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Report No: PAD1227

INTERNATIONAL DEVELOPMENT ASSOCIATION
PROJECT PAPER

ON A

PROPOSED ADDITIONAL STRATEGIC CLIMATE FUND LOAN
IN THE AMOUNT OF US$ 3.8 MILLION

AND A

PROPOSED ADDITIONAL STRATEGIC CLIMATE FUND GRANT
IN THE AMOUNT OF US$ 5 MILLION

TO

GRENADA

FOR THE

REGIONAL DISASTER VULNERABILITY REDUCTION PROJECT

APRIL 16, 2015

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

CURRENCY EQUIVALENTS

(Exchange Rate Effective February 3, 2015)

Currency Unit	=	East Caribbean Dollars
XCD1	=	US$0.37
US$1	=	XCD2.71

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
APL	Adaptable Program Loan
CAS	Country Assistance Strategy
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CSCC	Strategic Climate Fund Credit
CSCF	Strategic Climate Fund Grant
CIF	Climate Investment Fund
CPA	Country Poverty Assessment
DRM	Disaster Risk Management
EA	Environmental Assessment
EC	Eastern Caribbean
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMF	Environmental Management Framework
EMP	Environmental Management Plan
FM	Financial Management
FY	Fiscal Year
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoG	Government of Grenada
GRENLEC	Grenada Electric Services, Ltd.
ICB	International Competitive Bidding
ICAO	International Civil Aviation Organization
IDA	International Development Association
IPF	Investment Project Financing
M&E	Monitoring and Evaluation
MOA	Ministry of Agriculture
MoW	Ministry of Works, Communications, Physical Development, Public Utilities, ICT & Community Development
MTR	Mid-Term Review
NAWASA	National Water and Sewage Authority
NCCC	National Climate Change Committee

NPV	Net Present Value
OECS	Organization of Eastern Caribbean States
OP/BP	Operational Policy/Bank Procedure
PCU	Project Coordination Unit
PDO	Project Development Objective
PPCR	Pilot Program for Climate Resilience
RDVRP	Regional Disaster Vulnerability Reduction Program
RPF	Resettlement Policy Framework
RPS	Regional Partnership Strategy
SCF	Strategic Climate Fund
SORT	Systematic Operations Rating Tool

Vice President:	Jorge Familiar
Country Director:	Sophie Sirtaine
Senior Global Practice Director:	Ede Jorge Ijjasz-Vasquez
Practice Manager:	Anna Wellenstein
Task Team Leader:	Gaetano Vivo

GRENADA

REGIONAL DISASTER VULNERABILITY REDUCTION PROJECT

CONTENTS

ADDITIONAL FINANCING DATA SHEET

Grenada

Regional Disaster Vulnerability Reduction Project (Additional Finance) (P149259)

LATIN AMERICA AND CARIBBEAN

GSURR

Basic Information – Parent			
Parent Project ID:	P117871	Original EA Category:	B - Partial Assessment
Current Closing Date:	31-Dec-2018		

Basic Information – Additional Financing (AF)			
Project ID:	P149259	Additional Financing Type (from AUS):	Scale Up/Cost Overrun
Regional Vice President:	Jorge Familiar	Proposed EA Category:	B - Partial Assessment
Country Director:	Sophie Sirtaine	Expected Effectiveness Date:	24-Jul-2015
Senior Global Practice Director:	Ede Jorge Ijjasz-Vasquez	Expected Closing Date:	31-Dec-2018
Practice Manager:	Anna Wellenstein	Report No:	PAD1227
Team Leader(s):	Gaetano Vivo		

Borrower				
Organization Name	Contact	Title	Telephone	Email
Government of Grenada	Timothy Antoine	Permanent Secretary, Ministry of Finance	473-440-2928	psfinancegrenada@gmail.com
Government of St. Vincent and the Grenadines				

Project Financing Data - Parent (Regional Disaster Vulnerability Reduction APL1 - Grenada and St. Vincent and the Grenadines-P11787 1) (in USD Million)

Key Dates

Project	Ln/Cr/TF	Status	Approval Date	Signing Date	Effectiveness Date	Original Closing Date	Revised Closing Date
P117871	IDA-49850	Effective	23-Jun-2011	20-Sep-2011	01-Nov-2011	31-Dec-2016	31-Dec-2016
P117871	IDA-49860	Effective	23-Jun-2011	09-Sep-2011	18-Oct-2011	31-Dec-2016	31-Dec-2018
P117871	IDA-54500	Effective	09-May-2014	14-Aug-2014	12-Nov-2014	31-Dec-2018	31-Dec-2018
P117871	TF-10204	Effective	20-Sep-2011	20-Sep-2011	01-Nov-2011	31-Dec-2016	31-Dec-2016

P117871	TF-10206	Effective	09-Sep-2011	09-Sep-2011	18-Oct-2011	31-Dec-2016	31-Dec-2018
P117871	TF-11131	Effective	23-Jun-2011	20-Sep-2011	01-Nov-2011	31-Dec-2016	31-Dec-2016
P117871	TF-11132	Effective	23-Jun-2011	09-Sep-2011	18-Oct-2011	31-Dec-2016	31-Dec-2016
P117871	TF-16733	Effective	14-Aug-2014	14-Aug-2014	12-Nov-2014	31-Dec-2018	31-Dec-2018

Disbursements

Project	Ln/Cr/TF	Status	Currency	Original	Revised	Cancelled	Disbursed	Undisbursed	% Disbursed
P117871	IDA-49850	Effective	USD	10.00	10.00	0.00	3.91	4.93	39.13
P117871	IDA-49860	Effective	USD	10.92	10.92	0.00	3.95	5.85	36.15
P117871	IDA-54500	Effective	USD	35.60	35.60	0.00	0.00	33.56	
P117871	TF-10204	Effective	USD	8.00	8.00	0.00	2.69	5.31	33.61
P117871	TF-10206	Effective	USD	7.00	7.00	0.00	1.67	5.33	23.81
P117871	TF-11131	Effective	USD	8.20	8.20	0.00	2.69	5.51	32.79
P117871	TF-11132	Effective	USD	3.00	3.00	0.00	0.72	2.28	24.03
P117871	TF-16733	Effective	USD	5.00	5.00	0.00	0.00	5.00	

Project Financing Data - Additional Financing Regional Disaster Vulnerability Reduction Project (Additional Finance) (P149259)(in USD Million)

[ ] Loan [X] Grant [ ] IDA Grant

[X] Credit [ ] Guarantee [ ] Other

Total Project Cost:	8.80	Total Bank Financing:	0.00
Financing Gap:	0.00		

Financing Source – Additional Financing (AF)	**Amount**
BORROWER/RECIPIENT	0.00
International Development Association (IDA)	0.00
Strategic Climate Fund Credit	3.80
Strategic Climate Fund Grant	5.00
Total	8.80

Policy Waivers

Does the project depart from the CAS in content or in other significant respects?	No
Explanation	
Does the project require any policy waiver(s)?	No
Explanation	

Team Composition

Bank Staff

Name	Role	Title	Specialization	Unit
Gaetano Vivo	Team Leader (ADM Responsible)	Disaster Risk Management Specialist		GSURR
Plamen Stoyanov Kirov	Procurement Specialist	Senior Procurement Specialist		GGODR
David I	Financial Management Specialist	Sr Financial Management Specialist		GGODR
Adam Shayne	Counsel	Lead Counsel		LEGLE
Carolina J. Cuba Hammond	Team Member	Senior Program Assistant		GSURR
Gerald E. Meier	Team Member	Consultant		GSURR
Keren Carla Charles	Team Member	E T Consultant		GSURR
M. Yaa Pokua Afriyie Oppong	Safeguards Specialist	Senior Social Development Specialist		GSURR
Michael J. Darr	Safeguards Specialist	Consultant		GENDR
Nicholas James Callender	Team Member	E T Consultant		GSURR
Tatiana Cristina O. de Abreu Souza	Team Member	Finance Officer		WFALN
Tiguist Fisseha	Team Member	Disaster Risk Management Specialist		GSURR
Vipasha Bansal	Counsel	E T Consultant		LEGLE

Extended Team

Name	Title	Location

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
OECS Countries		Union Island			

OECS Countries		Kingstown			
OECS Countries		Georgetown			
OECS Countries		Arnos Vale			
OECS Countries		Gouyave			
OECS Countries		Constantine			
OECS Countries		Chemin River			
OECS Countries		Carriacou			
OECS Countries		Beausejour Estate			
OECS Countries		Dorsetshire Hill			
OECS Countries		Gouyave Fish Market			
OECS Countries		Milton Cato Memorial Hospital			

Institutional Data

Parent (Regional Disaster Vulnerability Reduction APL1 - Grenada and St. Vincent and the Grenadines-P117871)

Practice Area (Lead)

Social, Urban, Rural and Resilience Global Practice

Contributing Practice Areas

Cross Cutting Topics

[X] Climate Change

[ ] Fragile, Conflict & Violence

[ ] Gender

[ ] Jobs

[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Water, sanitation and flood protection	Flood protection	68		
Transportation	Aviation	24		
Public Administration, Law, and Justice	Public administration-Water, sanitation and flood protection	8		
Total		100		

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Social protection and risk management	Natural disaster management	65
Environment and natural resources management	Water resource management	35
Total		100

Additional Financing Regional Disaster Vulnerability Reduction Project (Additional Finance) (P149259)

Practice Area (Lead)

Social, Urban, Rural and Resilience Global Practice

Contributing Practice Areas

Cross Cutting Topics

[X] Climate Change

[ ] Fragile, Conflict & Violence

[ ] Gender

[ ] Jobs

[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %

Agriculture, fishing, and forestry	Forestry	40	50	
Water, sanitation and flood protection	Flood protection	40	50	
Transportation	Urban Transport	20		
Total		100		

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Environment and natural resources management	Climate change	60
Social protection and risk management	Natural disaster management	20
Urban development	Other urban development	15
Environment and natural resources management	Land administration and management	5
Total		100

Consultants (Will be disclosed in the Monthly Operational Summary)

Consultants Required? Consulting services to be determined

I. Introduction

1. This Project Paper seeks the approval of the Executive Directors to provide an Additional Strategic Climate Fund (SCF) Loan in the amount US$ 3.8 million, and an Additional SCF Grant in the amount of US$ 5.0 million to the Grenada: Regional Disaster Vulnerability Reduction Project (RDVRP) (P117871).

