Document of
The World Bank

Report No: 61372-ST

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT FROM THE

GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF USD 4.1 MILLION

TO THE

DEMOCRATIC REPUBLIC OF SÃO TOMÉ AND PRÍNCIPE

FOR AN

ADAPTATION TO CLIMATE CHANGE PROJECT

MAY 2, 2011

DEMOCRATIC REPUBLIC OF SÃO TOMÉ E PRÍNCIPE

CURRENCY EQUIVALENTS

(Exchange Rate Effective February 28, 2011)

Currency Unit	=	Dobra
17,740 Dobras	=	US$1
1 US$	=	17,740 Dobras

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

A2	Special Report on Emissions Scenario Storyline A2 (heterogeneous world, continuous increasing population, slow and fragmented economic growth)
AAP	Africa Adaptation Program
AFTEN	Environmental and Natural Resources Sector Unit, Africa Region
AFTFM	Financial Management Unit, Africa Region
AFTPC	Procurement Unit, Africa Region
AFCS3	Africa Country Management Unit for Zambia, Zimbabwe and Malawi
B1	Special Report on Emissions Scenario Storyline B1 (convergent world, population peaking at mid-century, global solutions to environmental and social sustainability)
BP	Bank Procedure
C (in text)	Degrees Celsius
C (in ORAF)	Completed
CONPREC	Council for the Prevention and Response to Disasters
CQS	Selection based on Consultants' Qualifications
DELTARES	Dutch based research institute and specialist consultancy group
DG	Directorate General
DGE	Directorate General of Environment
DRM	Disaster Risk Management
DPL	Development Policy Loan
EDF	European Development Fund
EMP	Environmental Management Plan
ESMF	Environmental and Social Management Framework
ETCCDMI	Expert Team on Climate Change Detection and Indeces (Climate Change Indeces)
FMS	Financial Management System
GCM	Global Circulation Model
GEF	Global Environmental Facility
GNI	Gross National Income
GFDRR	Global Facility for Disaster Reduction and Recovery
GPS	Global Positioning System
GSM	Global System for (Mobile) Communications
hPa	Hectopascals (unit of meteorological barometric pressure)
IA	Implementation Agency
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
ICR	Implementation Completion Report
ICS	Individual Consultant Selection
ICT	Information, Communications and Technology

IDA	International Development Association
IFMIS/SAFE	Integrated Financial Management Information System (Safe)
IFR	Interim Financial Report
ILO	International Labor Organization
INM	National Institute of Meteorology of São Tomé and Príncipe
IMAP	Maritime and Harbor Institute of São Tomé and Príncipe
INAE	National Roads Institute of São Tomé and Príncipe
IA	Implementation Agen
ISA	International Standards on Audit
ISN	Interim Strategy Note
LDC	Least Developed Country
LDCF	Least Developed Country Fund
LEGAF	Legal Department, Africa Region
MARAPA	Mar, Ambiente e Pesca Artesanal
M&E	Monitoring and Evaluation
M-I	Low Likelihood, High Impact Risk
M-L	High Likelihood, Low Impact Risk
MFIC	Ministry of Finance and International Cooperation
MPWNR	Ministry of Public Works and Natural Resources of São Tomé and Príncipe
MTR	Mid-Term Review
N/A	Not Applicable
NAPA	National Adaptation Action Plan
NCB	National Competitive Bidding
NCEP-II	National Centers for Environmental Prediction Reanalysis II Model
NYD	Not Yet Due
OP	Operational Policy
ORAF	Operational Risk Assessment Framework
PCU	Project Coordination Unit
QBS	Quality Based Selection
QCBS	Quality and Cost Based Selection
RPF	Resettlement Policy Framework
SAR	Search and Rescue
SIDS	Small Island Developing State
SSS	Single Source Selection
STARDEX	European Statistical and Regional Downscaling of Extremes Project
STP	São Tome and Principe
SW	Staff Weeks
TOR	Terms of Reference
TTL	Task Team Leader
UNDP	United Nations Development Program
UNESCO-IHE	Institute for Water Education (Netherlands)
UNFCCC	United Nations Framework Convention for Climate Change
USD	United States Dollar
WB	World Bank

Regional Vice President:	Obiageli Katryn Ezekwesili
Acting Country Director:	Olivier P. Godron
Sector Director:	Jamal Saghir
Sector Manager:	Idah Z. Pswarayi-Riddihough
Task Team Leader:	Sofia U. Bettencourt

Contents

PAD DATA SHEET

S. TOMÉ AND PRÍNCIPE
ADAPTATION TO CLIMATE CHANGE PROJECT

PROJECT APPRAISAL DOCUMENT
Africa Region
Environmental and Natural Resources Sector Unit

Date: May 2, 2011 **Acting Country Director:** Olivier P. Godron **Sector Director:** Jamal Saghir **Sector Manager:** Idah Z. Pswarayi-Riddihough **Team Leader(s):** Sofia Bettencourt **Project ID:** P111669 **Lending Instrument:** Specific Investment Loan	**Sector(s):** General Agriculture, Fishing, and Forestry Sector (20%); Flood Protection (80%) **Theme(s):** Climate Change (100%) **EA Category:** B (Partial Assessment)

Project Financing Data:

Proposed terms:

[ ] Loan [ ] Credit [X] Grant [ ] Guarantee [ ] Other:

Source	Total Amount (US$M)
Total Project Cost[1]:	**4.1**
Total Bank Financing:	
GEF	4.1

Borrower: Democratic Republic of São Tomé and Príncipe

Responsible Agency: Directorate General of Environment, Ministry of Public Works and Natural Resources
Contact Person: Mr. Arlindo de Ceita Carvalho, Director General of Environment
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Estimated Disbursements (Bank FY/US$ m)

FY	12	13	14	15	16	17
Annual	0.5	1.5	0.9	0.5	0.4	0.3
Cumulative	0.5	2.0	2.9	3.4	3.8	4.1

[1] In addition, the project will be complemented by parallel baseline financing of US$13.2 million. This financing, which in the GEF/CEO submission is designated as "co-financing" is implemented through separate projects. It supports the baseline and development costs complementary to the GEF alternative. See Annex 7 for further details.

Project Implementation Period: 5.5 Years Start: May 26, 2011 End: December 31, 2016 Expected effectiveness date: June 15, 2011 Expected closing date: December 31, 2016	
Does the project depart from the CAS in content or other significant respects?	○ Yes ● No
If yes, please explain:	
Does the project require any exceptions from Bank policies? Have these been approved/endorsed (as appropriate by Bank management? Is approval for any policy exception sought from the Board?	○ Yes ● No ○ Yes ○ No N/A ○ Yes ● No
If yes, please explain:	
Does the project meet the Regional criteria for readiness for implementation?	● Yes ○ No
If no, please explain:	
Project Development objective *To increase the adaptive capacity of vulnerable coastal communities in São Tomé and Príncipe to the adverse impacts of climate variability and change*	
Project description ***Component 1. Coastal Early Warning System and Safety at Sea.*** *This component will help artisanal fishers adapt to the adverse impacts of climate variability and change by establishing an early warning system to disseminate timely forecasts prior to extreme events, distributing safety equipment and training on safety at sea, and reinforcing community emergency preparedness.* ***Component 2. Coastal Protection for Vulnerable Communities.*** *This component will address coastal erosion and inundation by piloting participatory adaptation measures in vulnerable coastal communities, and develop public awareness and improved coastal resilient policies.* ***Component 3. Project Management.*** *This component will support project implementation.*	
Safeguard policies triggered?	
Environmental Assessment (OP/BP 4.01)	● Yes ○ No
Natural Habitats (OP/BP 4.04)	● Yes ○ No
Forests (OP/BP 4.36)	○ Yes ● No
Pest Management (OP 4.09)	○ Yes ● No
Physical Cultural Resources (OP/BP 4.11)	○ Yes ● No
Indigenous Peoples (OP/BP 4.10)	○ Yes ● No
Involuntary Resettlement (OP/BP 4.12)	● Yes ○ No
Safety of Dams (OP/BP 4.37)	○ Yes ● No
Projects on International Waters (OP/BP 7.50)	○ Yes ● No
Projects in Disputed Areas (OP/BP 7.60)	○ Yes ●No

Conditions and Legal Covenants:		
Financing Agreement Reference	*Description of Condition/Covenant*	*Date Due*
1.Section 4.01 of the FA	**Conditions of Effectiveness:** (a) The Recipient has hired a procurement specialist and an accountant for the Project Coordinating Unit (PCU) with qualifications and experience, and pursuant to terms of reference, satisfactory to the World Bank, in accordance with the provisions of Section III of Schedule 2 to this Agreement. (b) The Operational Manual has been issued and adopted by the Recipient, and approved by the World Bank.	Before effectiveness of the Grant
2. Section I.A of Schedule 2 to the FA	**Institutional Arrangements:** (a) The Recipient shall establish and thereafter maintain the PCU at MPWNR with a structure, equipment, functions and responsibilities acceptable to the World Bank; (b) The Recipient shall ensure that the PCU is headed by a Project coordinator and staffed with an accountant, a procurement specialist; and professional and administrative staff, hired with terms of reference, through competitive processes, in numbers and with qualifications and experience acceptable to the World Bank.	
3. Section I.B. of Schedule 2 to the FA	**Implementation Arrangements:** (a) The Recipient shall carry out the Project in accordance with an Operational Manual in form and substance acceptable to the World Bank (b) Except as the Recipient and the World Bank may otherwise agree in writing, the Recipient shall not abrogate, amend, repeal, suspend, waive or otherwise fail to enforce the Operational Manual or provisions thereof.	
4.Section I.D. of Schedule 2 to the FA	**Social and Environmental Safeguards:** The Recipient shall: (a) Prior to implementation of Parts A.1 (a) and B.2 of the Project, provide satisfactory evidence to the World Bank that (i) it complied with the provisions of the RPF; and (ii) complied with the environmental mitigation, monitoring, institutional strengthening other environmental protection measures set forth in the ESMF. (b) When applicable, the Recipient shall prepare and implement Resettlement Action Plans in accordance with the RPF, in form and substance acceptable to the World Bank	

4. Section I.D. of Schedule 2 to the FA (Cont'd)	**Social and Environmental Safeguards (Cont'd):** The Recipient shall: 5. When applicable, the Recipient shall prepare and implement Environmental Management Plans in accordance with the ESMF, in form and substance acceptable to the World Bank 6. Furnish to the World Bank any revisions proposed for the RPF and/or ESMF in order to achieve their objectives and, thereafter, introduce such revisions into such frameworks as shall have been agreed with the World Bank 7. Except as the Recipient and the World Bank may otherwise agree in writing, the Recipient shall not abrogate, amend, repeal, suspend, waive, or fail to enforce the provisions of the ESMF and RPF.	
5.Section II.A.1 of Schedule 2 to the FA	**Project Monitoring, Reporting and Evaluation:** The Recipient shall monitor and evaluate the progress of the Project and prepare Project Reports, covering the period of one (1) calendar year, submitted to the Bank.	Not later than forty-five (45) days after the period covered by such report
6. Section II B.2 of Schedule 2 to the FA	**Financial Management, Financial Reports, Audits:** The Recipient shall ensure that interim un-audited financial reports for the Project covering the quarter, in form and substance satisfactory to the World Bank, are prepared and submitted	Not later than forty-five (45) days after the end of each calendar quarter
7. Section II B.3 of Schedule 2 to the FA	**Audits:** The Recipient shall have its Financial Statements audited in accordance with the provisions of Section 2.07(b) of the Standard Conditions. Each audited Financial Statement shall cover the period of one (1) fiscal year of the Project Implementing Entity. Audited financial statements for each period shall be furnished to the World Bank	Not later than six (6) months after the end of the period.
8. Section IV.B.1 of Schedule 2 to the FA	**Retroactive Financing:** Notwithstanding the provisions of Part A of this Section, no withdrawal shall be made for payments made prior to the date of this Agreement, except that withdrawals up to an aggregate amount not to exceed ten thousand Dollars (US$10,000), equivalent may be made for payments made prior to this date but on or after April 1, 2011 for Eligible Expenditures under the Project.	
9. Section V of Schedule 2 to the FA	**Other Undertakings:** The Recipient shall, not later than four months after the Effective Date, hire the Project auditors, with qualifications and experience, and pursuant to terms of reference, satisfactory to the World Bank, in accordance with the provisions of Section III of Schedule 2 to this Agreement.	No later than four months after the date of Effectiveness

I. STRATEGIC CONTEXT

A. Country Context

1. The Democratic Republic of São Tome and Príncipe (STP) is a small island developing state (SIDS) with a fragile economy and high vulnerability to exogenous shocks. An archipelago comprising two main islands and four islets located in the Gulf of Guinea 350 km off the west coast of Africa, STP remains one of Africa's most isolated nations, with a surface area of just 1,001 sq km, and a population estimated at 163,000 in 2010.

2. The country's small size and insularity, poverty, limited institutional capacity, and aid dependency offer little flexibility for adaptation and few opportunities for risk diversification. Based on the last available survey, poverty rates are estimated at 57 percent, of which 28 percent live in extreme poverty. This figure rises to 65 percent for the rural population—such as the Angolares artisanal fishers—who are also the most exposed to the effects of climate change. These factors, combined with its Least Developed Country and SIDS status, make STP highly vulnerable to the effects of climate change, variability and sea level rise.

3. Despite these constraints and past political instability, successive Governments have consolidated macroeconomic stability, and followed policies in accordance with the 2003 Poverty Reduction Strategy Paper. This has permitted STP to achieve a 4.3 percent growth in Real Domestic Product over the past decade (largely due to services), and make steady progress on governance. It now ranks 101 out of 178 in Transparency International's list.

B. Sectoral and Institutional Context

4. STP's First National Communication to the United Nations Framework for Climate Change Convention (UNFCC) forecasts increases in temperature of up to 2º C by 2100 coupled with a decrease in average precipitation of about 15 percent. Subsequent studies carried out as a background to this project[2] predicted an increase in average temperature of 1-2 ºC by mid-century, a decline in wet season rainfall during March-May and heavier rainfall during September-November. They also found a general trend towards increasing aerosol concentration, stronger northeast winds, and precipitation during the December-February season, consistent with empirical reports that STP is experiencing longer dry seasons, increased flooding events, and that the fog season (*mini Gravana*, during December to February) has intensified since the 1980s. This is also the season where fishers experience the highest mortality at sea.

5. In 2007, STP released its National Adaptation Program of Action (NAPA) which identified 22 urgent and immediate climate change adaptation priorities. The purpose of STP's NAPA was to promote priority adaptations in the fisheries, agriculture, forestry, infrastructure, civil protection, health, and energy and water sectors, amongst others, to respond to the urgent and immediate needs of the most vulnerable groups (e.g., artisanal fishers, farmers and women). For coastal areas, the NAPA identified a series of structural and soft adaptation measures, including wave breakers, population retreat, dikes, beach rehabilitation and revegetation, sand dredging, a stronger early warning system, and reinforced monitoring. It also stressed the need for a National Disaster Contingency Plan. Based on the NAPA, the Government of STP

[2] See Annex 8.

established a National Adaptation to Climate Change Program with the goal of *increasing the adaptive capacity of its population to reduce their vulnerability to the adverse impacts of climate variability and change*. This national program has four major pillars, which directly support the NAPA:

(a) *Land-Based Adaptation in Vulnerable Areas* – funded currently under a Japan Africa Adaptation Project administered by the United Nations Development Program (UNDP).

(b) *Coastal Adaptation for Vulnerable Communities* – the focus of the present project.

(c) *Strengthened Adaptation Capacity* – funded by the Japan/UNDP Project for inland areas, and the present project, for coastal areas.

(d) *Program Management*

6. Artisanal fishers and coastal communities are particularly vulnerable to the changing climate. With nearly 20 percent of the nation's workforce employed in artisanal fisheries (about 2,000 people directly and an additional 18,000 indirectly), they encompass the poorest and most exposed segment of STP's population, and occupy its lowest professional status. Some 70 percent of the 1,440 fishing vessels are small dugout canoes (3-4 meters) using paddles, sails, and traditional gears (lines and nets). Only 270 canoes are motorized and made of fiberglass. As artisanal fishers navigate either by visual contact with land or by clouds at distances of 20 nautical miles from the shore and STP lacks a reliable early warning system, sudden squalls or dry fog result in increasing debilitating accidents and loss of life. The Meteorological Institute relies on a single functional meteorological station and regional models from Portugal and Brasil to compile 24-hour weather forecasts. Despite recent support from Portugal and the United States, STP's Coast Guard continues to face difficulties in search and rescue operations, particularly in locating inconspicuous dug-out canoes. As a result, STP has lost an average of 4.8 fishers per year at sea since 2006 – equivalent to 240 per 100,000 or three times the average reported by the International Labor Organization for fishing as an occupation. Consequently, the Government of São Tomé and Príncipe has given highest priority under the NAPA to the provision of navigation and safety equipment and strengthening of its early warning system.

7. In the past, most pressures on coastal areas were caused by a combination of natural and anthropogenic factors. This is being compounded by the effects of climate change and variability (see Annex 8 for further details). São Tomé Island rises abruptly from the seafloor, and is naturally vulnerable to flush flooding and coastal erosion. At the same time, socio-historical reasons have forced coastal communities to settle in marginal areas : during the colonial era (1500-1975), plantations claimed almost all arable land, and escaped slaves and other free communities settled in marginal lands of little or no interest to the plantations (frequently near river deltas). STP fishers, many known as Angolares, used to create temporary shelters along the coast (*Chadas*), returning home with the change of the seasons; gradually, these temporary settlements gave rise to more permanent communities. Coastal villages have recently become more diversified due to easier access to land and the growth of informal commerce, but have also become increasingly exposed to the effects of climate variability – in particular stronger river flooding and sea storms. When the two episodes coincide, the effects can be particularly devastating. Ribeira Afonso, for example, suffers from 23 flooding days per year on average.

8. Following extreme flood events in 2008-10, the Government of STP is investing seriously in short-term recovery measures and is looking for further international assistance to strengthen its climate resilience. It identified a source of deep-sea sand as a replacement to beach sand mining;[3] it established a new Council for the Prevention and Response to Disasters (CONPREC); it allocated US$1.3 million in budgetary resources for disaster contingency funds and another US$1.4 million for emergency coastal erosion works; and, with assistance from Taiwan, the African Union, Japan/UNDP, Taiwan, and own resources, it is upgrading its hydro-meteorological network. The Government is also building momentum towards integrated spatial planning, which would allow it to redirect the growth of vulnerable communities away from high risk areas (through incentives such as public infrastructure and redistribution of public land). Very importantly, the Government has adopted a new Fisheries Law, a Vessel Monitoring System, and is in the process of adopting a new Fisheries Regulation that will allow it to delineate exclusive fishing zones for artisanal fishers (3 in S. Tome and 1 in Principe), as well as create marine sanctuaries. These fisheries management measures are expected to be important complementary long-term measures to the safety at sea system, as over-exploitation of nearshore resources is one of the key factors motivating artisanal fishers to venture further offshore.

