PROJECT INFORMATION DOCUMENT (PID)
CONCEPT STAGE

Report No.: 71007

Project Name	Cunha Canal Rehabilitation Project
Region	LATIN AMERICA AND CARIBBEAN
Country	Guyana
Sector	Flood protection (100%)
Lending Instrument	Co-financing Grant
Project ID	P132408
{If Add. Fin.} **Parent Project ID**	N/A
Borrower(s)	GOVERNMENT OF GUYANA
Implementing Agency	Ministry of Agriculture - Agriculture Sector Development Unit (ASDU)
Environmental Screening Category	[ ]A [X]B [ ]C [ ]FI [ ]TBD (to be determined)
Date PID Prepared	November 8, 2011
Estimated Date of Appraisal Completion	July 20, 2012
Estimated Date of Board Approval	September 3, 2012
Concept Review Decision	Following the review of the concept, the decision was taken to proceed with the preparation of the operation.

I. Introduction and Context

Over three-quarters of the Guyanese population live in a 30 kilometer band along the Atlantic coast. This is an area of reclaimed lands, much of it below the regional mean sea level, situated between a water storage basin and a protective seawall complex. The coastal zone is transected by a dense network of drainage and irrigation canals. These canals link up to the East Demerara Water Conservancy (EDWC), a water storage system that provides regional agricultural lands and urban areas with irrigation and drinking water. During times of heavy rainfall this system functions as a regional drainage and flood control mechanism.

Present rates of sea level rise associated with global climate change pose a significant threat to the country and its economy. Recent flooding demonstrated the increased vulnerabilities of the existing drainage system and shortcomings in the current infrastructure. This project fits within the broader CAP program, which has been developed to guide a comprehensive upgrading program of the EDWC aimed at increasing discharge capacity and improving water level management. The CAP program will provide a framework for future donor intervention. In addition to developing the technical baseline for adaptation measures, the Program will include pilot infrastructure improvements to help cope with the immediate threats to the system.

Global Climate Change

The 2001 Third Assessment Report of the Intergovernmental Panel for Climate Change (IPCC) concluded that, with the continuing emission of greenhouse gases (GHG), the global mean

surface temperature may increase between 1.5 and 5.8 degrees Celsius over the next 100 years. Documentation being used in the preparation of the Fourth Assessment Report, due to be released by the year 2007 corroborates the range of the projected temperature increase. A change of this magnitude is unprecedented and will result in significant impacts on a global scale. These will come in the form of increases in sea level and modifications to global and regional weather patterns.

Climate Change in Guyana

Sea Level Rise

While sea levels are rising worldwide at a rate of 2-4 mm/year, Guyana's United Nations Framework Convention on Climate Change (UNFCCC) Initial National Communications Report (2002) and the Guyana National Vulnerability Assessment (2002) forecast a more severe impact locally. Analysis of tide gauge records from 1951 to 1979 shows the trend in sea level rise for Guyana to be in excess of 10 mm/year, which implies a net change in sea level of 0.9 feet over the 28 year period examined. If one assumes the rate to be constant to date, the net change in sea level from 1951 to 2005 is estimated at 1.8 feet. This projection is consistent with the work conducted by Douglas (1995) and Smith et al (1999) which indicates that sea level in the region of Guyana is increasing at a rate of more than 10 mm/year - or 2 to 5 times faster than the global estimate. This is corroborated by the estimates presented by Singh (1997) in his work on neighboring Trinidad and Tobago, which finds sea level rise in the Caribbean to be being significantly higher than the globally observed levels. New analysis by Miller (2006) confirms the gradual increase in sea level rise in the Caribbean basin.

