



ADAPTATION FUND

ADAPTATION FUND BOARD SECRETARIAT TECHNICAL REVIEW OF PROJECT/PROGRAMME PROPOSAL

PROJECT/PROGRAMME CATEGORY: Regular Size Full Proposal

Country/Region: Trinidad and Tobago/Caribbean

Project Title: Multisectoral Adaptation Measures to Climate Change in the South Oropouche River Basin for Flood Relief

Thematic Focal Area: Multisectoral

Implementing Entity: CAF, Development Bank of Latin America

Executing Entities: The University of the West Indies (UWI)

AF Project ID: AF00000261

IE Project ID:

Requested Financing from Adaptation Fund (US Dollars): USD 10,000,000

Reviewer and contact person: Micol Ullmann Auger

Co-reviewer(s):

IE Contact Person:

Technical Summary

The project "Multisectoral Adaptation Measures to Climate Change in the South Oropouche River Basin for Flood" aims to increase the resilience of the South Oropouche River Basin's population and ecosystems to flooding, sea level rise and expected increasing water deficit events. This will be done through the five components below:

Component 1: Strengthening of Territorial Planning and Risk Management (USD 2,232,000).

Component 2: Green and grey infrastructure enhanced to increase resilience to floods and droughts (USD 3,425,137).

Component 3: Vulnerable coastal and wetland ecosystems of the SORB enhanced (USD 1,440,675).

Component 4: Increase adaptation capacity and diversify livelihoods of vulnerable farmers and fishers to respond to increased climate risks (USD 975,270).

Component 5: Stakeholders of the SORB have built their capacities and are aware of climate risks (USD 285,900).

Requested financing overview:

Project/Programme Execution Cost: USD 857,608

	<p>Total Project/Programme Cost: USD 9,216,590 Implementing Fee: USD 783,410 Financing Requested: USD 10,000,000</p> <p>The initial technical review raises some issues such as considerations regarding social sustainability of project activities and management of the grievance mechanism beyond the project and the need to correct the total project costs in the budget, as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review.</p>
Date:	January 24, 2022

Review Criteria	Questions	Comments	IE response
Country Eligibility	1. Is the country party to the Kyoto Protocol?	Yes.	-
	2. Is the country a developing country particularly vulnerable to the adverse effects of climate change?	Yes. Trinidad and Tobago is extremely vulnerable to climate change impacts including increasing temperatures, frequent flooding and saline intrusion, with both health and economic ramifications, including on local farming and tourism livelihoods.	-
Project Eligibility	1. Has the designated government authority for the Adaptation Fund endorsed the project/programme?	Yes. As per the endorsement letter dated January 5, 2022.	-
	2. Does the length of the proposal amount to no more than One hundred (100) pages for the fully-developed project document, and one hundred (100) pages for its annexes?	No, the proposal is currently 105 pages. The annexes are within the page-limit. CAR1: Please reduce proposal to meet page limit requirements.	CAR1: The proposal has been reduced to 100 pages.
	3. Does the project / programme support concrete adaptation	Yes. The project aims to promote investments for enhancing water	-

	<p>actions to assist the country in addressing adaptive capacity to the adverse effects of climate change and build in climate resilience?</p>	<p>infrastructure, EbA measures in vulnerable and coastal ecosystems, and to raise awareness of climate change impacts and climate change adaptation focusing on the South Oropouche River Basin. The proposed activities are designed to strengthen institutional and regulatory systems for climate responsive planning and development, as well as information, monitoring, and climate information management and early warning systems. The planned activities include capacity building for local farmers and fishers for climate adaptive farming as well as improved livelihoods options.</p>	
	<p>4. Does the project / programme provide economic, social and environmental benefits, particularly to vulnerable communities, including gender considerations, while avoiding or mitigating negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?</p>	<p>Yes. The project will adopt a landscape approach and provide benefits in all three areas. The Project will directly reach 9,758 community members, 50.1% of which female. 679 people will benefit from diversified livelihood options supported by the project.</p> <p>175 ha of key coastal and wetland ecosystems in the Godineau Swamp will be rehabilitated and 17.5 ha will be improved due to the introduction of sustainable production practices.</p>	<p>-</p>

		The expanded hydrometeorological information network and improved flood emergency response plans, which will incorporate the information of developed flood risks maps will indirectly benefit the whole basin population, and therefore benefit up to 197,540 inhabitants.	
	5. Is the project / programme cost effective?	Yes. The project will prioritize no-regret and low regret options and cost-effective technologies for adaptation assessed in the study conducted by the Inter-American Development Bank (IDB) in Trinidad and Tobago "Understanding the economics of climate adaptation in Trinidad and Tobago", which include capacity building activities, mangrove restoration and improved DRM. The project's overarching logic and approach are grounded on numerous studies, including a 2019 "Rapid assessment for the rehabilitation and improvement of drainage infrastructure in Trinidad" to assess the no-regret and short-term measures for a rapid rehabilitation of the drainage infrastructure on Trinidad after the October 2018 flood event.	-
	6. Is the project / programme consistent with national or sub-national sustainable	Yes. The project will support five out of the six national environmental priorities set by the	-

	development strategies, national or sub-national development plans, poverty reduction strategies, national communications and adaptation programs of action and other relevant instruments?	<p>National Environmental Policy (2018) for Trinidad and Tobago, the National Policy and Programmes on Wetland Conservation for Trinidad and Tobago (2002), National Protected Areas Policy (2011), National Forest Policy (2011), National Climate Change Policy (2011), National Wildlife Policy (2013), National Tourism Policy (2010), and National Integrated Water Resources Management Policy (2005).</p> <p>The proposal is aligned with a number of national strategies and plans as well as with efforts being undertaken through the OPDM to update the governance framework for Disaster Risk Management.</p>	
	7. Does the project / programme meet the relevant national technical standards, where applicable, in compliance with the Environmental and Social Policy of the Fund?	Yes. The project will be executed by the University of the West Indies through its St. Augustine Centre for Innovation and Entrepreneurship (STACIE), and commits to ensure adherence to all laws, policies and regulations of the Government of Trinidad and Tobago.	-
	8. Is there duplication of project / programme with other funding sources?	No. The project will build on existing efforts to strengthen governance and management of the SORB. A participatory approach was used for project formulation (as per Annex 2 Stakeholder engagement report),	-