9. While further data may be needed before firm conclusions can be drawn about climate patterns, particularly in respect to rainfall signals and fog and wind trends, there is a reasonable amount of evidence that the country is already facing mounting pressure from both shifting climate patterns and growing anthropogenic effects—and that São Tomé and Príncipe is ready to act now to increase its resilience and prepare itself to handle future climate change impacts.

C. Higher Level Objectives to which the Project Contributes

10. The proposed project is fully consistent with the Government's new Poverty Reduction Support Program (2011-2015), which will supports, amongst others, the Reinforcement of Social Cohesion and Promotion of Integrated Human Development. One of the key priorities under this pillar is the Conservation of Natural Patrimony and Reinforcement of Mechanisms of Adaptation and Mitigation to Climate Change.

11. The proposed project is also consistent with São Tomé and Príncipe new Interim Strategy Note (ISN) for FY2011-2012. The ISN proposes a selective and targeted support program with the key objective of eliminating constraints to growth, based on two key pillars: (I) Acceleration of Sustainable and Broad-Based Economic Growth; and (II) Strengthened Governance, Public Institutions, and Human Capital. Pillar II, in particular, seeks to respond to the challenges of increasing employment and reducing poverty, by focusing on, amongst others, strengthening environmental protection and resilience to climate change to benefit the poor. It specifically identifies the challenges faced by artisanal fishers and coastal communities, including coastal erosion, flooding and safety at sea, which are the focus of the current project.

[3] This operation was halted temporarily in 2010 as the sand extracted from the deep sea bed had been exhausted. The Government is now auctioning off the rights of extraction and expects to restart operations within 2011. For the moment, thus, the problem of sand mining continues.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

12. The project's development objective is *to increase the adaptive capacity of vulnerable coastal communities in São Tomé and Príncipe to the adverse impacts of climate variability and change.*

B. Project Beneficiaries

13. The number of direct project beneficiaries is estimated at 8,300, including 75 percent of the active artisanal fishing population of STP (benefiting from the early warning system), 25 percent of the fishers (benefiting directly from safety at sea training), and 76 percent of the population on pilot coastal communities. An estimated 70 percent of the active population of STP (ages 15-65), or 63,500 people, will benefit indirectly from improved meteorological and early warning system (see Table 1 below).

Table 1. Estimated Project Beneficiaries

Components	*Proportion*	*Population*	*Total*
DIRECT BENEFICIARIES			
1. Coastal Early Warning and Safety at Sea			
1.1 Early Warning System	75% of artisanal fishers	1,500	**8,323**[2]
1.2 Improved Safety at Sea	25% of artisanal fishers	485	
2. Coastal Protection for Vulnerable Communities	76% population pilot communities[1]	6,823	
INDIRECT BENEFICIARIES			
1. Coastal Early Warning and Safety at Sea			
1.1 Early Warning System	70% of active population (age 15-65)	63,576	**63,576**
1.2 Improved Safety at Sea	100% fishers in trained communities (22)	1,539	
2. Coastal Protection for Vulnerable Communities	100% of target coastal communities (4)	8,228	

Notes : [1/] *Estimated population of the four pilot communities directly affected by flooding.*
[2/] *Direct beneficiaries from pilot communities + artisanal fishers – number of fishers in pilot communities.*

C. PDO Level Results Indicators

14. Achievement of the development objective will be assessed through the proportion of artisanal fishers with access to 12-hour weather forecasts during the fog/storm season; those using essential safety at sea equipment; and the average number of flooded days per event per year in target coastal villages, following the conclusion of project interventions (see Annex 1).

III. PROJECT DESCRIPTION

A. Project components

15. The project has three components, as summarized below and described in further detail in Annex 2.

- ***Component 1. Coastal Early Warning and Safety at Sea***. This component will address Priorities 1, 2 and 15 of the NAPA:[4]

  (a) *Establishment of an early warning system* for coastal communities and near-shore fisheries. This will include (i) acquisition and installation of early warning system equipment; and (ii) strengthening interagency coordination and capacity to produce coastal weather forecasts and provide early warnings.

  (b) *Improvement of safety at sea* for artisanal fishers to include (i) acquiring and installing safety, search and rescue, and communications equipment; (ii) providing safety at sea training (to about 485 artisanal fishers); (iii) improving the availability and utilization of safety at sea equipment, including distribution of essential equipment to trained fishers; (iv) community outreach and disaster preparedness and response training for (about 12) highly vulnerable coastal fishing communities; and (v) technical assistance.

- **Component 2**. ***Coastal Protection for Vulnerable Communities.*** This component will address Priorities 3, 9 and 10 of the NAPA,[5] and have the following sub-components:

  (a) *Community Preparedness*, to include (i) participatory climate-resilient development plans; and (ii) studies and engineering design for flood-and landfall reduction measures in about 4 pilot communities (expected to include Ribeira Afonso, Santa Catarina, and Malanza in São Tomé and Sundy in Príncipe).

  (b) *Coastal Protection for Vulnerable Communities* to finance the implementation of (i) urgent medium-scale coastal adaptation activities; and (ii) building commitment and awareness towards climate resilience through the promotion of small-scale, community-based adaptation activities in the above four pilot communities.

  (c) *Promotion of Coastal Resilience*, to fund (i) exchange and dissemination of lessons learned; and (ii) developing a climate-resilient coastal spatial planning and resource management policy.

- **Project Management**, to support project implementation, monitoring, and evaluation, and incremental operating costs.

[4] Priority 1 is "*Provision of Training and Equipment for Artisanal Fishermen"*. Priority 2 is "*Establishing a System for Climate Alert*". Priority 15 is "*Reinforcement of Human Technical Capacity of National Civil Protection and Fire Brigade*" - presently linked to CONPREC.

[5] Priority 3 is *Communication action for behavioral change*; Priority 9 is *Relocation of local communities (Malanza, Sta. Catarina, and Sundy) at risk from floods and landfalls*; Priority 10 is *Construction of shelters and parks for artisanal canoes.*

B. Project Financing

Lending Instrument

16. The project will be financed through a US$4.1 million Grant from the Global Environmental Facility (GEF) Least Developed Grant Fund (LDCF) Trust Fund.

Project Financing Table

17. The total GEF LDCF financing requirements as shown on Table 1 are estimated at US$4.1 million, inclusive of physical and price contingencies and taxes (estimated at US$0.3 million).

Table 1. Project Costs by Component and Use of Financing (US$ Million)

	BASE COSTS (US$ million)			%	TOTALCOSTS
	Local	Foreign	Total	Foreign Exchange	(US$ million)
A. Component 1. Coastal Early Warning and Safety at Sea					
1. Coastal Early Warning System	0.1	1.1	1.2	93	1.4
2. Safety at Sea for Artisanal Fishers	0.2	0.2	0.4	55	0.5
Subtotal Component 1. Coastal Early Warning and Safety at Sea	*0.3*	*1.3*	*1.6*	*84*	1.9
B. Component 2. Coastal Protection for Vulnerable Communities					
1. Community Preparedness	0.2	0.1	0.3	45	0.4
2. Coastal Protection for Vulnerable Communities	0.8	0.2	1.0	20	1.3
3. Coastal Policy	0.0	0.1	0.1	53	0.1
Subtotal Component 2. Coastal Protection for Vulnerable Communities	*1.0*	*0.4*	*1.4*	*28*	1.8
C. Component 3. Project Management	0.3	0.0	0.3	21	0.4
Subtotal Base Costs	*1.6*	*1.7*	*3.3*	*54*	
Physical Contingencies	0.2	0.2	0.4	49	
Price Contingencies	0.2	0.2	0.4	32	
Total Project Costs	**2.0**	**2.1**	**4.1**	**51**	4.1
of which Taxes			*0.3*		

18. The project will be complemented by parallel baseline financing of US$13.2 million, which is detailed in the Additional Financing Analysis Annex (Annex 7). This financing, which is implemented through separate projects, supports the baseline and development costs complementary to the GEF alternative.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

19. The Ministry of Public Works and Natural Resources (MPWNR) under its Directorate General of Environment (DGE), will be the executing agency and take overall responsibility for the project. MPWNR/DGE already has experience executing the Project Preparation Grant and is also the overall agency responsible for the National Adaptation Program (under which the Japan Adaptation Project operates). To accommodate the expansion of its responsibilities, DGE will create a small Project Coordination Unit (PCU), consisting of the project's procurement specialist, an accountant, and technical specialists and a Government-designated project coordinator. The PCU will act as the Project's Secretariat and be responsible for all procurement, financial management, reporting, and day-to-day monitoring, reporting directly to the Director General of Environment. The PCU's fiduciary staff will be contracted prior to project's effectiveness. The technical advisor hired under the Coastal Protection component will also take the overall functions of advisor to the project coordinator and Director General of Environment. The Project's Preparation Manual (which includes Procurement and Financial Management Arrangements) is being modified to serve as the Operational Manual, and will be ready prior to effectiveness.

20. To monitor and coordinate project activities with others under the National Adaptation Program, MPWNR/DGE will rely on inter-sectoral mechanisms supported by already existing legislation to facilitate coordination among all the entities involved in project implementation: at the highest level, the National Sustainable Development Committee chaired by the Minister Secretary General of the Government will formally oversee program implementation. At the technical level, the Director General of Environment will convene quarterly review meetings with the Climate Change Technical Committee and the Disaster Management Technical Committee (under CONPREC), to whom the PCU will report and seek periodic operational support. This will ensure the coherence of project activities with other complementary actions of the Government.

21. MPWNR/DGE will also be responsible for involving Government agencies, according to their mandate, on the implementation of project components. For the training of safety at sea (Component 1.b.ii) and community-based adaptation works (Component 2.b.ii), qualified local Non-Governmental Organizations will be engaged. This is detailed further in Annex 3.

B. Results Monitoring and Evaluation

22. The baseline monitoring data indicates that the CONPREC platform has a reasonable capacity to collect casualty and damage information, although the reliability of the records needs strengthening. Mechanisms to improve the records' reliability are built into the project design (see Annex 3). Intermediary results indicators are, for the most cases, baseline independent. They will be assembled by the PCU and incorporated into annual progress reports, to be presented to the Bank and to the National Committees.

C. Sustainability

23. Project sustainability will ultimately depend on the Government's ability to sustain the early warning system and its search and rescue operations, and periodic repair and maintenance of coastal erosion and flood prevention infrastructure. Both have been problematic in the past, but there are indications that this is changing. With CONPREC's establishment, the Government has created a new disaster contingency fund of US$1.37 million in 2011 (funded by contributions from Taiwan and Equatorial Guinea), and has given assurances that this will include adequate provisions for search and rescue operations and the operation of a free emergency line. This will be reflected in the minutes of negotiations. The Government has also shown its commitment to improved meteorological services and to flood control by allocating substantial own resources (US$1.44 million) to these items, in addition to annual decentralized capital expenditures to the development of the pilot communities estimated at about US$0.14 million/year. In addition to the Government's contribution, the project has a significant baseline of activities which are providing complimentary support and will help ensure strong impacts on the ground over the long term (see Annex 7). They include (a) US$8.8 million equivalent by the European Development Fund (EDF, through the European Commission), for coastal erosion control which has had some significant success in promoting Interest Groups for Road Maintenance (based largely on paid women's labor). This model will be promoted further, funded partially by the district-level budgets as well as by the project; (b) US$400,000 from the Japan Africa Adaptation Program (through the United Nations Development Program, UNDP), which contributes substantially to the Government's National Adaptation Program; and (c) US$650,000 from the International Development Association (IDA) for the Central African Backbone Project – Phase II, which is expected to halve the telecommunication costs in STP and therefore help sustain the early warning system.

24. An important factor towards sustainability will be incentives – improving fisheries management in coastal areas (thereby decreasing fishers' motivation to venture offshore); developing cost-effective alternatives to sand mining; and strengthening coastal service infrastructure inland to attract people away from high risk coastal areas. CONPREC and district Governments are currently actively discussing these activities, and whilst budget and LDCF eligibility may prevent the project from funding them directly, it will provide an enabling framework under which they will be promoted.

25. An essential item of the early warning system is a Doppler (weather) radar. To ensure its sustainability and maintenance, the radar will be purchased with guaranteed installation, maintenance and spare parts for a period of 5 years.

V. KEY RISKS

26. The project is technically simple and phased, adjusted to the implementation capacity of the Government. At the same time, it is relatively large for STP and has risks which, if not mitigated, could potentially have significant to high impact. These risks, summarized in the Operational Risk Assessment Framework (Annex 4) are mostly tied to implementation and will be addressed through technical assistance and continuous implementation support. The overall risks are therefore rated as M-I (Low Likelihood, High Impact).

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

27. The anticipated benefits of the proposed project are lives and livelihoods saved. Whilst an economic analysis was carried out for the second component (Coastal Protection of Vulnerable Communities), it was not carried out for the first component (Coastal Early Warning and Safety at Sea) due to the inherent uncertainties and difficulties in estimating, and controversy related to, the value of human lives. However, the benefits are likely to be substantial. As mentioned before, current rates of casualties at sea - 4.8 per year for a total population of 2,000 fishers, or 240 per 100,000 - are three times as high as reported ILO's international average for capture fisheries (80 per 100,000), and nearly twice the rate of Australia's (143/100,000). In 2010 alone, STP lost 12 fishers at sea (7.5 times the international average). The socio-economic impact on dependents left behind is even more severe if one considers that casualties are concentrated on a few fishing communities: in Ribeira Afonso and Santa Catarina, for example, 1 in 20 families have lost members at sea.

28. There are three main causes of losses at sea: engine failure, causing canoes to drift out of land sight; loss of land navigational references due to fog and/or storms; and accidents with larger vessels at night (due to lack of lights and use of radar reflectors). The high concentration of casualties during the month of March – coinciding with the mini-Gravana season – suggests that an early warning and safety at sea system could, over the long term, save a significant number of lives. This is corroborated by the experience of the Pacific Islands where the introduction of safety at sea programs (particularly when implemented in conjunction with coastal fisheries management) brought about noticeable results – in Samoa casualty rates dropped from 850/100,000 to nearly zero in 6 years, following the introduction of strict regulations requiring artisanal canoes to carry standard life-saving equipment.

29. For the analysis of the second component – Coastal Protection of Vulnerable Communities – the project team first considered the cost-benefit of *retreat* (relocation of communities) versus *protection.* Given the relatively small size of the villages' population, relocation appeared initially the most cost-effective option. However, it was rejected due to its profound socio-cultural impacts as well as sustainability concerns (as households would likely relocate again in areas at risk). Instead, the project chose a protection strategy, accompanied by long-term incentives in the form of a gradual spatial relocation of centers of economic activity.

30. The adaptation investments, when aggregated across the four pilot communities, have an estimated economic internal rate of return of 15 percent, assuming that the combined interventions will conservatively reduce the number of flood days (on average) by two-thirds (Table 2). It was not possible to separate the effects of individual adaptation activities as in all pilot communities, several concurrent interventions will be needed to control flooding. The economic analysis was performed by taking into account a 10-year average life span for flood-reduction structures, a 10 percent annual maintenance cost, and reported losses of livelihoods during flood days. Other benefits of flood control – such as health benefits, and general damages averted – were not taken into account, and hence the benefits are considered to be under-estimated. The investments are sensitive to increases in maintenance costs and reduction in

flood control benefits, and these aspects will need to be particularly controlled during engineering design. Since this is not a revenue generating project, a separate financial analysis was not carried out. Further details of the economic analysis are available on project files. As required by GEF projects, an Additional Cost Analysis was also carried out (see Annex 7).

Table 2. Summary of Economic Analysis for Component 2. Coastal Protection for Vulnerable Communities

Scenarios		*ERR (%)*	*NPV (US$)*
Base Scenario:	*Impact on Flood Reduction 66%, maintenance costs 10%*	*15%*	*287,526*
Scenario 1.	Impact on Flood Reduction 75%	20%	578,747
Scenario 2.	Impact on Flood Reduction 50%	-1%	(545,680)
Scenario 3.	Maintenance costs increase to 20% a year	5%	(264,407)
Scenario 4.	Benefits include also savings in periodic house raising due to floods	20%	535,966
Scenario 5.	As for Scenario 4, with Impact on Flood Reduction 75%	25%	827,187
Scenario 6.	As for Scenario 4, with Impact on Flood Reduction 50%	4%	(297,239)
Scenario 7.	As for Scenario 4, with maintenance costs increased to 20% a year	10%	(15,966)

B. Technical

31. The Bank team appraised the various studies carried out during project preparation and found them to be sound and in conformity with international experiences in coastal adaptation, particularly in SIDS (see Project Files and Annex 8):

- *Climate change trends*, as reported empirically in the NAPA, were analyzed with further scientific rigour based on historical daily rainfall and temperature data for 1990-2010, and forecasted for 2040-60 using 15 Global Circulation Models (GCM). This analysis also studied preliminary decadal changes in winds, geopotential height, sea surface temperature, aerosols, and North Atlantic Oscillation. The results are summarized on Annex 8.
- *Geographical, economic and social context.* This important analysis (see Annex 8) stressed the failure of past unisectoral and uncoordinated development programs in STP, and suggested that integrated spatial planning (using an island-system approach) and coordinated public investments stimulating town growth away from marginal lands could, over the long term, offer important incentives to diminish the vulnerability of coastal populations. These lessons were incorporated into project design.
- *Selection of Pilot Communities.* The pilot communities for Component 2 were selected based on the NAPA, and further refined by the NAPA team based on a multi-criteria analysis which included physical and social vulnerability, expected impact, and sustainability (see Annex 8). Background information was further refined through CONPREC field visits. These reports were examined by the Bank team and found to be sound.
- *Technical Design of the Safety at Sea and Early Warning System.* The design of this component was based on best international experience in SIDS coastal fisheries, as well as emerging experience on the use of radar reflectors, mobile phones, and basic navigation

equipment amongst coastal fishers in STP. The Bank team discussed the design with local and international experts and found it to be sound.