Using the commonly accepted Atmospheric - Ocean General Circulation Model (A-0 GCM) approach to analyze future sea level changes, the forecast rise of the mean sea level, ignoring melt water runoff from land areas, is projected to be 40 cm by the end of the 21st century. The analysis of local tide gauge data suggests greater increases in mean sea level in Guyana. The rate of sea level rise will continue to be tracked through a network of monitoring stations employing geo-referenced gauges (archived at UWICED). This network was funded under the GEF financed Caribbean Project on Planning for Adaptation to Climate Change (CPACC), whose objective was to support Caribbean countries in preparing to cope with the adverse effects of global climate change.

Decrease in Average Rainfall; Increase in Rainfall Intensity

The Initial National Communications Report and National Vulnerability Assessment (2002) also found evidence that, since 1960, there has been a tendency for below normal rainfall, as well as increased intensity of rainfall events. To forecast future trends, both studies employed the (A-OGCM) of the Canadian Climate Centre (CGCM 1) to develop predictions of rainfall, temperature, evaporation and water deficit for a doubling of carbon concentration. Under this scenario, temperature is expected to rise by an average of 1.2°C in the period 2020 to 2040 from the present. Increases in excess of 1.5°C are expected in southern Guyana in the Second Dry Season (August to October). Rainfall is expected to decrease by an average of 10 mm per month but the decrease in the First Wet Season and Second Dry Season (May to October) will be 12 mm per month or higher.

Estimates from climate models developed by the United Kingdom's Meteorological Office's Hadley Centre, support the prediction that Guyana will be experience a general drying trend. In fact these models predict that Guyana will be among the most affected countries in the world, with average precipitation decreasing by roughly 1 mm/day by 2050. A drying trend of this nature would lead to not only increased intensity of rainfall events, but also to a greater reliance on the EDWC water storage system during dry seasons. To meet this need, storage levels would have to be kept at high levels to support agriculture and urban centers on the coastal plain, exacerbating the need for effective capacity to manage water levels in the EDWC system.

Guyana Coastal Drainage and Flood Control

Guyana's drainage and irrigation system has its origins during the Dutch colonial period beginning in the late 1600's. Land reclamation began under their tender and continued through the British colonial period until Guyana gained independence on May 26, 1966.

The country's coastal zone (Map 1) consists of a low-lying system of marine and riverine deposits which formerly comprised an extensive network of tidal deltas. Much of the land now in use in northern Guyana lies in this coastal zone below the mean high tide level of around 54 ft Guyana Datum (GD), as shown in Figure 1. This land was reclaimed from tidal areas, beginning in the 1600's by the Dutch, and is protected by an intricate network of seawalls, dykes, polders and drainage structures, including the EDWC system. Guyana's agrarian economy, which accounts for over 35 percent of GDP, is highly dependent on this coastal drainage and irrigation system that, among other benefits, allows for bi-annual harvests of rice and sugar.

Human settlement and infrastructure is concentrated in the reclaimed coastal plain where approximately 75 percent of the nation's population resides. The population is distributed in locations determined by the availability of suitable land for housing and services. The areas of the Essequibo Islands – West Demerara (Region 3), Demerara – Mahaica (Region 4) and the Mahaica – Berbice (Region 5) are the most densely populated areas, with the majority of Guyana's citizens located in Region 4. The highest population densities are found in the vicinity of the capital, Georgetown, and adjoining areas.

Drainage during rainfall events has been managed through the use of gravity based systems augmented with pumps. This system is under increasing stress and suffering from the impacts of sea level rise because an adequate discharge window is no longer guaranteed. The maximum safe operating level of the EDWC was about five feet above the peak 1951 sea level, which left a narrow operating window for emergency discharges during times of heavy rain. This maximum safe level has closed to three feet since then. As the sea level continues to rise and the discharge window continues to shrink, the ability to manage water levels is being compromised.

Today's problems stem from the fact that the coastal drainage and irrigation systems in Guyana were largely constructed some 150 years ago. The additional stress on the system raises posed by sea level rise raises concerns about the possible collapse of the EDWC. If the discharge flow is not amplified, and the system continues to be managed without regard to climate change related rises in sea level, rainfall collection in the system will outpace the ability to release excess water (because the period available to discharge continues to shrink), causing the EDWC to overtop and the levees to breach.

