technical expertise and training as well as the necessary equipment and facilities. It also addresses the current and additional resources needed to implement these procedures.

171. *Works and Equipment for Risk Reduction:* In addition to the non-structural flood risk reduction measures (i.e. data collection, engineering studies, drainage modelling, dam designs etc.), the CAP has funded the rehabilitation and upgrading of the two sluices at Lama on the eastern side of the EDWC. A long-boom excavator was also purchased and a floating punt and pontoon were designed and constructed under the project. This has improved drainage and helped to rapidly mobilize equipment to areas of the dam in need of repair and respond to dam breaches, thereby improving dam safety. The purchase and installation of the hydrological instrumentation has also helped manage the EDWC water levels on a near real-time basis, and contributed to the national weather-forecasting system. Finally, other essential surveying equipment, office supplies and computing equipment were also purchased under the project.

172. In parallel, GoG has been carrying out several improvements to the drainage system. For instance, the EDWC dams have been reinforced in several places, maintenance and repairs have been carried out and several sluices, relief-structures and channels have been rehabilitated, including those at Cunha and Kofi. Also, a new channel was excavated from the northern borrow channel near Flagstaff to the Kofi waterway to improve conveyance within the EDWC. The modeling results show that these improvements have increased outflow capacity of the EDWC by 25% during 50 and 100-year flood scenarios. Additionally, and importantly, a Northern Drainage Relief Channel to help relieve discharge pressure on the eastern side of the EDWC during times of flood. The construction includes a new intake regulator, a bridge over the public road and a sluice at the Atlantic Ocean. The CAP modeling results show that this relief channel, once operational, will lead to a significant reduction in water levels in the EDWC, particularly in the north-eastern corner of the EDWC.

### **III. LESSONS LEARNED**

173. The following lessons were provided in the Implementation Completion Report for the CAP project:

174. *Project design:* (i) It is recommended that all future projects enable the use of a Designated Account as a mode of disbursement and budget should be made available to directly fund staff under the project; (ii) a detailed procurement plan should be established at appraisal for all key components of the project, especially those that directly impact the timing of other project components (such as equipment purchase, key contracts); (iii) TOR specifications should incorporate close and continued technical supervision to avoid delays and/or misunderstandings;

and (iv) technical review of the project should run throughout project implementation and include aspects for quality control.

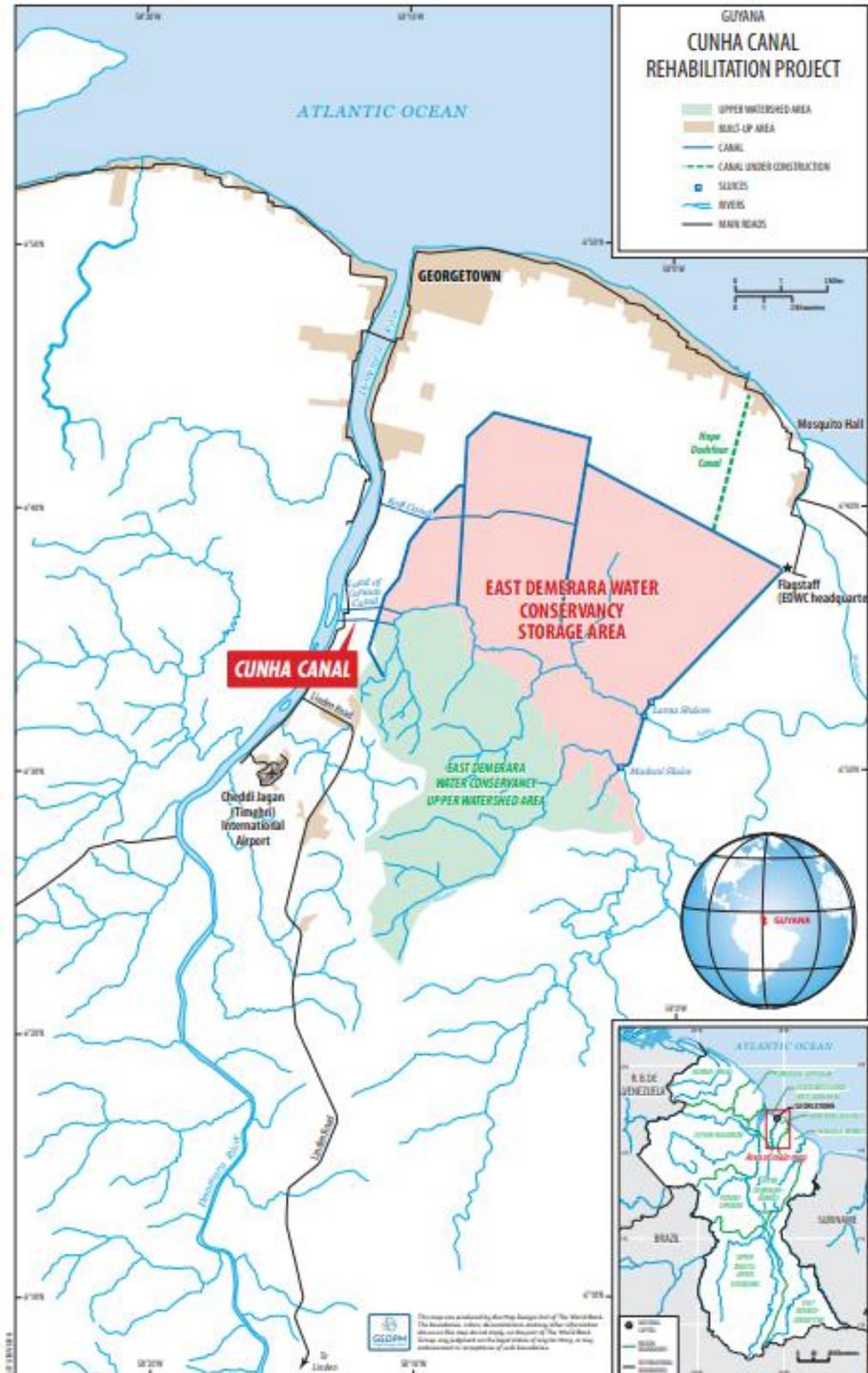
175. *Contract awards:* Use of a single contract award, to implement large parts of the project, facilitated implementation and ensured consistency across deliverables.