- *Technical Design of the Coastal Protection for Vulnerable Communities Component.* The design of the second component is based on a geomorphology and participatory vulnerability mapping study that is being completed by UNESCO-IHE and DELTARES. The Bank team examined its preliminary conclusions, and visited urgent remedial works completed by the Government in similar locations. The indicative investments are considered sound. Given the scale of river flooding and the coast's geomorphology, it was concluded that "soft" adaptation solutions such as ecosystem-based adaptation would not be sufficient and that structural measures - embankments, revetments and improved drainage – will also be necessary (see Annex 2).

C. Financial Management

32. The Bank team carried out a financial management assessment of DGE under the Ministry of Public Works and Natural Resources. It concluded that the proposed financial management arrangements as summarized in Annex 3 meet the minimum requirements for financial management under OP/BP 10.02.

33. The main capacity constraints of DGE are the lack an accounting information system to prepare the project accounts, and lack of qualified and experienced accounting staff – even though DGE has prepared the project adequately, implementation will require more complex accounting. As a result, the Government has agreed to advertise the position of project accountant under terms of reference satisfactory to the Bank prior to negotiations. Effectiveness conditions will include the appointment of an experienced accountant staff and the finalization of the Project Operational Manual. While the DGE's present accounting system includes the use of Microsoft Project spreadsheets to maintain project preparation accounts, it was agreed that soon after effectiveness the PCU will acquire a professional accounting software and organize training thereof, as well as mobilize the project auditors. Upon implementation of the proposed measures, the residual financial management risk rating is M-I (Low Likelihood- High Impact).

D. Procurement

34. The procurement activities for the proposed project will be managed by the PCU within DGE and the Ministry of Public Works and Natural Resources. The PCU will need to be resourced with a qualified Procurement Specialist and technical specialists during project implementation. The Bank carried out an assessment of the current DGE team responsible for project preparation and concluded that it does not yet possess adequate experience and capacity to carry out the more complex procurement activities required by the implementation phase. As a result, the procurement risk at implementation is assessed as High. The following risk mitigation measures, however, have been agreed with the Government: (a) advertisement of a new experienced procurement specialist, under terms of reference satisfactory to the Bank, prior to negotiations; (b) update the Project Operational Manual to incorporate all procurement information relevant to the project and record keeping procedures; and, by effectiveness (c) appoint a qualified procurement specialist. The procurement plan was received by the Bank and

approved on April 25, 2011. It will be updated at least annually (or as required) to reflect project implementation needs.

E. Social

35. The project targets two vulnerable stakeholder groups : artisanal fishers, and coastal communities. Project interventions for artisanal fishers will provide more accurate and timely weather information and much needed safety equipment, so that fewer boats and fewer fishers are lost at sea. These interventions have no adverse impact on the artisanal fishing industry, neither on fishers (who are exclusively men) nor on fishmongers (who are almost entirely women). In fact, the interventions will marginally increase the fish catch – and thus local incomes –and greatly improve the life chances of fishers and their families, thus reducing the economic consequences of breadwinners lost at sea.

36. For historical reasons, coastal communities in STP settled in the most vulnerable areas of the islands, frequently near floodable river deltas. Their vulnerability to floods has increased in recent times due to climate variability and the permanency of the settlements. The proposed adaptation investments on the land (including beach and river revetments) will reduce the severity of the flooding impact on communities.

37. The project has been designed to limit the extent of involuntary resettlement to the fullest extent possible. The NAPA earlier contemplated relocating to higher ground entire neighborhoods that were regularly flooded by sea surges and/or river overflow. It was subsequently recognized that, while low-lying coastal neighborhoods are located in sub-optimal areas that flood periodically, many residents have managed to adapt to floods by raising their houses (although they continue to suffer important livelihood losses) and that relocating communities would be highly disruptive to their socio, cultural and economic patterns. For this reason, the project will provide protective seaside and riverside works, but leave communities in their present location. At the same time, as an urgent and immediate adaptation action, the project will support local land-use planning activities that identify and develop suitable residential areas for community expansion. The aim here will be to foster the development of "poles of attraction", new neighborhood areas that offer basic public facilities (e.g. school, market, utilities) eventually attracting residents towards lower risk areas. It is expected that, over time, people will opt to relocate on their own to these newer higher-ground areas. The project, however, will not support any forced relocation of families from low-lying neighborhoods.

38. The improved design notwithstanding, the project may require involuntary resettlement as some houses may have to be relocated and some land acquired for public purposes. This may occur under three potential situations: (a) houses fronting on the sea or the river may have to be relocated farther from the water if a protective wall is to be built or raised. There is also the possibility that houses near the river could be damaged during construction of protective works; (b) some houses or outlying structures may be built on or over strategic drains that are now no longer functional or that need to be built anew; and (c) construction of protective sheds for fishing boats will require land. Unoccupied State or community lands will be used for this

purpose wherever possible. However, it may be the case that in some localities, appropriate government land is not available for these facilities. For these reasons, the Government of STP has developed a Resettlement Policy Framework (RPF) to guide the development and implementation of any involuntary resettlement operation that may be required for project investments. In instances where no publicly appropriate land is available for the construction of sheds, for example, the Government would apply the RPF to ensure appropriate measures are in place during the purchase or transfer of private land. The RPF, dated March 23, 2011, was approved by AFTOS for disclosure on March 9, 2011, and was disclosed locally and in Infoshop on March 28 and 29, 2011, respectively.

F. Environment

39. The project is rated as Category B and triggers OP/BP 4.01, OP/BP 4.04, and OP/BP 4.12. Cultural property is not impacted by the project. Since the technical and engineering studies are not yet finalized, STP has prepared an Environmental and Social Management Framework (ESMF) identifying the likely environmental impacts and proposed mitigating measures.

40. Preliminary results of preparation studies, added to field inspections conducted during the preparation of the ESMF, reveal that works will generally be small to medium-scale and environmental impacts are likely to be short-term, site specific, non-sensitive or reversible, and that adequate mitigation measures can be designed to reduce the negative impacts.

41. Natural Habitats (OP/BP 4.04) is triggered because two of the pilot coastal communities (Malanza in São Tomé and Sundy in Príncipe) fall within the buffer zone of the Natural Parks of Ôbo of São Tomé and Príncipe. However, the Directorate General of Environment – who is responsible for providing environmental and social clearance to activities within the buffer zone – has provided assurances that the adaptation activities proposed are compatible with those allowed for the buffer areas. The ESMF includes an Environmental Management Plan (EMP) with environmental criteria and procedures for the evaluation of the activities and practical methods for determining impact during construction, taking into consideration STP's safeguards requirements for buffer areas. The EMP also includes a capacity building program to carry out the activities necessary to comply with the Bank's safeguard requirements. These are summarized further in Annex 3. The ESMF, dated March 22, 2011, was approved for disclosure by AFTOS on March 24, 2011, and was disclosed locally and on InfoShop on March 29, 2011.

Annex 1: Results Framework and Monitoring
São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT
Results Framework

Project Development Objective (PDO): The development objective of the proposed project is to increase the adaptive capacity of vulnerable coastal communities in São Tomé and Príncipe to the adverse impacts of climate variability and change.

PDO Level Results Indicators*	Core	Unit of Measure	Baseline (2006-2010)	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection
				YR 1	YR 2	YR3	YR 4	YR 5-10			
Long-Term Programmatic Indicator: Early warning and safety at sea system reduces disappearances at sea during extreme weather events	☐	# of Artisanal Fishers Officially Reported Lost at Sea due to extreme weather events (annual)	23 (4.8/year)	n.a	n.a	n.a	n.a	2/year[1]	Annual records, averaged over 5-years to smoothen inter-annual variability	Harbor Protection Records (Harbor Department)	Harbor Department
				YR1	**YR2**	**YR3**	**YR4**	**YR5**			
Indicator One: Early warning system disseminates timely warnings to artisanal fishers prior to fog/storm events	☒	At least 75% of fishers have access to 12-hour weather forecasts during fog/storm season	0%	n.a	n.a	50%	n.a	75%	Periodic project monitoring in pilot villages (MTR and ICR)	As above	CONPREC/ MARAPA/
Indicator Two: Essential safety at sea equipment used regularly by artisanal fishers	☒	% of Artisanal Canoes using mandatory[2] safety at sea equipment	0%	n.a	n.a.	30%	n.a	70%	MTR and ICR, complemented by annual Coast Guard monitoring data	Random survey of fishers in 22 coastal communities targeted by MARAPA	CONPREC/ MARAPA
Indicator Three: Coastal adaptation measures reduce flooding exposure of target communities (by reducing risk of flooding and/or increasing drainage)	☒	Average # of flooded days per flood event per year reduced by two-thirds 1.Ribeira Afonso 2. Malanza 3. Sta Catarina 4. Sundy	 5.5 3.5 1.5 3.0	 n.a n.a n.a na	 n.a n.a n.a n.a	 n.a n.a n.a n.a	 n.a n.a n.a n.a	 1.8 1.2 0.5 1.0	Annual records, averaged over a 2-3 year period following adoption of adaptation measures	CONPREC Local Committee records	CONPREC

[1] – This will not be a core project indicator due to factors influencing fatalities at sea which are beyond the control of the project, and may not be achievable within the life time of the project. However, it will be monitored and kept as a long-term national goal.

[2] – To be specified by legislation but expected to include at a minimum, a compass, bailer, portable flashlight, glass mirror, radar reflector and for canoes fishing at night, a lantern.

INTERMEDIATE RESULTS											
Intermediate Result (Component One): Coastal Early Warning and Safety at Sea System											
Intermediate Result indicator One: Emergency risk management committees established in high risk coastal villages	☒	No. of community risk management committees: S. Tome Principe	 1 0	 2 0	 3 1	 5 1	 7 2	 10 2	Annual records	Periodic field monitoring reports	CONPREC
Intermediate Result indicator Two: Artisanal fishers are trained on and have access to basic safety at sea equipment	☒	Training in safety at sea and basic equipment provided to 25% of the fleet: # of fishers trained # of safety at sea sets distributed	 0 0	 50 50	 200 200	 300 300	 485 485	 485 485	Upon delivery of training	Annual project monitoring records	MARAPA
Intermediate Result (Component Two): Coastal Protection for Vulnerable Communities											
Intermediate Result indicator One: Participatory vulnerability plans adopted for high-risk coastal villages	☒	No. of participatory vulnerability plans developed and adopted by pilot communities:	0	0	2	3	4	4	Annual records	Periodic field monitoring reports	PCU
Intermediate Result indicator Two: Sustainable coastal adaptation/protection measures implemented	☐	River flood protection works completed (m) Area of coast protected (m) Community-based adaptation activities implemented	0 500 0	0 500 1	600 1,000 3	1,200 1,500 6	2,000 1,800 8	2,000 1,800 10	Annual records	Contractors records and field monitoring	PCU
Intermediate Result indicator Three: Climate resilient coastal planning policy	☒	Draft policy developed , discussed with key stakeholders and presented for formal adoption	0	0	0	Draft	Final	(Adoption)	Annual records	Project monitoring reports	DGE

Annex 2: Detailed Project Description
São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT

1. The development objective of the proposed project is *to increase the adaptive capacity of vulnerable coastal communities in São Tomé and Príncipe to the adverse impacts of climate variability and change.*

2. At project completion, the following will have been achieved: (i) STP will have a functional weather and climate monitoring capacity, including an operational Early Warning System for coastal fishers transmitting reliable weather information on a 12-hour basis; (ii) safety at sea practices will have been introduced and adopted amongst a majority of the islands' artisanal fishermen (resulting, over the long term, in a reduction of loss of lives due to extreme weather events); (iii) coastal adaptation measures are put in place in highly vulnerable communities that reduce their exposure to climate risks while providing the STP government with a menu for future adaptation actions; and (iv) a process of climate resilient coastal spatial planning is initiated to steer future community development away from the most exposed coastal areas.

3. To this end the project investments are concentrated in two main investment components and one project management component as outlined in detail below. Both components contribute to a larger, multi-donor program that aims to increase the adaptive capacity of STP's population to the effects of climate change and climate variability by providing, *inter alia*, for strengthening hydro-meterological capacity, and coastal protection to increased river flooding, as well as to storm and coastal erosion. These investments are critical to allow STP to urgently address mounting loss of life and property due to increased climate hazards, while establishing a solid foundation to monitor, analyse, and respond to changing climate patterns and increased climate variability. Nonetheless, the activities included in the GEF LDCF project are self-contained and will, by themselves, enable the project to achieve its objectives.

4. The total project costs are estimated at US $ 4.1 million for supply of goods and equipment, civil works, technical assistance, training and workshops, and incremental operating costs. They include:

Component 1. *Coastal Early Warning and Safety at Sea*: (US$1.9 million)

5. This component will support the establishment of a functional early warning system, installation and distribution of safety equipment, training on safety at sea, and coastal emergency preparedness for artisanal fishers, in direct support to Priorities 1 and 2 of the National Adaptation Plan of Action (*Training and Equipment for Artisanal Fishermen* and *Early Warning Climate Alert System).* It also addresses NAPA Priority 15, *Reinforcement of Capacity of Civil Protection Agencies,* in order to strengthen STP's preparedness against extreme weather events.

6. In an environment of shifting seasonal patterns and increased strength of extreme weather events, introducing an early warning system and making safety equipment available to artisanal fishermen—neither of which are available in STP today—will fill a critical gap in the communities' capacity to adapt and survive changing climate conditions, when their traditional knowledge and navigation practices are no longer reliable. The component will further introduce

climate change considerations in the island's nascent coastal emergency preparedness practice. The LDCF project will fund, under this component:

(a) *Establishment of an early warning system* for coastal communities and near-shore fisheries (US $1.4 million), including:

(i) Creating national capacity to conduct real-time weather observations through the acquisition and installation of Coastal Early Warning System equipment, including a meteorological marine station, a Doppler weather radar, servers, computers, and data links as well as expanding the coverage of the existing STP Global System for Mobile Communication (GSM) to cover critical coastal gaps.[6]

(ii) Strengthening interagency coordination and capacity for producing, issuing, and disseminating 12 hour coastal weather forecasts and for providing early warning to coastal communities and fishermen, by:

1. Providing specialised training in marine meteorology and the preparation and dissemination of weather reports through multi-media channels to the National Institute of Meteorology, the Maritime Institute and Port Authority, and the media.

2. Operationalizing STP's Coastal Early Warning System, including the provision of an operation plan, protocol, and decree for its functioning and effective monitoring.

(b) *Improvement of safety at sea* (US $0.5 million), including:

(i) Acquiring and installing safety at sea and communication equipment, including simple compasses, emergency flares, waterproof mobile phone covers, life vests, radar reflectors, first aid kits, rain coats, lanterns, GPS devices, an emergency phone line, and computers.

(ii) Providing safety at sea training to about 485 artisanal fishermen in São Tomé and Príncipe.

(iii) Developing a system to improve the availability and utilization of the safety at sea equipment by artisanal fishermen, including distribution of essential equipment to trained fishers[7].

(iv) Providing community outreach and training in disaster preparedness and response to about 12 highly vulnerable coastal fishing communities (10 in São Tomé and two in Príncipe).

[6] Given budget limitations, the project will likely limit itself to an X-band storm Doppler radar, with a 150-250 km range (including installation, training, and maintenance and spare parts for 5 years). Should further financing be secured, the specifications could be upgraded during implementation. Early warning equipment will also include adding transceivers to existing antennas directed to the sea, and a micro-wave link from Neves to Santa Catarina, estimated at US$24,000.

[7] The project will provide, free of charge, essential life saving equipment to trained fishers, such as radar reflectors, first aid kit, compasses, cell phone protection bags, and emergency flares. Other non-essential equipment will be provided to trained fishers at 30 percent of imported price. The Government may decide, at its discretion, to continue to subsidize the importation of life saving equipment to stimulate its adoption.

(v) Providing specialized technical assistance to the Department of Fisheries and the Coast Guard for the establishment of a regulatory and monitoring system for safety at sea incidents.

7. The table below gives an estimate of the number of targeted fishers and communities under this component, relative to the population of artisanal fishers in São Tomé and Príncipe:

	Total	*S. Tomé*	*Príncipe*
Estimated total number of artisanal fishers (STP)[1]	2,000		
Dugout canoes with paddles and sails (STP)	1,012		
Motorized canoes (STP)	424		
# Fishers targeted for training safety at sea	485	420	65
# Communities targeted for training on safety at sea	22	16	6
Communities targeted for training in disaster preparedness and response (CONPREC)	12	10	2

[1] *Believed to be underestimated* Source: MARAPA

Component 2. *Coastal Protection for Vulnerable Communities:* (US$1.8 million)

8. Component 2 will address coastal erosion and inundation, by piloting participatory coastal adaptation measures and promoting public awareness and improved coastal management policies in the vulnerable coastal communities of Ribeira Afonso, Malanza, and Santa Catarina (São Tomé) and Sundy (Príncipe). These communities were identified under the NAPA and subsequently prioritized during participatory consultations (see Annex 8). The component addresses NAPA Priorities 3 (*Communication Action for Behavior Change), 9 (Relocation of Local Communities at Risk of Floods and Landfalls*) and 10 *(Construction of Shelters for Artisanal Fishermen)* by introducing to STP a menu of urgent and immediate structural (hard) and non-structural (soft) coastal adaptation practices and establishing a basis for re-directing future community development away from high risk areas, as increasing intensity of climate hazards make the traditional community location and livelihood patterns unsustainable. Based on best international practices and participatory community feedback, the component choose to protect and manage *in situ,* as well as offer incentives for the communities to gradually expand towards lower risk areas, rather than relocate them outright.

9. The component will finance:

(a) *Community Preparedness* (US $0.4 million)

(i) Specialized technical assistance to the pilot communities in developing participatory climate resilient development plans (to encourage community growth to lower-risk areas).

(ii) Expanding coastal geomorphological analysis to the pilot communities of Malanza and Sundy (not covered under the Project Preparation Grant) and preparing detailed engineering designs of flood-reduction measures in all four pilot villages.

(b) *Coastal Protection for Vulnerable Communities* (US $1.3 million), including:

(i) Participatory implementation of urgent and priority medium-scale soft (non-structural) and hard (structural) coastal adaptation works (see below).

(ii) Building community capacity and commitment towards climate resilience and response to extreme weather events, through small (less than US$20,000/each) community-based coastal adaptation works. To the maximum extent possible, adaptations which encouraged ecosystem resilience ("*soft*" adaptation) will be promoted.

