PROJECT EXECUTIVE SUMMARY 39064

REQUEST FOR Work Program Inclusion

GEFSEC PROJECT ID:
IA/ExA'S PROJECT ID: P103539
COUNTRY: Guyana
PROJECT TITLE: Conservancy Adaptation Project
GEF IA/ExA: World Bank
OTHER PROJECT EXECUTING AGENCY(IES):
DURATION: 3 Years
GEF FOCAL AREA: Climate Change
GEF STRATEGIC OBJECTIVES: Adaptation to Climate Change
GEF OPERATIONAL PROGRAM: Special Climate Change Fund
PIPELINE ENTRY DATE: September 2006
ESTIMATED STARTING DATE: February 1, 2007
IA/ExA FEE:

FINANCING PLAN (US$)			
		PDF	Project*
GEF	A		5,000,000
	B		
	C		
GEF Total			5,000,000
Co-financing		(provide details in Section b: Co-financing)	
Government			12,000,000
Co-financing Total			12,000,000
Total			17,000,000

*Financing for Associated Activities If Any: 25,000,000

For multi-focal projects, indicate agreed split between focal area allocations

CONTRIBUTION TO KEY INDICATORS IDENTIFIED IN THE FOCAL AREA STRATEGIES: The proposed project contributes to the Climate Change Focal Area strategies, specifically to the SCCF strategies to assist Guyana to adapt from Climate Change risks in its water resources management, adapting the existing and new infrastructure from Climate Change induced flooding and sea level rise, and capacity building of key institutions.

Approved on behalf of the World Bank. This proposal has been prepared in accordance with GEF policies and procedures and meets the standards of the GEF Project Review Criteria for work program inclusion.

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Date: September 28, 2006

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PROJECT SUMMARY

a) Project rationale, objectives, outputs/outcomes, and activities.

Introduction

Over three-fourths of the Guyanese population lives within 30 kilometers of the Atlantic coast. This is an area of reclaimed lands, much of which lies below the regional mean sea level. Protected by a seawall complex, the coastal zone is heavily intervened with a network of drainage and irrigation canals. These link the East Demerara Water Conservancy (EDWC) water storage system to regional agricultural lands and provide for regional drainage and flood control.

Present rates of sea level rise and projected environmental impacts associated with global climate change, including increased rainfall intensity, pose a significant threat to the country and its economy. While recent climate change projects around the world have served to define needs and highlight policy deficiencies, recent flooding demonstrates the immediate vulnerabilities of Guyana to climate driven events and shortcomings in the current infrastructure. This project is designed to provide some immediate infrastructure improvements to cope with the local effects of sea level rise and provide a technical baseline for the continued management and adaptation of the local drainage and flood control network.

While sea levels are rising on a global scale at a rate of 2-4 mm/year, Guyana's National Vulnerability Assessment (2002) forecasts a greater impact locally. Based on the analysis of tide gauge records from 1951 to 1979, the trend in sea level rise for Guyana is in excess of 10 mm/year,[1] which results in 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 present, 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 indicate that sea level in the region of Guyana is increasing at a rate in excess of 10 mm/year - or 2 to 5 times faster than the global estimate. This is further corroborated with the estimates presented by Singh (1997) in his work on neighboring Trinidad-Tobago citing sea level rise in the Caribbean as being significantly higher than the globally observed levels.

Using the commonly accepted Atmospheric - Ocean General Circulation Model (A-0 GCM) approach to analyze future sea level changes, the projected rise of the mean sea level, neglecting melt water runoff from land areas, is projected to be 40 cm by the end of the 21st century. Given the analysis of local tide gauge data, greater increases in mean sea level are suggested in Guyana. Compounding this effect, the coastal drainage and irrigation in Guyana systems were largely constructed some 125 years ago. As a result, these systems are already suffering from the effects of sea level rise (estimated 150 years at 7mm/year approximately 1 meter increase) experienced since their original construction.

The meteorological by-product of climate change that will put the most strain on Guyana's water conservancy and flood control systems is the anticipated change in rainfall patterns. According to Guyana's National Vulnerability Assessment (2002), a doubling of carbon dioxide emissions is expected to decrease monthly rainfall by 10mm/month (averaged annually). Singh (1997) notes that variability in the current wet season/dry season for the Caribbean region is suggestive of a trend toward greater extremes with wetter wet seasons and dryer dry seasons. Estimates from climate models developed by the United Kingdom's Meteorological Office's Hadley Centre, support the prediction that Guyana will be confronted with a general drying trend. In fact these models demonstrate that Guyana will be among the most affected countries in the world, with average precipitation decreasing by roughly 1 mm/day by 2050.

Guyana Coastal Drainage and Flood Control

Guyana's coastal zone consists of a low-lying system of marine and riverine deposits which formerly comprised an extensive network of tidal deltas. The origin of the coastal sediments includes discharges from local river systems and a large sediment load that is transported from the Amazon River northward

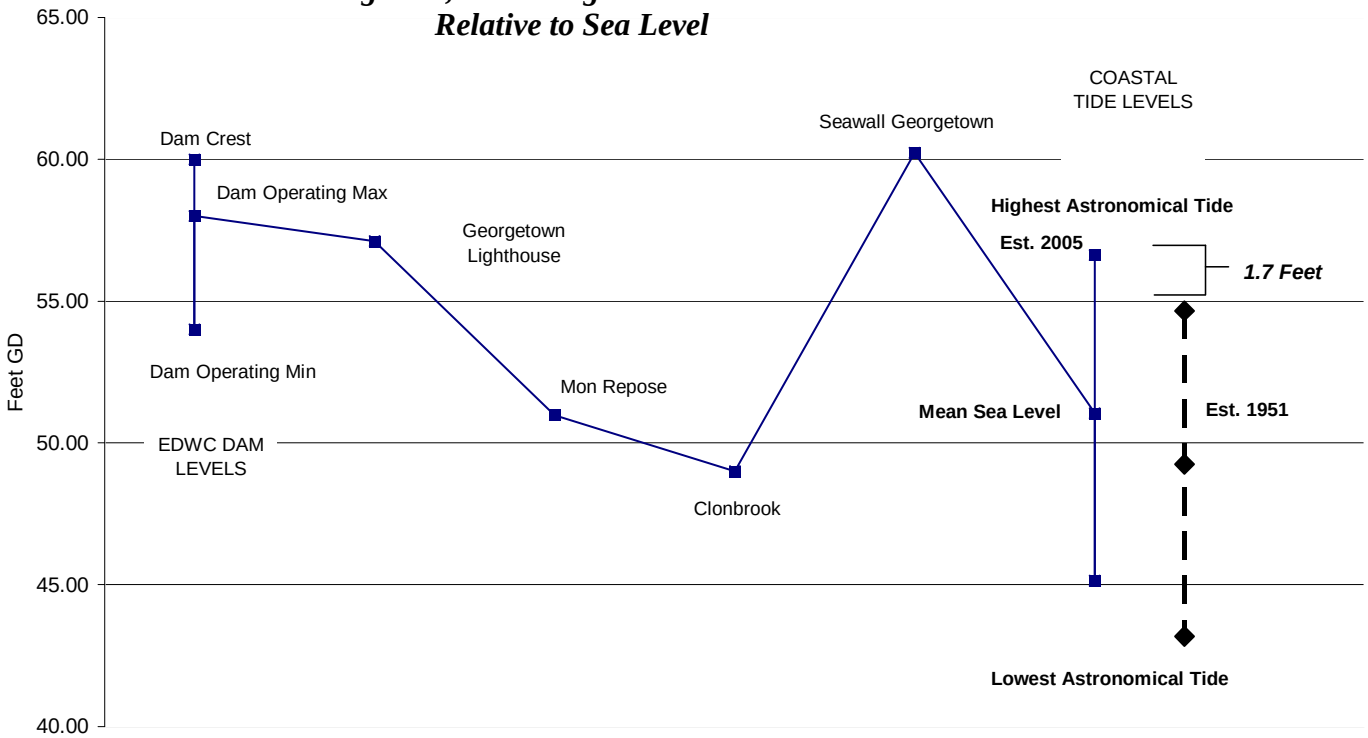
along the northern coast of South America by the Guiana current. Much of the land now in use in northern Guyana lies in the coastal zone below the mean high tide level of around 54 ft Guyana Datum (GD). This land was reclaimed from tidal areas and is protected by an intricate network of seawalls, dykes, polders and drainage structures. Guyana's agrarian economy, which contributes over 35 percent to the GDP, is highly dependent on this coastal drainage and irrigation system as are the homes and businesses of the region.

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 due to its proximity to the agricultural zone and access to port facilities.

Over the 160 years of operation, the drainage and irrigation system has been modified and amplified to increase the quantity of tillable land. Drainage has been managed through the use of gravity based systems augmented with pumps, but the system is now suffering from the impacts of sea level rise over the fifty years because an adequate discharge window is no longer guaranteed. The previous ad-hoc approach to flood control is no longer viable and will eventually lead to a disastrous flooding incident. A series of severe storms have further stressed the drainage and water storage system and, at the present time, the reclaimed coastal areas are highly susceptible to flooding. Given the forecasted impacts of global climate change and sea level rise, the risk of future flooding-even during normal weather events-is increasing significantly.

As demonstrated in figure 1, the difference in elevation between the water level of the East Demerara Water Conservancy (EDWC) at representative locations and tide levels, is a matter of a few feet. Towns such as Mon Repose and Clonbrook occupy elevations below both the minimum operating level of the EDWC and the mean high water spring tide level of 54.99 feet GD. Without a well functioning drainage system, these towns and many others-including the capital-would not be able to survive.

Figure 1, Select Region 4 Elevations Relative to Sea Level



With pressures on the current system continuing to mount due to sea level rise and increased rainfall intensity, effective management of water levels will become more difficult to achieve due to the decreasing length of time available for water discharge. Without adapting to these evolving challenges by more effectively discharging water during the shorter windows of time available to do so, the system will eventually collapse. Therefore, 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.

Project Development Objective

The objective of the Conservancy Adaptation Project is to help the GoG adapt to global climate changes by reducing the country's vulnerability to catastrophic flooding. Specific project objectives include: a) increasing the drainage relief capacity of the EDWC; b) strengthening the GoG's understanding of the EDWC system and coastal plain drainage regimes; c) identifying key drainage regimes for follow-on intervention; d) developing and operationalizing an emergency flood contingency plan; and e) executing hands-on training programs to transfer technology developed with the creation of digital elevation and hydrologic flow models.