176. *Training:* Provisions for continuous training, practice and supervision (e.g. data acquisition, hydrological modelling, GIS) should be incorporated throughout the life-span of the project minimizing the use of one-off workshops or training events.

177. *Communication:* The CAP communication plan was funded by a GFDRR grant. It helped regularly disseminate the results of the project, facilitated knowledge transfer, boosted coordination and informed future activities. It is recommended that all future projects incorporate a communication/dissemination plan.

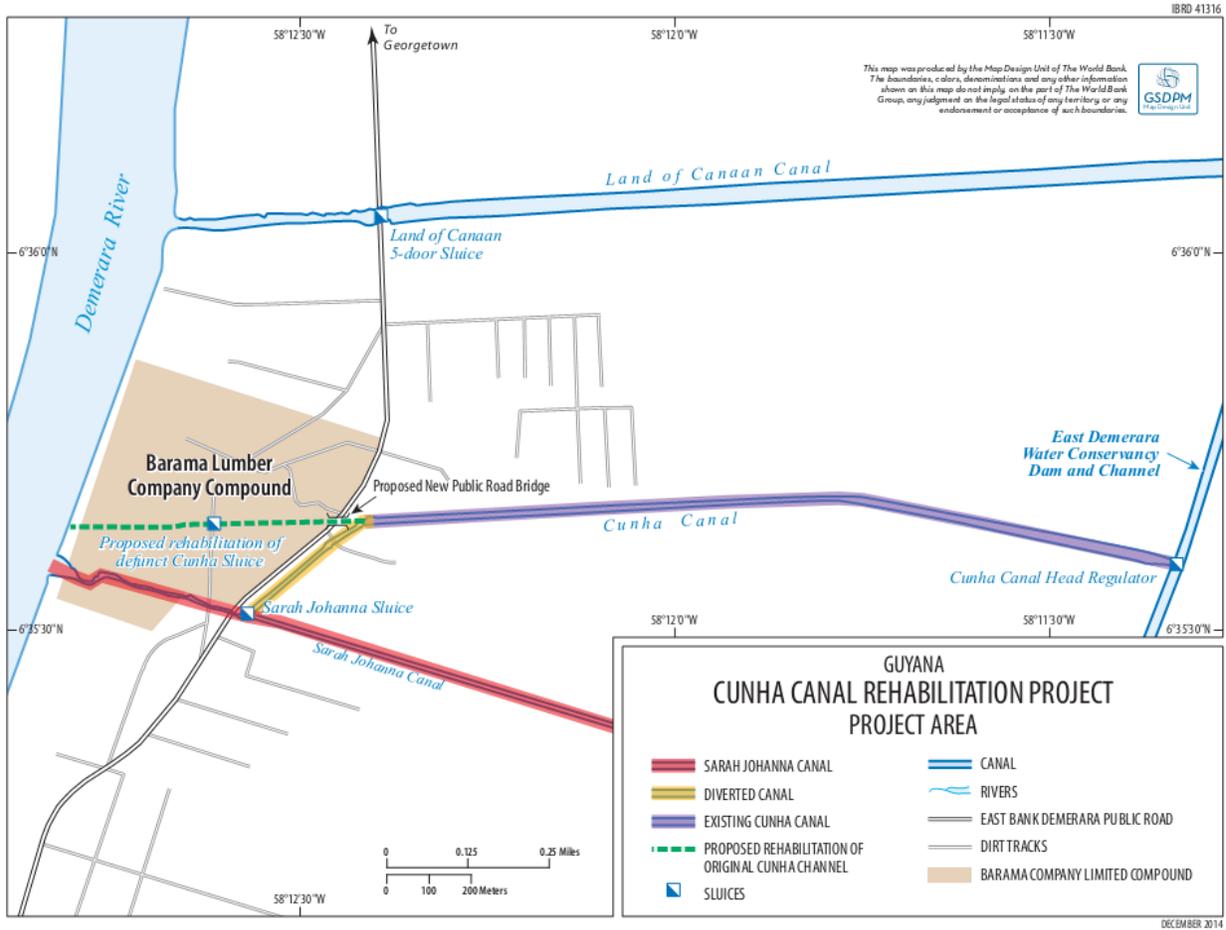
178. *Technical baseline:* The remote sensing technologies and modelling were tested in the CAP and can be replicated for other regions in Guyana or in other Caribbean countries with similar situations. Development of a technical foundation for risk analysis conducive to rationalizing key-investment strategies is a necessary step in reducing flood risk.

## Annex 8: MAPS



**Figure 8.1:**  
**General Map of the Cunha Canal Rehabilitation Project Area**

**Figure 8.2: Map of the Cunha Canal Rehabilitation Project Area**



**Figure 8.3: Areas to be Drained by the Cunha Canal Rehabilitation Project Area**