The indicative list of priority interventions, which will be refined further after completion of the geomorphological studies, is outlined below:

	Malanza	*Ribeira Afonso*	*Sta. Catarina*	*Sundy*
Community Data:				
Population (estimated)	900	4,500	3,500	413
Population affected by flooding (%)	79%	72%	75%	72%
Medium-Scale Adaptation:				
Beach restoration◊	√	√		√
Beach revetments and other shore/off-shore protection structures●	√	√	√	
River bed dredging and embankment construction●	√		√	
River bank revetments ●			√	
Larger drainage systems reconstruction●	√		√	
Community-Executed Adaptation:				
Beach restoration (small-scale) and/or revegetation◊	√	√		√
House Elevation/Platforms/Canoe Shelters●	√	√	√	
Feeder drainage systems●	√	√	√	√
Community climate resilience awareness campaigns◊ √	√	√	√	

◊ *Soft Adaptation Measures* ● *Hard Adaptation Measures*

(c) *Promotion of Coastal Resilience* (US $0.1 million)

(i) Supporting cross-community and island-wide exchange and dissemination of lessons learned through study tours and workshops.

(ii) Providing technical assistance and workshops for a climate-resilient coastal spatial planning and resource management policy.

10. The activities in Component 2 will be phased in accordance with local capacity and to permit a better absorption of lessons learned. Thus, activities in Ribeira Afonso and Santa Catarina will start first, as the geomorphology study was extended to Malanza and Sundy. Adaptation activities in these two other communities will then be phased in as the study's results and participatory mapping became available.

Component 3. Project Management. *(US$0.4 million)*

This component will support:

(a) Project implementation (including procurement, financial management and audits), communications, reporting, monitoring and evaluation.

(b) Incremental operating costs for the Project Coordination Unit, the National Technical Committee for Climate Change and the National Council for Prevention and Response in their support to the project's monitoring and implementation. These are deemed to be critical for strengthening the climate risk management and adaptation capacity of the STP Government in the long term.

Annex 3: Implementation Arrangements
São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT

1. Project Administration Mechanisms

1.1 Project Institutional and Implementation Arrangements

1. The *Directorate General of Environment* (DGE) under the Ministry of Public Works and Natural Resources (MPWNR) and its Director General of Environment, will take overall responsibility for project execution, and overseeing and coordinating project implementation.

2. DGE/MPWNR will establish a small Project Coordination Unit (PCU), who will act as a Secretariat responsible for all project procurement, financial management, and day-to-day monitoring and evaluation. The PCU will be staffed by a procurement specialist, an accountant, and technical specialists, one of whom - responsible for the Coastal Protection component - will take the functions of key Project Advisor to the Director General of Environment (the Government-designed Project Coordinator). The procurement specialist and accountant will be appointed prior to project effectiveness. The PCU will be guided by a Project Operational Manual (including sections on financial management and procurement) which will be completed prior to effectiveness.

3. While retaining overall project responsibility, DGE will also involve various Government agencies in the components' implementation according to their mandate (see Table A). For this, it will rely on inter-sectoral mechanisms supported by already existing legislation to facilitate coordination among all the entities involved in project implementation, including:

- At the *highest level*, the National Sustainable Development Committee, reporting to the Minister Secretary General of the Government and composed of all participating Ministers, will formally oversee the implementation of the National Adaptation Program, providing strategic guidance, and policy decisions.

- At the *working level*, the Director General of Environment will convene joint quarterly meetings of the Climate Change and the Disaster Management Technical Committees, to which the PCU will report to ensure coherence between the project and related Government programs. This will also help ensure close coordination between agencies responsible for coastal areas, which presently span across three Ministries (Public Works and Natural Resources, Parliamentarian Affairs and Decentralization and Defense and Public Security – see Table A).

1.2 Measures to Address Capacity Constraints

4. The project built in measures to address technical capacity constraints where these were found to be weakest: specialized training in marine meteorology and instrument maintenance is expected to take place at Regional Meteorological Centers in Dakar, Lisbon, and Niamey. Radar operations training will be an integral part of the Doppler radar installation contract. Safety at sea operations are generally well known in São Tomé, although limited international technical

Table A. Distribution of Responsibilities for Project Activities

Component	Activities	Overall Responsibility: DGE Delegated Responsibilities	Mandate/Ministry	Ministry
1.Coastal Early Warning and Safety at Sea	1.1.a.Aquisition and installation of equipment	PCU	Project Management	MPWNR
1.1Early Warning System	1.1.b Specialized Training	INM/IMAP/Social Communications	Meteorology/Ports/ Communication	MPWNR
	1.1.c Operationalization of Early Warning System	INM/COMPREC/IMAP/Social Communications/MARAPA	Meteorology/Disaster Risk Mng/ Communications/NGO	MPWNR/Decentral.
1.2 Safety at Sea	1.2.a. Acquisition and installation of equipment	PCU	Project Management	MPWNR
	1.2.b. Training on Safety at Sea	MARAPA	NGO	
	1.2.c. Sustainable distribution of safety equipment	Harbor Department/INM/ DG Fisheries	Civic Defense/Meteorology/ Fisheries	NGO Defense/MPWNR
	1.2.d. Community disaster preparedness committees	CONPREC	Disaster Risk Management	Decentralization
	1.2. e. Specialized Technical Assistance for monitoring safety at sea	PCU (procurement) Coast Guard/Harbor Department IMAP (implementation)	Project Management Civil Defense Ports Authority	MPWNR Defense MPWNR
2. Coastal Protection	2.1.1. Participatory climate resilient plans	PCU/UNESCO-DELTARES/District Municipalities/CONPREC	Project Management/Consultants Local Government /Disaster Mng	MPWNR Decentralization
2.1Community Preparedness	2.1.2 Expand geomorphological study to 2 new communities	PCU (UNESCO-DELTARES)	Project Management/Consultants	MPWNR
	2.1.3. Detailed engineering design	Consultant firm	Consultants	MPWNR
2.2 Coastal Protection	2.2.1 Medium-scale works	INAE/Construction Firm	Public Works	MPWNR
	2.2.2. Community-executed works	District Municipalities/Local NGOs	Local Government/NGOs	Decentralization/ NGO
2.3 Coastal Policy	2.2.3. Coastal Policy and Dissemination of Lessons Learned	DGE/Consultants/District Municipalities/Land Tenure/Others	Policy Development	MPWNR/ Decentralization
3. Project management		PCU	Project Management	MPWNR

assistance – particularly to accompany the first years of the program – has been envisaged. For the coast protection component (Component 2), geomorphology analysis and weak compilation of geographical and socio-economic data remain the main capacity gaps. DGE is beginning to address these constraints by establishing a Geographical Information Unit. Further specialized assistance and exchange of lessons learned is envisaged under the Coastal Policy sub-component.

5. While DGE has executed the Project Preparation Grant efficiently, implementation will add a level of fiduciary complexity which requires higher levels of capacity and/or training. As such, the Government agreed to re-advertise the positions of procurement specialist and accountant, with a view to recruit qualified candidates by the time of project effectiveness (see follow up sections on Financial Management and Procurement). The PCU will also be able to count on assistance from other experienced PCUs implementing Bank projects. The DGE's safeguards monitoring capacity is, moreover, expected to be reinforced through specialized annual cluster training in lusophone countries (see follow-up section on Safeguards).

2. Financial Management and Disbursements

2.1 General Assessment

6. The Bank's financial management assessment of the Ministry of Public Works and Natural Resources (MPWNR) concluded that the project's financial management arrangements meet the Bank's minimum requirements under OP/BP10.02. The overall residual risk rating for the project was rated as Medium-I (Low Likehood, High Impact).

7. The objective of the financial management assessment was to determine whether the financial management arrangements were (a) capable of correctly and completely recording all transactions and balances relating to the project; (b) facilitate the preparation of regular, accurate, reliable and timely financial statements; (c) safeguard the project's entity assets; and (d) were subject to auditing arrangements acceptable to the Bank. The assessment complied with the *Financial Management Manual for World Bank-Financed Investment Operations* that became effective on March 1, 2010 and the Africa Region Financial Management Unit (AFTFM) *Financial Management Assessment and Risk Rating Principles*. Overall, the assessment was favorably impacted by the fact that the DGE has been responsible for the implementation of the Project Preparation Grant, whose experience will be used during the project's implementation period.

2.2 Project Financial Management Arrangements

8. **Budgeting Arrangements.** The budgeting process is deemed to be adequate, and it has taken into account all relevant aspects of the project. The project's design simplicity will also play a role in reducing any potential problems in this area. The DGE, in coordination with MPWNR, will prepare budget activities which will be captured in annual work plans. The budget will be monitored through the accounting software which will be purchased for the project and

through the unaudited quarterly financial reports, which will measure actual performance against targets for each period.

9. **Accounting Arrangements.** The Government of STP is still in the early stages of rolling its Integrated Financial Management Information System (IFMIS-SAFE) to line ministries. While the existing system that has been used throughout the PPG period has worked satisfactory, it needs some strengthening to minimize the risk of human error and enhance the summarization of accounting transactions. As such it is recommended that the government purchases an off the shelf accounting software, and that appropriate training is provided prior to submission of the first interim financial report. In addition to the accounting system to be installed and the books needed to maintain an accurate and complete record of transactions, the PCU should maintain a set of additional books of registry for control purposes. These books will include:

1. A Fixed Asset Register;
2. Contracts Register and;
3. Gasoline log books

10. The project will recruit an adequately qualified and experienced accountant to ensure that the financial management aspects of the project are adequately guaranteed.

2.3 Internal Control Arrangements

11. **Internal Control Systems.** A review of the internal system of the implementing entity, as identified on prior audit reports, raised some internal control issues related to filing, as well as some missing supporting documentation. However, these should be mitigated by having a qualified accountant overseeing all financial management aspects of the project, and the acquisition of an accounting software. Additionally, the project already has an existing procedures manual which documents some responsibilities related to the project transactions, approval process, and funds flow and disbursement processes. The manual will be updated to include other relevant information such as accounting records, supporting documents and filing and detailed processes from budgeting to auditing requirements. It will also summarize authorization procedures, the financial reporting process (including the agreed format of quarterly reports) contract administration and management, as well any other issues that may be relevant for the accounting software program.

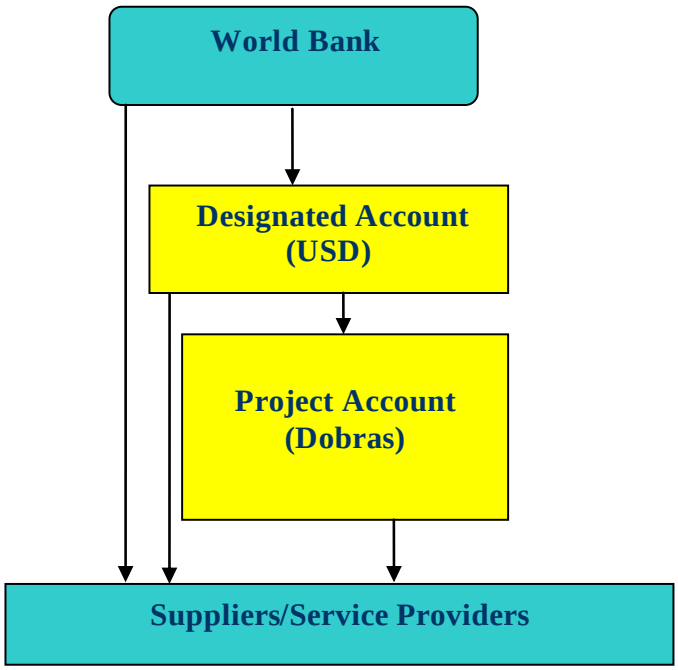
2.4 Funds Flow and Disbursement Arrangements

12. **Banking Arrangements**. DGE/MPWNR will open a Designated Account denominated in United States Dollars for the project. It may also open a Project Account denominated in Dobras. Details of the Designated Account once opened and the authorized signatories should be submitted to the Bank. The arrangement is relatively simple with centralized payments, allowing for more effective control of the project funds.

13. **Funds Flow Arrangements.** The project will submit an initial withdrawal application to the Bank with six-months cash flow projection based on agreed project work plans and budgets.

The Bank will process the withdrawal application and deposit the funds into the Designated Account.

Figure 1. Fund Flow Arrangement



14. **Disbursement arrangements**: The project will use traditional transactions-based disbursement procedures. It may also use other methods of disbursement such as direct payments, special commitments and reimbursements. Details concerning disbursements will be spelt out in the project's Disbursement Letter.

15. **Financial Reporting Arrangements.** DGE/MPWNR will prepare quarterly un-audited financial reports in a form and content that have been agreed with the Bank, to be submitted to the Bank within 45 days after the end of the quarter to which they relate. Such details of the reporting requirements, including content, format as well as frequency will be defined on the Project Operational Manual.

2.5 Auditing arrangements

16. Annual audited financial statements with the respective management letter will be submitted by the PCU to the Bank within six months of the end of the year being audited. The audits will be conducted in accordance with International Standards on Auditing (ISA). The Annual Financial Statements for the project will incorporate all activities, and include:

- A Statement of Sources and Uses of Funds showing funds from GEF and how they were applied;
- A Summary of Expenditures analyzed by both Component and Category; and

- The supporting Notes in respect of significant accounting policies and accounting standards adopted by management;
- Designated Account Activity for the Year showing deposits and replenishments received, payments substantiated by withdrawal applications, interest that may be earned on the account and the balance at the end of the fiscal year;
- Summary listing of withdrawal applications by reference number, date and amount.

17. The project's auditor should be hired within four (4) months of effectiveness, with audit terms of reference satisfactory to the Bank.

Table B. Table of Audit Compliance Requirements

Action	*Periodicity*	*By whom*
Submit audit report within 6 months of period close	Annually	PCU

2.6. Financial Management Action Plan

18. As stated, the project's financial management arrangements meets the Bank's minimum requirements under OP/BP 10.02. Given its residual risk rating, the project will require twice a year field supervisions. The financial management action plan below outlines the mitigating measures which, if implemented, will strengthen the financial management arrangements.

Table C. Financial Management Action Plan

	Action	***Date due by***	***Responsible***
1	Recruitment of a project accountant	By Effectiveness	PCU
2	Hiring of Independent Auditor	Within 4 months of effectiveness	PCU

3. Procurement

3.1. General Assessment

19. The procurement assessment concluded that the PCU – as currently staffed for the preparation of the project - did not yet possess adequate experience and capacity to carry out procurement activities related to implementation of the Project. Hence, the risk associated with carrying out the project was rated High. Risk measures have been agreed with DGE/MPWNR and include: (i) the hiring of a new full-time experienced procurement officer under Bank procurement procedures; (ii) update the Operational Manual to incorporate all procurement information relevant to the project and record keeping procedures. These actions will be completed by project effectiveness, with advertisement of the procurement officer completed by negotiations. Further, it was agreed that the procurement officer should undergo training in

World Bank procurement procedures shortly after his/her mobilization, and refresher training, as needed, through the project life.

3.2 Procurement Provisions

20. Procurement for the proposed Project will be carried out in accordance with the World Bank's "*Guidelines: Procurement of Goods, Works and Non-consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers*" dated January 2011, and "*Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers"* dated January 2011; and the provisions stipulated in the Legal Agreement. "*Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants*", dated October 15, 2006 shall apply to this project.

21. The Implementation of the procurement activities for the proposed project will be entrusted to a PCU within the Directorate General of Environment at the Ministry of Public Works and Natural Resources.

3.3 Procurement Review Thresholds

22. Prior-review and procurement method thresholds for the project entered in the procurement plan and guided by the Table D below.

Table D: Procurement Thresholds

	Prior Review Thresholds Proposed (US$ million)	*Procurement Method Thresholds Proposed (US$ million)*								
		ICB	LIB	NCB	Shopping	QCBS	CQS	Least Cost	SSS	ICS
Works	≥0.50 DC: all	≥0.50		<0.50	<0.05					
Goods	≥0.25 DC: all	≥0.25	≥0.25	<0.25	<0.05					
Consulting Services	≥0.1: for firm SSS: all					≥0.1	<0.1	<0.1		
	≥0.05: for Individuals SSS: all								N/A	≥0.05

3.4 Procurement Plan and Procurement Arrangements

23. **Procurement Plan.** The PCU has prepared a Procurement Plan during pre-appraisal, which was reviewed by the Bank and approved on April 25, 2011. This plan will be updated annually or as required to reflect project implementation needs. The excel format of the Procurement Plan, including all activities to be implemented, shall be used as a tool of monitoring the activities and shall be updated at least quarterly.

24. **Procurement Arrangements.** International Competitive Bidding and Limited Competitive Bidding procedures are expected to be used under the Project for a limited number of contracts under the Procurement of Goods. Most of the contracts for Goods and Works will be procured under National Competitive Bidding (NCB) and shopping procedures – this includes medium-sized Coastal Protection Works (river bed dredging, embankments, drainage) – and communications, livesaving equipment and vehicle. Small works estimated to cost less than US$50,000 will be procured under community procurement procedures - this includes rehabilitation of secondary drainage, re-plantation, cleaning, maintenance, and construction of flood-resistant housing and/or structures. Consulting services will normally be selected under Quality and Cost Based Selection (QCBS) method: Relatively small value assignments for firms will be selected under Selection Based on Consultants' Qualifications (CQS), while for assignments of a standard or routine nature (audit services, works supervision) will be selected under Least Cost Selection (LCS). When justified, and with Prior approval by the Bank, Single Source Selection method may be used. These may include Geomorphological Studies in the four beneficiary regions and Training and Sensitization of Target Fishers. Individual Specialists on Safety at Sea, Spatial Planning, Island Systems, and Coastal Policy will be selected under Individual Consultant's Selection (ICS).

25**.** **Standard Bidding Documents.** The World Bank Standard Bidding Document for Goods and Works will be used for ICB and the Standard Request for Proposals will be used for consulting service packages for a value over USD 100,000. Documents in Portuguese satisfactory to the Bank will be used for contracts to be procured under NCB. NCB documents may be based on Government own documents that have been prepared in the framework of the São Tomé and Principe new procurement legislation.

26. **Operating Costs.** Incremental operating costs shall consist of (i) office equipment and supplies; (ii) office utilities and reasonable communications expenses; (iii) office rental expenses; (iv) Project's vehicle maintenance costs, fuel and spare parts and car rental required for project activities; (v) travel expenses and per diems for official Project staff (excluding salaries of Recipient's civil servants); (vi) bank charges; (vii) insurance costs; (viii) operation and maintenance of office equipment; (ix) communication materials, including courier services; and (x) press releases.

27. **Training and Workshops**. Training and workshops shall include the reasonable cost of (i) training materials and rental of training and workshop facilities and equipment; (ii) tuition fees, travel, accommodation and per diem of trainers, trainees and workshop participants; and (iii) any other reasonable expenses related to training, study tours, and workshops to be carried out under the Project.