		<p>which has guaranteed that all the activities have been proposed by the local communities and government agencies, building upon what is already in place in the country.</p> <p>The project design has been coordinated with the Ministry of Planning and Development and CAF, and by addressing the topic throughout the bilateral meetings with the various stakeholders in order to avoid duplication. Complementarity and synergies are described in the table on pgs. 67-68 and broken down by components.</p>	
	<p>9. Does the project / programme have a learning and knowledge management component to capture and feedback lessons?</p>	<p>Yes. Project component 5 focuses on knowledge management and dissemination of lessons learned.</p> <p>A knowledge management strategy will be outlined at the start of the intervention to ensure effective use and dissemination of the information and data generated by the Monitoring and Evaluation System and the best practices and lessons learned, which may be disseminated through printed materials and short videos.</p> <p>Component 5 also plans for peer-to-peer learning between key</p>	-

		<p>government staff supported by specialists from the university, development of training material, embedding climate change and risk reduction planning to address flooding in the school curricula or through extra-curriculum activities, and annual workshops and trainings.</p>	
	<p>10. Has a consultative process taken place, and has it involved all key stakeholders, and vulnerable groups, including gender considerations in compliance with the Environmental and Social Policy and Gender Policy of the Fund?</p>	<p>Yes, as elaborated in Section H, page 74, and in Annex 2 - Stakeholder engagement report, which includes sex-disaggregated participants lists. A kick-off workshop in November 2020 was attended by governmental and non-governmental organizations. Bilateral interviews and follow-up meetings with key stakeholders were organized and prioritized in conjunction with CAF and the Ministry of Planning, NDA of the Adaptation Fund in Trinidad and Tobago.</p> <p>On 22 April 2021, a Validation Workshop was held to confirm the identified climate risks, baseline conditions, main barriers, and to validate the proposed draft activities and interventions, as well as the prioritization of areas to implement the project and the institutional arrangements foreseen. The feedback from the consultations process informed the project components.</p>	<p>Kindly note that, besides from this, bilateral meetings continued until December 2021 and that on the week of 6-10 December 2021 there was a field mission during which CAF, national government, local government, the university and representatives of local communities discussed about the climate impacts on the ground and the proposed solutions. Additionally, several locations where the works will be conducted were visited and flooding affected population were consulted.</p>

		A new virtual workshop was held in October 2021 to update all relevant stakeholders on the formulation process, which was attended by 52 participants (40% women).	
	11. Is the requested financing justified on the basis of full cost of adaptation reasoning?	Yes. The proposal provides a comparison of the baseline versus activities with AF Funding for each component and demonstrates that the project activities are relevant in addressing its adaptation objectives.	-
	12. Is the project / program aligned with AF's results framework?	Yes, as outlined in Section F on page 100.	-
	13. Has the sustainability of the project/programme outcomes been taken into account when designing the project?	<p>Yes. The proposal includes capacity building activities for key government technical staff and decision-makers, and local communities, the development of partnerships and agreements with relevant governmental institutions for the maintenance of investments, supporting local ownership of activities.</p> <p>It would be useful to understand how the project will ensure the continued commitment to maintain the grievance mechanism and E&S monitoring of the project once the project is finished. Aside from the planned awareness and capacity building activities, does the project contemplate signed agreements to guarantee the</p>	<p>CR1: As part of the planned awareness and capacity building activities, the project contemplates signing agreements to guarantee the social and environmental sustainability of project outcomes. This project is framed within the overarching policy objective of integrating climate risks in the national development process. Therefore in 2022, a roll out of integrating the findings of the Vulnerability Capacity Assessment (VCA) through its implementation plan will be done, which would provide complementarity to the activities being undertaken under the project. The incorporation of the risk management activities in the overall climate risk management process will be supported during project</p>

		<p>social sustainability of project outcomes?</p> <p>CR1: Please provide more information on how the project will ensure the maintenance of the grievance mechanism and ensure the social sustainability of project activities.</p>	<p>implementation thus ensuring longer term E&S outcomes.</p> <p>Regarding the sustainability of the grievance mechanism after the project end, it is proposed to work with the three regional corporations during project implementation to streamline their processes and ensure incorporation of the project's grievance mechanism into governmental existing structures. There are already several agencies that administer this type of mechanism, as described below.</p> <p>The country has a legal/policy mechanism under the Environmental Management Act and the subsidiary legislation (Certificate of Environmental Clearance (CEC) Rules, Water Pollution Rules, Air Pollution Rules, etc.), administered by the Environmental Management Authority (EMA). There is a mechanism for receiving and addressing complaints at the EMA, that includes environmental issues including those related to the subsidiary rules (air pollution, waste management, flooding, noise, etc.). The Town and Country Planning Division (TCPD) also receives complaints. Addressing the complaints usually involves a discussion with relevant</p>
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			<p>stakeholders related to the complaint, including timeframes for response. Issues/complaints can also be resolved by the Environmental Commission which is a court of superior record established under the Environmental Management Act.</p> <p>The Regional Corporations (at least the PDRC) have a complaints form through which grievances/complaints may be reported and may serve to satisfy a first level of engagement.</p> <p>Building on the implementation of the environmental and social safeguards and grievance mechanism capacity building activities, the project will work with national and local institutions to mainstream SORB project-specific issues and ensure that the grievance mechanism is operational in the post-project phase under the government's responsibility.</p> <p>These considerations have been included in the FP and the ESMP.</p>
	<p>14. Does the project / programme provide an overview of environmental and social impacts / risks identified, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?</p>	<p>Yes, as per the checklist of the project's impacts and risks on page 81, the ESMP (Annex 6), the evidence-based risk identification (Annex 5), the gender assessment (Annex 3), and the Gender Action Plan (Annex 4).</p>	-