2. The proposed Additional Financing (AF) would scale up activities initiated under the RDVRP and close a financing gap in the parent project contributing to institutional capacity improvements that will be fundamental for transformative change in Grenada's long-term climate resilience agenda, as endorsed by the Pilot Program for Climate Resilience (PPCR) Sub-Committee. Specifically, the AF would: (i) ensure climate risk reduction outcomes for an important part of Grenada's population and economy, through improved drainage and flood prevention infrastructure in selected urban areas; and (ii) contribute critical building blocks to the technical and institutional capacity to manage climate resilience of the forestry and water resource management departments.

II. Background and Rationale for Additional Financing

3. **Vulnerability Context.** Grenada is exposed to meteorological (high wind/excess rainfall/hurricanes and drought) and geophysical (seismic/volcanic/tsunami) hazards, causing a high risk to its economic stability. These hazards often result in significant and recurrent damages to national infrastructure. As is the case with most island states, a single hazardous event can impact the entire population and economy of Grenada given its small population and limited geographical area. For example, Hurricane Ivan (2004) resulted in losses exceeding 200 percent of Grenada's annual GDP. Damages to facilities virtually paralyzed the government and 97 percent of Grenada's schools as well as 2/3 of the housing stock were damaged or destroyed.

4. Over the past 50 years, about US$3 billion in losses can be attributed to the consequences of natural hazards in the Eastern Caribbean. If this trend continues, the Eastern Caribbean will face a potential annual loss of US$350-870 million. Between 1992 and 2011, Grenada experienced average annual losses of 9.5 percent of its GDP[1]. The resulting fiscal losses, coupled with the ongoing effects of climate change have contributed to unsustainable budgetary deficits and imposed significant negative constraints to economic growth. Accordingly, disaster risk management and climate change adaptation are top priorities for the Government of Grenada (GoG).

5. **Link between proposed AF Activities and the Parent Project.** The RDVRP is the main financing instrument to deliver on Grenada's climate resilience goals and objectives as outlined in the country's Strategic Program for Climate Resilience (SPCR). The RDVRP finances a combination of priority risk reduction investments, and activities that contribute to build Grenada's capacity to better manage climate risks. Risk reduction investments were chosen based on a high risk of structural failure to 10-year events (Category 1 hurricane or M7.0 earthquake) in the case of buildings and bridges, or where annual flooding occurs in the case of flood management and

[1] Global Climate Risk Index 2013, Germanwatch, November 2012. (http://germanwatch.org/en/download/7170.pdf)

urban drainage. Capacity building activities have focused on creating capacity to better manage spatial information and to use it for decision making for reducing climate vulnerability. In addition, the AF supports additional risk reduction investments and assessment of potential climate impacts through capacity building in two additional departments (forestry and water resource management).

6. **Additional cost of resilient infrastructure.** The original costs for RDVRP activities were estimated based on data available at the time of project approval and prior to the completion of technical designs for the civil works. During the first three years of the project implementation additional technical studies were carried out to ensure more resilient construction standards. These studies, pre-engineering assessments, and some final designs indicate that the cost of building more resilient infrastructure in Grenada is almost 20 percent more expensive than the original budget estimates which were based on existing building practices at the time.[2] The re-appraised infrastructure costs based on improved design is estimated at US$4.5 million over original project estimates for activities prioritized for financing under the RDVRP.

7. **Building capacity.** The expanded activities under the AF would also build capacity for better informed watershed management, forestry, and engineering. After consultations with the GoG agencies,[3] a list of investments was identified which should provide GoG with additional data and capacity needed to integrate climate risks in watershed management and forestry. The new data will also be useful for development planning purposes. Most of the potential of the project to catalyze national level resilience building relies on building the capacity to carry out climate risk informed planning, which has proven to be one of the long-lasting adaptation strategies in Small Island States.

8. **Alternative options considered.** The GoG explored various options to meet the costs of the additional resilience measures. Due to Grenada's fiscal situation, co-financing the Project was not feasible. Moreover, IDA-17 funds are committed to budgetary support to address Grenada's current fiscal position. Finally, re-allocation or cancellation of other risk reduction sub-projects was ruled out as these activities are critical for the resilience of vulnerable communities. These investments, currently at advanced implementation stage, include rehabilitation of social infrastructure (schools, public accommodation for the elderly), protection of bridges, and construction of roads for low-income relocated communities. Cancelling these investments would significantly hinder the socio-economic impact of the Project, whose successful delivery is seen as the foundation of Grenada's SPCR.

[2] This cost differential is in line with recent findings from the 2013 World Bank Report "Building Resilience – Integrating Climate and Disaster Risk into Development", which notes that recent disaster assessment experience suggests that the costs of 'building back better' typically amounts to 10–50% more than the replacement cost.

[3] These included Ministry of Agriculture (MOA), Forestry Department, Environment Department, National Water and Sewage Authority (NAWASA), Ministry of Works, Communications, Physical Development, Public Utilities, ICT & Community Development (MOW), National Land Planning, National Meteorological Service, Ministry of Finance, among others.

9. **Links to the Strategic Program for Climate Resilience.** The activities to be financed support the implementation of the Grenada's SPCR[4] dated March 2, 2011. Specifically, they would contribute to four of the five SPCR expected outcomes, namely: (i) improved resilience of infrastructure; (ii) restored and improved forestry resources; (iii) improved government capacity for assessment and management of Grenada's water supply; and (iv) improved use of data and geospatial analysis for climate change adaptation. The activities proposed under the AF are also closely linked with the objectives of the Grenada National Strategic Development Plan (2007-2017)[5]. Furthermore, increasing capacity to manage risk from natural hazards and climate change is a core outcome of the Organization of Eastern Caribbean States (OECS) Regional Partnership Strategy (RPS) FY15-FY19[6]. To minimize transaction costs on the Government, and to address climate resilience in a comprehensive and integrated manner in Grenada, the proposed additional PPCR financing would be channeled as an AF to the RDVRP.

10. **Coordination with other country investments.** Activities planned under the AF position the GoG to leverage other national and donor-supported initiatives around integrated watershed management and climate resilience well beyond the life of the project. Among others, the ongoing GIZ-funded Integrated Climate Change Adaptation Strategies in Grenada offers potential synergies with the proposed scale-up activities. For instance, data and analysis provided could address gaps currently faced by community-based watershed management interventions. Activities planned under the proposed AF would lay the technical foundation needed to effectively design and implement future climate resilience investment strategies supported by the GoG and its development partners. The recently re-activated National Climate Change Committee (NCCC) will play a critical role in ensuring overall coordination and guidance for the implementation of climate adaptation investments in Grenada.

11. **Links to Poverty Reduction and Shared Prosperity Goals.** The 2008 Country Poverty Assessment (CPA) showed that 37.7 percent of Grenada's population is living below the poverty line; in addition, a further 14.6 percent is vulnerable to falling into poverty in the event of an external shock, such as by hurricanes. The proposed activities contribute to the Grenada Growth and Poverty Reduction Strategy 2012-2016 particularly with respect to the Strategic Orientation Pillar 4: Environmental Protection and Comprehensive Disaster Risk Management (DRM). The proposed activities will directly support all four strategic objectives within the pillar, namely: (i) natural resources sustainably managed; (ii) environmental management improved; (iii) comprehensive DRM practices adopted; and (iv) climate change adaptation mainstreamed. Investments will help reduce both physical and socio-economic vulnerabilities of individuals,

[4] Grenada Strategic Program for Climate Resilience. Available at: http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/Grenada%20SPCR%20revised%2020apr2011.pdf

[5] The proposed project would particularly contribute to Goal #7 of the National Strategic Development Plan: Sustainable Environment and Physical Development and to the following specific objectives: (i) To promote awareness of and commitment to environmental considerations; (ii) To promote and provide for disaster risk reduction, hazard mitigation and climate adaptation; (iii) To promote the efficient allocation of land among competing uses. Available at: http://www.carib-export.com/obic/documents/Consolidated_NATIONAL_STRATEGIC_DEVELOPMENT_PLAN21.pdf

[6] Report N. 85156; Available at: http://documents.worldbank.org/curated/en/2014/10/20324234/oecs-countries-regional-partnership-strategy-period-fy15-19

business and communities to climate-related disasters. Planned disaster mitigation activities, such as river defense works and drainage infrastructure design, would ensure continued access to markets, schools, and hospitals in the aftermath of an adverse natural event. Science-based hazard modeling will enhance early warning systems, emergency response plans and protection of livelihoods.