28. **Project Operational Manual.** A Project Preparation Manual was prepared to address the activities under preparation phase. This Manual is being updated in order to incorporate procurement information relevant to the project and record keeping procedures. The Manual will be updated from time to time to reflect new activities and/or update of procedures or information.

29**.** **Procurement Action Plan and Frequency of Procurement Supervision.** In addition to prior review supervision to be carried out from Bank offices in Luanda and Maputo, semi-annual

procurement supervision missions will be undertaken and post review of procurement actions will be carried out at least once per year. The proposed Procurement Action Plan is as below.

Table E: Procurement Action Plan.

	Issues/Risks	*Action*	*Responsible* *Date due by*
1	Risk that Bank procurement procedure may not be applied properly	Hiring of a new full-time experienced Procurement Officer under Bank procurement procedures	PCU and DGE Before Effectiveness
2	Operational Manual does not yet detail all applicable procurement procedures	Update the procurement part of the Operation manual, in a manner acceptable to the Bank	PCU Before Effectiveness

4. Environmental and Social (including safeguards)

4.1 Project Type, Locations and Impact Assessment

30. **Project Type and Locations**. The project will involve (a) a set of *non-structural activities* (mostly related to Component 1), involving the the early warning and safety at sea system, as well as reinforcement of capacities of the Government, fishers and coastal communities; and (b) *structural investments* involving medium-sized and small works and adaptation interventions aimed at reducing river flooding and storm action. The structural interventions will take place in four pilot communities, namely Malanza (South São Tomé, District of Caué), Ribeira Afonso (East São Tomé, District of Cantagalo) Santa Catarina (Northwest São Tomé, District of Lembá) and Sundy in Príncipe Island. Structural interventions fall into three major categories: (a) river flood protection works (including river bed dredging, embankment, revetments, revegetation, and drainage reconstruction); (b) coastal protection (including beach restoration and/or revegetation, revetments, offshore breakwaters) and (c) local flood protection measures (secondary drainage works and maintenance). They will be phased in, with Ribeira Afonso and Santa Catarina implemented first, and Malanza and Sundy implemented after conclusion of a geomorphology study and participatory planning. The two sets of communities are likely to be separated in phasing by a year.

31. **Environmental Impacts.** Environmental impacts are likely to be modest, short-term, site-specific, non-sensitive or reversible, and mitigation measures can be designed to reduce negative impacts. The project is classified as Category B, as defined by paragraph 8(b) of OP 4.01, triggering OP/BP 4.01 (Environmental Assessment), OP/BP 4.04 (Natural Habitats) as well as OP/BP 4.12 (Involuntary Resettlement). Even though none of the project areas falls within the legal limits of a conservation areas, two communities – Malanza and Sundy are within the buffer zone of Natural Parks of Obô of São Tomé, and of Príncipe, respectively, triggering OP/BP 4.04 (Natural Habitats). However, the Government has provided assurances that the activities proposed under the project are fully compatible with those authorized in the buffer areas. There are no cultural sites near any of the proposed works. Hence, cultural property will not be affected by the project.

32. The project is expected to yield significant positive environmental impacts, including (a) reducing flood risks; (b) reducing vulnerability to natural disasters; (c) improving the general

environmental conditions and quality of life of pilot communities (by diminishing their exposure to floods). Expected negative impacts during the project include (a) temporary impacts on quality of life for households living in the vicinity of the works (caused by increased levels of noise, dust, traffic, access restrictions); (b) minor interference with existing municipal infrastructure; (c) removal of vegetation; (d) sedimentation; (e) generation of debris; (f) risk of accidents; and (g) unmet expectations and insecurity amongst the population. Component 1 is not expected to have significant negative impacts, although the possibility of land acquisition and/or works disruption for the meteorological equipment (particularly for the microwave link) cannot be completely discounted. The Doppler radar and maritime meteorological station are expected to be installed in public land (respectively at the airport and port). These impacts These are summarized in an Environmental and Social Management Framework (ESMF) which the Government of STP has completed in February 2011.

33. The risk of maldaptation must always be considered in projects that deal with sensitive coastal and hydrological systems. However, this is being minimized by a careful geomorphology and hydrological study (to be completed in June 2011) the results of which will guide the detailed investments.

34. **Social Impacts.** In general, the project is expected to have positive social impacts, by (a) diminishing the risk of loss of lives of fishermen, and resulting impact on their dependents; (b) diminishing loss of assets (particularly canoes) to floods; (c) strengthening community mobilization; and (d) have a moderate impact on livelihoods (by diminishing the number of flood days and therefore allowing people to return to work more rapidly after an event). In general, the project interventions will protect fishers at sea and their coastal communities along the coast from the (generally) negative impacts of further climate change, variability and sea level rise.

35. **Resettlement.** The project has been designed to limit the extent of involuntary resettlement to the fullest extent possible, and will not support or underwrite any forced relocation of families from low-lying neighborhoods in the pilot communities. Instead of relocating people at risk from floods, the project has chosen to implement flood protection and management measures, and sponsor local land-use planning activities identifying lower-risk residential areas, where the Government will progressively install public facilities (schools, health centers, electricity, etc). In time, it is expected that people will opt to relocate on their own to these lower-risk areas.

36. Nonetheless, involuntary resettlement may be needed under three potential situations:

(a) Some houses on the seaside may have to be relocated farther from the water if a seawall is built or raised. Such relocation will require the Government to involuntarily relocate some residences for the safety of the occupants.

(b) Some houses or outlying structures may be built on or over strategic drains that are now no longer functional or that need to be restored. Rehabilitating these drains would require the removal of the houses and associated structures, and relocation to immediately neighbouring areas. Also, there may be the possibility that houses near the river could be damaged during construction of protective works.

(c) Three, should protective sheds be built for community fishing canoes, a raised platform, or for the microwave link, they will require land. Unoccupied State or community lands will be used wherever possible. However, in cases where this may not be possible, the Government will have to apply the principles of the project's Resettlement Policy Framework to ensure appropriate measures are in place during the purchase or transfer of private land.

37. It is not possible at this time to identify the precise areas or structures that may require involuntary resettlement, since the geomorphological studies are not yet completed. For this reason, the Government of STP has prepared a Resettlement Policy Framework (RPF) in February 2011 to define the principles that will guide the development of any potential Resettlement Action Plans that may be required under the project. In the very unlikely case that every canoe shed built under the project requires private land (with housing) and that every residence potentially affected by potential construction works must in fact be relocated, a total of 21 families (about 100 people) could potentially be affected by the project.

4.2. Key Measures to be Taken by the Client to Address Safeguards Policy Issues

38. The Government of STP has prepared an Environmental and Social Management Framework (ESMF), proposing practical methods of mitigating the impacts of project structural investments during construction and operation, including those in the buffer areas cited in paragraph 31 above. The ESMF and RPF have been disclosed both in São Tomé and Principe as well as through the World Bank's Infoshop.

39. **Adequacy of Government's Environmental and Social Policies.** Due diligence was conducted to identify any potential environmental and social liability of the protective works in the pilot project communities, including any physically connected projects and other potential corporate reputational risks. This review – carried out at pre-appraisal – confirmed that the Government of STP has acceptable environmental, health and safety policies in place, with no potential environmental and social liabilities identified in the participating communities. They are also in compliance with relevant national and social regulations and policies.

40. **Mitigation Measures**. Environmental impacts will be mitigated according to the measures proposed in the ESMF guidelines (including the EMP), which include (a) close involvement of communities in awareness and participatory planning to manage their expectations; (b) supervision and appropriate engineering design of the works to ensure that environmental standards are followed (particularly for revegetation, control of sedimentation, and disposal of de debris); (c) correct planning and supervision to ensure adherence to workers' safety standards; (d) coordination with service providers within the communities to insure minimum interference with existing infrastructure. The EMP includes an Environmental and Social Screening Checklist, a template for a simplified Environmental Assessment and the environmental regulations to be followed for each structural investment funded under the project. Due to the sensitive nature of activities within the buffer zones, the Environmental Assessments for Malanza and Sundy will be reviewed by the Bank.

41. Social impacts will be mitigated by avoiding disruption to people's lives and livelihoods to the maximum extent possible and avoiding taking land in the first place. The community, with assistance from project officers, will explore all possible configurations of the project and its possible location in order to avoid the need to taking any land or at least to minimize its

extent. Where land acquisition is unavoidable, a Resettlement Action Plan following the principles of the RPF and OP 4.12 will be required, to at least restore, and preferably improve, the standards of living of project-affected people.

42. **Compensation.** The illustrative matrix of compensation, in the case where the project would find it necessary to proceed with involuntary land acquisition, is given on Table E, below. The estimated budgetary requirements would be US$11,200 for land, and US$20,000 for residences.

Table F. Illustrative Table of Compensation Packages in Cases of Involuntary Land Acquisition by Type of Asset Lost and Ownership Right

Impact	*Right*	*Compensation*
Land	Formal title or customary title	Replace with plot of similar size and location for residence or similar size and characteristics soil, water) for agriculture; possibility of cash compensation under carefully specified conditions. Indemnification of all administrative fees (e.g., registry fees)
	Renter or Leasee	No payment for land; assistance to identify and rent a replacement plot of similar size and characteristics
	Squatter	No payment for land; as above, assistance to locate and acquire a replacement plot
House or Business Premise (including all infrastructure such as wells, fences, outdoor kitchens, chicken coops and the like)	Owner	Replace with structure of at least same size, materials and infrastructure; any cash compensation at new (i.e., undepreciated) unit values. Indemnification of all administrative fees (e.g., registry fees).
	Renter	Reimburse any advance rental payments. Provide assistance to locate new rental property; provide at least three months rent (as disturbance fee).
	Squatter	Provide assistance to locate new rental property; provide at least three months rent (as disturbance fee). Assistance to acquire houseplot, with all administrative fees paid, recommended.
Crops	Owner/farmer	Compensate for lost production (yield) at average price between harvests of crop lost
Trees	Owner	Provide seedings as productive part replacement. Value of lumber or of fruit lost until seedlings come into production
Business	Owner	Compensate monthly profits foregone during period of relocation. Pay employee salaries during period of relocation
	Renter	Compensate profits and employees for wages.as above, plus assistance to acquire new locale (as for all renters)

Source: STP Adaptation to Climate Change: Resettlement Policy Framework. February 2011.

43. **Process for Safeguards Implementation.** The PCU and DGE will be responsible for ensuring that the proposed project activities follow the ESMF and RPF. The PCU will first review the technical designs of the proposed works, and propose, if needed, any adjustments in the technical and environmental specifications. DGE will then ensure that the activities follow the requisite environmental and social screening procedures. Activities of category "B" which trigger positive (Yes) responses to the checklists would be subject to further environmental assessments, and sent to DGE for further processing. In addition, DGE would ensure that any RAP prepared under the project would be reviewed by the Bank. Due to the sensitive nature of activities within the buffer zones of the Natural Parks of Obô of São Tomé, and of Príncipe, activities of category "B" triggering further environmental assessments within the communities of Malanza and Sundy would also be reviewed by the Bank.

44. **Safeguard Capacity Building.** To familiarize themselves further with safeguards procedures, staff from both DGE and PCU will participate in regional safeguard training sessions led by the World Bank in lusophone countries (Angola, Mozambique, Cape Verde or Brazil). The costs of this training are estimated at US$28,000. In addition, the project will support the consolidation of technical, social, and environmental information into a GIS system, which will facilitate safeguards monitoring. Budget for this is included in the overall project monitoring costs (US$26,500). This is additional to an estimated US$51,000 mainstreamed into the bidding documents of the proposed works to mitigate any specific environmental and social impacts, and the estimated US$31,000 should involuntary resettlement be required.

45. **Public Consultations**. In addition to the consultations carried out by the NAPA team (see Annex 8), a social assessment and physical geomorphology assessment were carried out in Ribeira Afonso and Santa Catarina on January 22-26, 2011, followed by consultations with key community stakeholders in Malanza, Ribeira Afonso and Santa Catarina on February 8-10, 2011. The social assessment identified the main organizational and social structure of the communities, people's perceptions of the problems and solutions, other project's impacts, and their ideas for participation. The second round of consultations (in February 2011) focused on verifying the problems identified, the typologies of interventions proposed (and whether they were adequate to the local context), local support for their intervention and mitigation measures proposed. This was concluded with a national workshop on the 14th of February in the city of São Tomé, involving all key stakeholders. The ESMF and RPF were officially approved by the Directorate General of Environment on March 25, 2011, and have been disclosed at the Téla Nón web site, São Tomé and Príncipe Digital newspaper, on March 29, 2011, and have been made available for public consultation at DGA. They were also disclosed at the Bank's InfoShop on March 29, 2011. All technical designs of the activities as well as environmental assessments and RAPs, should be subject to further public consultation and disclosure with the beneficiary communities and interested agencies prior to their approval and execution.

5. Monitoring and Evaluation

46. Monitoring and evaluation has been mainstreamed into all project components and will be conducted at three levels: (a) fiduciary compliance; (b) project implementation; and (c) impact monitoring. To this end, the project provides for quarterly financial reports and annual progress reports (Project Implementation Reports), as well as independent mid-term and final reviews. Standard provisions for independent financial audits are further incorporated. The

quarterly interagency reviews and a participatory evaluation process funded as part of the project management offer a broad platform to both capture and disseminate lessons learned as well as to engage Government and stakeholders in adopting corrective measures, if deemed necessary. Most importantly, they will allow concerned Government agencies to review feedback from pilot communities and undertake complementary actions that may be necessary to supplement their development needs.

47. Acquiring and processing the data for project indicators will be done primarily through the CONPREC platform, by the lead agencies with responsibilities for the respective project components (Coast Guard, Harbor Department, National Institute of Meteorology and MARAPA, for Component 1, and the PCU, and local CONPREC Committees for Component 2). Based on the baseline analysis (see Annex 1), the Government has a reasonable capacity to collect casualty and damage data. The key limitation, however, is to obtain detailed and reliable meteorological records as well as impact data at the community level (e.g. on livelihood losses). The project has built in capacity to address these limitations by:

- Strengthening the CONPREC as a robust interagency Platform for communication and coordination, including data/information acquisition and exchange
- Identifying a lead agency for Safety at Sea activities (expected to be the National Maritime and Port Institute, IMAP) and working with the communities to set up a reporting and monitoring mechanism in the context of a comprehensive baseline assessment of safety issues in the fisheries sector.
- Supplying the National Institute of Meteorology with needed equipment and establishing interagency information networks that allow for data acquisition, processing, and archiving.

48. The project has also made provisions for sharing lessons learned and scaling up. The four pilot coastal villages are expected to actively involve district Municipalities. Since CONPREC is under the Ministry for Parliamentary Affairs and Decentralization, and each pilot coastal community is located in a different district, the platforms will also serve as a way to disseminate lessons learned to neighboring communities within the district. Under component 2.3, the project has made provisions for cross-village sharing of lessons learned, and study tours to the pilot sites. It is hoped that this approach will help scale up the climate-resilient coastal planning approach within each district, and gradually extend it to the national level.

49. The project's monitoring and evaluation costs (including external auditing) are estimated at aboutUS$114,500.

Annex 4
Operational Risk Assessment Framework (ORAF)

São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT

Appraisal and Post Appraisal Package Version

Project Development Objective		
To increase the adaptive capacity of vulnerable coastal communities in S. Tomé and Príncipe to the adverse impacts of climate variability and change		
PDO Level Results Indicators:	1.	Essential safety at sea equipment used regularly by artisanal fishers
	2.	Early warning system disseminates timely warnings to artisanal fishers prior to fog/storm events
	3.	Coastal adaptation measures reduces flooding exposure of target communities

Risk Category	Risk Rating	Risk Description	Proposed Mitigation Measure
1. Project Stakeholder Risks			
1.1 Stakeholder	M-I	Coastal erosion, flooding and sea level rise affect many in the target communities. For this reason, many households may consider themselves "at risk" and feel entitled to project benefits, resulting both in conflict as well as a higher moral hazard.	In each pilot community, adaptation interventions will only start after a participatory vulnerability plan is agreed. The project's activities are primarily of a public goods nature. Private investments at risk will be handled indirectly – by promoting a gradual shift towards lower risk areas – or be addressed only for very vulnerable households identified in the vulnerable plan or directly affected by project activities
2. Implementing Agency Risks			
	M-L	While the DG of Environment and its PCU have managed the preparation proactively , keeping an efficient contracting schedule for the past 9 months with continuous support from the Bank, the PCU will need reinforced capacity for implementation, particularly to handle more complex forms of procurement, address weaknesses in financial management, and strengthen project monitoring and safeguard oversight.	The Ministry of Public Works and Natural Resources (under which the PCU is established) will contract a full time qualified procurement specialist and a project accountant, and acquire a dedicated accounting software. Project monitoring will be strengthened by the hiring of a project advisor and assistance from CONPREC and a qualified NGO (MARAPA). Staff from the Directorate General of Environment will also receive further training in Bank's safeguard policies at a lusophone hub.

Risk Category	Risk Rating	Risk Description	Proposed Mitigation Measure
3. Project Risks			
• Design	M-I	The project includes only two inter-related investment components (Early Warning System and Coastal Protection for Vulnerable Communities). The technical design is based on best practices which have been field tested in other SIDS and community coastal management projects. There is some risk that key Government counterparts may change during implementation, jeopardizing coordination amongst the involved agencies.	While the precise community adaptations under Component 2 will only be decided during early implementation, the likely interventions are already known and were appraised. The coordinating platforms (Climate Change Technical Commission and CONPREC) and national stakeholders involved are sufficiently broad to ensure continuous high commitment and institutional coordination.
• Social & Environmental	M-I	Given the delicate natural balance of the coast, and geomorphology and biological processes, there is a risk that structural project interventions (e.g. breakwaters, drains) could alter sand deposits and cause coastal alteration. The project will not support any forced relocation of families from low-risk neighborhoods. Rather, it has opted to carry out protective adaptation investments and to promote planning and economic growth to lower risk areas (to develop poles of attraction for people to settle there over the long term). Nonetheless, there may be three cases where involuntary resettlement might occur (a) where houses fronting the sea might have to be relocated farther from the water if a seawall is built; (b) inland, some houses or structures may be built over strategic drains that may need to be restored; and (c) where construction of protective sheds for fishing canoes or installation of a microlink for mobile phone communication may require land (unoccupied State or community land would be used whenever possible)	The Government has mobilized UNESCO-IHE/DELTARES to carry out a hydrological and geomorphological modeling at the pilot sites, thus ensuring that the final intervention are correctly designed so as to minimize environmental and social risks. The Government has also finalized an ESMF, including an EMP, which found that environmental impacts are likely to be modest, short-term, site-specific, non-sensitive or reversible, and that mitigation measures can be designed to reduce negative impacts. The documents have been disclosed. OP 7.50 is not triggered by the project. The project has prepared a comprehensive Resettlement Policy Framework in accordance with OP/BP 4.12 and Government standards, which has been disclosed. In the unlikely event that resettlement would be needed under the project, a Resettlement Action Plan in accordance with OP/BP 4.12 would be prepared.