The project takes a two pronged approach to improving flood protection in Guyana. First, critical near-term civil works will be carried out to increase the drainage relief capacity of the EDWC. This will allow the Government to more effectively manage conservancy water levels during times of intense rainfall. Activities to be carried out include widening the Cuffy discharge canal and changing the internal flow dynamics of the EDWC system to allow for greater flows to the Demerara River and away from the Mahaica-Mahaicony river system.

Under the second phase, the GEF will finance a comprehensive analytical assessment of the both the EDWC system and the inhabited coastal lowlands. The output of this assessment will be a critical hydrologic analysis and management tool that will be used to analyze, design and prioritize key interventions and rehabilitation works that would be undertaken by the GoG, the Inter-American Development Bank (IDB) and other donor agencies. As analytical work is undertaken, representatives from key government ministries will be involved in the development of the analysis and simulation tools and will receive hands on training in their use to ensure that these tools are institutionalized and fully integrated with the national drainage and flood control management program.

Project Components

The project will finance specific rehabilitation works and operational improvements aimed at enhancing the flood control capacity of the EDWC and the development of a comprehensive micro-topographic baseline and analytical tools to plan future interventions within the coastal system lowland drainage system. The tools developed under the analytical component of the project will be used by the IDB and other agencies to design and develop a comprehensive flood management program.

- *Component 1 – Urgent infrastructure civil works and operational improvements (Total US$2.35 mil)*: The objective of the first component is to 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. This objective will be achieved through the:
    - *Rehabilitation of key drainage relief canals*
    - *Improvement of water flow system within EDWC*
    - *Repair of water control structures*
    - *Selected Equipment Purchase and Installation*

The key outcome of increased capacity to manage water levels in the drainage system is the lessening of the high vulnerability the system has to relatively high frequency events - at a low cost. By the end of project, this component will be responsible for 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 2.

- *Component 2 – System Analysis and Hydrologic baseline (Total US$2.0 mil):* The objective of the second Component is to provide the hydrologic baseline necessary for contemplating rational interventions to 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 this hydraulic baseline will be a topographic model of the inhabited coastal plain to be used as the basis for hydrologic analysis of the region. The results from this component will provide the hydrologic baseline critical for flood zone management and the design of effective interventions. Hydraulic engineers 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 hydraulic analysis to be financed under 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.

  The NDIA, Lands and Surveys Commission and River and Sea Defense unit have received extensive technical support from previous European Union projects. These agencies support modern GIS capabilities and have been trained in data collection, management and analysis as well as in precision geodetic surveying techniques to improve their technical capabilities. These entities are considered critical partners to the project and allow the GEF project to build on the results of EU institutional strengthening efforts.

- *Component 3 – Institutional Strengthening (Total US$0.175 mil):* The objective of the third component is to better understand the current institutional framework for flood control in Guyana and make recommendations for future improvement. This work will take the form of two specific products, including:
    - *Contingency Plan for flood events*
    - *Institutional Analysis of the Drainage Sector*

  The key outcome of this institutional analysis will be improved Government effectiveness in rationalizing the emergency response and general maintenance phases of 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.

- *Component 4 – Government Consensus Building and Project Management, (Total US$0.1 mi)*: The objective of the fourth component will be increased awareness of the current needs in the flood control sector and increased participation by the donor community. In addition to financing overall project management activities, the project will finance consultations with senior government officials, civil society, and the donor community to create consensus and develop a prioritization strategy. Pre-engineering studies developed under the project will be used to help direct physical interventions and the institutional analysis will help guide future organizational arrangements in the sector.

  The Steering Committee (see Institutional Coordination and Support, section (c) for elaboration on the Steering Committee) will be responsible for disseminating conclusions and recommendations based on the hydraulic analysis in order to build consensus for a long term intervention strategy. The local Bank office will not only participate in this dialogue with the Government, but will also keep the donors abreast of project progress.

  In addition to the Steering Committee (SC), a Project Execution Unit will carry out project implementation. The PEU already exists within the Ministry of Agriculture and is currently working to implement the IDB financed Agricultural Support Services Project. In accordance to the desire of the GoG, the project will be executed by a single, enhanced, PEU within the Ministry of Agriculture. This arrangement will mirror the project execution units in the Ministry of Health and Ministry of Works that have recently been consolidated into single units that manage several projects from a variety of donors. With oversight by the Bank team, the PEU will execute the procurement of these contracts in a transparent manner that is in line with World Bank guidelines.

- *Component 5 – Major infrastructure civil works and operational improvements (Total US$12.0 mil):* The objective of the third component is to, based on the engineering foundation developed under the project, strengthen flood control infrastructure in order to more effectively manage water levels during times of heavy rainfall. Based on the pre-feasibility studies developed and hydraulic outputs from the Flow Models, the GoG will develop and implement a comprehensive physical intervention strategy.

Table 1. Total project costs by component

Component	Sub-Component	GEF Funds	GoG Funds	Total
1 - Urgent Internvention Works and Operational Improvements				
	1.1 - Rehabilitation of Key Drainage Relief Canals	$950,000	-	$950,000
	1.2 - Improvement of Water Flow System within EDWC	$300,000	-	$300,000
	1.3 - Rehabilitation of Flood Control Structures	$600,000	-	$600,000
	1.4 - Selected Equipment Purchase and Installation	$500,000	-	$500,000
	TOTAL COMPONENT 1	$2,350,000	$0	$2,350,000
2 - Drainage and Flood Control Analysis				
	2.1 - System Mapping : Use of Topographic and Bathymetric Mapping to Support Modelling	$1,300,000	-	$1,300,000
	2.2 - Assessment of EDWC System Integrity	$250,000	-	$250,000
	2.3 - Flow Modeling of EDWC System and Coastal Lowlands for Flood Control Management	$300,000	-	$300,000
	2.4 - Pre-feasibility Studies - EDWC dam and Coastal Lowlands Drainage Analysis and Works Identification	$150,000	-	$150,000
	TOTAL COMPONENT 2	$2,000,000	$0	$2,000,000
3 - Institutional Strengthening				
	3.1 - Development of Contingency Plan	$50,000	-	$50,000
	3.2 - Drainage Sector Institional Analysis	$125,000	-	$100,000
	TOTAL COMPONENT 3	$175,000	$0	$175,000
4- Government Consensus Building and Project Management			-	
	TOTAL COMPONENT 4	$100,000	$0	$100,000
5- Major Internvention Works and Operational Improvements			-	
	5.1 - Rehabilitation of Key Drainage Relief Canals	-	$3,000,000	$3,000,000
	5.2 - Strengthening of Drainage Infrastructure	-	$5,000,000	$5,000,000
	5.3 - Rehabilitation of Flood Control Structures	-	$2,800,000	$2,800,000
	TOTAL COMPONENT 5	$0	$7,800,000	$10,800,000
6- Contingencies		$375,000	$1,200,000	$1,575,000
	TOTAL	$5,000,000	$12,000,000	$17,000,000

b) Key indicators, assumptions, and risks (from Logframe)

Key indicators related to the project development objective include:

- By end of project, increased drainage capacity to the Demerara River from the EDWC by 35 percent;
- By end of second year of project, development of 3D Digital Elevation Model (DEM) for populated coastal lowlands;
- By end of third year of project, construction of EDWC Flow Model and Coastal Lowlands Flow Model;
- By end of project 10 key engineering staff (to be selected at appraisal) trained in the use of DEM and flow models;
- By end of project, 15 – 20 pre-engineering studies completed for future donor and government intervention;

Project Risks

Various national private stakeholders hold vested interests in the EDWC system and may feel threatened by the project, as they may interpret its activities as potential constraints on their current operations. These risks can be mitigated through consultations, workshops, seminars, and presentations designed to alleviate any misconceptions, explain facts and discuss the urgency of the problem in such a fashion.

Critical Risks	**Proposed Measures**	**Level of Risk**
System failure – country floods before the system can be repaired	Reducing the risk of system failure is the primary objective of the project. Not carrying out the GEF project and the subsequent follow-on IDB rehabilitation program would result in an increased likelihood of system failure. The EDWC system's dam and drainage components are at a critical state and must be upgraded quickly to protect the vulnerable population and regional agricultural productivity- before the system collapses.	H
Delayed implementation of the IDB follow-on program	The Bank and IDB teams are coordinating closely, demonstrated through joint missions, in order to develop a streamlined and comprehensive program that will make use of all available synergies – including a shared Project Execution Unit that will be responsible for all procurement to be carried out under the joint program. The project is geared not only to support future IDB interventions, but also to guide other donor financed work in the sector.	M
Poor implementation capacity at the local level	The Government of Guyana needs significant outside support and consultation to prepare and implement the project. Guyana has limited technical capacity and will need extensive support to confront the challenges of upgrading the water conservancy systems. The project will likely consist of three to four contracts with close supervision from the World Bank team and support to Guyanese technical staff.	M
Change in Government priority – Government decides	A key component of the project is to inform and educate the Guyanese authorities of the risks they face due to the weakness of the EDWC dam and the system's inability to expunge rainwater during the wet	M

the program is no longer a national priority	season. Doing so will maintain momentum generated at project preparation and mitigate potential changes in government priorities.	
Sustainability of the physical interventions being made under the project	Assurances will be sought under the project that GOG will allocate sufficient resources to maintain the improvements being under the project. The likely follow-up IDB project will also help monitor the maintenance activities.	S
	Overall Risk	S

2. COUNTRY OWNERSHIP

a) COUNTRY ELIGIBILITY

Guyana ratified the UN Framework Convention on Climate Change on August 29, 1994 and entered the agreement on November 27, 1994. Guyana is in conformity with the GEF's eligibility criteria as determined by the Conference of the Parties to the UN Framework Convention on Climate Change. Article 4.1 (e) of the Convention recognizes the importance of adaptation in the context of disasters, stating, "All Parties shall 'Cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods.'" The project aims to increase the Government's understanding of the dynamics of the EDWC system and to better control water levels in an effort to effectively manage water flows during wet and dry periods.