Status of Original Project

12. **Project Financing.** The RDVRP was approved in June 2011 and became effective in October 2011. The project is being implemented in Dominica, Grenada, Saint Lucia, and Saint Vincent and the Grenadines. Total financing for the project in Grenada and SVG (P117871) amount to US$87.7 million, broken down as follows: Grenada: US$10.0 million in IDA credits, US$8.0 million in PPCR grants and US$8.2 million in PPCR concessional loans; SVG: US$46.5 million in IDA credits, US$12.0 million in PPCR grants and US$3.0 million in PPCR concessional loans.

13. **Project Objectives and Description.** The PDO is to measurably reduce vulnerability to natural hazards and climate change impacts in Grenada and in the Eastern Caribbean sub-region. Project components include: Component 1 - prevention and adaptation investments; Component 2 - regional platforms for hazard and risk evaluation, and applications for improved decision making; Component 3 - natural disaster response investments; Component 4 - project management and implementation support and; Component 5 – payment of Caribbean Catastrophe Risk Insurance Facility (CCRIF) insurance premium. Cross-cutting themes (gender, knowledge management and Monitoring and Evaluation) are addressed under the project (RDVRP).

14. The Project has funded studies and pre-engineering investigations (e.g. hydraulic/hydrologic studies, geotechnical investigations) and associated engineering activities to support design and safeguard compliance. Project works include bridge construction, rehabilitation of schools and homes for the elderly, landslide risk reduction, flood mitigation works, improvements to the water storage supply and specific improvement works for two low income, relocated communities. The RDVRP has supported capacity building activities within the NaDMA and has acquired fire trucks, rescue boats and equipment, allowing the national airport to comply with the International Civil Aviation Organization regulations. The RDVRP has laid the groundwork for data sharing, collaboration and analysis among Government agencies. To cover residual risk, the program has also prepared an emergency recovery mechanism that could be activated in the event of an adverse natural event, following declaration of national emergency.

15. **Implementation Status.** Project implementation is currently rated Moderately Satisfactory and progress towards the achievement of the PDO is rated Satisfactory. All design and supervision activities for infrastructure-related works sub-projects are under contract or nearing the contract stage. The Project has disbursed US$5.9 million (23%), and disbursement trends are within expectations given large construction component. Disbursements are expected to increase significantly in 2015 as construction of civil works progresses. During the May 2104 Mid-Term Review mission, the financing gap based on revised estimates for civil works was determined

to be US$4.5 million[7]. Finally, the project is compliant with all conditions and legal covenants and procurement, safeguards and financial management capacity is rated Satisfactory.

16. **Project Risks**. The overall implementation risk rating for the RDVRP is moderate. The macroeconomic risk is rated as moderate as, in case of a sizeable external shock, Grenada could face potential fiscal space constraints, which could impact implementation. Nevertheless, the outlook at this point remains positive with favorable developments in the debt sustainability profile, increase in tourism revenues, and overall positive growth performance. Given the size of the country, implementation capacity to handle a large number of contracts is limited. Inter-institutional coordination, quality control, and information sharing among various agencies are also limited. In order to mitigate these risks, the RDVRP has supported targeted training on procurement, financial management and safeguards for project staff. Moreover, the RDVRP includes a provision of technical assistance to improve the technical capacity of relevant government institutions.

III. Proposed Changes

Summary of Proposed Changes

The activities under the proposed AF include scaling up of investments for flood protection and improved drainage in urban areas, acquisition of baseline data (e.g. high accuracy digital elevation topographic datasets, bathymetry, soil map, etc.), optimization and modernization of the hydro-meteorological data collection network and data management system, watershed modeling training for flood and drought hazard mapping and calculation of hydraulic parameters for climate-proofing infrastructure design and forest management capacity building.

AF proceeds would also be allocated to meet a financing gap and cover project management expenses for an additional two years. Collectively, these activities would aim to increase national resilience to the impact of climate change and improve the capacity of government ministries to identify and manage the impacts associated with natural hazards and climate variability.

Change in Implementing Agency	Yes [ ] No [X]
Change in Project's Development Objectives	Yes [ ] No [X]
Change in Results Framework	Yes [X] No [ ]
Change in Safeguard Policies Triggered	Yes [ ] No [X]
Change of EA category	Yes [ ] No [X]
Other Changes to Safeguards	Yes [ ] No [X]

[7] The financing shortfall value includes both actual shortfalls from executed Project activities as well as anticipated shortfalls based on revised estimates with built in contingencies that were reviewed following the design phase commissioned under the Project. The US$4.5 million value is therefore reflective of both actual overruns based on executed activities as well as overruns expected for the remainder of the Project.

Change in Legal Covenants	Yes [ ] No [X]
Change in Loan Closing Date(s)	Yes [X] No [ ]
Cancellations Proposed	Yes [ ] No [X]
Change in Disbursement Arrangements	Yes [X] No [ ]
Reallocation between Disbursement Categories	Yes [ ] No [X]
Change in Disbursement Estimates	Yes [ ] No [X]
Change to Components and Cost	Yes [X] No [ ]
Change in Institutional Arrangements	Yes [ ] No [X]
Change in Financial Management	Yes [ ] No [X]
Change in Procurement	Yes [ ] No [X]
Change in Implementation Schedule	Yes [ ] No [X]
Other Change(s)	Yes [ ] No [X]

Development Objective/Results

Project's Development Objectives

Original PDO

The Program aims at measurably reducing vulnerability to natural hazards and climate change impacts in the Eastern Caribbean Sub-region. The objective of the Project in Grenada is to measurably reduce vulnerability to natural hazards and climate change impacts in Grenada and in the Eastern Caribbean Sub-region. The objective of the Project in Saint Vincent and the Grenadines is to measurably reduce vulnerability to natural hazards and climate change impacts in Saint Vincent and the Grenadines and in the Eastern Caribbean Sub-region.

Change in Results Framework

The AF would have the same expected outcomes as the RDVRP, but with a greater scale, which include: (i) greater capacity built to identify and monitor climate risk at the national level; (ii) reduced risk of Grenada's population to potable water shortage due to natural hazards or climate change impacts; (iii) reduced vulnerability of select public infrastructure to flooding. M&E mechanisms would remain the same as the original Project. New indicators and targets were added to account for the newly included activities. Targets were revised to accommodate the change in scope of activities. Annex 1 highlights the changes to the results framework.

Compliance

Covenants - Additional Financing (Regional Disaster Vulnerability Reduction Project (Additional Finance) - P149259)

Source of Funds	Finance Agreement Reference	Description of Covenants	Date Due	Recurrent	Frequency	Action
				☐		

Conditions

Source Of Fund	Name	Type
CSCC	Signing of Loan Agreement	Effectiveness

Description of Condition

Loan agreement has to be executed and delivered

Source Of Fund	Name	Type
CSCF	Signing of Grant Agreement	Effectiveness

Description of Condition

Grant agreement has to be executed and delivered

Source Of Fund	Name	Type
CSCC	Updating the Project Operational Manual	Effectiveness

Description of Condition

The GoG has to update the Project Operational Manual in a form and substance satisfactory to the Bank

Risk

Risk Category	Rating (H, S, M, L)
1. Political and Governance	Low
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Low
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary	Moderate
7. Environment and Social	Moderate
8. Stakeholders	Low
9. Other	N/A
OVERALL	Moderate

Finance

Loan Closing Date - Additional Financing (Regional Disaster Vulnerability Reduction Project (Additional Finance) - P149259)

Source of Funds	Proposed Additional Financing Loan Closing Date
Climate Investment Funds	31-Dec-2018

Loan Closing Date(s) - Parent (Regional Disaster Vulnerability Reduction APL1 - Grenada and St. Vincent and the Grenadines - P117871)

Explanation:

The loan, credit and grant closing dates, pertaining to Grenada, would be extended by two years to December 31, 2018 to accommodate for the increased scope of the Project with the Additional Financing.

Ln/Cr/TF	Status	Original Closing Date	Current Closing Date	Proposed Closing Date	Previous Closing Date(s)
IDA-49850	Effective	31-Dec-2016	31-Dec-2016	31-Dec-2018	31-Dec-2016
IDA-49860	Effective	31-Dec-2016	31-Dec-2018		31-Dec-2018
IDA-54500	Effective	31-Dec-2018	31-Dec-2018		31-Dec-2018
TF-10204	Effective	31-Dec-2016	31-Dec-2016	31-Dec-2018	31-Dec-2016
TF-10206	Effective	31-Dec-2016	31-Dec-2018		31-Dec-2016, 31-Dec-2018
TF-11131	Effective	31-Dec-2016	31-Dec-2016	31-Dec-2018	31-Dec-2016
TF-11132	Effective	31-Dec-2016	31-Dec-2016	31-Dec-2018	31-Dec-2016
TF-16733	Effective	31-Dec-2018	31-Dec-2018		31-Dec-2018

Change in Disbursement Arrangements

Expenditures will no longer be split by the various sources of funding. There may be a sequencing of the usage of the sources of funding where the SCF grant funds may be utilized fully first, followed subsequently by the SCF loan and then finally the IDA credit, except for expenditures under Component 3 for Emergency Recovery and Reconstruction Sub-projects and Component 5 for Payments of CCRIF Insurance Premiums which are eligible to be financed only by the IDA Credit. This revision was requested by the Government of Grenada and will also apply to the original operation. In addition, the definition of operating costs will be revised to provide clarity on what is considered eligible for financing under this item. Operating costs will be financed by the SCF grant and SCF loan in both the original project and the AF. The relevant legal documents and disbursement letters for the original operation have been revised to reflect these changes.