Risk Category	Risk Rating	Risk Description	Proposed Mitigation Measure
• Program & Donor	L	The project is part of a broader adaptation program which also involves UNDP/Japan and other partners (EC). However, the projects run in parallel, have their own assigned PCU staff, and are not co-dependent to achieve their respective DOs.	The projects have been designed to be part of a broader National Adaptation Program, but be independent in terms of implementation.
• Delivery Quality	M-I	The level of LDCF funding (US$4.1 million) is quite high for S. Tome and raises concerns about the Government's ability to sustain project interventions. This is particularly the case for the maintenance of the Doppler radar, and search and rescue operations. Baseline data are scarce and/or difficult to collect (as they are often found outside S. Tome), and there is weak capacity in project monitoring	The Government has started a disaster contingency fund of US$1.4 million (presently seeded with contributions from Taiwan and Equatorial Guinea) which will help maintain search and rescue and CONPREC operations. The Government's commitment to provide adequate recurrent budget for search and rescue operations has been reflected in the minutes of negotiations. As an LDC SIDS, São Tomé and Príncipe is expected to continue to receive substantial levels of global climate change adaptation funding for the foreseeable future, which will mitigate Government shortfalls in recurrent expenditures. The project is piloting interventions first in 2 communities (Ribeira Afonso and Sta Catarina) slowly expanding to Malanza and Sundy after first lessons learned. To ensure financial sustainability, community interventions have been kept at levels compatible with Government's comparable budget allocations for remedial works and recurrent costs. Indicators have been selected to be easily measurable and (for most cases) baseline-independent. Field monitoring capacity will be reinforced with the help of CONPREC and with a partnership with the NGO MARAPA

Risk Rating: Preparation	Risk Rating: Implementation	Comments
M-I	M-I	The project is relatively large for São Tomé and Príncipe , and has risks (including safeguards) which, if not mitigated, could potentially have a significant to high impact. However, appropriate measures have been put in place to mitigate these risks. In particular, the project design has been kept simple and phased, adjusted to the implementation capacity of the client. Most residual risks – tied to implementation – can be mitigated adequately through technical assistance and continuous on-the-job support.

Annex 5: Implementation Support Plan
São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT

1. Strategy and Approach for Implementation Support

1. The Implementation Support Strategy takes into account the relatively simple design of the project, its corresponding risk profile, and the country counterparts' institutional capacity. The strategy focuses on the risk-mitigation measures identified in the ORAF. In parallel, it strives to provide the client with flexible and effective assistance through the duration of the project, while helping build essential government institutional capacity and creating an enabling environment for stronger community participation in decision-making.

- **Procurement:** Implementation support will include (a) helping the client update the Operational Manual to incorporate all procurement information relevant to the project and record keeping procedures; (b) additional on-the-job training to the PCU procurement specialist; (c) providing detailed guidance on the Bank's Guidelines to the PCU and MPWNR, particularly as related to more complex procurement forms (e.g. QCBS, ICB) not yet covered under the project's preparation phase, (d) reviewing procurement documents and providing timely feedback; (e) timely feedback on procurement plan revisions; and (e) regular progress monitoring against the agreed detailed operational and procurement plans.

- **Financial Management**: Implementation support will include: (a) helping the client update the Operational Manual to incorporate all relevant FMS and disbursement information, including the format and content of quarterly project financial reports; (b) on-the-job accounting software training; and (c) supervision reviews of the project's financial management system, including accounting, reporting, and internal controls. The Bank will work with the Government to systematically build up DGE/MPWNR financial management capacity and coordinate program implementation sequencing to avoid overwhelming the Government's limited capacity.

- **Environment and Social Safeguards**: Implementation support will include: (a) guidance on any issues arising from implementation of the agreed-upon Environmental and Social Management Framework and Resettlement Policy Framework; (b) specialized safeguards training for PCU and DGE staff in an appropriate lusophone hub; (c) assisting the client in incorporating environmental and social information into a database for project monitoring purposes; (d) review of any required Environmental Assessments for project activities and (e) review of any Resettlement Action Plans.

- **Community Empowerment**: The project provides for strong community engagement in its design, specific implementation activities, and project auditing. Implementation support, including technical experts, will further strengthen this process, by ensuring (a) the soundness and community buy-in for the implementation of the coastal plans developed with project support, (b) community ownership and long-term maintenance of project-supported infrastructure, and, importantly, (c) transparency and accountability in project contracting,

given the limited pool of qualified experts and infrastructure providers available in the islands.

- **Technical Inputs**. Through its access to global knowledge, the Bank team will provide the STP team with strategic advice on (a) comparative experiences with safety-at-sea and early warning and community preparedness programs, notably in small island systems; (b) policy and technical advice on coastal adaptation options; and (c) reinforcement of capacity on climate change modeling (an on-going partnership with University of Cape Town experts).

2. Implementation Support Plan

3. Given the limits of STP's Bank program and the lack of a Bank's Resident Office, the project will be followed on a routine basis by a core task team based on the Africa mainland, including the project's TTL, procurement and financial management specialists, and environment and social safeguard specialists. The task team will be in contact with the project team in STP on a constant, daily basis, by e-mail and/or Skype. Additional specialized technical expertise will be available from headquarters on as-needed basis. Formal supervision and field visits will be conducted semi-annually. Detailed inputs will be as follows:

- **Fiduciary inputs:** Training will be provided by the Bank's procurement and FM specialists before commencement of project activities. In addition to prior review supervision to be carried out from Bank offices in Luanda and Maputo, semi-annual procurement supervision missions will be undertaken and post review of procurement actions will be carried out at least once per year. The Bank team will work with the PCU to enable it to produce documents in Portuguese to the satisfaction of the Bank which could be used for contracts procured under National Competitive Bidding procedures. Assistance and training for introduction to accounting software will be provided within the first three months after project effectiveness. As with procurement oversight, financial management supervision will be conducted semi-annually. Fiduciary inputs are and will continue to be coordinated with UNDP to ensure consistency and augment client capacity-building efforts.

- **Safeguards**: While the project's social and environmental impacts are projected to be relatively small, inputs from environmental and social specialists might be required to augment the client's limited capacity, particularly if the project triggers individual resettlement activities. In addition to encouraging PCU and DGE staff to attend training on Safeguard Policies conducted in lusophone countries, country-based training will be provided for environment monitoring and reporting, including in setting up a national environmental and social database on project areas. The team includes lusophone social and environmental specialists and field visits will be carried out on a semi-annual basis.

- **Operation and technical inputs**: A field-based TTL will provide day-to-day oversight and coordination with client, development partners, and team members. The team's technical specialists will provide flood and coastal engineering inputs to review selected bid documents to ensure fair competition and technical quality. Technical supervision will be further required during equipment installation and infrastructure construction in order to verify that contractual obligations are met. The team's technical specialists will conduct

annual site visits timed in line with the project deployment schedule, with an option for semi-annual supervision during peak procurement time as needed.

4. The main focus of implementation support is summarized on Tables A and B below

Table A. Estimated Implementation Support Plan

Time	Focus	Resource Estimate		Partner Role
First 12 months	Procurement training and supervision	Procurement specialist	3 SW	NA
	FM training and supervision	FM specialist	3 SW	
	Environment training and supervision	Environment Specialist	3 SW	
	Project planning activities/ implementation	Coastal Management/ Adaptation Specialist	3 SW	
	Technical and procurement review of bidding documents	Flood Management Engineer Procurement Specialist	2 SW 2 SW	
	(Land acquisition and resettlement)*	Social Specialist	(3 SW)*	
	Team leadership, institutional arrangements, and project supervision coordination	TTL	5 SW	
12-60 months	Project planning activities/ implementation	Coastal Management/ Adaptation Specialist	4 SW	NA
	Technical and procurement review of bidding documents	Coastal/Flood Management Engineer Procurement Specialist	3 SW 5 SW	
	Project infrastructure installation/ construction	Coastal/Flood Management Engineer	4 SW	
	Environment and social monitoring and reporting	Environment Specialist Social Specialist	4 SW 4 SW	
	Annual Procurement reviews	Procurement Specialist	5 SW	
	Financial management disbursement and reporting	Financial Specialist	8 SW	
	Team leadership and project supervision coordination	TTL	15 SW	

Notes: SW=Staff Weeks

** If needed. The need for resettlement activity, if any, will be determined only after detailed engineering design for Component 2 activities is available.*

Table B. Summary of Staff Skill Mix Requirements

Skills Needed	Number SW	Number Trips	Comments
Procurement	13	two annually	Region-based
Financial Management	11	two annually	Region-based
Environment	7	two annually first two years, than one annually	Region-based
Social	7	as required first year, than annually	Region-based
Flood Management Engineer	5	as required	
Coastal Management/ Adaptation	7	as required	
TTL	20	two annually	Region-based

Annex 6: Team Composition
São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT

World Bank staff and consultants who worked on the project:

Name	Title	Unit
Sofia U. Bettencourt	Lead Operations Officer	AFTEN
Milen F. Dyoulgerov	Coordinator, Adaptation and Disaster Risk Management	GFDRR
Mark Tadross	Consultant/Climatologist	AFTEN
Elvis T. B. Langa	Financial Management Analyst	AFTFM
Sonia C. Guilherme	Procurement Specialist	AFTPC
Gordon Appleby	Consultant/Social Safeguards	ASPEN
Jayne A. Kwengwere	Operations Analyst	AFTEN
Hellen Mungaila	Program Assistant	AFCS3
Eduardo Brito	Sr. Counsel	LEGAF
José Janeiro	Sr. Financial Officer	CTRFC
Fiona Tummon	Consultant/Climatologist	U. of Cape Town

Key Government staff and consultants who worked on the project:

Name	Title	Unit
Arlindo de Ceita Carvalho	Director General of Environment	DGE
Henrique Pinto da Costa	Consultant/Spatial Planning and Economic Specialist	Consultant
Aderito Santana	Consultant/Lead Meteorologist and Adaptation	Consultant
Joana Talafré	Consultant/UNFCCC Specialist	Consultant
Alexandre Forte	Consultant/Environmental Safeguards	Consultant
Jorge de Menezes	Procurement Specialist	Consultant
Lourenço Monteiro de Jesus	Procurement Analyst	Consultant
Manuel Amado	Financial Analyst	Consultant
Natacha Amado Vaz	Lawyer, Ministry of Finance and Int. Cooperation	MFIC
Lúvia Rossana de Carvalho	Lawyer, Ministry of Public Works and Natural Resources	MPWNR
Joe Oliveira da Trindade	Economist, Ministry of Finance and Int. Cooperation	
Cecílio Quaresma	National Coordinator	CONPREC
Carlos Dias	Sub-Commissioner, CONPREC	Fire Brigade
Silvestre Soares	Lead Officer	Prime Minister's Office
Wander Ceita	Search and Rescue Officer	Coast Guard
Hans Båge	Consultant/Safety at Sea and Fisheries Specialist	Consultant
João Pessoa		MARAPA
Ernestino Nascimento	Fisheries Specialist	Consultant
Alessio Giardino	Coastal Morphologist	DELTARES
Bouke Ottow	Sociologist	DELTARES
Roshanka Ranasinghe	Coastal Morphologist	UNESCO-IHE
Dano Roelvink	Coastal Morphologist	UNESCO-IHE
Frank van der Meulen	Coastal Zone Management	UNESCO-IHE/DELTARES
Otto de Keizer	Hydrologist	DELTARES
Tatiana Filatova	Economist	DELTARES

Annex 7: Additional Financing Analysis
São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT

1. The STP Adaptation to Climate Change Project's total investment cost is estimated at US$ 17.3 million, of which US $ 4.1 million are requested from Global Environmental Facility Least Developed Countries Fund (GEF LDCF). The funds will support institutional capacity-building, supply of equipment, and civil works for urgent and immediate adaptation priorities undertaken by the Government of STP for vulnerable coastal communities, as well as early warning and safety at sea campaigns designed to meet the most immediate coastal adaptation needs faced by STP. The proposed LDCF-supported investments, as outlined in Annex 2, would not have been urgent or necessary at this time in the absence of what are already clearly identifiable shifts in historic climate patterns.

2. The project's parallel baseline financing amounts to US$13.2 million, and includes a Government contribution of US$3.0 million in-cash for civil works, equipment, maintenance activities, and institutional development, and US$0.3 million in-kind for project management; US$0.4 million through the Japan Africa Adaptation Program (AAP) supporting equipment acquisition and institutional capacity-building, US$ 8.8 million equivalent thought the European Development Fund (EDF) through the European Commission, for public works, technical assistance and project management, and US$ 0.7 million from the International Development Association (IDA) for the Central African Backbone Project – Phase II allocation to STP, for technical assistance to Information Communications and Technology sector-enabling activities and project management.

3. All planned Project interventions are derived from the STP's 2007 NAPA and build on current or planned strategic development investments in STP. Specifically, this Project will implement Priorities 1, 2 and 3 of the NAPA and three additional associated sector priorities (priorities 9, 10 and 15) listed in the NAPA's top tier. As such, the proposed project also forms an integral part of STP's National Adaptation to Climate Change Program.

1. Project context

4. A Least Developed Country (LDC) and Small Island Developing State (SIDS), STP is recognized under the United Nations Framework Convention on Climate Change (UNFCCC) to be among the most vulnerable countries exposed to the impacts of climate change. Given its small size, isolation, susceptibility to natural disasters, and limited capacity to achieve sustainable development, the country is highly exposed to the effects of present climate variability and future climate change. Its coastal communities and, its artisanal fishermen in particular, are among the islands' most vulnerable population groups and already experience the impacts of shifting seasonal patterns[8] and escalating climate hazards:

[8] While STP exhibits a wealth of microclimates, the overall patterns is one of dual rainy and dry seasonality: two wet seasons February-May and October-December and two dry seasons in December-February and June-September. Historically storms activity has been most intensive in the June-September period (Gravana season) but is now increasingly shifting to overlap with the October-December wet season, resulting in catastrophic floods and coastal damage (2008-2010 coastal storms and floods).

- Artisanal fishermen facing a growing trend of loss of life and equipment due in part to shifts in seasonality and intensity of fog and storm events, making their traditional fishing and navigation practices (seasonal fishing patterns combined with reliance on visual and cloud navigation) ineffective and in some cases outright dangerous;

- Coastal communities experiencing increased livelihood losses, infrastructure damage and land loss as a result of intensified storms and precipitation events.

5. In the baseline situation, the lives and livelihoods of STP coastal communities and the economic development of the country are increasingly threatened by the above-outlined trends. The STP Government and development partner interventions (US $ 13.2 million, outlined on Table A below), which form the development baseline of the project, focus on providing basic weather forecasting and ICT services and address the immediate damage incurred as a result of recent (2008-2010) storm and flood events. Nascent Disaster Risk Management capacity is being put in place and limited river flood disaster risk reduction works are taking place in selected river deltas within the area and vicinity of the project.

Table A. Table of Project Financing showing Baseline (Co-Financiers) and Additional GEF Contributions

S. Tome and Principe
Adaptation to Climate Change Project
Components by Financiers
(US$' Million)

	GEF		The Government		Japan/AAP		EC/FED		IDA		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
A. Component 1. Early Warning System for Coastal Fishing Communities												
1. Coastal Early Warning System	1.44	68.5	0.46	21.9	0.20	9.6	-	-	-	-	2.10	12.1
2. Safety at Sea for Artisanal Fishers	0.45	30.4	0.45	30.5	0.03	2.0	-	-	0.55	37.1	1.48	8.6
Subtotal Component 1. Early Warning System for Coastal Fishing Communities	1.89	52.7	0.91	25.4	0.23	6.5	-	-	0.55	15.3	3.59	20.7
B. Component 2. Coastal Protection for Vulnerable Communities												
1. Community Preparedness	0.43	86.6	0.07	13.4	-	-		-	-	-	0.49	2.8
2. Coastal Protection for Vulnerable Communities	1.33	11.7	2.02	17.8	-	-	7.99	70.4	-	-	11.34	65.4
3. Coastal Policy	0.09	33.6	0.00	-	0.17	66.4	-	-	-	-	0.25	1.5
Subtotal Component 2. Coastal Protection for Vulnerable Communities	1.84	15.3	2.09	17.3	0.17	1.4	7.99	66.1	-	-	12.08	69.8
C. Component 3. Project Management	0.41	24.8	0.30	18.1	-	-	0.84	50.8	0.10	6.0	1.65	9.5
	4.15	23.9	3.30	19.0	0.40	2.3	8.83	50.9	0.65	3.8	17.32	100.0

6. Building on this foundation, the LDCF financing (US $ 4.1 million) will implement top NAPA priorities and address most urgent community adaption needs by establishing a functional early warning system, and introducing adequate safety of life at sea practices for artisanal fishermen in the context of the changing climate patterns. Urgent and immediate adaptation measures will be further implemented in the most vulnerable coastal communities of São Tomé and Principe to reduce the concurrent impacts of multiple climate risks, while providing the STP government with practical experience and an application toolkit to carry on future adaptation actions. Most importantly, a process of climate resilient coastal spatial planning will be initiated *to steer future community development away from the most exposed coastal areas*. This strategy is considered essential to sustain the NAPA priorities, as without it, the same underlying weaknesses that resulted in high vulnerability are likely to recur.

The loss of life among fishermen which also peaks during the period of dry fog and high winds (December-February, or mini Gravana season) is further steadily increasing.

2. Additional Cost Assessment

Outcome 1: Stemming the loss of lives and gear due to extreme weather events and shifting climate patterns

7. **Baseline:** At present, STP communities have little access to weather information as the country has a single functioning weather station, relies exclusively on regional forecasts obtained through satellite data (which does not capture storm conditions), and only transmits 24-hour forecasts. There are very limited records of climate data to allow for analysis of long-term climate change trends, with the partial climate data sets from STP's (1951-2010) digitized for the first time as part of this project preparation analysis. Artisanal fishermen rely on century-old fishing practices, without use of basic navigation instruments such as compasses or life-saving equipment such as flares or life jackets. Such equipment is generally not commercially available at STP as indigenous navigation and fishing practices, based on landmarks or cloud patterns, had traditionally served fishermen well. This is no longer the case now that weather patterns – and particular fog and wind patterns during the dangerous mini-*Gravana* season in December-February - have become disturbed. Once in distress, there is little that can be done to locate and rescue them, especially in reduced visibility, as the small wooden canoes have no radar reflectors and cannot therefore be detected by STP's Coast Guard radars.