Considering the accumulated and expected impact of sea level rise, the current ad-hoc approach to flood control is no longer viable. It is also clear that any program to strengthen and upgrade the system will have to take into account the impact of climate change. Given the forecast impacts of sea level rise, the risk of future flooding - even during normal weather events - is increasing year after year. It is critical that the Government of Guyana (GoG) and the donor community embark in earnest on a comprehensive program to strengthen the current system. This Project is part of the broader CAP program, which constitutes the first step in this process.

II. Proposed Development Objective(s)

The objective of the Cunha Canal Rehabilitation Project is to improve drainage in the East Demarara Water Conservancy (EDWC), thereby contributing to the CAP program-level objective of reducing the vulnerability of catastrophic flooding in Guyana's low-lying coastal area that is currently threatened by sea level rise resulting from global climate change.

The CAP program objective will be achieved through a) strengthening the GoG's and donor understanding of the EDWC system and coastal plain drainage regimes while identifying key drainage regimes for follow-on intervention; b) implementing infrastructure investments aimed at increasing the drainage capacity of the EDWC; c) strengthening institutional capacity of the GoG to manage water levels in the EDWC and to guide interventions aimed reducing Guyana's vulnerability to floods. Cunha Canal rehabilitation will improve drainage in the EDWC through: a) rehabilitation and widening of the current drainage channel to allow for increased flow into the Demerara River; b) building a new sluice to prevent inflow of river water during high tides; and c) construction of a bridge across the canal on the nearby public road.

At CAP Program completion, the GoG will be in possession of a master plan for future upgrading of the EDWC. Possible interventions for at least 10 key drainage regimes will be identified and presented to the donor community, and the drainage relief capacity of the EDWC to the Demerara River by will be increased by at least 35 percent.

III. Preliminary Description

The CAP program will finance the development of the technical foundation for a master plan of future interventions within the EDWC and lowland drainage systems, as well as specific upgrading works and operational improvements aimed at enhancing the flood control capacity of the EDWC. The tools developed under the analytical component of the CAP will be used by the GoG and donor agencies to guide future investments.

- Component 1 – Pre-investment studies for engineering design of works (US$2.0 mil): The objective of this component is to provide the hydrologic baseline necessary for contemplating rational interventions aimed at increasing the current discharge capacity of the flood control system. This objective will be achieved through:

  - Detailed topographic and landuse mapping
  - Hydrologic modeling of coastal lowlands

- Assessment of EDWC system integrity
- EDWC hydraulic modeling
- Pre-feasibility studies for coastal lowland interventions
- Operational capacity building

The key outcome of these pre-investment studies will be a topographic model of the inhabited coastal plain to be used as the basis for hydrologic analysis of the region under projected climate scenarios. The results from this component will pinpoint key areas of intervention to increase discharge capacity critical for flood zone management. Pre-engineering designs will be completed for a set of prioritized interventions. Specialized staff within the following agencies will be trained in the application of the analytical tools produced: NDIA, the Lands and Surveys Commission, the Ministry of Works' River and Sea Defense Division, the Guyana Environmental Protection Agency and the Civil Defense Commission.

- Component 2 – Investments in specific adaptation measures (US$1.5 mil of GEF financing and US$1.2 million to be financed by donor to be identified): The objective of this component is to counteract the effects of sea level rise, which has decreased the GoG's ability to manage water levels of the EDWC system. The investments will improve the ability of the Government to manage water levels behind the EDWC dam during heavy rains by improving internal water flows in the EDWC and increasing EDWC drainage relief capacity to the Demerara River and eventually the Atlantic Ocean. This objective will be achieved through:

- Widening of key drainage relief canals
- Improvement of water flow system within EDWC
- Upgrading of water control structures
- Selected equipment purchase and installation
- Major infrastructure civil works and operational improvements