Allocations - Additional Financing (Regional Disaster Vulnerability Reduction Project (Additional Finance) - P149259)

Source of Fund	Currency	Category of Expenditure	Allocation	Disbursement %(Type Total)
			Proposed	Proposed
CSCC	USD	Category 1	5.00	100.00
		Total:	5.00	
CSCF	USD	Category 1	3.80	100.00
		Total:	3.80	
IDA	XDR		0.00	0.00
		Total:	0.00	

Components
Change to Components and Cost
Component 1: Prevention and Adaptation Investments (Increase by US$5,200,000). The proposed AF would support the carrying out of selected infrastructure investments and related supporting studies, including: (a) pre-engineering studies and design for the Morne Rouge drainage system; (b) river training works for the St. Johns River flood mitigation sub-project; and (c) support for the preparation of sub-projects all through the provision of works, technical advisory services, operating costs and acquisition of goods. Component 2: Regional Platforms for Hazard and Risk Evaluation, and Applications for Improved decision making (Increase by US$3,000,000). The AF supported activities are divided into four sub-areas, specifically: (i) hazard data development providing the foundation for analysis of the physical environment; (ii) hydro-meteorological infrastructure and data management; (iii) watershed analysis and training for flood and drought management; and (iv) forest management capacity building. Component 4: Project Management and Implementation Support (Increase by US$600,000). The additional financing would support strengthening and developing the institutional capacity for Project management, and improving the capacity for disaster risk management and climate change monitoring through provision of training to PCU staff and the staff of relevant key agencies in Project management, implementation support, coordination of disaster risk management and climate resilience activities under the Project. This will be accomplished through the provision of technical advisory services, training, operating costs and acquisition of goods.

IV. Appraisal Summary

Economic and Financial Analysis

The Project would limit the loss of economic output, lessen the fiscal shock, and ease balance of payment risks caused by violent weather patterns. Additionally, it will improve the ability of the Government to provide vital services in the wake of disasters, reducing loss of life and allowing economic activity to return to normal levels quicker. A cost-benefit analysis was applied to the Saint Johns River works, which was selected because it represents the physical intervention where data availability permitted a thorough cost-benefit analysis. This sub-project was in the originally designed works and the analysis conducted and economic return calculated under the original project remains valid with likely additional benefits.

The Economic Internal Rate of Return (EIRR) was calculated at 45 percent. Using a discount rate of 12 percent, which roughly equates to the country's cost of capital, and an appraisal period of 50 years, the NPV is US$14.6 million for an initial investment of US$4.5 million. These figures attest to the sizable economic benefits that would result from engagement in this activity. Public sector financing is appropriate as all activities are designed to improve national capacity for disaster risk management and climate change monitoring to support improved integration of risk management principles in national development. In addition, the MoW has a legal obligation to build and maintain the public infrastructure, so the physical works of the AF are under their purview.

The economic rationale for disaster management and mitigation is based on the premise that improved recuperative capacity of the economy will lower any adverse longer-term negative impacts on the country's economic growth trajectory. The costs of natural disasters and other hazard events can be broken down into the opportunity cost of not being able to safeguard the population and their property, and the opportunity

cost of lost economic activity, especially if damages to physical infrastructure cause prolonged disruptions in economic activity.

The World Bank has experience working on climate resilience and disaster risk management (DRM) infrastructure projects in Grenada, the Caribbean and globally. The Bank can provide technical assistance and guidance as Grenada continues to build capacity and becomes more resilient. Lessons learnt and best practices from across the world can be applied to the Project.

Technical Analysis

The proposed civil works, institutional strengthening, capacity building and project management activities have been evaluated and were found consistent with the short term and long term objectives of the program. Specific works have been included based on economic benefits and priorities identified by the Government of Grenada. The sites of the proposed works were visited and the detailed technical reviews were conducted. In all cases, clear relationships between the works and PDO were identified and the supporting engineering, environmental and safeguard activities are being prepared. The proposed civil works can be reasonably completed within the increased lifespan of the Project.

Social Analysis

The social benefits of the parent project are expected to be positive and will remain so under the AF. Improved infrastructure resilience will likely lead to reduced flooding exposure and associated social benefits for impacted beneficiaries. For example, in the case of Saint John's River, the two schools adjacent to the river bank should experience fewer flood-related school closings (major flood events) and disruptions (for more frequent minor flood events) and may experience a reduction in fungus infections of the skin of school children (which school administrators link with flood events) as well as an increased sense of security and safety for the school community.

Compliance with safeguards under the parent Project has been satisfactory to date. A discrete amount of land acquisition took place during the implementing of the parent project implicating one household and resulting in the development of an abbreviated RAP. This served to build the capacity of the PCU for preparing and implementing land acquisition and was supplemented by targeted training of PCU on safeguards trainings. PCU internal capacity has also recently improved with the recruitment of a new Senior Engineer, and a Social Specialist with significant experience in construction oversight.

OP 4.12 (Involuntary Resettlement) was triggered under the parent project and a Resettlement Policy Framework (RPF) was developed and disclosed on April 28, 2011. The RPF prepared for the parent project has been updated to reflect the AF activities and was disclosed in final version on February 26, 2015. A small amount of land acquisition is anticipated for the St. Johns River sub-project. An Abbreviated Resettlement Plan will be completed in accordance with the RPF once the design of the sub-project undergoes its final review and prior to the commencement of any works.

Environmental Analysis

As the type and location of investments proposed under the AF are similar to those of the parent project, no change to the Environmental Assessment Category (Category B) is proposed. Environmental Assessment (OP 4.01), Natural Habitats (OP 4.04) and Physical Cultural Resources (OP 4.11) policies were triggered under the parent project and will continue to be triggered under the AF. As a precaution, the Pest Management Policy is being triggered under the AF, so that upgrades to a nursery facility may include provisions for a Pest Management Plan, and would improve the level of practice for any associated work.

Specific details sufficient for the design of individual sub-projects will be defined during implementation, therefore an Environmental Management Framework (EMF) is the appropriate safeguards instrument to be used, based on: an (i) update of the project portfolio, (ii) update of the assessment of environmental effects of interventions, (iii) update of the standard mitigation measures to include Pest Management; and (iv) update of the scoping and screening criteria for additional assessment included in the Operations Manual.

The EMF has been adapted readily from the existing Environmental Assessment document prepared for the Grenada DVRP and was finalized and initially disclosed on January 30, 2015. The consultation process included notification to stakeholders and soliciting input; however, as no comments were received the EMF was finalized and republished on February 27, 2015. For the more complex works at St. Johns River, an Environmental Impact Assessment had been conducted previously and included an Environmental Management Plan which was found to meet Bank standards.

Existing safeguard instruments have been updated and disclosed in-country, as a comprehensive Environmental Management Framework (EMF). The EMF includes an inventory and preliminary scoping of all potential activities and sub-projects. Additionally, screening procedures to: (i) generate standardized Environmental Management Plans (EMPs); and (ii) identify conditions where more complex or sensitive environmental conditions exist will be defined through sub-project specific Environmental Impact Assessments (EIA). An EIA has already been prepared for works in the St. Johns River and its associated EMP is referenced in the EMF. Specific EMPs will be developed during implementation, and the Operations Manual has been modified to reflect the improved screening and management procedures. The PCU's capacity to implement environmental safeguards will be improved by contracting an environmental specialist for periodic support, especially as civil works begin and field activities increase. Finally, the project will benefit from sub regional safeguards workshops which will be periodically conducted to strengthen ties and enhance practical environmental management practices in other World Bank OECS DVRP projects.

V. World Bank Grievance Redress

38. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms of the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/GRS. For more information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1: Revised Results Framework and Monitoring Indicators

Project Name:	Regional Disaster Vulnerability Reduction Project (Additional Financing) (P149259)			Project Stage:	Additional Financing	Status:	DRAFT
Team Leader(s):	Gaetano Vivo	Requesting Unit:	LCC3C	Created by:	Nicholas James Callender on 29-Oct-2014		
Product Line:	IBRD/IDA	Responsible Unit:	GSURR	Modified by:	Nicholas James Callender on 17-Feb-2015		
Country:	Grenada	Approval FY:	2015				
Region:	LATIN AMERICA AND CARIBBEAN	Lending Instrument:	Investment Project Financing				
Parent Project ID:	P117871	Parent Project Name:	Regional Disaster Vulnerability Reduction APL1 - Grenada and St. Vincent and the Grenadines (P117871)				

Project Development Objectives

Original Project Development Objective - Parent:

The Program aims at measurably reducing vulnerability to natural hazards and climate change impacts in the Eastern Caribbean Sub-region. The objective of the Project in Grenada is to measurably reduce vulnerability to natural hazards and climate change impacts in Grenada and in the Eastern Caribbean Sub-region. The objective of the Project in Saint Vincent and the Grenadines is to measurably reduce vulnerability to natural hazards and climate change impacts in Saint Vincent and the Grenadines and in the Eastern Caribbean Sub-region. The achievement of the Program Development Objectives of the Regional Disaster Vulnerability Reduction Program (RDVRP) would be measured using the following key indicators: (a) Reduced risk of OECS population to failure of public buildings and infrastructure due to natural hazards or climate change impacts; and (b) Increased capacity of OECS Governments to identify and monitor climate risk and impacts.