The project would support the GEF Climate Change Focal Area by increasing Guyana's ability to adapt to the regional impacts from climatic changes. More specifically, the project supports the Special Climate Change Fund Operational Program by promoting adaptation measures through the upgrading of EDWC system's drainage component to address the increased demands that stem from lower annual volume and increased intensification of rainfall in the coastal zone.

b) COUNTRY DRIVENNESS

The floods of 2005 and 2006 highlighted the significance of the risks posed by the weakened containment and drainage capacities of the EDWC system. After the January 2005 floods, the authorities demonstrated only modest commitment to recommendations made in early 2005 to open blocked relief canals and implement a long-term rehabilitation strategy. Within a constrained public finance framework, action was not taken because it was argued, and widely believed, that the January 2005 floods were a once in a thousand year event. As flooding occurred again the following year, the Government and the international community recognized flood management to be crucial to Guyana's economic, social and political well-being. Analytical work conducted since the recent events points to sea level rise as an important culprit of the flooding.

The recent United Nations Development Program (UNDP) Engineering Assessment, developed in collaboration with the Government of the Netherlands (February 2006), captured the Government's attention. The report underscores the vulnerability of the EDWC dam and the system's ability to discharge excess water, which could soon lead to structural failure if no immediate and aggressive intervention aimed at reducing the EDWC system's vulnerability is undertaken.

As a result of the recent flooding, the GoG asked the donor community to support their recovery efforts. Moreover, the IDB, the World Bank and other donors have been asked for assistance in developing a long term solution to the challenges posed by the decreasing discharge window caused by sea level rise.

Without a proactive strategy to increase the drainage capacity of the current system, the Government is well aware that if the sea level continues to rise, it will become increasingly difficult to manage water levels during times of heavy rainfall.

The last Guyana Country Assistance Strategy (CAS) was issued on September 19, 2002. Strengthening of the EDWC system was not included in the CAS because major floods that weakened the system had not occurred and the ensuing high risks to the network were not so apparent. Impacts of climate change were not taken into account and the EDWC was not expected to reach its operationally effective threshold. With over 75 percent of the population living in at risk areas, and because the integrity of the system is suspect, strengthening the EDWC system is now a top priority of the Government and the donor community. Flood control will be included in the CAS update.

3. PROGRAM AND POLICY CONFORMITY

a) FIT TO GEF FOCAL AREA STRATEGIC OBJECTIVES AND OPERATIONAL PROGRAM

The project is to be supported under the Special Climate Change Fund, with emphasis being placed on the implementation of physical adaptation measures and the planning of future physical interventions based on the results of an analysis of the drainage management system. The integration of technology and analytical methods for the design of interventions under this project are replicable. This project can serve as a demonstration for the development of adaptation interventions that can be implemented in similar contexts (e.g. delta regions, coastal zones, river systems) throughout the world.

Somewhat different in scope and theme than previous GEF projects, the Guyana Conservancy Adaptation Project represents important opportunities for learning and future application. The majority of climate change related GEF projects have been focused on green house gas emissions abatement and the study of the potential impacts from climate change. These projects often do not involve large infrastructure components aimed at strengthening physical assets to help reduce a country's vulnerability to intense climatic events. Yet infrastructure is a critical sector to consider when implementing adaptation measures to better cope with the effects of climate change. Structures that were not built to withstand the affects of climate change will suffer damages, and costly losses will follow. Shifting the focus of the GEF Adaptation Program to the development and implementation of adaptive measures to strengthen infrastructure will increase the program's robustness and effectiveness.

b) SUSTAINABILITY (INCLUDING FINANCIAL SUSTAINABILITY)

Operational

No adequate topographic baseline currently exists for evaluating the coastal drainage of Guyana and until one is developed, internal flood control management will remain a matter of guesswork and response to localized empirical observation rather than integrated system planning. Additionally, at present it is impossible to evaluate the effects of development activities on the system. The tools developed under the project will allow for the informed management of future development and landuse by managing its impact on flood control and drainage management. Understanding the local micro-topography enables the determination of water sources and flow regimes that must be captured or otherwise managed to reduce flooding and manage drainage efficiencies. The Government and the donor community will benefit from the engineering baseline developed under the project to target key physical interventions that will continue to reduce Guyana's vulnerability to catastrophic flooding.

Crucial to the sustainability of the project is a comprehensive program to build the capacity of Guyanese engineers to use the information developed, gather additional on the ground data in response to the needs identified under the analytical portion of the project. Engineers will be trained in the use of 1D-2D Flow

Models and the integration of 3D high resolution topographic data for the analysis of local drainage regimes and their optimization. The engineering firm contracted to carry out the analysis under Component 2 shall be tasked with the requirement of training the Guyanese in the proper use and management of the models and data systems developed. Engineers from the NDIA, Lands and Surveys Commission, River and Sea Defense Unit, Guyana University and others that may be identified at project appraisal will benefit from this knowledge transfer.

Financial

With sea levels rising and rainfall intensity increasing in the region, the impacts of climate change will continue to shorten the window of time available to purge water from the EDWC system. The risk of system failure will continue to rise from its already high level and if no work is done in the sector, the EDWC will fail. The economic consequences of a dam breach would be catastrophic. The majority of the populated coastal zone, including the capital city, would remain submerged for several months, impacting homes and livelihoods. Inability to drain water from saturated soils would put significant pressure on the social structure of the country and could lead to a disintegration of the rule of law. Therefore, economic losses resulting from the collapse of the EDWC dam are difficult to quantify due to their catastrophic nature – but would amount to 3 to 4 times the annual GDP of Guyana. Moreover, unpredictable social costs that may result from a breakdown of the rule of law have the potential to be even more damaging.

Because it is difficult to ascertain the probability of collapse, the financial benefits of interventions aimed at strengthening the critical infrastructure within the EDWC system cannot be accurately quantified, but nevertheless far outweigh the cost. Works aimed at relieving pressure behind the EDWC dam by increasing drainage relief capacity of the system during times of heavy rains will lessen the likelihood of system collapse and an ensuing catastrophic event that would affect the majority of the inhabited population for several months.

c) REPLICABILITY

Like other low-lying coastal countries, Guyana is highly vulnerable to sea level rise and changes in rainfall patterns. Heightened sea levels and more intense rain events increase the vulnerability of low-lying coastal countries to severe flooding. Drainage and irrigation systems that were constructed over a hundred years ago were not designed to cope with these rapidly evolving threats.

The project would serve as a template that could be applied to countries with similar geographical attributes and aims to raise awareness to promote the worldwide application of physical infrastructure upgrades to reduce the vulnerability to the additional risks brought on by climate change. The project would be a model incorporating a suite of technologies that would enable other governments to assess big infrastructure projects to ensure that engineering designs are sufficient to withstand and accommodate the effects of climate change. In terms of a demonstration project, it is anticipated that the technologies and practices used in this effort could be replicated in other regions facing similar challenges.

d) STAKEHOLDER INVOLVEMENT

Every citizen of Guyana will benefit from the successful implementation of the Conservancy Adaptation Project. Direct beneficiaries will include the 75 percent of the population currently living in coastal areas protected by the conservancy drainage system. The remaining 25 percent of the population will benefit indirectly from the increased political and economic stability resulting from a more reliable drainage system that is less at risk of systemic failure.

Over the course of two visits by the World Bank and IDB teams since March 2006, meetings and consultations have taken place with key government participants. Discussions were held with the three key departments are responsible for flood control in Guyana, including the: National Drainage and Irrigation Authority; Sea and River Defense unit within the Ministry of Works; Lands and Surveys Commission. Members of the Ministries of Finance and Agricultural, as well as the EPA have been consulted and kept abreast of project progress as well.

Additional agencies that will be involved in project appraisal include Guyana Water Incorporated, the University of Guyana and the Civil Defense Commission. All of these organizations will be directly involved in the project through their participation in the flood control Steering Committee. An institutional analysis will be executed under the project to better understand the role and responsibilities of each group.

Donor community participation was initiated during a June 2006 meeting hosted by the UNDP. Representatives from the British Department for International Development, USAID, CIDA, and the EU participated in the discussion and expressed support for the joint strategy proposed by the World Bank and IDB teams. Coordination will continue to be led by the World Bank and the IDB during appraisal and project implementation. The donor community is working together and sharing ideas to best assist the Government in adapting to the emerging changes that have resulted from climate change. The donor dialogue will continue through regular meetings to discuss progress achieved and challenges remaining in the sector. This dialogue will be spearheaded by the World Bank country office in Guyana.

e) MONITORING AND EVALUATION

Monitoring and evaluation has been mainstreamed into all project components and will be conducted at three levels: i) contract compliance; ii) impact monitoring; and iii) project implementation. The PEU will liaise with the SC and the engineering firm contracted for analytical work and will input information as to progress achieved. With regards to physical interventions made to increase drainage capacity, the SC, through the engineering firm will report these increases based on work completed.

The Bank will closely coordinate with the PEU and retain the services of an internationally known hydraulic engineer to follow project implementation and review quarterly progress reports provided by the engineering firm. In addition, the Bank team will conduct semiannual supervision missions to assess progress made in the implementation of project activities. Supervision missions will draw lessons learned to date and provide guidance to the project team. In addition, the Bank, together with the hydraulic engineer, will conduct a midterm evaluation of project execution. The midterm review will be conducted no later than 1.5 years after the first project disbursement. The midterm review will focus on: i) progress in achieving project outcomes; ii) institutional arrangements for project implementation; iii) effectiveness and suitability of the monitoring system; and, iv) review of both the project implementation plan and general project operation manual.

A final evaluation will be conducted in the last semester of project execution. The key objectives of this final evaluation will be to assess attainment of the expected project results, and to draw lessons learned from project implementation.

4. FINANCIAL MODALITY AND COST EFFECTIVENESS

The Government and several donors are currently active in water management and flood control. Attached below is a summary of projects related to these themes and include projects being prepared and currently ongoing. The high level of Government resources should be noted. Over the course of the 3 year project, the Government, through the Drainage and Irrigation Authority will invest US$12 million in

flood management. Additional investment, particularly through the River and Sea Defense unit of the Ministry of Works, is being by the Government for flood control.

