PROJECT INFORMATION DOCUMENT (PID)
CONCEPT STAGE

Report No.: AB2689

Project Name	Conservancy Adaptation Project
Region	LATIN AMERICA AND CARIBBEAN
Sector	Flood protection (100%)
Project ID	P103539
GEF Focal Area	Climate change
Borrower(s)	GOVERNMENT OF GUYANA
Implementing Agency	
Environment Category	[ ] A [X] B [ ] C [ ] FI [ ] TBD (to be determined)
Date PID Prepared	November 20, 2006
Estimated Date of Appraisal Authorization	December 19, 2006
Estimated Date of Board Approval	February 22, 2007

1. Key development issues and rationale for Bank involvement

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 has been developed to guide a comprehensive upgrading program of the EDWC aimed at increasing discharge capacity and improving water level management. It will provide a framework for future donor intervention. In addition to developing the technical baseline for adaptation measures, the project will include pilot infrastructure improvements to help cope with the immediate threats to the system.

Sea Level Rise and Change in Climate Patterns

While sea levels are rising worldwide at a rate of 2-4 mm/year, Guyana's UNFCCC Initial National Communications (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.

The Initial National Communications 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 System

Guyana's coastal zone 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 the coastal zone below the mean high tide level of around 54 ft Guyana Datum (GD). This land was reclaimed from tidal areas and is protected by an intricate network of seawalls, dykes, polders and drainage structures, including the EDWC system. Guyana's agrarian economy, which contributes 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 in Guyana systems were largely constructed some 150 years ago. Sea level rise since then is estimated at 1 meter (estimated 150 years at 1mm/year). The additional stress on the system raises concern 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 and the donor community embark in earnest on a comprehensive program to strengthen the current system. This project constitutes the first step in this process.

2. Proposed objective(s)

The objective of the Conservancy Adaptation Project is to reduce 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.

This objective will be achieved through a) strengthening the GoG's and donor understanding of the East Demerara Water Conservancy system and coastal plain drainage regimes 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 the country's vulnerability to floods.

3. Preliminary description

The project will finance the development of a master plan for 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 project will be used by the GoG and donor agencies to guide future investments.

- *Component 1 – Pre-investment studies for engineering design of works (Total US$2.45 mil / GEF portion 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*
    - O*perational 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 with several agencies (the Drainage and Irrigation Authority (NDIA), the Lands and Surveys Commission and the Ministry of Works, River and Sea Defense, the University of Guyana, etc.) will be trained in the analysis undertaken in the project. The engineering firm contracted to conduct the analysis will also be responsible for providing hands-on training in the use of the tools developed throughout the project.

- *Component 2 – Investments in specific adaptation measures (Total US$17.2 mil / GEF portion US$1.5 mil)*: The objective of this component is to counteract the effects of sea level rise, which has decreased the GoGs 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 Government, through the National Drainage and Irrigation Authority, will direct additional investment in the strengthening of drainage and irrigation infrastructure based on the engineering foundation to be developed under Component 1.

- *Component 3 – Institutional Strengthening and Project Management (Total US$0.35 mil / GEF portion US$0.3 mil):* The objective of this component is to strengthen the institutional framework for flood control in Guyana. The project will finance activities to increase understanding of the current needs in the flood control sector by key decision-makers, and the affected population. The project will also support consultations with civil society and the donor community to create consensus around a medium and long term intervention strategy to help the country adapt to sea level rise. This work will center around specific products, including:

    - *Contingency Plan for flood events*
    - *Institutional Analysis of the Drainage Sector*
    - *Monitoring and evaluation of project progress*
    - *Project Management*

  The key outcome of this institutional analysis and project management will be improved Government effectiveness in managing flood control. With clear lines of responsibility in times of urgent need as well as times of calm, the government will be better equipped to manage flood control policy.

4. Safeguard policies that might apply

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[X]
Pest Management (OP 4.09)	[ ]	[X]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[ ]	[X]
Involuntary Resettlement (OP/BP 4.12)	[ ]	[X]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of dams (OP/BP 4.37)	[X]	[]
Projects in Disputed Areas (OP/BP/GP 7.60)*	[ ]	[X]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[X]

No relief is sought from Bank safeguard policies and those that will apply to the project which include Environmental Assessment (OP/BP 4.01) and Safety of dams (OP/BP 4.37.

OP/BP 4.01 Environmental Assessments

This project is considered Category B due to the civil works component. Environmental assessments are to be developed for specific works as they are identified. Additionally, for smaller works, environmental contracting guidelines will be provided for inclusion in small works contracts. In general, the project seeks to develop the information and modeling tools required to understand the behavior of the EDWC and coastal lowland drainage system. This information itself is a major contribution to the understanding of the physical environment of the region and will be used to advance informed management and decision making regarding future water control projects and land-use decisions.

OP/BP 4.37 Safety of dams

This safeguard is triggered as the work contemplated is associated with a dam structure that spans some 64 km length behind the inhabited areas of Region 4. Under the project, no interventions to the dam structure are to be made and no physical upgrading of the dam is contemplated. Project activities associated with the dam are limited to the in-depth engineering and structural assessment of the dam for use in future upgrading projects to be undertaken by the GoG or other donors.

Limited drainage improvements will be made to water control systems under this project which are of an urgent nature and required to add safety relief capacity to the EDWC system. This additional capacity is contemplated to allow EDWC operators the ability to reduce water levels behind the dam in a more timely fashion considering the current fragile condition of the structure and limitations in present relief capacity. Specifically, 2 control structures, the Maduni and the Lama sluices are presently used as options of last resort to reduce water levels below critical elevations. When these gates are used in this manner, the inhabited areas downstream of the structures are flooded. Future drainage improvements are designed to limit the need for using the Maduni and Lama Sluices.

The work contemplated under this project are fundamentally the studies called for under OP 4.37, Safety of dams and include the technical assessments that the safeguard is designed to promote. As such, while

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

the project contemplates no work on the dam structure, the studies produced will provide the OP 4.37 assessments for use by the GoG or future donors during any dam upgrading exercise.

5. Tentative financing

Source:		($m.)
BORROWER/RECIPIENT		0
GLOBAL ENVIRONMENT FACILITY		3.8
ADDITIONAL DONOR		1.2
	Total	5.0

6. Contact point

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