Proposed Project Development Objective - Additional Financing (AF):

Results

Core sector indicators are considered: Yes	Results reporting level: Program Level

Project Development Objective Indicators							
Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
New	Reduced risk of Grenada's population to failure of public buildings due to natural hazards or climate change impacts	☐	Number of people (public building occupants)	Value	444.00	444.00	0.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
New	Number of government officials from Public Works; Agriculture; Forestry; NAWASA able to set up and run watershed analysis software	☐	Number	Value	0.00	0.00	15.00
				Date	31-Dec-2014	31-Dec-2014	31-Dec-2018
				Comment			
New	Direct project beneficiaries	☒	Number	Value	0.00	0.00	110000.00
				Date	23-Jun-2011	31-Dec-2014	31-Dec-2018
				Comment			
New	Female beneficiaries	☒	Number	Value	0.00	0.00	54000.00
			Sub Type				
			Supplemental				
No Change	Reduced risk of OECS population to failure of public buildings and infrastructure due to natural hazards or climate change impacts	☐	Number of people (public building occupants)	Value	764.00	764.00	0.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
Revised	Relocated low income households with access to safe	☐	Number of households	Value	0.00	0.00	41.00
			Sub Type	Date	23-Jun-2011	30-Jun-2014	31-Dec-2018

	infrastructure addressed under the Project		Breakdown	Comment			Number of families
No Change	Reduced risk of SVG's population to failure of public buildings due to natural hazards or climate change impacts	☐	Number of people (public building occupants)	Value	320.00	320.00	0.00
			Sub Type	Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
			Breakdown	Comment			
No Change	Increased capacity of OECS Governments to identify and monitor climate risk and impacts	☐	Number of Government officials	Value	6.00	10.00	14.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
Marked for Deletion	Number of Government officials able to produce location specific exposure maps	☐	Number	Value	2.00	2.00	8.00
			Sub Type	Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
			Breakdown	Comment			
Intermediate Results Indicators							
Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
New	Operations Manual prepared and action plan of activities updated annually to ensure preparation to facilitate disbursement in the event of an emergency	☐	Yes/No	Value	No	Yes	Yes
				Date	23-Jun-2011	31-Dec-2014	31-Dec-2018
				Comment			
New	Number of Government officials trained in spatial data analysis under the Project in Grenada	☐	Number	Value	0.00	0.00	15.00
				Date	31-Dec-2014	31-Dec-2014	31-Dec-2018
				Comment			Staff from technical line

							users serving as end users of data products trained in spatial data analysis
New	Number of Government officials trained in forest management under the Project in Grenada	☐	Number	Value	0.00	0.00	8.00
				Date	31-Dec-2014	31-Dec-2014	31-Dec-2018
				Comment			Staff from the Ministry of Agriculture and Forestry trained
New	Increased seedling holding capacity within rehabilitated nurseries in Grenada	☐	Number	Value	0.00	0.00	50000.00
				Date	31-Dec-2014	31-Dec-2014	31-Dec-2018
				Comment			
New	Number of functional hydromet stations providing data to a shared platform in Grenada	☐	Number	Value	0.00	0.00	0.00
				Date	31-Dec-2014	31-Dec-2014	31-Dec-2018
				Comment			Target TBD by the baseline assessment study which will be carried out by the Project in the second half of 2015
New	LiDAR mapping for the entire territory of Grenada completed and available on a shared platform	☐	Yes/No	Value	No	No	Yes
				Date	31-Dec-2014	31-Dec-2014	31-Dec-2018
				Comment			
No Change		☐	Percentage	Value	0.00	100.00	100.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018

	Percentage of public buildings geo referenced in a national exposure database in SVG			Comment	0 percent of public buildings in national exposure database	All 366 public buildings in SVG have been included in a national exposure database	
No Change	Public building geo spatial information collected in SVG	☐	Number of buildings	Value	0.00	366.00	160.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment	0 public buildings in which geo-spatial information has been collected	Geo-spatial information for 366 public buildings in SVG has been collected.	
No Change	Number of gabion baskets used in construction of flood mitigation works in SVG	☐	Number	Value	0.00	0.00	8400.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment	0 gabion baskets have been used at the start of the project		
Marked for Deletion	Number of location specific exposure maps completed by staff trained under the Project in Grenada	☐	Number	Value	0.00	0.00	20.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
Marked for Deletion	Number of Government officials in Grenada who complete training on producing location specific exposure maps	☐	Number	Value	2.00	2.00	8.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			

No Change	Designs and Pre engineering/geotechnical studies completed for roads and bridges rehabilitated under the Project in SVG	☐	Number of studies	Value	0.00	0.00	6.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment	0 designs and Pre-engineering/geotechnical studies are complete		
No Change	Reduced risk of SVGs population to failure of roads and bridges due to natural hazards or climate change impacts	☐	Number of people (road and bridge users)	Value	30500.00	30500.00	0.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment	Daily users currently at risk: 1) Fenton (2) - 500 2) South Rover Rd Bridge - 10,000 3) Mt Greenan & Spring – 9,800 4) Carriere, Maroon Hill & Ginger Village - 10,200	Increased daily users with the inclusion of additional roads and bridges.	Measurement in reduction of number of user days of roads at decreased capacity due to floods, landslides, or structural failure.
No Change	Public building geo spatial information collected	☐	Number of buildings	Value	0.00	0.00	150.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
			Percentage	Value	0.00	0.00	100.00

Marked for Deletion	Percentage of public buildings geo referenced in a national exposure database in Grenada	☐		Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
No Change	Designs and Pre engineering/geotechnical studies completed for road protection and bridges rehabilitated under the Project	☐	Number of studies	Value	0.00	1.00	6.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
No Change	Number of location specific exposure maps completed by staff trained under the Project in SVG	☐	Number	Value	0.00	4.00	20.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment	0 exposure maps completed by staff trained under the Project		
No Change	Number of Government officials who complete training on producing location specific exposure maps in SVG	☐	Number	Value	2.00	8.00	8.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment	2 technical officials have completed training on producing location-specific exposure		
No Change	Reduced risk of SVG s population to flooding in areas with flood mitigation works financed by the Project in SVG	☐	Number of people	Value	1700.00	1700.00	0.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment	425 households with an average of 4		

					people per household for a total of 1700 people		
Marked for Deletion	Reduced risk of Grenada's population to failure of roads and bridges due to natural hazards or climate change impacts	☐	Number of people (road and bridge users)	Value	76000.00	76000.00	0.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
New	Grenada's infrastructure made less vulnerable to natural hazard and climate change impacts in Project areas	☐	Percentage of works completed	Value	0.00	0.00	100.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			Targets – YR 5 – 16% YR 6 – 34% YR 7 – 66% YR 8 – 100%
Marked for Deletion	Reduced risk of Grenada's population to potable water shortage due to natural hazards or climate change impacts	☐	Number of people	Value	41200.00	41200.00	0.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
No Change	Number of gallons increase of water storage capacity as a result of the Project in Grenada	☐	Number	Value	0.00	0.00	450000.00
				Date	23-Jun-2011	30-Jun-2014	31-Dec-2018
				Comment			
No Change	Increased capacity of communities to respond to disaster events	☐	Number of warehouses	Value	0.00	0.00	6.00
				Date	17-Dec-2013	30-Jun-2014	31-Dec-2018

				Comment	0 fully operational satellite warehouses located within vulnerable communities		
New	Country-wide Emergency Communication Network is in place	☐	Yes/No	Value	No	No	Yes
				Date	17-Feb-2015	17-Feb-2015	31-Dec-2018
				Comment			Country-wide VHF communication network including repeaters/antennas and transceivers

Annex 2: Detailed Description of Project Activities

1. **Added Value of the Additional Financing**. The RDVRP has supported capacity building activities to improve climate resilience and DRM capacity. A large focus of the AF activities will be on acquiring datasets, improving data management systems, and building national capacity in the use of these data to produce analysis required to identify and evaluate appropriate interventions with respect to climate change adaptation. Addressing the conditions that contribute to recurrent infrastructure failure requires data that presently do not exist in Grenada. Under the AF basic datasets and collection systems are to be developed that will permit the analysis of these factors on a watershed scale. The applications of this analysis are wide ranging and improve hazard and vulnerability assessment, engineering designs, land planning and land use allocation.

2. **Timing of the Additional Financing.** The proposed AF is critical to reduce the vulnerability to hazards in the short term and, through enhanced information basis, strengthen the ability, over time, to achieve resilience to climate change. The phasing of the investments under the RDVRP has allowed Grenada to address critical infrastructure needs as well as lay the foundations for the utilization and integration of scientific planning and analysis in decision making. The AF is particularly needed at a time when RDVRP designs and plans are ready and nearing implementation. The systems are in place to manage core data collected and facilitate training and practical application in engineering and planning processes. The combination of successful RDVRP outcomes coupled with planned AF investments set Grenada on track towards both understanding its climate challenges and having the tools in place to plan and adapt to them.