		The project is classified as a Category B.	
Resource Availability	1. Is the requested project / programme funding within the cap of the country?	Yes.	-
	2. Is the Implementing Entity Management Fee at or below 8.5 per cent of the total project/programme budget before the fee?	Yes.	-
	3. Are the Project/Programme Execution Costs at or below 9.5 per cent of the total project/programme budget (including the fee)?	Yes.	-
Eligibility of IE	1. Is the project/programme submitted through an eligible Implementing Entity that has been accredited by the Board?	Yes , CAF which is an accredited Regional Implementing Entity.	-
Implementation Arrangements	1. Is there adequate arrangement for project / programme management, in compliance with the Gender Policy of the Fund?	Yes , as per Section A, on pages 83-87.	-
	2. Are there measures for financial and project/programme risk management?	Yes , as per Section B on page 87, the ESMP and grievance mechanism (Annex 6), the evidence-based risk identification (Annex 5), the gender assessment (Annex 3), and the Gender Action Plan (Annex 4).	-
	3. Are there measures in place for the management of for environmental and social risks, in	Yes , as per Section C on page 87, the ESMP and grievance mechanism (Annex 6), the	-

	line with the Environmental and Social Policy and Gender Policy of the Fund?	evidence-based risk identification (Annex 5), the gender assessment (Annex 3), and the Gender Action Plan (Annex 4).	
	4. Is a budget on the Implementing Entity Management Fee use included?	Yes , as per page 107.	-
	5. Is an explanation and a breakdown of the execution costs included?	Yes , as per page 107 of the detailed budget.	-
	6. Is a detailed budget including budget notes included?	<p>Yes, as per Section G on page 108 which includes a detailed budget with budget notes indicating the break-down of costs at the activity level, and E&S specialist to ensure gender-responsive implementation. However, there are some discrepancies to fix.</p> <p>In addition, it would be useful to understand why the E&S specialist will be hired on a part-time basis, rather than full time like the livelihoods and water ecosystems specialists.</p> <p>CAR2: It is suggested to add the totals for each component in the detailed budget under section H for easier verification. The totals per component do not match the number in the detailed budget table. Please amend accordingly.</p>	<p>CAR 2 Budget discrepancies: The requested discrepancies have been reviewed and fixed. Additional rows with totals for components have been added.</p> <p>CR2 dedication of E&S specialist: The dedication of the E&S specialist has been revised in greater detail to meet the needs of the project in its different phases. The initial phases (year 1 and year 2) can be extremely intense and demanding since there are many submission requirements (e.g., activities requiring CECs and monitoring). However, once the infrastructure has been installed, i.e., the drainage works and the weirs constructed, the required time commitment of the E&S consultant is significantly less. Therefore, the budget has been reviewed to reflect a full-time dedication of this specialist during the first part of the</p>

		<p>CR2: Please provide rationale for part-time versus full-time use of an E&S specialist.</p>	<p>project and a part-time dedication (60% of the time) during the second part of the project (year 3 and year 4). This is based on the project management experience of the government and the formulation team.</p> <p>This has been reflected in the Budget. The ESMP has been updated to reflect the last version of the PMU structure according to the budget.</p>
	7. Are arrangements for monitoring and evaluation clearly defined, including budgeted M&E plans and sex-disaggregated data, targets and indicators, in compliance with the Gender Policy of the Fund?	<p>Yes, as per page 90.</p>	-
	8. Does the M&E Framework include a break-down of how implementing entity IE fees will be utilized in the supervision of the M&E function?	<p>Yes, as per page 107.</p>	-
	9. Does the project/programme's results framework align with the AF's results framework? Does it include at least one core outcome indicator from the Fund's results framework?	<p>Yes, as per sections E and F on pages 92-101.</p>	-

	<p>10. Is a disbursement schedule with time-bound milestones included?</p>	<p>Yes, included on page 108. However, some adjustments are needed.</p> <p>CAR3: Please correct the disbursement table and ensure all numbers add up correctly. The total of the 2nd tranche doesn't sum up to US\$ 3,662,023 as in the proposal. In addition, the sub-total of project funds and execution cost (US\$ 9,215,791) doesn't match with the numbers in the detailed budget.</p>	<p>CAR3 Disbursement table: numbers have been revised and corrected.</p>
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ADAPTATION FUND

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org



ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/ PROGRAMME INFORMATION

Project/Programme Category:	Project
Country/ies:	Trinidad and Tobago
Title of Project/Programme:	Multisectoral Adaptation Measures to Climate Change in the South Oropouche River Basin for Flood Relief
Type of Implementing Entity:	Regional Implementing Entity (RIE)
Implementing Entity:	CAF, Development Bank of Latin America
Executing Entity/ies:	The University of the West Indies (UWI)
Amount of Financing Requested:	USD 10,000,000 (4 years)

Project / Programme Background and Context:

Summary Overview

1. Traditionally, flooding in the South Oropouche River Basin (SORB) from high intensity, short duration storms occur about ten times each year. However, in the last five years, basin-wide floods with high water depths, taking several days to subside, have been occurring almost annually. These floods cause major disruption to the productive sector and the populated centers, and frequently result in loss of personal property. Losses are estimated at between USD 19 - 36 million per year at the country level, depending on the climate scenario. According to the models, climate change is expected to increase the frequency and intensity of floods but will also cause sea level rise and augment the occurrence of drier periods. Climate-induced changes in the marine environment threatens livelihoods such as small-scale fisheries present in the area.
2. Climate change will exacerbate the problems that currently exist in the basin, with the confluence of various economic activities in the same territory (agriculture, fishing, commercial, oil and gas production), the poor condition of the drainage systems, and the pressures of major urban growth in the area in recent years. The riverine system is especially susceptible to the effects of climate change, including the threats of saline intrusion which affects both flora and fauna. Economic impacts are evident on people's livelihoods.
3. The path of the South Oropouche River within the South Oropouche watershed takes it from the generally flat and gently undulating arable lands in Barrackpore to the Godineau Swamp, an estuarine wetland of 3,171 ha, and out to the Gulf of Paria. The swamp receives the drainage from a catchment basin of 42,473 ha which includes the nearby urban communities. This swamp, which acts as a buffer against flooding and sea level effects, is also under pressure by human activities and the environmental change caused by climate change and needs to be reinforced and protected to in turn protect the population of the basin.
4. The SORB has been prioritized by the country because of the chronic flooding issues that occur even in periods of moderate rainfall, it is a region of high population density and agricultural and commercial activity and thus disruption and economic losses are significant; the most recent studies have identified this region as vulnerable to climate change; the local communities have shown evidence of sea water