8. **Project Development Co-financing:** The project's *development co-financing* will establish basic weather monitoring capacity through the installation of 4 basic weather observation stations (through Japan/AAA support, US$202,500) and the rehabilitation by the Government of 6 river monitoring hydrological stations (US$366,500). As a result the country will improve its capacity to produce (though not disseminate) 24-hour weather forecasts and follow/record microclimate trends. Separately, with the installation of the Central African Backbone broadband connectivity, STP's telecommunication system will be considerably improved, allowing for greater penetration of wireless connection and halving mobile phone and internet connection costs. This will benefit artisanal fishers and coastal communities indirectly, but no provisions will be made to establish an effective early warning system, apart from the establishment of an emergency "Green" telephone line. The dissemination of early warning information to both coastal communities and fishermen at sea will continue to be lacking as capacity for real-time observation of weather hazards and issuing of weather warnings, including the capacity to identify and track squall lines moving through the Gulf of Guinea will continue to be inexistent (as current methods of satellite based monitoring fail to detect rapidly forming storms). Fishers will continue to lack access to regular weather forecasts and the casualty trends are likely to continue growing at least over the foreseeable future. Little or no actions will have been taken to improve fishers' safety at sea or search and rescue capacity, apart from ensuring availability of fuel for search and rescue operations (estimated at US$90,000 a year).

9. **LDCF alternative**: The activities under Component 1 of the proposed project will leverage the development baseline investments to allow STP to build functional weather and climate monitoring capacity, including for real-time weather observations and tracking of extreme weather events, and put in place an operational *Early Warning System* that reduces the risk of loss of lives and property both at sea as well as amongst coastal communities. With the acquisition of a Doppler radar, STP will, for the first time, be able to track rapidly approaching

storms and squalls at sea. Fishermen will have access to 12-hour weather forecasts and real-time weather warning dispatches disseminated through the wireless telephone network/SMSs, radio, television, and community networks. The expanded weather and climate monitoring capacity will further facilitate increased public awareness of the impact of climate change on livelihoods. It will also allow the Government to improve its understanding of climate processes and change, resulting in better informed decisions and development options.

10. In parallel, previously unknown *safety at sea* practices and equipment will be introduced to artisanal fishermen, enabling them to adapt their fishing and navigation practices to the changing climate. Safety training and equipment, such as compasses, emergency flares, life jackets will be made available to trained fishermen, and in collaboration with STP's most experienced coastal NGO, the local production of low-cost radar reflectors will be encouraged, whilst safety equipment will be gradually introduced to the STP market. The STP's *Search and Rescue* system will be significantly strengthened through links to community disaster committees, enabling it to identify and assist fishermen in distress, thus further reducing the risk of loss of life due to extreme weather events.

Outcome 2: Coastal adaptation measures reduce climate risk for targeted communities

11. **Baseline:** Historically established in the vicinities of flood-prone river deltas, the communities of Ribeira Afonso, Malanza, Santa Catarina and Sundy have been hit hard by a series of extreme weather events (overlapping storms and torrential rains) over the last several years. These events have exacerbated the inherent vulnerability of these—and other STP coastal—Angolares communities. The resilience of these communities has been undermined by past unsustainable sand extraction practices and increasingly weekend by stronger and overlapping coastal storms and torrential rains. The confluence of such hazards in 2008-2010 has resulted in widespread flooding across all communities, accelerated coastal erosion, inundation and destruction of stilt houses, damage of critical infrastructure, including to the only access road to Sta. Catarina and the regional center of Neves and a coastal road portion in Ribeira Afonso. STP Government has actively moved to curb sand mining and is working with donor partners to restore damaged infrastructure. While there is growing awareness of shifting climatic conditions and associate structural changes/threats affecting the coastal communities and a nascent effort to initiate coastal planning, STP Government has neither the resources nor the expertise to initiate, on its own, long-term adaptation measures.

12. **Project Development Co-financing**: STP Government and development partners will reconstruct major coastal access infrastructure (access roads, bridges) damaged by the past few years' events of coastal storms and flooding. Both the US$1.4 million Government investment in emergency flood-reduction works in priority river deltas, and the estimated US$8.0 million committed by the European Commission European Development Fund (EDF) for urgent coastal protection works on the only access road to the communities of Santa Catarina and Neves follows a series of coastal storms in 2008-2011, including out-of-season storms, that are reported to be unprecedented for the last half a century, as well as intensification of coastal erosion. The river embankment work along several coastal deltas, including in one of the more vulnerable communities identified in the NAPA, are likely to partially limit risk of flooding.

13. In parallel, the Government has established a new disaster risk management platform (CONPREC), with a substantial annual allocation for coastal areas (US$136,000/year) and is earmarking decentralized capital budgets to vulnerable coastal communities (ca. US$35,000/village/year) which could prove key to gradually helping move them to lower risk areas. However, partly due to the Government's limited resources, these measures do not yet take an integrated climate risk-reduction approach, nor do they address community adaptation needs beyond the reconstruction of damaged major transport infrastructure. Regional development plans also do not factor in the projected intensification of weather events associated with changing climate and increasing climate variability.

14. **LDCF Alternative**: Integrated coastal adaptation measures will be put in place in four of the most vulnerable STP coastal communities (Ribeira Afonso, Malanza, Sta. Catarina and Sundy)[9] identified by the NAPA team in order to reduce their exposure to climate risks, and address the simultaneous impacts of coastal storms and river flooding triggered by increasingly strong precipitation events. A menu of "soft" (beach restoration, re-vegetation, community awareness) and "hard" adaptation measures (off-shore breakwaters, composite beach revetments, embankments, dragging, and drainage) will be piloted in the project communities to reduce their immediate exposure to floods and storms, while providing the STP government with experience and an operational toolkit for future adaptation actions. Importantly, a process of climate resilient coastal planning will be initiated in all pilot communities to steer future community development away from the highest risk areas. To consolidate and scale up pilot experiences to the national level, specialized technical assistance will be provided for community outreach and development of a climate resilient coastal policy.

15. The summary Additional Cost Financing calculations are shown on Table B.

[9] Planned coastal road reconstruction works supported by the Government of Portugal in Pantufo and Praia Melão, the fifth community on the NAPA list, is expected to address to a large extend the coastal erosion that is the main hazard faced by that community.

Table B. Summary Additional Cost Table

Project Component	*Cost Category*	*Costs (US$ million)*	*Outcomes*
Coastal Early Warning and Safety at Sea	*Development Baseline*	1.70	Development of basic weather monitoring capacity and improved telecommunication services.
	With GEF	3.59	Reduced risk of loss of lives and property due to extreme weather events
	Additionality	1.89	Advanced weather and climate monitoring, storm tracking, and information dissemination capacity, and introduction/operationalization of an Early Warning System Improved capacity for climate change analysis and scenario development for STP to inform better planning for adaptation Strengthened SAR system and improved safety at sea practices amongst the islands' artisanal fishermen
Coastal Protection for Vulnerable Communities	*Development Baseline*	10.24	Critical infrastructure restoration/rehabilitation and partial reduction of flood risk within the area of the project. Nascent planning and DRM capacity in place.
	With GEF	12.08	Reduced community exposure to climate risks while offering a menu of adaptation options to inform future community development and government adaptation planning and action
	Additionality	1.84	Integrated hard and soft adaptation measures for coastal adaptation are put in place in most vulnerable communities A process of climate resilient coastal spatial planning is initiate to steer future community development away from the most exposed coastal areas.

Annex 8: Summary of Socio-Economic Setting, Climate Change Analysis and Selection of Pilot Communities

São Tomé and Príncipe: ADAPTATION TO CLIMATE CHANGE PROJECT

1. This Annex gives a summary of STP geographic, social and economic setting, as relevant to the project's background; it discusses the conclusions of observed historical climate changes and projected changes from Global Circulation Models; and it outlines the participatory process followed by the NAPA team to select the pilot coastal communities under Component 2.

A. Geographic, Social and Economic Setting[10]

Geomorphology

2. *STP is an inactive volcanic oceanic archipelago, with steep, naturally erodible mountaneous slopes.* STP comprises two main islands and several islets, with a total surface of 1,001 km^2, 260 km of coastline, and an Exclusive Economic Zone of 170,000 km^2. It is Africa's second smallest State after the Seychelles. Although part of the Cameroon Volcanic Line, they are oceanic islands resulting from now extinct volcanic activities which were never connected with each other or with mainland Africa. Both islands consist of highly erodible landscapes of precipitous basaltic mountains and volcanic plugs. The area of mangroves and coral reefs is relatively small.

3. The main island of São Tomé (859 km^2, population 163,783) falls sharply to the sea, particularly on the western shore, rising to 2,024 m at the Pico of São Tomé on the north. Príncipe (139 km^2, population 7,230) located 140 km away, has a gentler slope, but also rises steeply to 680 m. Both islands are crossed by numerous rivers (at least 23 in São Tomé and 8 in Príncipe), often broken by waterfalls, and feeding into small deltas and coastal swamps. STP's soils are generally fertile, but (particularly along the coast) thin, sandy, and easily erodible when cleared.

Socio-Economic Context

4. *The plantations (roças) have been the backbone of the islands' socio-economic structure*. The archipelago was originally uninhabited rainforest covering both islands from sea level to the mountain summit. This primary vegetation was first cleared in the 15th century for sugar plantations. During the early 19th century, coffee and cocoa were introduced to the islands, and by early 1900s, STP had become the largest cocoa producer in the world. The focus on a pattern of economic development that was capital-intensive, resource intensive- and trade-intensive has led to an inherent vulnerability and instability in STP social and economic fabric. The *roças* were abandoned by their owners from the end of 1974 to the time of independence (1975), and the Government took them over through nationalization. Numerous

[10] da Costa, Henrique. 2011. *Contexte Pays: Situation Générale Géographique, économique, climatique*, and *Coastal Zone, Population, Gender and Vulnerabilities*.

programs, plans and projects were developed over the years, but many were uncoordinated and failed to take into account the structural problems affecting the island as a whole, and the land was subsequently allotted by the Government to small, privately-owned units. Even though this was first seen as an opportunity to raise income and eliminate widespread poverty through agriculture development, it quickly led to disappointment, as indebtedness, reduction of export crops and growing deforestation were compounded by ill-planned housing and infrastructure development.

5. *The incidence of poverty has grown significantly over the past 15 years.* Poverty rates have increased significantly since 1987, from 36 percent (of which 13 percent lived in extreme poverty) to 57 poverty in current times (with 28 percent in extreme poverty). Rural households, in particular, consume 32 percent less than urban households, and women-led households have an average consumption that is 11 percent lower than those headed by men.

6. *Coastal villages were heavily defined by the roças history and their boundaries.* Composed of runaway or freed slaves and descendents from plantation workers, fishers used to create temporary settlements or *Chadas* along the coast and return home as soon as the climate conditions became less favorable. With the establishment of the cocoa and coffee *roças,* the plantations tolerated *Chadas* primarily in marginal lands (e.g. river deltas) which were vulnerable to coastal erosion and flooding from both rivers and sea. After independence, *Chadas* gradually gave rise to more permanent settlements. With increased access to land, their population grew and became more diversified, whilst fishing families themselves declined and/or started diversifying their activities into agriculture, or informal commerce. In Riberia Afonso, for example, less than 10 percent of the population today is actively engaged in fishing (in Sta. Catarina, the proportion remains about 65 percent). At the same time, these communities remain amongst the poorest and most vulnerable in São Tomé and Príncipe. Importantly, their natural vulnerability to floods is being compounded by changing climate patterns (see Climate Change Analysis, below).

Figure 1. *Houses in Ribeira Afonso. Flood levels are shown on the right.*

7. *Artisanal fishing has continued to be performed by a socially marginalized group of people, called loosely the "Angolares", who are frequently associated by urban dwellers with low social status, illiteracy, and poor hygienic conditions.* Having developed their unique way

of life, they tend to be strongly individualistic. The virtual lack of refrigeration and freezing capacity makes fishing strictly seasonal, and the cost and availability of fuel has put motorized vessels beyond the reach of the majority of the fishers. As coastal areas are over-fished, fishers are often forced to take great risks to reach more remote fishing grounds. The predominantly sail and rowing canoes, however, effectively limit the range to which the majority of fishers can operate. Moreover, mortality at sea is heavily concentrated during the fog and squall period (the *mini-Gravana* season, see Figure 5) suggesting that reduced visibility and storms at sea play a key role in the casualties.

8. *Santomean society is deeply paternalistic and strongly politicized*. Most people expect top-down decisions, from either private initiatives or Government institutions. There is little collective sense of shared values and identity, and most decision making remains based on personal, rather than common interest and expectations of favoritism. This makes it difficult – but not impossible – for community-based initiatives to succeed. In recent times, there have been several attempts to form rural community associations, and some – such as the Interest Group on Maintenance of Roads – have had measured success. However, they remain for the most part sectoral and ad-hoc and need to be introduced with careful consideration of the overlaying cultural characteristics.

9. *Two important trends to consider have been the continuing emigration of skilled laborers, and the rapid growth of informal commerce.* The loss of skilled laborers is a matter of serious concern for STP as it is not being compensated by appropriate technical training and the remaining skilled laborers increasingly age. At the same time, unemployment remains significantly high (48 percent in 2008) particularly amongst women. Stimulated in part by underemployment, as well as by the distribution of agricultural land into small plots, a growing number of people have become part-time merchants and producer-vendors, contributing to the rapid growth in informal commerce, from foodstuffs to second hand garments, timber, and miscellaneous imported products. This impetus has contributed to the rapid population growth of secondary towns, like Ribeira Afonso (mostly consisting of youth).

Climate

10. *STP's climate is characterized by a long rainy season, alternating with two dry seasons when sea storms are most prevalent* (Figure 1). Precipitation in coastal areas averages around 1,000 mm a year, but at higher altitudes, it can exceed 7,000 mm a year (and in Principe 5,000 mm/year). The rainy season – from September to May – is followed by a dry period known as *Gravana*, generally known for rough seas. The months from December to February also experience a lower rainfall (the *Mini Gravana*). The average temperature registered at the airport meteorological station (sea level) is 26.2ºC with humidity varying between 70-80 percent.

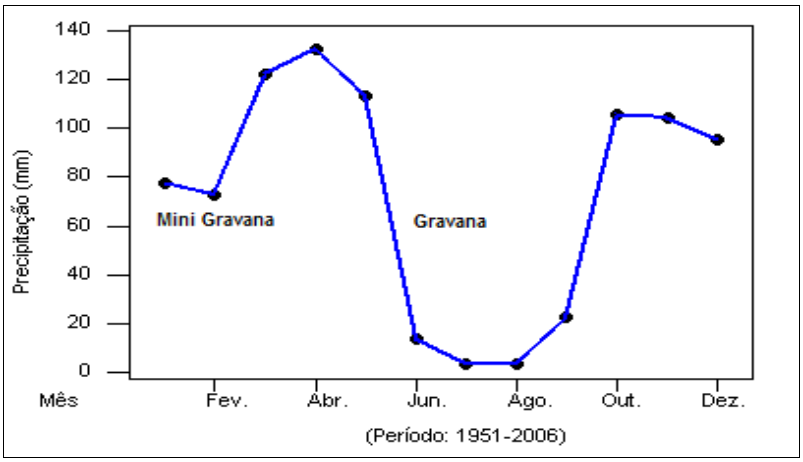


Figure 2. *Rainfall Patterns in São Tomé*

B. Climate Change Analysis

B.1 Trends Reported in the NAPA

11. Based on community feedback, the 2007 NAPA reported the following climate trends, as relevant to coastal areas[11]:

- *River flow decline* – in all regions of STP, people reported a decline in average river flow.
- *Prolongued dry season* – whilst previously the dry season lasted three months, over the last few years it has lasted 6-7 months.
- *Sea level rise* – reported regional sea level rise trends were seen as presenting a major long-term threat to coastal communities.
- *Storm surges and wave action* - this was reported in the NAPA to have intensified over the past few years in the coastal communities of Malanza, Santa Catarina, Ribeira Afonso, Micoló, Pantufo and Praia Gamboa, exacerbating coastal erosion and leading to destruction of houses and fishing canoes.
- *Torrential rains and river flooding* – whilst on average river flows are reported to have declined, communities report torrential rains and river flooding in some areas, particularly river deltas. The problem is compounded in coastal villages when early torrential rains coincide with coastal storms (e.g. in September).
- *Landslides* – Landslides were generally reported after torrential rains (e.g. in Sundy).
- *Increased storms and sudden fog at sea* - Increased storms and sudden fog and dust from mainland Africa – reported to have increased since the 1980s and concentrated during the *mini-Gravana* season – was said to contribute to loss of lives at sea, loss of fishing gear and canoes, and increased poverty amongst surviving families (in particular widows).
- *Temperature* - The First National Communication reported an average temperature increase of 0.032^{o} C a year (maximum) and 0.021 ^{o}C (minimum) from 1960-2010.

[11] For other reported trends, unrelated to coastal areas or climate change, see Government of São Tomé and Principe (2007). *National Adaptation Program of Action.*

B.2 Climate Change Analysis - Historical and Projected

12. To determine the basis for the empirical observations recorded in the NAPA, national meteorological experts from STP collaborated with experts from the University of Cape Town on a two-stage study of historical and projected climate change parameters[12].

- The first stage study analyzed trends in winds, geopotential height (high/low pressure at different heights), atmospheric temperature, sea surface temperature, precipitation, aerosols, and North Atlantic Oscillation for the 1980s, 1990s, and 2000 period.[13]
- The second stage study analyzed daily rainfall and temperature data for the Airport Meteorological Station from 1990-2010, applying 10 indeces of annual rainfall variability and 21 indeces of seasonal variability.[14] Simulated future changes for the 2040-2060 period were made using 13 Global Circulation Models, and the B1 and A2 emission scenarios.

13. The study indicated the following:

- Average temperatures are expected to rise between 1-2^{o} C by 2050. The increases appear greater during June to November.
- STP has experienced a general drying tendency in March-May and increases in daily rainfall (>90th percentile) during September-November. These results are also consistent with the median GCM projections of rainfall change for the STP region. The decrease in the long wet season rainfall could in part explain the NAPA's stakeholders' observation that precipitation is declining, contributing to a reduction in river flow and lengthening of the dry season. This latter observation was also shown in the rainfall records as an increase in the maximum number of consecutive dry days.
- The NAPA's stakeholders' observation of torrential rains, leading to landslides, and flooding, is also consistent with demonstrated and projected increases in heavy rainfall during September –November, at the end of the dry season (see figure). It may be that other factors such as deforestation and land use change also play a role in flooding events, but the observed and predicted rainfall trends consistently support a climate signal for increased torrential rains which could lead to flash flooding.