3. **Project Cost and Financing.** The table below summarizes the project cost and financing by Component.

	Current Cost		**Proposed Cost**	
	SCF Grant:	31%	**SCF Grant:**	37%
	SCF Loan:	31%	**SCF Loan:**	34%
Components	**IDA:**	38%	**IDA:**	29%
1 - Prevention and Adaptation Investments	10.62		15.82	
2 - Regional Platforms for Hazard and Risk Evaluation and Applications for Improved Decision Making	10.58		13.58	
3 - Natural Disaster Response Investments	1.00		1.00	
4 - Project Management and Implementation Support	2.00		2.60	
5 - Payment of CCRIF Insurance Premium	2.00		2.00	
Total	26.20		35.00	

4. **Component 1: Prevention and Adaptation Investments** (Original allocation US$10,620,000, increase by US$5,200,000 to US$15,820,000). The proposed AF would support carrying out of selected infrastructure investments and related supporting studies, including: (a) St Johns river defense systems; (b) works pre-engineering studies and design for drainage mitigation system in the Morne Rouge area; and (c) investment in fiber optic upgrades to assist agencies with participating in a national data sharing platform (i.e. GeoNode, national hydro-met network) which will store, manage and disseminate large datasets required to incorporate climate information in planning, design and engineering activities. The design of investments under Component 1 will, to the extent possible, integrate data collected and analyzed under Component 2. Analytics and tools developed by Component 2 will also complement priority flood mitigation works carried out under the project. For instance, digital elevation models, soil maps, and hydro-met data will provide the basis for modelling floods, informing upstream watershed management (e.g. through forest restoration) and increasing long term resilience of the works.

5. This component would be used to scale up the impact of RDVRP in terms of building disaster and climate resilience of the built infrastructure in the proposed Project locations. Specific sub-projects and activities identified under this component are listed below.

6. **Background.** The subject area for the St Johns River intervention is located just north of the city of St Georges, in the South-Western end of the island. The river, near its estuary, is traversed by the main highway linking St Georges to the north of the island and critical communities such as Victoria, Gouyave and Marigot. Extreme flood events within the project area that stakeholders note occurred in 1998, 2002, 2003, 2008 and 2011. The project area is vulnerable to regular flooding8 from St. Johns River, and the current standard of protection is low and below that acceptable for an urban area such as the River Road area, which includes residential and commercial properties as well as the national stadium of Grenada. The social impacts are particularly significant because in this area, there are three schools (primary, secondary, high schools hosting a total of 900 students) whose activities are disrupted by the floods. Impact on economic activities is equally important given the extent of development and the importance of River Road for commuting into the capital city. Furthermore, the St. Johns River poses an additional flood risk to the Queen's Park Power Station, operated by Grenada's electricity company GRENLEC. For this reason alone the consequences of major flooding could be devastating on a national scale, not only affecting the project area.

St. Johns River Defense System

7. Sub-project rationale. A 2006 flood hazard assessment for the entire country was done within the Grenada National Hazard Mitigation Plan The assessment highlighted that flooding occurs along the St. Johns River on the floodplain, with most vulnerable areas in the vicinity of two sharp bends and around the stadium by the Humpback Bridge, both of which flood even for a frequent 2-year rainfall return period. The assessment found that danger posed by flooding from the 2-year rainfall event generally is low to medium except around the Humpback Bridge where it is high. For the 5-year rainfall event, the danger increases with a substantial portion of the inundated area designated as high. For higher rainfall (10-year and the 25-year) events, the assessment indicated that persons should avoid almost all of the inundated area as there is strong threat to life.

[8] During preparation of the AF, a consultation with community members living in the River Road area suggested that floods occur on average 2-3 times a year.

8. The frequency and effects of flooding are increasing and will continue to do so due to the effects of development in the catchment area, changes in land use, inadequacy of local infrastructure, and the ongoing impacts of climate change. Flooding in this area occurs annually, with expected annual damage estimated at EC$0.7 million (US$0.35 million)[9]. Changes resulting from natural disasters can similarly cause impact at a catchment scale, such as the effects of Hurricane Ivan.

9. Sub-project beneficiaries. Direct project beneficiaries will be 200 people who currently live in housing with significant flood risk with many more people in the local community suffering secondary effects of flooding. An estimated 40-50 residential buildings, shops and commercial properties line the River Road along the Project site, all of which are impacted by water during a flood event. Three school facilities where more than 900 students are enrolled are located on the active floodplain and receive no formal warning of flood events. During major events floodwaters pose a flood risk to the Power Station and GRENLEC which produces electricity for Grenada. Due to the predicated effects of climate change and increasing flood risk from sea level rise and more significant river flooding, more than 200 properties could be at risk and both direct (property) and indirect damages will be greater due to property and infrastructure flooding as well as major disruption to the local community, businesses and traffic.

10. **Proposed Investments.** The intervention along the St. Johns River project area involves river training works and protective measures using a combination of reinforced concrete retaining walls, realignment of the riverbed, and gabions walls. The flood mitigation works are designed to reduce flooding by improving river discharge capacity over a critical 1.65km section terminating at the coast. Technical studies, including hydrological analysis and hydraulic modelling, site inspection and research of the previous flood studies have been completed. The Environmental Specialist reviewed the EIA and noted that it includes an assessment of baseline environmental conditions, and concurs that no impacts on biodiversity are expected to occur. The EIA also has developed an EMP with a very comprehensive set of mitigation measures for construction, which will be adopted and used in the project contracts.

Morne Rouge drainage project pre-engineering studies and design

11. **Background.** Flooding in the Morne Rouge area has now become an annual occurrence with each event increasing in severity due to increased local development and impacts from sea level rise. The flooding affects directly and indirectly, all but one of the major hotels located in the Grand Anse beach, one of Grenada's most iconic tourist attractions, as well as the largest shopping mall on the island, other smaller businesses, the local police station, the largest multipurpose hall on the island, a youth center, approximately 4 ha of Crown Land property and access to residential areas.

12. **Sub-project rationale.** Given the importance of tourism in the area of the Morne Rouge drainage system, interventions will pay particular attention to reducing recurrent flooding without damaging the coastal resources associated with Grand Anse Beach. Additionally, future development plans need to be taken into account to help ensure that interventions are not overcome by hydraulic changes provoked by future development.

[9] Source: Dessau Soprin International

13. **Proposed Investments.** Pre-engineering studies (including data collection) and design are expected to require, under a very optimistic scenario, 42 months for completion. The planned duration of the AF is 42 months. Estimated construction time is approximately 20 months hence the overall time required for this work is 5 years. This would go well beyond the completion date of the project. Therefore, in this context, only the pre-engineering study and engineering design will be commissioned under the project.

14. **Component 2 – Regional Platforms for Hazard and Risk Evaluation, and Applications for Improved Decision making** (Original allocation US$10,580,000, increase by US$3,000,000 to US$13,580,000). This component finances critical building blocks to Grenada's technical and institutional capacity to manage climate resilience in forest and water resource management departments, with additional applications for MoW, the NADMA, and the National Planning Office, which could contribute to a transformative impact on Grenada's capacity to build climate resilience. Additional Activities to be financed include: high resolution topography and bathymetry models, high resolution forest cover mapping, high resolution soils mapping, modernization of the national hydromet network, capacity building for watershed analysis and modeling, and institutional strengthening and capacity building in forest resources management. Developing/consolidating data resources and improving the analytical capability of select institutions will provide a platform for informed risk reduction decisions in the sectors prioritized under the SPCR, including water resource management, disaster prevention and emergency planning, and forestry. These investments are transformational in nature and provide the basic backbone for climate resilient development over the long-term based on sound scientific principles.

15. **End-users of Climate Resilience Data.** A series of consultations carried out with all national stakeholders[10] involved in the Grenada SPCR allowed a prioritization of the data-based applications and highlighted critical capacity gaps. The SPCR counterparts in Grenada are also the main end users of hydro-meteorological and climate data. They will be engaged from the outset to provide feedback on their information needs and their specific requirements for the data to be collected during Project implementation. This would enhance the development and uptake of information, products and services for resilience. In the identification of the activities, priority was given to the acquisition of critical baseline data and the development of analytical capacity designed to advance multi-sector applications in climate adaptation. Building this capacity in-country is a long-term transformative process. As such the AF activities seek to build the foundation and develop institutional capacity to apply this technology beyond the life of the project.

- *Public Works*. Forward looking design and construction is key to long-term resilience. To accomplish this, local scale climate modeling is required to provide criteria as a foundation for improved resilient design. Activities under the AF support this concept by building the foundation for analyzing design conditions by providing baseline data and building capacity to improve design analysis. Applications include modeling the return periods for rainfall events and runoff produced on a local scale, which will allow for the development of resilient engineering designs with respect to expected conditions (e.g. 1:25 year storm, 1:50 year storm). In island settings, these events are highly localized often associated with thunderstorms that are generated by atmospheric interactions

[10] Agencies benefiting from the tools and data to be introduced include, among others, Ministry of Agriculture and Forestry, MoW (including Land Planning), Ministry of Education, Ministry of Health, NADMA, Ministry of Housing, NAWASA, National Meteorological Service.

with island topography. This requires multiple years of observations. The modernization of the hydromet network is designed to capture that variability. Coupled with improved data on topography, soils, and land cover, and training in analytical applications, GoG will have the basic tools required improve the resilience of future designs.