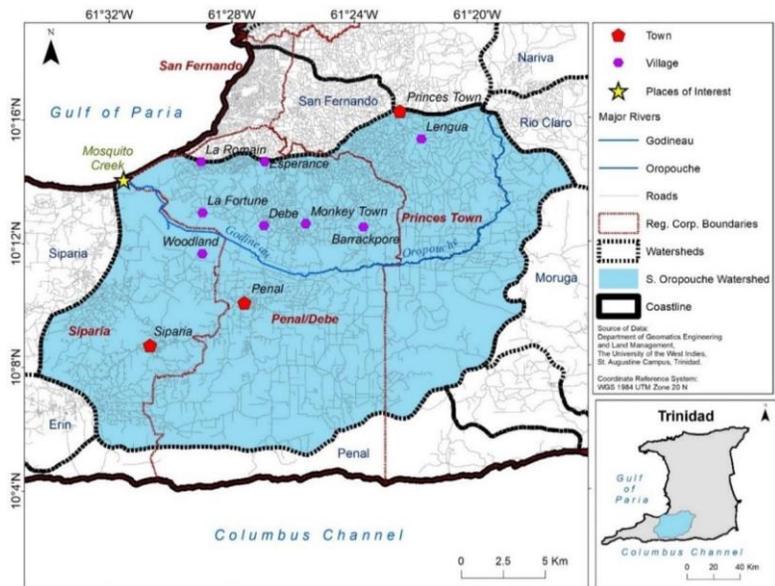
intrusion; and climate change scenarios show that projected impacts are likely to exacerbate the existing situation unless adaptation measures are taken.

5. The Project will be nationally led by the Ministry of Planning (NDA) and implemented by the Development Bank of Latin America (CAF). It aims to increase the resilience of the South Oropouche River Basin's population and ecosystems to flooding, sea level rise and expected increasing water deficit events. The proposed activities will strengthen territorial planning and risk management, will promote investments for enhancing water infrastructure, EbA measures in vulnerable and coastal ecosystems, increase the adaptive capacity of vulnerable farmers and fisherfolk to diversify and strengthened their livelihoods, and raise awareness, build capacities, and mobilize the stakeholders of the SORB towards climate change resilient actions that account for gender justice.
6. The expected total number of beneficiaries sums up to 197,540 beneficiaries, since some of the expected investments such as the expanded hydrometeorological information network and improved flood emergency response plans, which will incorporate the information of developed flood risks maps will indirectly benefit the whole basin population. In terms of direct support to increase adaptation capacities with direct adaptation concrete solutions or capacity building, the Project will reach 9,758 community members, being 50,1% women. Furthermore 679 people will avoid a decrease in income due to the diversified livelihood options supported by the Project. Additionally with the intervention 175 ha. of key coastal and wetland ecosystems in the Godineau Swamp will be rehabilitated coupled with 17.5 ha which will be improved due to sustainable production practices.

The South Oropouche River Basin (SORB)

7. The South Oropouche River Basin (SORB) is situated on the southwestern coast of Trinidad (Figure 1). Its catchment area of about 450 km² is drained westward by a dense network of tributaries that drain into the Godineau/South Oropouche Swamp.

Figure 1. The South Oropouche River Basin (SORB)



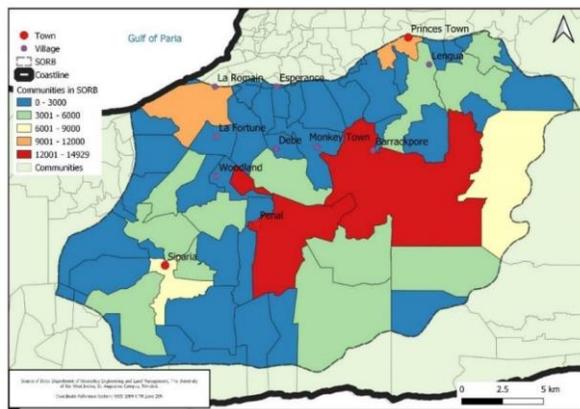
8. A sand dune on the coast extends across the interface with the Gulf of Paria that controls free flow into the sea. Drainage is through two openings in the dune, the Godineau River to the south and Mosquito Creek to the north. The catchment is relatively flat with the highest point being about 175 m MSL. The average slope of the catchment along Godineau River, the main westward flowing watercourse, is about 0.30%. The longest flow path is about thirty (30) km and the travel time to the coast is about one (1) day. The average annual flow from the basin is 3.6 m³/s, but it varies appreciably. In some years, streamflow stations have recorded almost no flow along the main channel.
9. In its natural form, about 15% of the catchment was occupied by a lagoon and surrounding swamp lands, with the majority of it being in the lower segment and continuous with the coast. Some pockets of marsh lands extended to Barrackpore, which is about 15 kilometers inland from the coast. About 80% of the soils in the basin have clay textures but there are some pockets of sand toward the southwestern segment. A land capability assessment of the catchment has described the soils as having imperfect drainage with very low infiltration rates¹.

A. Social, Economic, and Environmental Context

a) Demographic data in the project area

10. Portions of three Regional Corporations comprise SORB, namely Siparia, Penal/Debe and Princes Town. Overall, the population of the SORB accounted for 143,855 people in 2000, equivalent to 11.35% of the total population of Trinidad and Tobago at that time. In 2011, date of the last census, the population had grown to 197,540 people (50.1% women).

Figure 2. Population distribution in the SORB (2011)



Source: University of the West Indies, 2021

11. Siparia is just over 51,000 hectares, roughly 10% of the total land area, and features a variety of settlements of various sizes, on and offshore oil production bases, ports, industrial areas, fishing centers, forest, swamps, agriculture, and numerous beaches stretching along the 100 kilometers coastline of southwest Trinidad from Godineau River to Quinam Bay. Oropouche East and West fall under the Penal/Debe Regional Corporation. Princes Town municipality, which is next to the Penal/Debe region, is one of the largest municipalities at 62,000 hectares. It is made up of fifty-six communities and extends to the coast in the South, abutting the City of San Fernando in the North.

¹ Brown, C. and Bally, G., 1968. Land Capability Survey of Trinidad and Tobago No. 5 Soils of South Trinidad. Orbit Press, Port-of-Spain.