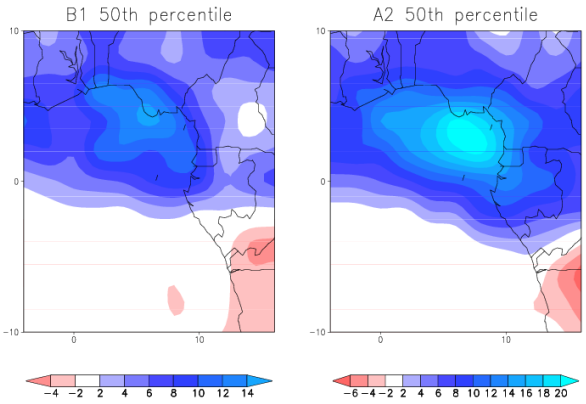


Figure 3. *Median change in average rainfall by 2040-2060 (mm/month) during September-November season.*

[12] Tadross (2011). "*São Tomé and Príncipe: Adaptation to Climate Change Program – Technical Support for Climate Modeling. Projected and Observed Changes in Climate from Historical Data and GCMs*" February (draft), and Tadross and Tummon (2010) "*Historical Decadal Changes in Regional Climate and Aerosols*", July.
[13] This used NOAA's atmospheric and oceanic NCEP-II reanalysis dataset http://www.esrl.noaa.gov/psd/data/gridded/reanalysis/
[14] ETCCDMI indeces, http://cccma.seos.uvic.ca/ETCCDMI/software.shtml and STARDEX indexes, respectively. See Tardoss (2011).

- The general observed trend towards increased aerosols concentration and squalls during December-February (*mini-Gravana* season) for the past two decades is likely to result from several factors. Stronger southerly and southeast trade winds may increase aerosol transport from mainland Africa. Similarly, increases in sea surface temperature and surface southerly winds may also induce local increases in atmospheric moisture near the surface. The increase in aerosol concentrations can also lead to smaller increases in surface temperature than at altitude, causing humidity to accumulate in surface layers, and potentially leading to more clouds, fog and rainfall. This theory requires further research, but actual fog observations for STP are lacking.

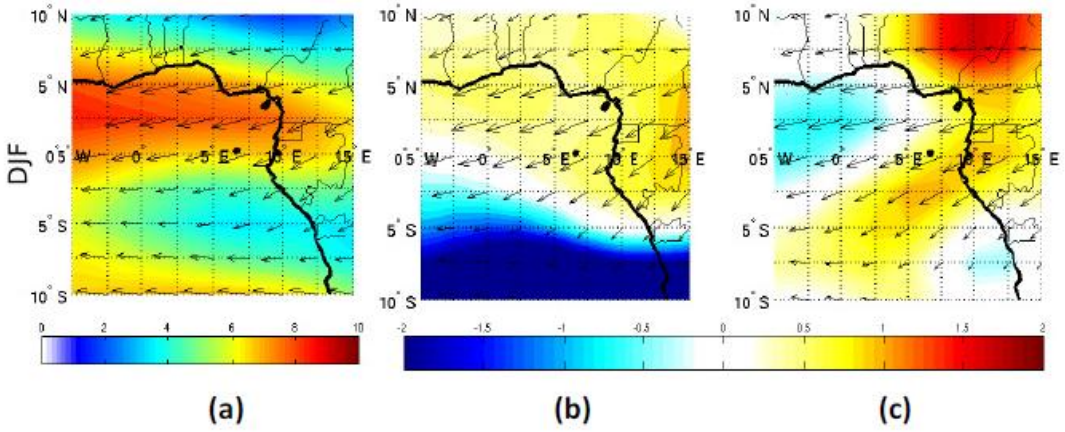


Figure 4. *Seasonal Average Winds at 700 hPa for the 1980s, 1990s and 2000s. Colors indicate wind speed and difference in wind speed between current and previous decade. Arrows indicate average wind speed and direction for that decade.*

14. While further data will be needed in the future to confirm this trend, Harbor Department statistics clearly show that the majority of losses at sea occur during January-February (the mini-Gravana season).

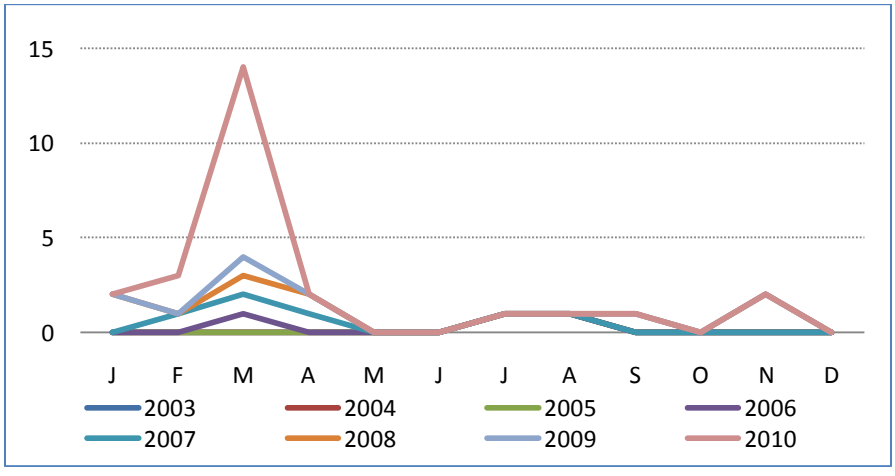


Figure 5. *Fishers Reported Lost at Sea by Harbor Department, São Tomé and Príncipe (2003-2010). Note the concentration of official reports during the month of March. As search and rescue continues for about a month after the actual event, this corresponds to losses during February, the peak of the mini-Gravana season.*

15. There is insufficient data on sea level rise in STP to derive a local trend, as the only available tidal gauge was installed after 2000. Nonetheless, if one adds to the global sea level rise trends the estimated surge levels for STP for a 30-100 year return period event (0.50-0.57 meters), STP could be facing sea level rise, compounded by storm surges of a meter or more (not counting the added impact of waves). Since pilot communities are located in river deltas with the predominant topography varying from 0-1.5 meters at high tide (maximum height about 5 meters), the overall impact is expected to be significant.

C. Selection of Pilot Villages

16. To refine the selection of pilot villages and identify the specific climate change issues affecting them, the national NAPA team carried out simple random interviews in the communities of Santa Catarina, Ribeira Afonso, Praia Melão/Pantufo, and Malanza (São Tomé Island) and Sundy (Príncipe) during December of 2010. The NAPA team opted to use the following selection criteria[15]:

1. Level of community exposure to extreme impacts of climate change - 15%
2. Avoiding loss of human lives *(how the adaptations proposed might reduce loss of human lives)* – 13%
3. Reduction in vulnerability (how adaptations proposed might reduce vulnerability) – 12%
4. Sustainability – 12%
5. Poverty reduction value – 10%
6. Implementation risks – 8%
7. Population density and proportion of fishing/percentage of population affected – 7%
8. Key infrastructure at risk – 6%
9. Financial cost – 7%
10. Likely natural resources impact – 5%
11. Synergy (potential for transversal benefits) – 5%

17. Flooding – both from the river and sea – is the most common hazard faced by the pilot villages (see figure 6), affecting 79 percent of respondents in Ribeira Afonso, 72 percent in Malanza, and about 75 percent in Sta. Catarina. Houses remain the most affected assets. The most common reported impacts are illnesses, temporary evacuation or abandonment of houses, and livelihood losses (due to work interruptions). Reported deaths are mostly of fishers perished at sea.

18. For the most part, communities report a passive outlook towards adaptation, such as waiting for external solutions, calling authorities, or simply waiting. Some communities – namely Santa Catarina and Sundy, recurred to neighbours, or moved temporarily. Amongst the solutions proposed, respondents cited most often the need for seawalls, river protection works, and breakwaters; other (less often) cited solutions included improved drainage, retreat, establishment of self-help organizations and (in Sundy) support to social activities and to telecommunications.

[15] See Santana, Aderito. 2011. *Climatologia e Adaptação.* Background Report VF1.

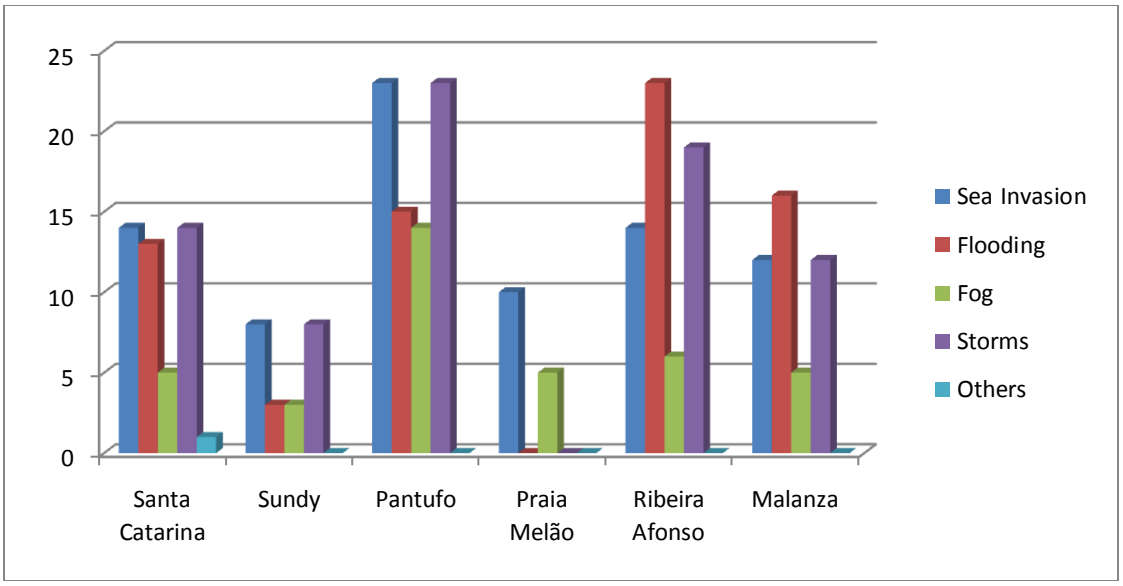


Figure 6. *Main Climate Hazards Reported by Coastal Communities*

19. Based on the community consultations and criteria specified on paragraph 16 above, the NAPA team established the following priority ranking for pilot communities in Component 2:

- Ribeira Afonso
- Malanza
- Santa Catarina
- Praia Melão/Pantufo
- Sundy

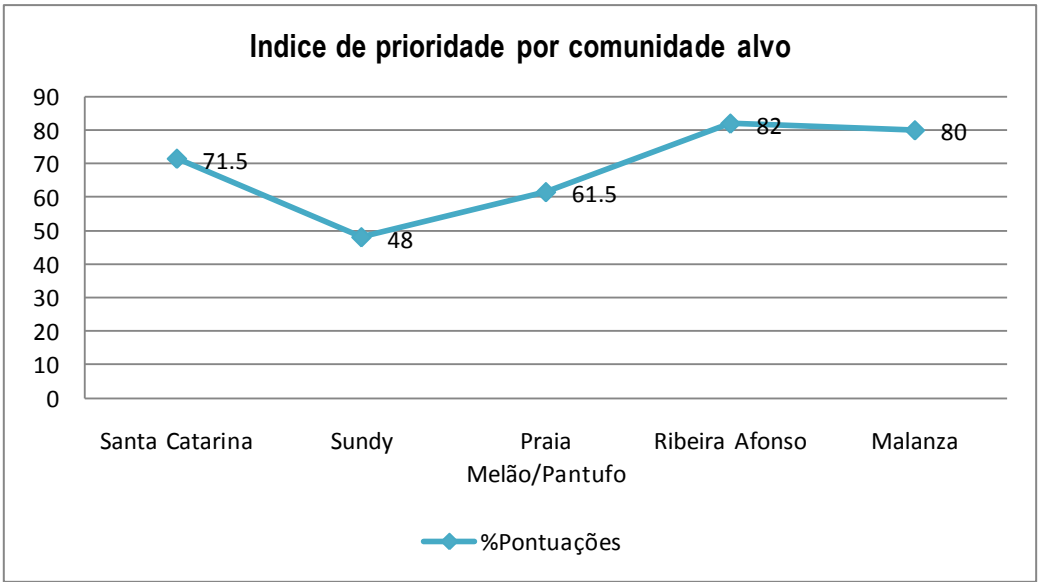
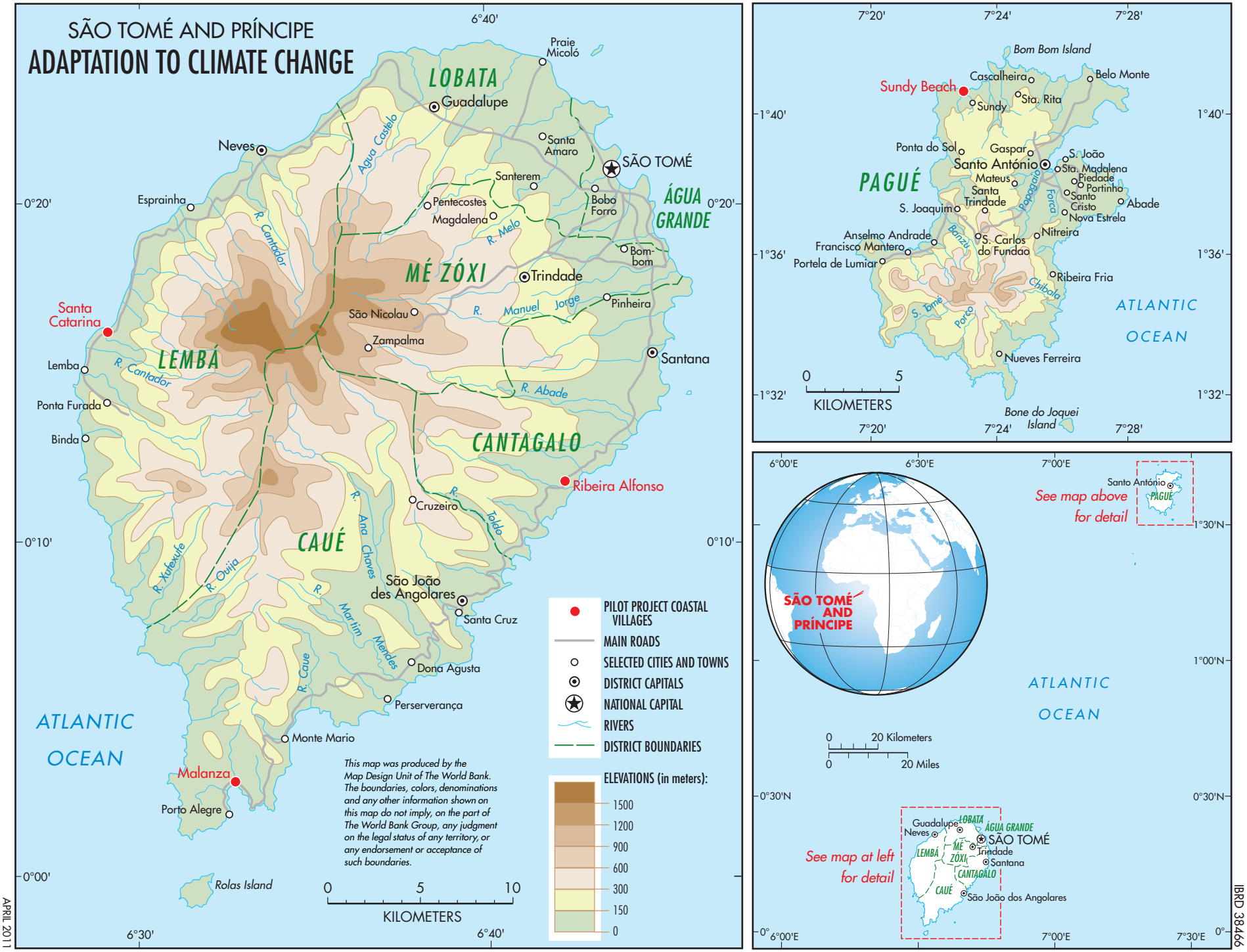


Figure 7. *Prioritization of Pilot Coastal Communities under Component 2*

20. Praia Melão/Pantufo was not included as a pilot in Component 2 for several reasons: first, the communities are close to the city of São Tomé and are likely to benefit indirectly from the rehabilitation of the coastal road envisaged under Portuguese assistance. Second, fishers from these communities will benefit from the early warning and training in safety at sea provided under Component 1; and third, it was important to select a community in Príncipe (Sundy) for representativeness and future scale up. Should the model piloted in Component 2 prove successful, this decision could be reconsidered.


SÃO TOMÉ AND PRÍNCIPE
ADAPTATION TO CLIMATE CHANGE
LOBATA
MÉ ZÓXI
ÁGUA GRANDE
LEMBÁ
CANTAGALO
CAUÉ
Praie Micoló
Guadalupe
Neves
Santa Amaro
SÃO TOMÉ
Santerem
Esprainha
Pentecostes
Magdalena
Bobo Forro
Bom-bom
Trindade
Pinheira
Santa Catarina
São Nicolau
Zampalma
Santana
Lemba
Ponta Furada
Binda
Ribeira Alfonso
Cruzeiro
São João des Angolares
Santa Cruz
Dona Agusta
Perserverança
Monte Mario
Malanza
Porto Alegre
Rolas Island
Agua Castelo
R. Cantador
R. Melo
R. Manuel Jorge
R. Abade
R. Toldo
R. Ana Chaves
R. Martin Mendes
R. Caue
R. Ouija
R. Xufexufe
ATLANTIC OCEAN
PILOT PROJECT COASTAL VILLAGES
MAIN ROADS
SELECTED CITIES AND TOWNS
DISTRICT CAPITALS
NATIONAL CAPITAL
RIVERS
DISTRICT BOUNDARIES
ELEVATIONS (in meters):
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Mateus
Piedade
Portinho
PAGUÉ
Santa Trindade
Papagaio
Forca
Santo Cristo
Abade
S. Joaquim
Nova Estrela
Anselmo Andrade
Francisco Mantero
Benzu
S. Carlos do Fundaa
Nitreira
Portela de Lumiar
Ribeira Fria
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