- *Land planning*. Landslip and rainfall runoff are significant parameters needed to inform Grenada's National Development Order (national land use plan) and Local Area Plans, a responsibility of the Physical Planning Unit. Physical modeling of the impacts of proposed development plans to the landscape is needed to avoid generating damaging runoff to downstream communities e.g. increased flooding or destabilization of downstream slopes promoting landslides or damaging drinking water resources. Coastal risks from storm surge, storm waves, and tsunami cannot be evaluated properly without bathymetric information. Tourism resources as well as coastal (typically lower income) fishing villages are particularly vulnerable. Coupled with high resolution topography, this data will permit the future evaluation of coastal risks of hazard events and longer-term sea level rise at the community level.

- *Disaster Risk Management.* Stream gauges are not adequate to produce sufficiently early warning of floods. With an East-West diameter of approximately 8 miles and a central North-South mountain range, surface runoff has only a 4-mile transit from mountain top to sea. Watershed calibration and modeling rainfall input with respect to stream rise will allow future early warning systems to be based on a rainfall trigger providing additional alert time to affected populations.

- *Disaster Risk Financing*. New data acquired with the AF will be important inputs to improve modeling of storm surge, flood risk, and landslide risk, which could lead to the development of disaster risk financing strategies and instruments that cover these hazards and therefore compliment other existing risk financing instruments, which are particularly critical given Grenada's fiscal constraints.

- *Forestry*. Forest management is a major tool for improving water resources (quantity and quality), protecting coastal ecosystems and reducing hazard vulnerability among other functions. Forest management planning cannot be successful without critical data such as topography, soil types, forest cover mapping, rainfall regimes, etc. To use forest resources as a mitigation tool, it is necessary to model the impact of potential reforestation activities to optimize investments for mitigating runoff and sediment discharge, enhance slope stability and ensure ecological compatibility of the species composition. Scaled up activities are designed to advance Grenada's ability to develop this level of analysis. With the development of the core data and analytical tools, the project will support investments in capacity building and training within the forestry department to prepare them to use this technology in developing their long-term forest management program with emphasis on ecological sustainability, watershed management and risk reduction, and coastal zone protection.

16. Component 2 activities are divided into four sub-components:

(a) Hazard data acquisition (e.g. high accuracy digital elevation topographic datasets, bathymetry, soil map, etc.) providing the foundation for analysis of the physical environment;

(b) Optimization and modernization of the hydro-meteorological data collection network (i.e. rain and stream flow gauges) and data management system;
(c) Watershed analysis and training for flood and drought management (hazard mapping and calculation of hydraulic parameters (e.g. water runoff) for climate-proofing infrastructure design);
(d) Forest management capacity building.

17. Specific sub-components and activities identified under this component are listed below.

(a) Hazard data acquisition

18. Under this activity the datasets represent the foundation for analyzing the physical environment of Grenada and form the basis for integrating climate analysis in the development process. They include: (i) the creation of LiDAR topography, ortho-photography, and bathymetry digital datasets as well as watershed extraction; (ii) scanning and rectification of historical ortho-photos (covering the past 30 years); (iii) large scale soils survey and mapping; (iv) a land use/land cover GIS update; and (v) a GIS update of drinking water abstraction points and distribution network.

(b) Optimization and modernization of the hydro-meteorological data collection network and data management system

19. Rainfall and flood response are variable across the country. Rainfall variation is highly local and varies with altitude and geographic exposure. Critical applications for these data include the establishment of early warning systems, short and medium term weather forecasting and surveillance of water borne diseases. Investments are designed to modernize the current rain and stream gauge network in order to improve field data resolution to capture and analyze the recurrence of short-term events to support the development of Intensity, Duration and Frequency (IDF) curves to be used in engineering and planning. Together with the geospatial data developed, hydro-meteorological data provides the analytical input for hydraulic and hydrologic analysis. Investments in hydro-meteorological infrastructure and data management include inter-alia: (i) Hydrologic analysis and station optimization study; (ii) Hydromet Data management system; and (iii) Rain and stream gauge instrument network.

20. There is significant capacity, locally and especially regionally, for meteorological analysis. Lacking is the ability to assess the orographic effect on Grenada's rainfall distribution with respect to intensity and duration. Local variability is substantial and significant and depends on the interaction of the landscape with weather systems. This behavior varies from watershed to watershed. The project is designed to provide data to calibrate and analyze watershed interactions accounting for orographic effect on a large (watershed) scale. As observations are recorded over time, these data will feed into engineering design and development planning, accounting for terrain and coastal exposure to prevailing conditions (windward – leeward, xeric/mesic regimes, etc.)

(c) Watershed Analysis and Training for Flood and Drought Management

21. With the data systems in place, the final area of activity is to provide an initial analysis using data developed and provide training in the development of modeling activities designed to improve the scientific basis for decision making. Multiple agencies will be trained in the use of modeling software

based on their individual interests and objectives for integrating improved science in the planning and engineering processes. Activities include inter-alia: (i) Watershed modeling – rainfall/runoff, erosion and sedimentation; (ii) Stream flow Modeling; (iii) Remote Sensing/GIS Training; and (iv) ERDAS Image Analysis Software.

(d) Forest Management Capacity Building

22. Under this activity, the AF will contribute to one of the key outcome indicators of the Grenada Strategic Program for Climate resilience, namely the restoration and improvement of the national forest resources. Specifically, the project will fill critical knowledge gaps and build capacity needed of the Grenada Forestry Department for planning and implementing reforestation and watershed rehabilitation programs in the future. This will include: (i) Basic data and analysis for forest management (soil map, forest cover and inventory); (ii) Nursery rehabilitation and procurement of equipment and supplies; (iii) Framework and guidance note on how to carry out sustainable reforestation programs; and (iv) Sub-regional collaboration with other forestry departments of Windward Islands (in particular, St. Lucia, St. Vincent and the Grenadines, Dominica).

23. **Re-scoped Forestry Activities.** The originally endorsed PPCR Concept Note for the AF included the rehabilitation of 100 hectares within the Grand Etang Forest nursery, preparation of 55,000 seedlings consisting of commercial and mixed natural forest species and land preparation and enrichment planning. During the project preparation it became clear that there were important pre-requisites to ensure that such investment would be effective and sustained. In particular, strengthening the Forestry Department's institutional capacity to manage geo-spatial data and make evidence-based decisions is essential to undertaking any activity to preserve/restore forest resources. For instance, datasets such as topography, soil types, forest cover mapping and rainfall regimes are critical for forest management planning. To use forest resources as a tool for climate resilience, it is necessary to model the impact of potential reforestation activities to optimize investments for mitigating runoff and sediment discharge, enhance slope stability and ensure ecological compatibility of the species composition. Without this data in place the GoG realized the impact of forestry investments would be small and potentially ineffective and opted for shifting the focus of the forestry component to build in long term capacity for forest management and resilience. With the development of the core data and analytical tools, the AF will support investments in capacity building and training within the Forestry Department to prepare them to use this technology in developing its long-term forest management program with emphasis on ecological sustainability, watershed management, risk reduction, and coastal zone protection.

24. **Component 3: Natural Disaster Response Investments** (No change from Parent). Grenada has a high risk of exposure to natural disasters that have the potential to impact this operation by severely affecting the productive sectors of the economy, adding pressure on the fiscal position, and redirecting public resources away from long-term development plans. Despite the vulnerability reduction investments under the RDVRP, residual risk across vulnerable public infrastructure in Grenada remains.

25. Project design was developed bearing in mind the country's hazard risk. In order to cover residual risk and provide quick liquidity in the event of an emergency, US$1 million is available as contingent funding under this component to complement existing post-disaster financing options. The component

would become operational following declaration of a national emergency and submission of a recovery action plan describing sub-projects and activities to be financed. This component strengthens the RDVRP and AF program, managing the risk of exogenous shocks on the project at large, allowing the Government quick access to funds to finance emergency recovery sub-projects in the event of a disaster. Access to these funds in conjunction with other post-disaster financial protection instruments would minimize compromising the long term transformative change in climate adaptation and enhanced resilience against natural hazards in the occurrence of a disaster event.

26. **Component 4 – Project Management and Implementation Support** (*Original allocation US$2,000,000, increase by US$600,000 to US$2,600,000).* For the two additional Project years, the AF would support strengthening and developing the institutional capacity for project management and improving the GoG's capacity to coordinate SPCR implementation. This will be accomplished through the provision of technical advisory services, training, operating costs and acquisition of goods. In particular, this Component will support: (i) strengthening capacity of the Project Coordination Unit (PCU) and relevant government agencies in project management, implementation support, and coordination with other climate resilience investments in Grenada; (ii) strengthening capacity of the PCU and relevant government agencies to monitor the delivery of the SPCR (including climate resilience activities supported by other development partners), monitor and report on the PPCR core indicators, and generate knowledge for the other participating countries. As requested by the GoG, this Component will also strengthen operational capacity of the PCU by financing rental and regular upkeep of office facilities. Project management and implementation support activities may include training and capacity building through participating in regional workshops and seminars. These activities are designed to improve national capacity for disaster risk management and climate change monitoring to support the integration of risk management principles into national development planning. In addition, the activities would strengthen the capacity of the PCU and relevant GoG's agencies to monitor the delivery of the Grenada SPCR.