12. **Population:** According to the last census (2011) 86,949 people reside in the region of Siparia living in 22,393 private households. The recorded population of Penal/Debe is 89,392 persons, living in the 26,067 recorded private households in the region. In Princes Town, the total recorded population is 102,957 with a population density of 148 per km² in the last census². The population of the three regional corporations is relatively young, with more than half of the population under 35 years of age. The age/gender comparison shows an almost even distribution of the population by gender.
13. **Education Level:** Examination of the highest qualification attained in Siparia and Penal/Debe approximately 49% of those 15 years or older had no qualifications. However, 30% of those who had qualifications in the Siparia and Penal Debe population had attained primary-level education. Tertiary non-university level educational attainment stood at 5.7% and 5.4% for those who attained tertiary university-level education in Siparia; and at 6.1% and 7.9% in Penal Debe. The National Human Development Index ranks Princes Town as having the fourth lowest “secondary and higher education” attainment rate. Princes Town had the lowest rate of female participation in the workforce.
14. **Gender Equality:** Siparia and Penal/Debe were among the regions that scored the lowest in the gender inequality index compared to other regions in the country. This trend also applies to Princes Town, with the municipality recording the lowest rate of female participation in the workforce in its last available Economic Profile. Siparia has a higher-than-average female labor force participation rate – 50.3%, while Penal/Debe had the second lowest female labor force participation rate in the country (43.7%). Princes Town has the lowest rate of female participation in the workforce.
15. **Health and Life Expectancy:** In Trinidad and Tobago, in 2016 the total life expectancy was 63.3 years with 4.9% of adult population considered undernourished (2015–2017, 3-year average); 19.7% of adult population considered obese (2016); 12.5% prevalence of diabetes in the adult population (2014) and 23.6% of iron deficiency anemia in women of reproductive age (2016). In the case of the South Oropouche region, Siparia recorded a slightly higher life expectancy of 74.65 for both sexes; 73 for males and 76.6 for females. However, Siparia has a slightly lower incidence of chronic diseases of 21.8 percent compared to the national average. Penal/Debe’s life expectancy is higher than the national average; 70.2 years for males; and 76.5 years for females. Penal/Debe also has a relatively low incidence of chronic diseases of 20.7% and recorded the second lowest population percentage without adequate sanitation facilities, with 3.9% of its households. Princes Town reflects a similar life expectancy of 74.20 years, while the municipality has the second highest incidence of chronic diseases.
16. **Informal settlements:** In 2011, within the SORB area, there were 187 informal settlements registered in Trinidad. However, these figures do not account for the many squatter communities which remain unregistered. According to ODPM 2014, there were around 23 settlements in Siparia, 12 in Penal Debe, 10 in Princes Town.
17. **Disabilities:** People with disabilities are the most vulnerable to climate risks and they require specific attention in emergencies. According to the 2011 census, the percentage of people with disabilities at the Regional Corporations were: Penal Debe 3,3%, Princes Town 4,5% and Siparia 4,8% from total of population.

b) Access to public services

18. According to the 2011 census³, households of the SORB face challenges related to unmet basic needs (UBN). As presented in Table 1, the percentage of households in the region with one or more UBN ranges from 18.06% and 22.32%, and with two or more the range varies from 2.85% to 4.67%. The higher percentages of UBN are those related to housing, which varies from 5.76% to 7.53%.
19. The Penal Debe Regional Corporation presents the lowest percentage of population among the three municipalities with two or more UBN (2.85%), while the municipality of Princes Town shows the highest percentage of the population with one or more UBN (22.32%). Siparia has the lowest percentage of households with one or more UBN but has the highest value for two or more UBN (4.67%).

² These figures are for the entire regional corporations not the project area.

³ Source: <https://cso.gov.tt/census/2011-census-data/>.

Table 1. Access to Public Services in the South Oropouche watershed

Indicators	Penal-Debe	Princes Town	Siparia
Households with one or more UBN, 2011 (%)	19.24	22.32	18.06
Households with two or more UBN, 2011 (%)	2.85	3.90	4.67
Households with housing UBN, 2011 (%)	5.76	7.53	6.99
Households with water UBN, 2011 (%)	2.28	2.36	1.73
Households with sanitation UBN, 2011 (%)	4.45	5.10	4.69
Households with light UBN, 2011 (%)	1.23	1.97	3.21
Households with refuse collection UBN, 2011 (%)	6.44	6.97	2.20

Source: Trinidad & Tobago 2011 Population and Housing Census

20. The productive and social infrastructure in the project area presents different levels of progress among municipalities and sectors. In general, there are needs in the region related to road infrastructure, stormwater management and coastal protection, solid waste management, housing quality and disaster management.
21. The three municipalities are reasonably well supplied with school places at the primary and secondary levels allowing relatively ease of access to the relevant cohorts. However, there may yet be some shortfall in facilities for early childhood care. Some level of expansion has taken place for post-secondary education, and tertiary education with UWI University Centre in San Fernando and UWI Distance Education facilities.
22. Primary health care facilities are relatively well distributed through Health Centers in the Municipality. Secondary care services are available only at some distance to most communities. However, these might be more than one hour away for many communities. This means that many residents are at risk in the case of medical emergencies that require immediate treatment and intervention. A new hospital has been constructed for the area, which has led to major improvement in access. Moreover, the extension of the Highway from San Fernando to Point Fortin is expected to reduce time in access to secondary and emergency care services.
23. In terms of connectivity, Penal-Debe's poor quality roads impose high transport costs on the movement of goods and in the provision of some services, as well as risk to female travelers in particular who risk sexual violence. The serious flooding during heavy rainfall events impacts on roads and the agricultural traces in the region. Roads present similar challenges in Princes Town and Siparia. The roll-out of telecommunications services offer possibilities to the remote communities in the municipality. Residents in many areas in Penal Debe and Princes Town have gained access to cable television and internet access including broadband. Telecommunications infrastructure in Siparia, which has several industrial towns, is excellent in many communities. Residents in many areas have access to telephone services – fixed and mobile, cable television and internet access although some rural and remote locations may suffer unreliable access. In the urban centers, access is good.
24. The Social Vulnerability Index map (Figure 3) is based on the information from the 2011 Population Census and processed through GIS analysis at five levels of vulnerability. It shows the communities with the most socially vulnerable conditions related to the age dependency ratio of children, the old-age dependency ratio, overcrowded housing, lack of formal education, unsatisfied basic needs - UBN (poverty), and unemployed people. The high level of social vulnerability shows that these indicators concentrate the highest numbers of each one. The maps in Annex 7 Vulnerability Assessment allow to understand the different vulnerabilities within each municipality.