A) CO-FINANCING SOURCES

Co-financing Sources				
Name of Co-financier (source)	Classification	Type	Amount (US$)	Status*
National Drainage and Irrigation Authority	Government Funds	Budget Resources	12 million	$4 million annual budget
Sub-Total Parallel-financing			12 million	

* Reflect the status of discussion with co-financiers. If there are any letters with expressions of interest or commitment, please attach them.

B) ASSOCIATED ACTIVITIES

Parallel-financing Sources				
Name of Co-financier (source)	Classification	Type	Amount (US$)	Status*
European Union	Bilateral	Grant	14 million	Implementation
IDB	Multilateral	Concession Loan (Flood Control Project	25 million	Preparation
Sub-Total Parallel-financing			39 million	

C) ADMINISTRATIVE BUDGET

Not Applicable

5. INSTITUTIONAL COORDINATION AND SUPPORT

a) CORE COMMITMENTS AND LINKAGES

This project is intended for support under the Special Climate Change Fund, thus emphasis is being given to the implementation of adaptation measures. This will provide value added in terms of global learning and will not duplicate the activities under implementation or preparation. In this context, the project would coordinate its work with activities being developed with CARICOM's Community Climate Change Center (CCCC), being implemented through the World Bank/GEF.

The Government is responsive to threats posed by climate change and the need to implement an adaptation program. As such, the GoG supports the proposed project to help the country confront emerging vulnerabilities resulting from global climate changes. The GEF Focal Point has expressed strong agreement with this focus and has requested the World Bank to assist the Government to support such work.

The World Bank is working closely with the Government and the IDB to create an engineering baseline that will be used to develop a comprehensive strategy to improve flood control. Links have been established with key partners within the Government, including the Ministry of Agriculture, the NDIA, the River and Sea Defense Unit and the Lands and Surveys Commission. During the project appraisal mission, the Bank team will work with these agencies and seek to incorporate the University of Guyana

and any other relevant institutions. Members of these agencies will be represented on the project Steering Committee and will be responsible for overseeing project implement

b) CONSULTATION, COORDINATION AND COLLABORATION BETWEEN IAS, AND IAS AND EXAS, IF APPROPRIATE.

The US$5 million in grant funds will be used to provide the framework necessary for the Government to strongly commit to an upgrading of the EDWC and inhabited coastal lowlands systems. Doing so will strengthen the process of reducing the negative impacts of climate change that have manifested themselves in the form of extensive flooding over the past two years. Analytical tools developed under the GEF Conservancy Adaptation Project will be used as the input to a US$25 million IDB rehabilitation program. Linking the project to a larger project which incorporates the outputs of the project will help raise the profile of both the GEF Facility and the need to improve infrastructure to adapt to climate change.

Strong linkages have been made between the World Bank team and the IDB, in order to leverage the GEF funds to develop a comprehensive flood management strategy in coastal Guyana. The analytical tools developed under the proposed project will be applied by the Government of Guyana, together with the IDB, as they work towards implementing sound infrastructure improvements to assist the Government in managing increasing flood risks that have materialized as a result of climatic changes.

The World Bank and IDB teams are communicating and coordinating with other donor agencies engaged in Guyana in an effort to promote greater participation in climate change adaptation activities. It is hoped that as the process moves forward, additional funds will be made available for key drainage infrastructure investments that increase the Government's ability to manage water levels during times of increasingly intense rainfall.

C) PROJECT IMPLEMENTATION ARRANGEMENT

An implementation structure would be put in place that maximizes cost effectiveness, timely execution, ownership and transparency amongst stakeholders. Representatives from various government agencies that would be responsible for the use and management of the digital elevation and flow models will be involved throughout the project. Oversight, coordination and ownership amongst stakeholders for the success of the program therefore require the establishing of a Steering Committee. This committee will be formed through an inter-agency agreement between the participating members. The SC will be responsible for ensuring that all technical aspects of the project are compliant with the technical specifications of the project. The Members of the Steering Committee would include (to be finalized at appraisal):

The Chairman of the National Drainage & Irrigation Authority (NDIA) or his delegate, who will chair the meetings, which will involve the following participants:

- A representative of the Minister of Finance;
- The Head of the River and Sea Defense Division of the Ministry of Public Works;
- The Head of Lands and Surveys Commission ;
- Chief officer of the Civil Defense Commission;
- Representative from Guyana Water Company;
- Representative from the University

The project implementation unit will be housed within the Ministry of Agriculture. There currently exists a Project Execution Unit (PEU) within the MoA that manages the ongoing IDB financed Agricultural

Support Services Project. Due to the small value, and limited number of contracts involved in the GEF project, the PEU will manage the administrative and fiduciary aspects of the project. The GEF project will have a specific Project Manager who will be responsible for reporting on and ensuring the completion of all fiduciary aspects of the project, as well as coordinating the technical aspects of the project with the Steering Committee (SC). The PEU would serve only to implement the fiduciary requirements, including procurement and financial reporting, while the SC will be responsible for project supervision. During the pre-appraisal mission, specific responsibilities for the PEU and the SC will be discussed and finalized.

Administrative Responsibilities

The GEF Project Manager will be responsible for supervising the procurement of each contract and will report to a SC as to the progress made. Since the GEF program entails the procurement of a limited number of contracts, the IDB Project Execution Unit within the Ministry of Agriculture will carry out the bidding and contracting. The PEU, created for the Agricultural Support Services Project currently includes a: (i) procurement officer; (ii) accountant; (iii) administrative assistant; (iv) civil engineer; (v) agricultural engineer; and (vi) institutional specialist. With oversight by the Bank team, the PEU will execute the procurement of these contracts in a transparent manner that is in line with World Bank guidelines.

Technical Responsibilities

The GEF Project Manager of the PEU will act as the Secretary of the SC (without voting power), shall provide the Committee with all the relevant information and will be responsible for recording its deliberations. A team of technical staff, whose agencies are represented on the SC, will report on and evaluate the work of the engineering firms, under the supervision of the project manager. The team will be lead by the Chairman of the NDIA and will discharge their responsibilities on a part-time basis. Oversight, coordination and ownership amongst stakeholders for the success of the program require the SC to execute the following tasks:

- Define, develop and oversee Project Strategy;
- Complete Terms of Reference for work to be carried out under the project;
- Insure proper and timely coordination between the different stakeholders;
- Approve the annual Operation Plans and Budgets as well as the operational and technical processes for the implementation of the Project;
- Publish on the Government Web-Page GINA and through a press release, on a semi-annual basis, the major achievements of the Program;
- Provide guidance to the Project Execution Unit (PEU) as necessary.

ANNEX A: ADDITIONAL COSTS

Human settlement and infrastructure is concentrated in Guyana's reclaimed coastal plain where approximately 75 percent of the nation's population resides. Much of the land now in use in northern Guyana lies in the coastal zone below the mean high tide level. The coastal zone consists of a low-lying system of marine and riverine deposits which formerly comprised an extensive network of tidal deltas. This land was reclaimed from tidal areas and is protected by an intricate network of seawalls, dykes, polders and drainage structures. Guyana's agrarian economy, which contributes over 35 percent to the GDP, is highly dependent on this coastal drainage and irrigation system as are the homes and businesses of the region. Through 160 years of operation, the drainage and irrigation system has been modified and amplified to increase the quantity of tillable land. Drainage has been managed through the use of gravity based systems augmented with pumps, but the system is now suffering from the impacts of sea level rise over the fifty years because an adequate discharge window is no longer guaranteed.

Investments must be made in the sector for three reasons. First, as an old and complex drainage system, regular maintenance and repairs are required to ensure the system remains functioning. Second, as the water needs of the country expand, investment must be made in the expansion of the network of drainage canals and water storages. These two recurring costs have historically been financed by the Government and the donor community and the system has functioned satisfactorily, despite the relatively unorganized and ad-hoc approach that has been taken in the past. The third cost relates to the upgrades that must be made in the system to compensate for the shorter drainage window as a result of sea level rise. Because the system is gravity based, water can only be eliminated from the system when the sea level is below the water level in the system. Strengthening the system to adapt to a shorter drainage window caused by sea level rise will require significant investment and, over the course of the coming decades, a complete overhaul of the current drainage and irrigation system.

Historically, this gravity based system had a sufficient buffer to handle above average rainfall because of the difference between the water levels in the system and the sea. The estimated 1.8 foot increase in sea level that has occurred over the past 50 years has erased this buffer and severely stressed the current network. A series of severe storms have further stressed the drainage and water storage system and, at the present time, the reclaimed coastal areas are highly susceptible to flooding. Therefore, the previous ad-hoc approach is of flood control is no longer viable and will eventually lead to a disastrous flooding incident. Given the forecasted impacts of global climate change and sea level rise, the risk of future flooding-even during normal weather events-is increasing significantly.

The need for additional investment to protect against the effects of climate change in Guyana has been highlighted twice in the last two years, which has led to significant flooding both times. Higher than average rainfall during the winter rainy season overwhelmed the current drainage system as the Government was not able to purge water faster than the system accumulated water. The inability to eliminate excess water from the system was due in part to the fact that the drainage window is now smaller than it had been in the past.

The objective of the Conservancy Adaptation Project is to help the GoG adapt to global climate changes by reducing the country's vulnerability to catastrophic flooding.. This will be achieved through an increase in drainage relief capacity and the development of a long-term physical adaptation program designed to improve the drainage relief capacity of the EDWC and coastal lowlands systems. The project will provide the analytical baseline, critical component analysis, physical works, and framework for the future management of the drainage system. Execution of these activities will improve the GoG's understanding of the operational behaviors of the EDWC and coastal lowland drainage regimes.

This project would serve as a catalyst to bring in additional resources from bilateral and multilateral sources. Once an engineering foundation has been built for the EDWC and populated coastal lowlands, and a comprehensive intervention strategy is developed under the project, the donor community will be able to make well justified investments in strengthening flood control in Guyana. Considering the scale of the challenge, this approach is most appropriate to address the obstacles face d by Guyana as a result of the impacts of climate change. The need to adapt to the adverse impacts of climate change (in this case, a shorter water discharge window) presents an additional barrier to the achievement of Guyana's sustainable development goals.