27. **Implementation Arrangements**. The AF implementation, institutional and internal quality control arrangements would remain the same as the arrangements established under the RDVRP. The additional activities under the AF are within Grenada's current capacity to execute. The Project Coordination Unit is reasonably staffed and targeted training has facilitated capacity development to manage Bank-supported projects. The Social Specialist and Engineer will supervise safeguards for most activities, particularly for spot field inspections during construction. An external environmental consultant will be contracted to provide support for specialized tasks and for more frequent inspection of intensive construction efforts. The Operations Manual has been updated to reference the new Environmental Management Framework (EMF).

28. The proposed AF would also scale up technical assistance provided under the RDVRP to support improved project management capacity and financial management systems. Additionally, a project Steering Committee oversees the implementation and coordination of the RDVRP, and will support the execution of the AF activities as well as monitor its implementation. The composition of the Steering Committee has been amended in the Operations Manual in order to reflect the AF activities. The Grenada National Climate Change Committee was reactivated in July 2014 with support from GIZ and will be meeting with frequency; this is invaluable for ensuring long term climate planning in the country and the transformational success of the RDVRP in regards to disaster risk and climate adaptation.

Annex 3: Economic and Financial Analysis

1. The activities proposed in the RDVRP AF would reduce the country's macroeconomic vulnerabilities and benefit the local economy. The Project would limit the loss of economic output, lessen the fiscal shock, and ease balance of payment risks caused by violent weather patterns. Additionally, it will improve the ability of the Government to provide vital services in the wake of disasters, reducing loss of life and allowing economic activity to return to normal levels quicker.

2. Public sector financing is the appropriate funding vehicle as all activities are designed to improve national capacity for disaster risk management and climate change monitoring to support improved integration of risk management principles in national development. In addition, MoW has a legal obligation to build and maintain the public infrastructure, so the physical works of the AF are under their purview.

3. The World Bank has experience working on climate resilience and disaster risk management (DRM) infrastructure projects in Grenada, the Caribbean and globally. The Bank can provide technical assistance and guidance as Grenada continues to build capacity and becomes more resilient. Lessons learnt and best practices from across the world can be applied to the Project in Grenada. In addition, the Bank can support Grenada in trying to leverage additional funds to support decreasing vulnerability disasters and the fiscal shocks of disasters.

4. The proposed sub-projects and activities are designed to mitigate climate change risks and boost economic activity. In general, there are three types of losses incurred by a country due to natural disasters: (i) macroeconomic risks prompted by the event - namely a sharp increase in indebtedness and worsening of the balance of payment situation; (ii) direct loss and damage to physical property caused by the event; and (iii) loss of economic activity that is displaced by the event. The methodology used here addresses each level of loss.

5. Natural disasters pose a serious risk to Grenada's macroeconomic stability. According to the International Monetary Fund (IMF), one of the main economic challenges facing Caribbean states is vulnerability to natural disasters.[11] Additionally, the economic losses and the sudden inflow of international aid that tends to occur immediately following a natural disaster, create balance of payments risks as exports drop and imports rise. The government debt of Grenada relative to GDP was 110 percent in 2013 (IMF WEO, October 2014), giving the country little fiscal space to deal with exogenous shocks. Similarly, the country faces large current account deficits, which would only be exacerbated by another natural disaster.

6. Disaster preparedness measures reduce the long-term economic costs of disasters, as they allow activity to return more quickly to normal levels. Furthermore, the capital stock is less likely to be damaged, reducing the need for post-disaster borrowing. This improves the country's long-term macroeconomic outlook keeping debt levels and current account deficits lower than they would be in the absence of such interventions.

[11] International Monetary Fund. *Caribbean Small States: Challenges of High Debt and Low Growth."* February, 2013.

St. Johns River Sub-Project

7. A detailed cost-benefit analysis was applied to the St. Johns River works, which was selected because it represents a physical intervention where data availability permitted a thorough assessment of economic viability. This sub-project was in the originally identified works and the analysis conducted and economic return calculated under the original project remains valid with likely additional benefits. The methodological approach compares the costs of the interventions, which were re-appraised during preparation of the AF based on commissioned designs, against estimated economic benefits. The Halcrow Group conducted field visits and collected data to develop the expected average annual damage (AAD), which is the probability-weighted average of the direct and indirect event damage at a given return period (5 year selected). The benefits are estimated by the averted costs of direct damages, including: (a) damage to the fabric and contents or stock of residential and commercial property; (b) losses arising from the interruption of business activities; (c) loss of electrical power supplies from Queen's Park power station; and (d) damage to the pavement of River Road. Averted costs of indirect damages were also calculated using the opportunity cost of time spent in longer commutes due to detours and traffic congestion. The two main results of the analysis are the Economic Internal Rate of Return (EIRR) and the Net Present Value (NPV), both of which capture the estimated economic returns of the project, rather than the financial returns used in traditional cash flow analyses. The EIRR is 45 percent. Using a discount rate of 12 percent, which roughly equates to the country's cost of capital, and an appraisal period of 50 years, the NPV is US$14.6 million for an initial investment of US$4.5 million[12]. These figures attest to the sizable economic benefits that would result from engagement in this activity.

a. **Property Damage**. Using (i) floor level; (ii) building type; (iii) distance from river; (iv) floor area; and (v) stock/contents, Halcrow estimated the cost of reconstruction and replacement of contents for over 80 buildings around the river. This estimate includes a stadium building with 11,000m^2 and three schools which have a combined floor area of around 2,200m^2 and 1,000 pupils.

b. **Business Interruption**. Business losses were estimated using stock at risk and applying factors for (i) sales as a factor of stock at risk; (ii) gross margin for loss as a % of sales; (iii) days of loss per event; and (v) depth at which loss occurs.

c. **Power Outage**. Losses to the power station were estimated by factoring (i) duration of a power outage for a given event; (ii) output loss per day; and (iii) value per kilowatt hour.

d. **Pavement Damage**. The event damage is calculated as the present value of the reconstruction cost for a given event less the present value of the reconstruction cost in the absence of flooding.

e. **Traffic Diversions**. During a significant flooding event, traffic that would normally use River Road is diverted an additional 2km. The diversion is estimated to last 2 days for a 1 in 5 year event. The economic cost of diversion is represented by the road user costs (RUC) multiplied by the distance travelled and the volume of traffic for various vehicle classes.

[12] In-depth analysis was conducted by Halcrow Group Limited under the RDVRP. All assumptions are based on their models and the calculations were revised to reflect inflation and time, as necessary.

f. **Expected annual average damage (AAD)**. The table below summarizes the selected AAD.

Damage Category	Event damage in US$ million
Structural damage	0.85
Contents/stock	0.96
Business loss	0.04
Power Outage	0.00
Pavement/Road damage	0.07
Traffic diversion	0.01
Total	**1.93**

8. Using the AAD, a discount rate of 12 percent, and an appraisal period of 50 years, the EIRR 45% and the NPV is US$14.6 million for an initial investment of US$4.5 million[13]. These figures attest to the sizable economic benefits that would result from engagement in this activity.

Activity	Initial Investment (US$ millions)	EIRR	NPV (US$ million)
St. Johns River	US$4.5	45%	US$14.6

Economic Rationale for Component 2

The economic rationale for disaster management and mitigation is based on the premise that improved recuperative capacity of the economy will lower any adverse longer-term impacts on the country's economic growth trajectory. The costs of natural disasters and other hazard events can be broken down into the opportunity cost of not being able to safeguard the population and their property, and the opportunity cost of lost economic activity, especially if damages to physical infrastructure cause prolonged disruptions in economic activity.

The island's mountainous topography results in 3% of the land area laying at sea level and, consequently, the sites of major towns and socio-economic centers. The dependence on limited coastal land space leaves the country's economic centers exposed to inundation, erosion, storm surges and landslides. Losses from landslides and flooding occur on an annual basis. Measuring benefits to losses averted from such events cannot be accurately completed, but they are assumed to be

[13] In-depth analysis was conducted by Halcrow Group Limited under the Project. All assumptions are based on their models and the calculations were revised to reflect inflation and time, as necessary.

significant. Given the nature of the data acquisition, analysis and modeling activities, it is difficult to quantify the potential project benefits and estimate the economic rate of return to project investments. First, these sub-projects have no revenue generating activities that can be used to quantify the benefits. Second, the sub-projects strengthen the capacity to analyze and assess hazard risk, which in itself is difficult to quantify. Thirdly, Grenada has significant data limitations on hazard and disaster losses, therefore estimating averted losses is challenging.

Data collection and analysis investments within the project aim to strengthen Government capacity to monitor and understand hazard and climate risks and use that information as a basis for more informed decision-making in terms of disaster management and climate resiliency. The data developed provide a scientific foundation for developing engineering designs, conducting trade-off analysis needed in planning processes and addressing landslide management, coastal flooding and other recurrent risk exposures currently endured by the country. Institutional strengthening and investments in hazard risk assessment capacity would be made to avoid further indirect losses by enhancing Government response prior to and following major events.