c) Main Economic Activities (livelihoods)

25. According to the World Bank income group classification in 2020, "Trinidad and Tobago is a high-income country, with an open economy in which trade plays a very important role (70% of GDP in 2014)". However, economic and social indicators show significant levels of poverty in the project area.
26. Siparia has a lower-than-average household income per capita per annum, reporting figures of TT\$27,217 or US\$5,904 in 2012. Incomes fell in the municipality due to the shrinkage of the land-based oil industry in the area. Meanwhile Penal/Debe had the fourth highest household income per capita per annum at TT\$29,358 or US\$6,368 in 2016. The per capita household income for the Princes

Town Region in 2008-2009 was US\$6,105 or TT\$25,258, the fourth lowest in the country. Princes Town has the second highest incidence and highest intensity of Multidimensional Poverty among the municipal corporations with thousands of households receiving public assistance, with a poverty index of 29.3%. Penal/Debe have a similar Multidimensional Poverty Index (MPI) with 28.1% of the total population. In the case of Siparia, the poverty index accounts for 26.5% of the population.

Agriculture

27. While the energy sector dominates the economy and trade, agriculture contributes only 0.5% to GDP, and agri-food's share of total exports is only 2.6%. Agriculture's share of total employment is relatively higher (3.4%). Trinidad and Tobago imports 85% of its food supply. Although agriculture is not a major contributor to GDP in the country, the diversification of the economy and the reduction of the food import bill are among the country's development goals. Developing agriculture is included in the country's policy priorities (WB 2020).
28. According to the information provided in May 2021 by the Ministry of Agriculture, Land and Fisheries, the Victoria County, composed of the districts of Moruga, Barrackpore, Tableland, Piparo, Princes Town, Bonne Aventure, and Debe, comprise a total approximate land area of 600 km² and there are approximately 9,900 farmers, of which 3,377 are actively registered and 80% are men. In total, 992 hectares are cultivated, in which the most important cultivations are vegetables (161 ha), root crops (161 ha), cocoa (145 ha), and pigeon peas (102 ha). In addition to crops, poultry (280 pens), bees (339 hives), and cattle (3614 heads) are also important.
29. The St. Patrick East area covers an area of approximately 320 km² and has 3,266 registered farmers. The estimated production value of crops is US\$ 1,363,380. The most widespread crops are banana/plantain (101 ha), citrus (80.8 ha), cocoa (65 ha), coconut (30 ha), and watermelon (21 ha). Although there is no headcount for livestock, the estimated monetary value amounts to US\$ 2,292,899.

Fisheries

30. Small-scale fishing is one important livelihood of vulnerable communities in the project area. According to the Fisheries Division, as of mid-2020, Woodland had approximately 30 active vessels, and there is no data for the area called Mosquito Creek because it is not an official landing site on the government's records. Otaheite Bay, which is outside of the SORB but very close, had 171 registered vessels, of which 113 were active (fulltime and part time) but there is no information to confirm if there are fishers of the SORB registered in Otaheite Bay. Therefore, there is no exact number of people developing this activity in the project area. Local representatives affirm that 20% of the fishers are women, who sometimes go out with the fishermen and help with associate tasks.
31. Apart from the climate change threats and impacts described in the next sections, the small-scale fisheries sector faces many challenges. One, is the lack of added value to the product: the fish brought ashore is sold without any processes and all the catch is sold fresh to middlemen who wholesale and retail in other population centers. Also, as per consultations with representatives, the activity has become a dangerous work due to crime and pirates.
32. A fraction of the fishers is also dedicated to the harvesting of oysters and crabs. This activity is developed in the mangroves of the Godineau swamp, which constitutes a problem for this key ecosystem since the only method that is known by the fishers involves cutting the mangroves roots.

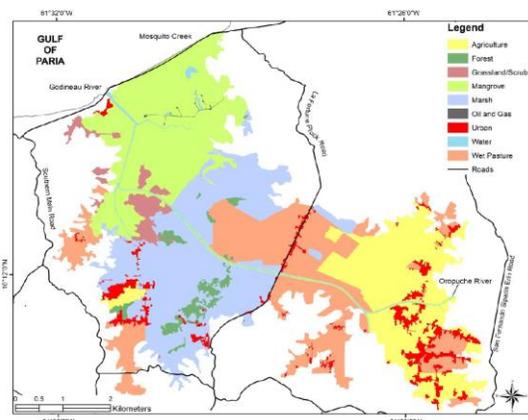
Commerce

33. Businesses currently operating in the municipality of Siparia account for 3.85% of the total formally registered in the country. The local economy in Siparia is predominantly comprised of businesses involved in Retail and Distribution (59.67%), the provision of Personal Services (16.37%), and Construction (7.95%). There exists a very well-established industrial sector. Siparia is also home to a substantial energy industry cluster. Commercial retail activities are concentrated in Princes Town central business district. The area has a high tourism potential.

d) Key ecosystems in the SORB

34. The path of the South Oropouche River within the South Oropouche watershed takes it from the generally flat and gently undulating arable lands in Barrackpore to the Godineau Swamp and out to the Gulf of Paria. The Godineau Swamp, also known as the South Oropouche Swamp, is an estuarine wetland of an area of only 3,171ha, yet it receives the drainage from a catchment basin of 42,473ha which includes the nearby urban communities of Penal/Debe, Siparia and Fyzabad. In a historical context, the swamp has been important to the economy of the region as a source of fish and shellfish. However, the conversion of land for agriculture, livestock farming, and housing threatens the ecological functioning of the swamp⁴.
35. Changes in salinities along channels in the swamp have shown that there are increasing zonation of mangrove species. Higher penetration of saline water further upstream limits the growth of some species of mangrove, with only one species (Red mangrove - *Rhizophora mangle*) showing increased tolerance to higher water salinities and conductivities. The changes in the biota of the swamp must be taken into consideration as mangrove replacement can be an important effort in protecting inland areas from flooding and thereby safeguarding the ecosystem goods and services that surrounding the communities depend on⁵.