The US$5 million in GEF grant funds will be used to provide the framework necessary for the Government to strongly commit to an upgrading of the EDWC and inhabited coastal lowlands systems. Doing so will strengthen the process of reducing the negative effects of climate change that have manifested themselves in the form of extensive flooding over the past two years. Analytical tools developed under the GEF Conservancy Adaptation Project will be used as the input to a US$25 million IDB rehabilitation program. Linking the project to a larger project which incorporates the outputs of the project will help raise the profile of both the GEF Facility and the need to improve infrastructure to adapt to climate change.

Strong linkages have been made between the World Bank team and the IDB, in order to leverage the GEF funds to develop a comprehensive flood management strategy in coastal Guyana. In March and June of 2006, both teams from both organizations traveled to Guyana to work with the Government in an attempt to develop a comprehensive program. The analytical tools developed under the proposed project will be applied by the Government of Guyana, together with the IDB, as they work towards implementing sound infrastructure improvements to assist the Government in managing increasing flood risks that have materialized as a result of climatic changes.

The World Bank and IDB teams are communicating and coordinating with other donor agencies engaged in Guyana in an effort to promote greater participation in climate change adaptation activities. It is hoped that as the process moves forward, additional funds will be made available for key drainage infrastructure investments that increase the Government's ability to manage water levels during times of increasingly intense rainfall.

The project will also assist the Government in directing their investment in the sector. In 2006, the Government approved an annual budget of roughly US$4 million for the National Drainage and Irrigation Authority to improve flood management. Over the life of the three year project, through the NDIA, the Government will have invested US$12 million of its own funds to improve the current system. The project will provide the extra funds necessary to upgrade the system to counter the affects of climate change, particularly sea level rise – which has limited the drainage window of the entire system.

ANNEX B: PROJECT LOGICAL FRAMEWORK

PDO	Outcome Indicators	Use of Outcome Information
a) Help the GoG adapt to global climate changes by reducing the country's vulnerability to catastrophic flooding	a) Increase in the drainage relief capacity of the EDWC to the Demerara River by 35% by EOP b) Hydraulic engineering foundation critical for flood control management analyzed and understood by GoG by EOP c) Identification of at least 15 key drainage regimes for follow-on intervention	• To inform the mid-term review of success achieved in the physical reduction of vulnerability to flooding • To be used by trained engineers in Guyana to more effectively manage water flows • To guide future Government, IDB and other donor intervention that should lead to a system that can discharge excess rainwater more effectively

Intermediate Results	Results Indicators for Each Component	Use of Results Monitoring
Component one: Infrastructure civil works and operational improvements		
i) Increased discharge capacity of key relief canal from EDWC to Demerara River	• Percentage of key canal rehabilitated, in compliance with national and project level environmental and safety requirements • Discharge capacity doubled (to be confirmed in first year)	To track quarterly progress of the physical work undertaken, completed to assess the increase in drainage relief capacity of the EDWC achieved
ii) Improvement of water flow system within EDWC	• % Increase in discharge capacity to the Demerara River • Internal Hydraulic Flow Model completed by PY1 and report presented on results	
iii) Repair of EDWC water control structures	• 100% of repairs identified at appraisal executed by EOP	
iv) Selected Equipment Purchase and Installation	• Key monitoring, communications, and other equipment purchased by PY1, installed by PY2, and fully operational by PY3	

Component two: System analysis and hydrologic baseline		
i) Detailed topographic and land-use mapping	• LIDAR data capture of Coastal Lowlands for Region 3, 4 and 5 completed, for input into 3D Digital Elevation Model • DEM model developed	To track quarterly progress of the analytical work undertaken, completed to assess the level of achievement in the development of decision making tools
ii) Hydrologic modeling of coastal lowlands	• 1D-2D model developed to identify key drainage regimes	
iii) EDWC hydraulic modeling	• 1D-2D model developed to identify map key interventions to be made within conservancy to improve water flow to the Demerara River	
iv) Assessment of EDWC system integrity	• Measurements taken and dam safety analysis completed to highlight areas in critical need of repair • Leveling and Bathymetry completed	
vi) Operational capacity building	• # of key staff trained in use of Digital Elevation Models • # of key staff trained in use of Flow Models • # of staff trained in use of monitoring equipment	

Component three: Institutional Strengthening		
i) Contingency Plan for flood events	• Contingency Plan developed with clear lines of responsibility by end of PY1 and operational by PY2	To track quarterly progress of institutional analysis completed and contingency plan operationalized
ii) Institutional Analysis of the Drainage Sector	• Institutional analysis concluded and recommendations proposed to GoG	

Component four: Government Consensus Building and Project Management		
i) Development of flood control thematic committee	• Steering committee formed and operational by PY1 • At least 10 committee meetings held by EOP with at least 80% attendance • Prioritization strategy to improve water management capacity developed by steering committee by	To track quarterly progress of the donor commitment completed to assess the increase in outside participation to the flood control sector

	PY3 and presented to donors by EOP • 3 Annual Reports provided by committee by EOP	
ii) Donor meeting to be held at project completion	• Donor meeting held at EOP with representatives from at least 5 different donors in attendance • # of pledges made	
Component 5: Major infrastructure civil works and operational improvements	To be developed by the Steering Committee and the GoG upon completion of hydraulic engineering foundation	

Monitoring and evaluation has been mainstreamed into all project components and will be conducted at three levels: i) contract compliance; ii) impact monitoring; and iii) project implementation. The PEU will liaise with the SC and the engineering firm contracted for analytical work and will input information as to progress achieved. With regards to physical interventions made to increase drainage capacity, the SC, through the engineering firm will report these increases based on work completed.

The Bank will closely coordinate with the PEU and retain the services of an internationally known Hydraulic Engineer to follow project implementation and review quarterly progress reports provided by the engineering firm. In addition, the Bank team will conduct semiannual supervision missions to assess progress made in the implementation of project activities. Supervision missions will draw lessons learned to date and provide guidance to the project team. In addition, the Bank, together with the Hydraulic Engineer, will conduct a midterm evaluation of project execution. The midterm review will be conducted no later than 1.5 years after the first project disbursement. The midterm review will focus on: i) progress in achieving project outcomes; ii) institutional arrangements for project implementation; iii) effectiveness and suitability of the monitoring system; and, iv) review of both the project implementation plan and general project operation manual.

A final evaluation will be conducted in the last semester of project execution. The key objectives of this final evaluation will be to assess attainment of the expected project results, and to draw lessons learned from project implementation.

Arrangements for Results Monitoring							
		Target Values			Data Collection and Reporting		
Outcome Indicators	**Baseline**	**YR1**	**YR2**	**YR3**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
Increased in the drainage relief capacity of the EDWC to the Demerara River by 35% by EOP	TBD (during first year)	Increase of 10% of discharge capacity (to be confirmed at appraisal) - cumulative	Increase of 30% of discharge capacity (to be confirmed at appraisal) - cumulative	Increase of 35% of discharge capacity (to be confirmed at appraisal) - cumulative	Annual	Engineering Firm Progress Reports	Project Execution Unit
Hydraulic engineering foundation, critical for flood control management analyzed and understood by GoG by EOP	TBD (during first year)	25% of foundation developed (DEM Models)	100% of foundation developed (Flow Models developed for EDWC and coastal lowlands)	80% of hydraulic engineers trained fully understand the engineering foundation	Annual	Engineering Firm Progress Reports and EOP Survey	Project Execution Unit
Identification of at least 15 key drainage regimes for follow-on intervention	0	10% complete DEM constructed	Flow Models Developed	15 key drainage regimes identified and pre-engineering studies completed	Annual	Engineering Firm Progress Reports	Project Execution Unit

Component 1: Percentage of key canal rehabilitated, in compliance with national and project level environmental and safety requirements	0	25% complete	100% complete				
Percentage of discharge capacity increased of key relief canal from EDWC to Demerara River	TBD (during first year)	0	Discharge capacity doubled (to be confirmed in first year)	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
Percentage of discharge capacity increased from EDWC to the Demerara River	TBD (during first year)	0	Discharge capacity increased by 30% (to be confirmed in first year) - cumulative	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
Internal Hydraulic Flow Model completed by PY1 and report presented on results	0	100% completed and report presented	-	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
100% of repairs identified at appraisal executed by EOP	0	20% completed	75% completed	100% completed	Annual	Engineering Firm Progress Reports	Project Execution Unit
Key monitoring, communications, and other equipment purchased by PY1, installed by PY2, and fully operational by PY3	0	Key equipment purchased	Equipment installed	Equipment fully operational	Annual	Engineering Firm Progress Reports	Project Execution Unit

Component 2: LIDAR data capture of Coastal Lowlands for Region 3, 4 and 5 completed, for input into 3D Digital Elevation Model	0	LIDAR flown over Region 3, 4 and 5	-	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
3D Digital Elevation Model developed	0	-	DEM created for Region 3, 5 and 4	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
1D-2D model developed to identify map key interventions to be made within conservancy to improve water flow to the Demerara River	0	30% complete	100% complete	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
Measurements taken and dam safety analysis completed to highlight areas in critical need of repair	0	Dam safety study complete, sections in need of repair included in annual report	-	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
Leveling and Bathymetry of EDWC completed	0	100% Measurements taken	-	-	Annual	Engineering Firm Progress Reports	Project Execution Unit
Number of key staff trained in use of Digital Elevation Models, and Flow Models, Monitoring Equipment	0	10 GoG engineers trained on use of LIDAR and DEMs	10 GoG engineers trained on methodology to develop flow models	10 GoG engineers fully trained on use of Flow Models and monitoring equipment	Annual	Engineering Firm Progress Reports	Project Execution Unit

Component 3: Contingency Plan developed with clear lines of responsibility by end of PY1 and operational by PY2	0	Contingency Plan developed	Completed and Operational	-	Annual	SC Progress Reports	Project Execution Unit
Institutional analysis concluded and recommendation proposed to GoG	0	0	50% completed	100% completed and proposed	Annual	SC Progress Reports	Project Execution Unit
Component 4: Steering committee formed and operational by PY1	Participants TBD at appraisal	Committee formed and operational	-	-	Annual	SC Progress Reports	Project Execution Unit
At least 10 committee meetings held by EOP with at least 80% attendance	0	2	6	10	Annual	SC Progress Reports	Project Execution Unit
Prioritization strategy to improve water management capacity developed by steering committee and presented to donors by EOP	0	10% Complete	30% complete	100% complete, and presented to donors	Annual	SC Progress Reports	Project Execution Unit
3 Annual Reports provided by committee by EOP	0	1	2	3	Annual	SC Progress Reports	Project Execution Unit
Donor meeting held at EOP with representatives from at least 5 different donors in attendance	0	0	0	Donor Meeting held	Annual	SC Progress Reports	Project Execution Unit
Number and value of pledges made	0	0	0	TBD	Annual	SC Progress Reports	Project Execution Unit
Donor meeting held at end of project	0	0	0	Meeting held	Annual	SC Progress Reports	Project Execution Unit

ANNEX C: RESPONSE TO PROJECT REVIEWS

a) Convention Secretariat comments and IA/ExA response

Not Applicable.

b) STAP expert review and IA/ExA response

Professor Bhawan Singh, PhD

The objective of the proposed Conservancy Adaptation Project (CAP) is to assist the Government of Guyana in adapting to on-going and future global climate changes by mitigating the risk of catastrophic flooding of its vital coastal areas. This will be achieved through an increase in drainage relief capacity and the development of a long-term physical adaptation program designed to improve the drainage relief capacity of the East Demerara Water Conservancy (EDWC) and coastal lowlands systems.