By the end of project, activities under this component should result in an increased drainage capacity of the EDWC to the Demerara River by roughly 35 percent (the exact figure will be finalized during the first year of implementation). The GoG, through the NDIA, will direct additional investment in the strengthening of drainage and irrigation infrastructure based on the engineering foundation to be developed under Component 1. Under the proposed GRIF-World Bank co-financing, the subcomponent for widening of key drainage canals will consist in the rehabilitation of the Cunha Canal, including specifically the widening of the canal, the construction of a new outlet structure, rerouting the canal to re-establish its original alignment, and construction of a bridge on the EBD Public Road where the canal intercepts the road.

- Component 3 – Institutional Strengthening and Project Management (US$.1 million): The objective of this component is to strengthen the institutional framework for flood control within the context of the national emergency management sector headed by the Civil Defense Commission. Also, through the Implementation Secretariat, all key actors involved in the flood control will be consolidated and under a framework of Memoranda of Understanding, will work together, coordinate activities and share information to promote a more streamlined approach to hazard and risk management in the country. Project management activities of the PEU will also be partially funded by the project. Specific outputs of this activity will include:

- o Contingency plan for flood events
- o Memoranda of Understanding among Implementation Secretariat members
- o Monitoring and evaluation of project progress
- o Project management

Through this component, the Government will be better positioned to respond to flood emergencies. Moreover, through the Implementation Secretariat, flood control work will begin to be consolidated in the country, which is expected to lead to greater information sharing and institutional memory throughout the government.

Cunha Canal Rehabilitation in the broader context of the CAP program will finance the following physical works to rehabilitate the Cunha Canal (US$ 1.91 M from GRIF):

a. Rehabilitation of the drainage channel. The channel will be re-routed, widened and excavated to remove the build-up of sediments and weeds and allow for a straight flow into the Demerara River that eliminates hydraulic restrictions. The canal will be widened to 66.6 ft with a total right of way of 101.2 ft including embankments.

b. Building of a new sluice to prevent inflow of river water during high tides. This sluice will be used to control the discharge of water and to prevent river water 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.

IV. Safeguard Policies that might apply

Safeguard Policies Triggered by the Project	Yes	No	TBD
Piloting the Use of Borrower Systems to Address Environmental and Social Issues in the Bank-Supported Projects (OP/BP 4.00)		X	
Environmental Assessment (OP/BP 4.01)	X		
Natural Habitats (OP/BP 4.04)	X		
Pest Management (OP 4.09)		X	
Physical Cultural Resources (OP/BP 4.11)		X	
Involuntary Resettlement (OP/BP 4.12)	X		
Indigenous Peoples (OP/BP 4.10)		X	
Forests (OP/BP 4.36)		X	
Safety of Dams (OP/BP 4.37)	X		
Projects in Disputed Areas (OP/BP 7.60)*	not eligible for piloting under OP 4.00		
Projects on International Waterways (OP/BP 7.50)	not eligible for piloting under OP 4.00		

V. Tentative financing

Source:	($m.)
Borrower/Recipient	0

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

IBRD		0
IDA		0.25
Others (specify)		1.91
	Total	2.16

VI. Contact point

World Bank

Contact: John Morton
Title: Senior Urban Environment Specialist
Tel: 202 473 3489
Email: jmorton@worldbank.org

Borrower/Client/Recipient

Contact: George Jervis
Title: Acting Permanent Secretary, Ministry of Agriculture
Tel: 592 227 5527
Email: george_jervis36@yahoo.com

Implementing Agencies

Contact: Elizabeth Ramlall
Title: Director, Agriculture Sector Development Unit
Tel: 592 227 3751
Email: asdumoa@yahoo.com

VII. For more information contact:

The InfoShop
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Telephone: (202) 458-4500
Fax: (202) 522-1500
Web: http://www.worldbank.org/infoshop