Figure 4. Land cover in the Godineau Swamp in 2007



36. The main plant communities within this wetland are the tidal marshes, wet pastures, and the mangrove swamp. Land cover is shown in Figure 4. Tidal marsh communities represent the major plant community of the swamp, and at 1,746ha, they account for more than half the total area of the swamp⁶. The Godineau mangrove forest includes the most common mangrove species locally and is approximately 740ha in size. The mangrove oyster (*Crassostrea rhizophorae*) is one of the species that is commercially harvested from the swamp. Though the extent of the Godineau mangrove forest has been generally unchanged since 1969, pollution, oil spills and hydrological alterations have severely impacted the forest. Mangroves have been cleared for roads and oil-drilling activities, interrupting the swamp's hydrological flow. Occasional dredging activities have created embankments within the

⁴ Juman, Rahanna A. 2010. Wetlands of Trinidad and Tobago. Institute of Marine Affairs, Trinidad and Tobago.

⁵ Atwell, Melissa & Wuddivira, Mark & Gobin, Judith. 2016. Abiotic water quality control on mangrove distribution in estuarine river channels assessed by a novel boat-mounted electromagnetic-induction technique. 42. 399-407. 10.4314/wsa.v42i3.04.

⁶ Juman, Rahanna A. 2010. Wetlands of Trinidad and Tobago. Institute of Marine Affairs, Trinidad and Tobago.

channels. These three activities have affected tidal flushing capacity of the swamp⁷. This reduces the overall dissolved oxygen content of the water upstream and fosters bacterial growth leading to a decline in water quality and the ability of the biota to withstand the rising anoxic conditions. In addition, it has been observed that the presence of the hairy crab in the South Oropouche mangrove is almost nil. At present, it is being decimated by overfishing by crab fishermen and it is likely that changing conditions in the climate will further harm this and other wildlife. To rehabilitate the ecosystem, in addition to restoration activities, it is necessary to raise public awareness and promote protective measures.

37. With rice cultivation commencing in the 1890s, this activity led to the clearing of 190ha of mangrove forest to develop rice paddies within a system of embankments and sluice gates. The failure of water control mechanisms to prevent saltwater intrusion led to the abandonment of rice farming and the emergent brackish marsh communities is now used by foraging bird species⁸.
38. Along the course of the South Oropouche River, there are communities that depend on it as a source of freshwater and for small scale fishing. Traditional practices such fishing, recreation, eco-tourism, housing, and religious activities are important to the communities are prevalent within the watershed. These practices are predominantly unregulated⁹ and have had an increasingly negative impact on water quality. The ultimate impact of wetland depletion will be the livelihoods of the surrounding communities.
39. With the backdrop of the South Oropouche watershed consisting of significant forest reserves and forest resources, unsustainable logging, unplanned development, land conversion and slash and burn agriculture add to the fragility of forests. Controlling these would assist in grappling with the issues related to climate change. It is anticipated that future changes in temperature and rainfall will create conditions that will increase the prevalence of forest and bush fires leading to the loss of significant portions of the forest reserve.
40. In the Penal/Debe municipality, forest reserves, steep slopes, gas line corridors, lands zoned for agriculture, areas of ecological importance, and land less than 1m in elevation present a peculiar set of planning challenges¹⁰. Siparia has a significant number of natural resources inclusive of oil, timber and fisheries¹¹, while Princes Town has extensive forest reserves and fishing activities which are concentrated along the southern coast of the municipality. Many of the fishermen from the area use the nearby facilities in Moruga. With issues such as coastal erosion, loss of arable lands to non-agricultural activities, land slippage, squatting and unregulated urban sprawl, the environmental integrity and livelihoods within the Princes Town municipality are threatened¹².

e) Flood governance in the SORB

41. This section describes the governmental and civil society stakeholders considered key for the project and offers a preliminary identification of agencies and tools to be considered for enhancing flood governance¹³. There are several civil society organizations linked to the watershed. Some of the organizations that were actively involved in the formulation of this project are the South Oropouche Riverine Flood Action Group (SORFAG), the Puzzle Island Farmers Association, the Woodland

⁷ Juman, Rahanna, A. & Hassanali, Khalil. 2013. Mangrove Conservation in Trinidad and Tobago. In G. Gleason & T. R. Victor (Eds.), *Mangrove Ecosystems: Biogeography, Genetic Diversity and Conservation strategies* (pp. 35-64). New York: Nova Publisher.

⁸ Juman, Rahanna, A. & Hassanali, Khalil. 2013. *Ibid.*

⁹ Juman, Rahanna, A. & Hassanali, Khalil. 2013. *Ibid.*

¹⁰ GENIVAR (Trinidad and Tobago) Limited. 2010a. Final Draft Municipal Development Plan. Penal/Debe Regional Corporation. Ministry of Local Government, Trinidad and Tobago.

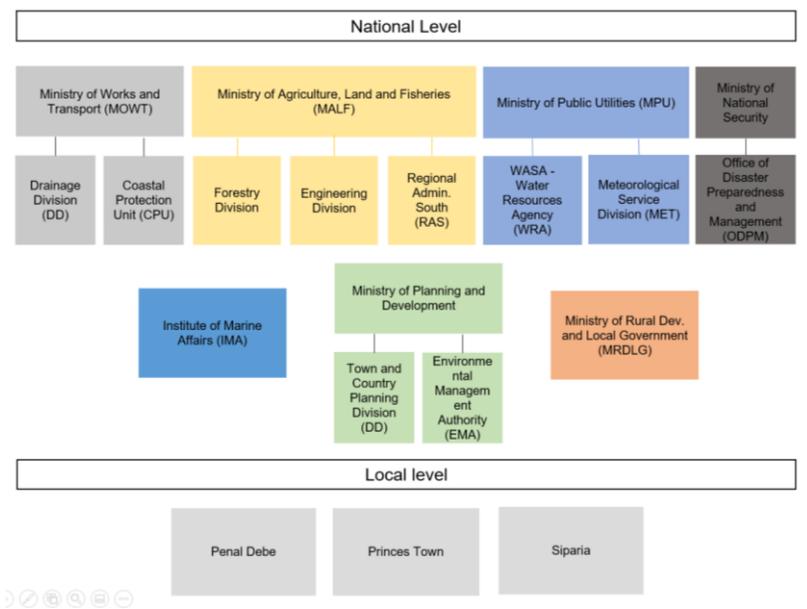
¹¹ All-Inclusive Project Development Services Limited. 2010. Siparia Final Draft Municipal Development Plan. Report Volume 1. Palo Seco Agricultural Enterprises Limited. Siparia Regional Corporation, Ministry of Local Government, Trinidad and Tobago.