Much of the land now in use in northern Guyana along the Atlantic coast 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. Guyana's agrarian economy, based mainly on sugarcane and rice, which contributes over 35 percent to the GDP, is highly dependent on this coastal drainage and irrigation system as are the homes and businesses of the region.

The East Demerara Water Conservancy (EDWC), variously constructed of clay, earth and organic material (pegasse), is the major conservancy system in Guyana. The EDWC is a freshwater impoundment located in Region 4, 15 miles south of the most densely populated section of Guyana along the Atlantic coast. It is bounded to the north by a 40 mile earthen dam structure built some 125 years ago and to the south by the natural topographic rise composed largely of ancient coastal dune formations. The area consists of an impoundment of approximately 550 hectares and ranges in depth from 12 to approximately 15 feet along the dam. Drainage of the EDWC has been managed through the use of gravity based systems augmented with pumps, but the system has suffered from the impacts of sea level rise over the past century. Recently, a series of severe storms during the two rainy seasons, the strongest between June and July and less intense season between December and January, have further stressed the drainage and water storage system and, at the present time, the reclaimed coastal areas are highly susceptible to flooding. Given the forecasted impacts of global climate change and sea level rise, the risk of future flooding, even during normal weather events, is increasing significantly.

Over two-thirds of Guyana's 750,000 citizens live near or below sea-level along the coast below the EDWC dam. They are concentrated in a 30 mile band along the coast, between Georgetown and the Mahaica River, protected from the Atlantic Ocean by the Guyana sea defense network. The EDWC serves as a source of all drinking water for, Georgetown, the capital, and the other major urban centers, but primarily serves to supply agricultural irrigation water during the dry seasons.

However, the EDWC conservancy relief canals are currently operating with severe limitations as changes in landuse and local increases in sea level have greatly limited their effectiveness. The degradation of the EDWC system has been compounded by a number of recent severe weather events, such as the floods of 2004-2005. Overtopping of the Dam during these rains, in addition to significant dam creeping, has weakened the integrity of an already vulnerable system.

The scope and urgency of the threat of a failure of the EDWC system is further exacerbated by the effects of climate change on the regional water cycle. Apart from the reduced effectiveness

of the canal drainage system, increases in sea level have reduced the time available for canal discharge operations. Furthermore, while climate models suggest that climate change is gradually reducing the annual rainfall to the region, there is concern that intensity of storm events will increase, thereby creating a condition for delivering more water over shorter periods of time.

The CAP project is intended to finance specific rehabilitation works and operational improvements aimed at enhancing the water management capacity of the EDWC during critical flood periods and provide a comprehensive analytical tool to plan future interventions within the system. The tools developed under the analytical component of the project are expected to be leveraged by the International Development Bank (IDB) to develop a more involved and comprehensive US$25 million flood management project. It is also expected that other donors, who have expressed interest in the program, will participate as the program evolves in the future.

The CAP project being proposed to the GEF (Global Environmental Facility) consists of three major components:

1. *Infrastructure civil works and operational improvements*: The project will finance key infrastructure interventions to the EDWC. Works to be financed by the GEF will focus on improving the ability of the Government of Guyana 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. Improvements to the EDWC dam are not contemplated under this GEF grant, on account of its broad scope and high cost. But the initial civil works and operational improvements under this CAP project, namely the engineering safety assessment and analysis of the dam structure, is expected to be used to leverage a larger IDB initiative to undertake major improvements to the EDWC system.

   The GEF fund being solicited is expected to finance a number of urgently needed infrastructure interventions within the EDWC, so as to alleviate coastal flooding problems in the near term. The interventions envisioned include:

- *Rehabilitation of key drainage relief canals:* the Cuffy Canal, which currently operates under capacity due to restrictions caused by sedimentation and vegetation growth, and possibly rehabilitation of the Cuhna Canal, based on feasibility and availability of funds.
- *Improvement of the water flow system within EDWC:* Due to vegetation overgrowth and clogging within internal waterways behind the EDWC dam, water is backed up in the north eastern part of the EDWC and this impedes the flow of water westward to the Demerara drainage structures, as originally designed. For example, the five-door sluice, one of the principal water control structures is presently operating at 70 percent efficiency. It is anticipated that improving internal EDWC flows will increase discharge efficiencies at this structure to near 100 percent. GEF funds are therefore being sought to develop a rationalization plan aimed at allowing the Government of Guyana to carry out the necessary rehabilitation works within the EDWC, to level the hydraulic gradient and to improve the drainage relief capacity to the Demerara River. It is expected that he effect of these improvements will significantly increase the western discharge capacity of the system and thus reduce the risk of flooding.

- *Repair of water control structures*: a number of sluice gates behind the EDWC are not operating efficiently, and in many cases leak water from behind the EDWC dam. These structures are to be repaired to so as to improve their efficiencies.

2. *Component 2 – System Analysis and Hydrologic baseline.* The GEF fund being solicited is expected to finance a second component consisting of a variety of analytical works aimed at providing the hydrologic baseline necessary for contemplating rationale interventions to the EDWC flood control system. These analyses are intended to find out how drainage regimes in the populated areas of the coastal lowlands behave, where flood waters originate or where interventions are going to be effective. Presently, emergency interventions are now being made without a full understanding of how the current flood control regime functions. Furthermore, years of neglect coupled with unregulated landuse change has greatly perturbed the original network of drainage canals and their ability to efficiently remove excess water, which has resulted in increased flooding of the coastal lowlands. It is also expected that the results from this component will provide the hydrologic baseline critical for flood zone management and the design of effective interventions. The analyses contemplated include:
    - *Detailed Topographic and Landuse Mapping*: This sub-component of the CAP will allow for a detailed topographic and landuse mapping of the EDWC and coastal drainage and irrigation systems, and landuse using the construction of digital elevation maps (DEMs) in combination with aerial photography coupled with LIDAR (light detection and ranging) technology. Where necessary, conventional land survey techniques will also be used to augment data production. Survey work will be tied to the national geodetic grid and vertical datum.
    - *Hydrologic Modeling of Coastal Lowlands* – Under this sub-component of the CAP, using the LIDAR derived topographic DEM as baseline, assumedly simple hydrologic models will be developed so as to identify and assess water flows within the EDWC and surrounding regions. These hydrological model simulations are expected to facilitate the identification of flood risks and optimum drainage options for flood management and to assist in evaluating the impact of future landuse changes on the drainage and flood control system.
    - *Assessment of* EDWC *System Integrity*: Under this sub-component of the CAP, an engineering evaluation of all EDWC structures, including dams, canals, levies, sluices and sluice gates, is to be conducted to determine which parts of the system are not operational, which need repairs and what needs replacement, so as to allow the system to operate at maximum capacity. Furthermore, it is expected that this sub-component will be used as a basis for follow-on efforts on the part of the Inter American Development Bank and other donors for long-term rehabilitation works.
    - *EDWC Hydraulic Modeling*: Under this sub-component, it is envisaged that within the EDWC, measurements and data will be collected to produce a system flow model. This model, supposedly, will be used to develop improved management procedures using refined operational parameters and to identify the improvements in drainage infrastructure needed to protect the system from failure. These flow models are also expected to help identify key bottlenecks for effective drainage and purging. The intended hydraulic model of the EDWC system will be developed, hopefully, to evaluate the most effective measures that can be taken to increase the drainage relief capacity of the EDWC

- *Pre-feasibility studies for coastal lowland interventions:* In this sub-component, it is proposed that, based on the results of the hydrologic modeling, and scenario analysis, a number of key interventions will be prioritized and presented to the Government of Guyana and the donor community to further improve coastal flood controls related to the EDWC.
- O*perational Capacity Building:* In this sub-component, it is expected that the development of an extensive training program will be undertaken so as to allow the pertinent Government of Guyana agencies to better understand, operate and maintain the EDWC and coastal lowland drainage relief systems.

3. *Component 3- Project Management and Donor coordination:* In this component it is expected that the GEF will finance broad consultations with donors, Government and civil society, in order to create consensus and develop a prioritization strategy in relation to drainage and flood control in the EDWC and surrounding coastal regions.

The proposed Conservancy Adaptation Project (CAP) is being developed in close collaboration with key donor partners. Over the past year, the Department for International Development (DfID) of the United Kingdom, the Canadian International Development Agency (CIDA) and the Inter-American Development Bank (IDB) have participated in discussions with the Guyanese government concerning the need to remediate and adapt the country's water conservancy systems to meet the increased flood hazard brought about, supposedly, by climate change. In response to the 2005 floods, DfID donated roughly US$2 million to the Government of Guyana to implement recommendations made by the 2005 World Bank's Needs Assessment.

The CAP project cost is estimated at US$ 5 million, which is to be totally borne by the GEF. Also, the IDB, with over US$25 million available for the rehabilitation of Guyana's water conservancy systems, has expressed interest in working with the World Bank to create a comprehensive and long term rehabilitation and management strategy for the country's water conservancy systems.

It has been established that climate change and climate variability and climate-driven sea level rise pose a significant threat to the sustainable development of low-lying coastal zones as in Guyana. Of particular concern are the projected rise in sea levels and the increase in the intensity and frequency of extreme weather events such as intense and heavy rainfalls and storm surges to which Guyana is particularly vulnerable. Climate change threatens the stability and integrity of marine and coastal systems. The coastal zone of Guyana has been recognized as most vulnerable to the impacts of climate change and sea level rise, and as requiring greater attention by the international community. The IPCC TAR highlights the vulnerability of countries like Guyana, on account of its geographic characteristics. Given the severity of the expected climatic shifts and sea level changes, the low level of its economic development which restricts its ability to cope with expected changes without great economic stress, and its limited capacity to undertake appropriate risk reduction or adaptation measures, climate change impacts may severely affect the sustainable development prospects of Guyana.

Present rates of sea level rise and projected environmental impacts associated with global climate change therefore pose a significant threat to Guyana its economy and people. Recent flooding events demonstrate the immediate vulnerabilities of Guyana to climate driven events and weaknesses in the current infrastructure. This project is designed to provide some immediate

infrastructure improvements to cope with the local effects of sea level rise and provide a technical baseline for the continued management and adaptation of the local drainage and flood control network.

Overall, the project appears to be rather ambitious given the level of financing and the level of economic and knowledge capacity of Guyana. This latter void is expected to be filled by contracting out to international consultants. It is claimed that the project would likely involve four contracts, to be executed by an international engineering firm with expertise in EDWC drainage systems. The firm is expected to conduct all studies and assessments. They are also expected to design, contract out, and supervise the ensuing infrastructure adaptation works.

However, the project has a lot of merit and responds to a number of pressing needs in relation to adaptation to greenhouse gas (GHG) climate change for key sectors, namely water resources, agriculture and coastal infrastructure in Guyana.

There is general agreement within the engineering community that the EDWC and its dam are fragile and in serious risk of failure if proactive actions are not taken and operations continue as they have been historically managed. The floods of 2005 and 2006 brought to light the extreme urgency for rehabilitating protective drainage structures, particularly in the EDWC system, and the urgent need for strengthening, the EDWC dam.

The continued deterioration of the EDWC system will have catastrophic consequences; potentially displacing 75 percent of the Guyana's population. This includes the loss of the capital city, Georgetown and other urban centers and the loss of the country's principal export products, sugarcane and rice. Considering the impacts of climate change, together with the deteriorated condition of the system, the scope of actions required to address this challenge is beyond the capacity of the Government of Guyana without outside technical and financial assistance.

Hence the justification for immediate funding by the GEF and other major donor agencies. Moreover, the project appears to fit very well within the context of the goals of the GEF. Current and anticipated collaboration with other donor agencies, such as the Department for International Development (DfID) of the United Kingdom, the Canadian International Development Agency (CIDA), the Japanese Thematic Climate Change Policy and Human Resource Development (PHRD) and the Inter-American Development Bank (IDB) further enhances the appeal of the project for GEF funding.

The Guyana Conservation Adaptation (CAP) project is estimated to US$ 5 million, which is to be totally borne by the GEF. Also, the IDB has ear-marked US$25 million for the rehabilitation of Guyana's water conservancy systems and has expressed interest in collaborating with the World Bank to create a comprehensive and long term rehabilitation and management strategy for Guyana's water conservancy systems.

Furthermore, the government of Guyana together with the Wider Caribbean region, has previously had fruitful links with the World Bank/GEF in similar projects in the past (CPACC, MACC). There is also ample evidence of political will on the part of the Government of Guyana to seriously address environmental issues as evidenced by their participation and fulfillment of their multiple MEA obligations (UNCCD, CBD, NBSAPs, and UNFCCC).

The Climate Convention guidance to the GEF on adaptation has in the past supported initial studies, vulnerability and adaptation assessments, and capacity building. More recently, the United Nations Framework Convention on Climate Change (UNFCCC) requested that the GEF support pilot and demonstration projects in the field of adaptation. Under its strategic priority "Piloting an Operational Approach to Adaptation", the GEF supports projects that provide real benefits and may be integrated into national policies and sustainable development planning. In addition, the GEF supports adaptation activities through the Least Developed Country Fund and the Special Climate Change Fund. The Guyanese CAP/EDWC project qualifies in both instances.

The proposed Conservancy Adaptation Project is to be supported under the Special Climate Change Fund, with emphasis being placed on the implementation of physical adaptation measures and the planning of future physical interventions based on the results of an analysis of the drainage management system. The integration of technology and analytical methods for the design of interventions under this project are transportable and this project can serve as a demonstration for the development of adaptation interventions that can be implemented in similar contexts (e.g. delta regions, coastal zones, river systems) throughout the world. The execution of the project will be coordinated with activities being developed within CARICOM's Community Climate Change Center (CCCC), currently implemented through the World Bank/GEF.

In accordance with the GEF/SPA guidelines the CAP project proposal which integrates adaptation planning and assessment that will hopefully be practically translated into national policy and sustainable development planning, as stipulated by the UNFCCC, further strengthens the merits of the proposal. Furthermore, in step with the SPA guidelines, the CAP project includes: (i) activities within a natural resources management context that generate global environmental benefits; and (ii) adaptation measures that provide other major developmental benefits. Also, the SPA requires that the majority of benefits translate into protection of global biodiversity and prevention of land degradation. The SPA guidelines also stipulate that, "activities should be country driven, cost- effective and integrated into national sustainable development and poverty reduction strategies". The project clearly demonstrates that these elements are integrated. Finally, the project meets the guidelines for co-financing which depend on the delivery of global environmental benefits, additional costs associated with actions necessitated by climate change, and the degree of capacity building. By reducing the risks to global commons, the project supports the design and implementation of specific adaptation measures that will enhance the resilience of vulnerable, globally-important ecosystems and biodiversity, and infrastructure and peoples, as to be found along the coastal zone of Guyana.

Also, the project, based on the information provided on pages 43-44, appears to be well-structured and scientifically and technically sound, and clearly demonstrates that its intent is to make efficient and integrated use of the capacity built in past operations in the Caribbean (CPACC, MACC, and ACCC) and limited human and financial resources to advance with practical steps on the actual implementation of adaptation measures. The project also provides an opportunity to seek synergies in support of various multilateral environment agreements and promotes and facilitates more effective coordination.

The CAP project complements the goals of the other previously-funded GEF climate change projects (CPACC, MACC) and applies the lessons and information gathered from these previous GEF-funded projects by piloting the implementation of adaptation measures in Guyana that has already taken mainstreaming decisions that seek to execute specific measures to address the impacts of climate change on water resources and coastal zone flooding, biodiversity and land degradation, through the detailed design and application of near-term pilot adaptation and follow-up long-term measures. The project is also expected to pioneer the establishment of institutional and operational frameworks for addressing holistically multiple convention objectives in accordance with national priorities, thereby serving as a model for other regions and countries. Finally, one of the main goals of the project is to make efficient and integrated use of the limited human and financial resources for these technical areas and illustrate how adaptation measures can be effectively implemented at the national and community levels, and this is advantageous.

The institutional and implementation arrangements and the monitoring and evaluation plans of the project are well detailed and are highly commendable. Other issues include linkages to other programs and action plans (DfID, IDB, IAB, and CIDA) and a clear identification of global environmental benefits and minimal impacts of the project on the environment locally. Furthermore, critical risks and possible controversial aspects of the project are clearly defined and discussed. Also, Institutional Strengthening, Capacity Building and Sustainable Development Strategies are clearly defined and discussed.

The Guyana CAP project also appears to closely adhere to established World Bank/GEF principles, namely independence, impartiality, transparency, disclosure, ethics, partnership, competencies and capacities, credibility, and utility.

Furthermore, the project seems to meet the operational guidelines of Climate Change Adaptation projects funded by the GEF, namely interventions that increase resilience to the adverse impacts of climate change of vulnerable countries, sectors, and communities. The CAP project also clearly demonstrates how adaptation planning and assessment can be practically translated into national policy and sustainable development planning. Also the project incorporates activities to be funded that are country-driven, cost-effective and integrated into national sustainable development and poverty-reduction strategies. The adaptation measures identified in the project will also be guided by such preparatory work as the first national communications of Guyana, NAPAs, and other relevant country studies.

The CAP project also responds to the SPA portfolio of the GEF, in that it is designed to maximize the opportunity for learning and capacity building and will be representative of particularly vulnerable regions, sectors, geographic areas, ecosystems, communities. The project also demonstrates that experiences and lessons from the CAP/SPA project would be applicable in a wide context and that the experience from the CAP/SPA could be used to develop good practices and estimates of the costs of adaptation to better mainstream adaptation into the full range of GEF activities.

Moreover, the CAP pilot project also includes activities within a natural resources management context that generate global environmental benefits, and adaptation measures that provide other major development benefits such as water resources management and flood control, agriculture, biodiversity, health and built infrastructure. The CAP project of Guyana also appears to meet

existing eligibility criteria for GEF funding, such as country drivenness, ecological and financial sustainability, replicability, stakeholder involvement; M&E, etc. The fact the CAP project demonstrates the requisite GEF components of incrementality and co-financing (IDB, IAB) clearly shows that it consistent with GEF practices and overall portfolio experience is also an advantage.

Safeguard policies required for GEF-funded projects, which include Environmental Assessments and policies designed to prevent unintended adverse effects on third parties and the environment, are also integrated in the project proposal. Specific safeguard policies identified in the CAP proposal aim to address natural habitats, cultural property, involuntary resettlement, indigenous peoples and safety of dams. Also, the safeguard policies identified in the CAP proposal appears to provide a platform for the participation of stakeholders in project design, and to be an important instrument for building ownership among the local population of Guyana.

The Guyana CAP project also seems to meet the GEF requirements relating to policies on business products and instruments, which establish rules for lending instruments, country economic and sector work, technical assistance, grants, guarantees and other Bank products. Also, the CAP project closely adheres to fiduciary policies of the World Bank, in that it spells out relevant rules governing financial management, procurement, and disbursement and selection of consultants. The management of the CAP project also adheres to GEF criteria on such areas as project monitoring and evaluation.

Furthermore, the Guyana CAP project appears to meet World Bank criteria relating to disclosure policies in that it demonstrates widespread sharing of information which is essential for development and which stimulates public debate, broadens public understanding, and enhances transparency and accountability. These disclosure policies will hopefully also strengthen public support for the CAP efforts to improve the lives of people in Guyana, which in turn will facilitate coordination among the many parties involved in development, and will improve the quality of the assistance projects and programs.

The CAP project also contains a section on project preparation and supervision, but it is not clear (Incomplete Appendix 11), how the Inspection Panel of the World Bank will be able to ensure compliance with Bank policies. The Bank wishes to have an independent body to which individuals and communities can turn if they believe that their rights or interests have been or could be directly harmed by a Bank-financed project.

Recommendations

However, the following are comments and suggestions that may help to focus and strengthen the project proposal:

1. The project, though very deserving, is highly ambitious, given the tasks identified, the limited budget from GEF (US $ 5 million) and the local skills capacity for such an undertaking. Longer term more efficient and permanent infrastructure remediations to the EDWC would have been the ideal solution, but excessive costs ($ US 200 to 300 million) would militate against this. So the approach taken is a piece-meal one, given the costs and the urgency of the problem. However, the project proposal can be strengthened by giving a greater priority to the pressing infrastructure upgrades that are required to reduce

the risk of flooding and loss of human lives and ecosystems and built infrastructure. Besides, the Component Two of the project relating to System Analysis and Hydrologic Baseline, seems highly technical and involved and costly (LIDAR measurements, DEM construction, hydrological modelling), demanding specialized expertise that may not be available locally and would call for the intervention of foreign consultants. If foreign consultants are to be used, as described in the project it would be worthwhile, given the complexity of the tasks (1-D and 2-D hydrological flow models) to involve local University level personnel (University of Guyana). As a matter of fact, it would be preferable to use simple flow models based on historical and GCM scenarios data and empirical-statistical relationships pertaining to rainfall-runoff relationships and flooding. This alternative would greatly simplify the undertaking, reduce the costs and allow for greater participation and ownership by the host country, Guyana.

2. The document contains a number of broad and sweeping statements relating to flooding problems and the EDWC, without providing sufficient proof or evidence. For instance, based on very limited historical data sets (2005 and 2006 for extreme rainfalls), the claim is that these extreme events may be due to GHG climate change (pages 9-10). Also, the tone of the document assumes that GHG climate change and its impacts are inevitable, which may well be the case, but caution must be exercised in such assumptions because of the high uncertainty, deriving from the level of GHG forcing, spatial issues and climate models imperfections. Furthermore, the project, supposedly, attempts to undertake hydrological modeling of the EDWC using historical data on climate and sea levels. No mention is made of taking future/scenarios climate and sea level changes which are critical in the design of the planned infrastructure works for the future. Besides, Governments are being asked to integrate climate change issues into Environmental Impacts Assessments (MACC, CIDA-ACCC)

3. The sectors that are targeted as the focus of the study, namely water resources, agriculture, drainage and flood protection and coastal infrastructure and peoples are critical for the well-being of Guyana. However, the document does not provide adequate information in terms of institutions and capacity for undertaking the engineering and impacts studies in these sectors and there is a lack of details relating the precise methodologies that are to be used to undertake hydrological flow models (Subcomponent 1.2 p 36). Besides details on Component 2 relating to Drainage and Flood Control Analysis in the EDWC system are very sketchy, and there are no identified timelines and one gets the impression that the planning of the project would evolve as it progresses.

4. The document provides details of budget allocations for the 3 activity components, namely Intervention Works and Operational Improvements for the EDWC, Drainage and Flood Control Analysis and Project Management and Donor Coordination (pp 35-43), for the GEF project proposal. However, there is no guarantee of the $ US 25 million IDB project to dovetail Component Two of the GEF project and this is a concern.

5. It would appear from the project proposal to the GEF, that a large part of the funding for Component Two (Drainage and Flood Control Analysis) will be handled by foreign consultants, since the tasks call for highly specialized expertise and equipment in mapping and hydrological modeling. This raises the issue of capacity building and in-

house expertise. Besides, once foreign consultants are done with a project follow-up and local ownership become issues.

6. The identification of critical risks and possible controversial aspects (native land claims) are to be commended. However, it is stated that there are no controversial aspects related to the project. This statement is very strong and must be justified, especially in view of the fact that major native settlements are located within or in the vicinity of the project area. Also, the fact that social and environmental impacts of the project are considered is also highly commendable (pages 61-63).

7. There a number of syntax and grammatical errors that needs to be corrected to improve the quality of the project proposal. Examples are use of Climactic instead of climatic, use of GoG and GOG interchangeably, page 30, paragraph 1, page 43: last line of paragraph 4.

8. There are a number of abbreviations and acronyms that are mentioned in the project document that are not defined (ITCZ, IDA, ECLAC…). It is recommended that a list of Abbreviations and Acronyms be inserted in the project proposal.

9. The project document has many incomplete sections (In-Country disclosure: p 65, and Annexes 11, 12 and 13), which should be addressed in order to ensure a complete and comprehensive evaluation of the proposal.

In spite of the above observations and comments, the Guyana CAP/EDWC project fits into the criteria of projects eligible for GEF funding for adaptation activities through the Least Developed Country Fund and the Special Climate Change Fund. Besides, the project addresses a number of very pressing and critical issues relating to climate change impacts and adaptation for water resources management, flood and drainage control, coastal zone infrastructure and livelihoods of people and the sustainable development of Guyana.

Though the project, in its present form needs some improvements, it is well-founded and justified and therefore GEF funding is highly recommended.

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September 25th, 2006.

Response to STAP Reviewer Comments

Generally, the comments received were quite positive and constructive. The vulnerabilities of the Guyanese coastal lowlands are well known and the urgency of the need to address the drainage system is a source of general agreement.

Overall, the project seeks to provide improvements to infrastructure while setting the stage for other donors and the Government of Guyana to continue with system improvements using the data and tools developed under this initial project. Close coordination with the GoG and donor agencies will assure a coordinated approach and maximum yield from the GEF investment.

The following concerns the issues addressed under the Recommendations section of the comments document and are presented in order as follows:

1. *Local skills capacity and technical complexity* – The project team has studied the local capacity within the GoG and has included as partners with two agencies (the Lands and Surveys Commission and the Ministry of Works, River and Sea Defense) which have received extensive technical support form previous European Union projects. Additional partners will be included by project appraisal. Both agencies now involved support modern GIS capabilities and both have been trained in data collection, management and analysis as well as in precision geodetic surveying techniques to improve their technical capabilities. Both entities are considered critical partners to the project and allow the GEF project to build on the results of EU institutional strengthening efforts.

   Rationale for technical analysis - No adequate topographic baseline currently exists for evaluating the coastal drainage of Guyana and until one is developed, internal flood control management will remain a matter of guesswork and response to localized empirical observation rather than integrated system planning. Additionally, at present it is impossible to evaluate the effects of development activities on the system. The tools developed under the project will allow for the informed management of future development and landuse by managing its impact on flood control and drainage management. Understanding the local micro-topography enables the determination of water sources and flow regimes that must be captured or otherwise managed to reduce flooding and manage drainage efficiencies.

   The use of LIDAR and hydraulic flow modeling is designed to provide the hydraulic baseline for the future design of infrastructure works in both the conservancy and coastal lowlands of the system. LIDAR was chosen as the most accurate and cost effective technology for developing this critical topographic base on a large scale at very high resolutions. The acquisition and processing of the data into a digital elevation model (DEM) format is technically complex is to be left to companies specializing in this area. The use of DEMs for hydraulic analysis and landuse planning is compatible with the GIS systems already in place in Guyana. As part of the technical assistance portion of the program, Guyanese technicians will work closely with the contractor in the development of the LIDAR based DEM and modeling and shall be trained extensively in their use as a modeling and planning tools.

The modeling to be developed under the project is not in support of general rainfall runoff models based on future climate scenarios. The model contemplated under this project is a hydraulic flow simulation allowing for the identification of topographic chokepoints in the drainage system and the development of engineering designs to improve internal hydraulic flows. Once developed, the system can be designed and tested, in the virtual world, against any future hydrologic regime which may be modeled using the techniques referred to in the comments.

2. The flood events of 2005 and 2006 are not attributed to global climate change. However, the inability to remove water, as was historically the case, has been exacerbated by the change in discharge parameters of the tidal cycle. Rainfall is a relatively minor factor in the process when one considers the estimated 1.8 foot rise in sea level experienced since 1951. Developing this project will allow the GoG to evaluate future scenarios concerning rainfall as they are developed in the research community.

   As the far as EDWC is concerned, the analysis to be completed there is structural integrity and internal system hydraulics as opposed to hydrologic. In other words, the project seeks to improve discharge efficiencies by improving flow characteristics within the system. The data developed on the EDWC provide a basis for the evaluation of the system's response to changes in regional hydrology by providing key data allowing for the calculation of EDWC useful head and other performance parameters.

3. Institutional relationships and specific timelines as well as organic institutional capacity will be further developed during the appraisal mission. It is the intent of the project that the major technical components will be carried out by international firms under contract to the GoG with the active participation of the GoG within a technical assistance framework.

4. Donor participation and broad consultations to leverage of the GEF program will be further developed during the project appraisal phase and throughout project implementation. While at this time there is no guarantee concerning the IDB project, the technical engineering baseline provided will provide a critical tool for any donor participating in the water sector. Donor meetings have and will continue to be a priority for the development of the project and donors will be actively involved during the entire process. Additionally, from the opposite perspective, the GEF project is leveraging the EU contribution to the sector by continuing the development of the same agencies previously involved and making extensive use of the data developed under their program.

5. Capacity building is a major component of the project and the project team is sensitive to the need to institutionalize the results. As discussed under 1, GoG participation is a matter of the TA component of the project but also, integrating the broad government consultations and donor community participation serves to emphasize the value of the results as a planning tool allowing them to reinforce support for the institutions trained during the project. This allows not only future support form GoG resources but helps assure continued support for the products and institutional capabilities developed thorough the Donor network as well.

6. Text in the pad has been amended to reflect that no native lands will be affected by project activities as they lie outside the domain of the drainage systems being considered under this project.

7. and 8. Addressed in the editing of the PAD.

9. Sections to be finished resulting from meetings and interchanges to be developed during the next appraisal mission.

c) GEF Secretariat and other Agencies' comments and IA/ExA response