¹² GENIVAR (Trinidad and Tobago) Limited. 2010b. Final Draft Municipal Development Plan. Princes Town Regional Corporation. Ministry of Local Government, Trinidad and Tobago.

¹³ Note: With the partial proclamation of the Planning and Facilitation Act, the Town and Country Planning Division (TCPD) will be subsumed into the National Planning Authority. Therefore, in the next stages of the project formulation, a follow-up of the creation of the proposed Authority will be made.

Fisherfolk Association and The Penal Debe Foundation. Key governmental stakeholders are shown in Figure 5 and described in Annex 2 – Stakeholder engagement report.

Figure 5. Key governmental stakeholders



42. Local governments in Trinidad and Tobago function largely as extensions of the central government, with significant limitations on local autonomy and resource allocation. Municipal corporations have no independent revenue base and are totally dependent on the central government for national budget allocations. Planning in Trinidad and Tobago is almost exclusively at the national level, although there has been an effort to develop municipal land use plans. Also, some disaster risk management plans have been developed in several corporations.
43. The Municipal Disaster Management Units are linked to the Office of Disaster Preparedness and Management (ODPM), the national organization in charge of disaster preparedness for the nation. The susceptibility to severe flooding makes it imperative that each municipality has an effective disaster management unit.
44. The achievement of flood resilience within SORB requires the pursuit of approaches that can best be placed into five classes: flood risk prevention, flood defense, flood risk mitigation, flood preparation, and flood recovery. Such should be included in considering flood governance on a national scale. Such pursuits fall outside the scope of this project, but it is worth considering from among the existing governance structure in the country the agencies that might be involved and the tools required for being effective in the required roles. This is shown in summary in the table below, where the tools that will be addressed by the project are marked in bold type:

Table 2. Preliminary identification of agencies and tools to be considered for enhancing flood governance.

Approach	Lead agency	Supporting Agency(ies)	Tools/techniques	Comment
Flood prevention	Town and Country Planning Division	Regional Corporations; EMA, ODPM	Flood hazard map ; necessary enforcement instruments;	Control of investment in high-risk areas
Flood defense	Drainage Division	WRA; TTMS; Ministry Local Government; Ministry of Agriculture; Ministry of Finance	Comprehensive Hydrologic database ; drainage manual; soft and hard computer facilities	Development of structural measures, like levees, Drainage manual would inform options. Use of computer models will improve effectiveness
Flood mitigation	Town and Country Planning Division	Regional Corporations; Ministry of Works and Transport; EMA	Drainage manual; flood hazard map	Will control development on floodplains and minimize losses from floods
Flood preparation	ODPM; Regional Corporations	Ministry of Works; WRA; TTMS; Ministry Social Development	Community Flood Early warning system; flood hazard map ; vulnerable persons mapping ; floodproofing manual ; emergency plans .	ODPM, in conjunction with these agencies, will be able to issue early flood warnings, do pre-planning for identifying evacuation routes, develop emergency plans; and then operationalize them during floods.
Flood recovery	Ministry of Planning	Ministry of Works; Ministry of Agriculture; Ministry Social Development; EMA; APETT	Round table Post-mortem exercises to shed light on reason for floods; Revision of flood hazard map; revision of flood manual	A system is needed for post-mortems so that lessons from a flood event can be used for improving future responses and inform methods for rebuilding.

Flood emergency response in the SORB

45. In Trinidad and Tobago, there is a clear emergency response scheme, with differentiated roles among the different national and local government institutions. Each of the 3 Regional Corporations has its own disaster emergency plan, although they have been reported by them as outdated. According to their representatives, they consider that there is good coordination among the RCs and with other agencies acting at the local level - police, firefighters, emergency help service -. When the level of alert rises, the request for assistance is triggered at the level of national agencies such as the ODPM and the defense forces, or at the regional level (CDEMA). Until before the COVID-19 pandemic, the RCs used to conduct awareness raising activities with communities. The RCs have shelters and have increased the number of shelters during the pandemic to facilitate safer health conditions.
46. However, during extreme events, resources are never sufficient. As reported by communities during the consultation process, in large events many people are left without help and the same local organizations must organize themselves to unblock streets, rescue people or bring drinking water to affected families. These organizations have their own household databases and their own communication channels via telephone messages. They also mentioned that sometimes help arrives from different agencies in an uncoordinated manner; that the equipment and machinery of these agencies is not sufficient to meet all the needs; and that many people do not know what the emergency plans that apply in their jurisdiction are about. The Regional Corporations, in turn, recognize there is a need for improvement at the emergency response level, including updating plans with a participatory approach, resume awareness-raising activities and find funding for improving the insufficient pieces of equipment they have.
47. The table below aims to illustrate some of the emergency needs the agencies need to respond to during flood events.

Table 3. Records of emergency response by the Princes Town Regional Corporation

Date of event	# house-holds assisted	Types of events	Remarks	Types of actions from the RC
Jun 2017	379	Flooding (221) Landslip (3) Fallen Tree (36) Fallen Electricity (3) Collapse House (9) Blown roof (103) Overflow River (4)	-Several inches of water inside the house -Damaged refrigerator, washing machine, TV, stove, damaged mattresses, etc. -Damage to crops and livestock -Leaky Roof -No food or water -The drain needs cleaning -Tree fell blocking the driveway or downed power lines -The river needs dredging and cleaning landslide on the highway	- ODPM: Tree Removed - Home Repair Grant - Referred to: Social services T & TEC Department of agriculture Ministry of Social Development PTRC - Technical / Health -Army visit to distribute goods - basket, mattresses, sand beds and distributed canvas -Watercourse cleaning requirement
Oct 2017	384	Flooding (343) Landslip (25) Fallen Tree (9) Fallen Lines (2) Collapse House (2) Fire (2) Fatality (1)	- Several inches of water inside the house - Damaged refrigerator, washing machine, TV, stove, damaged mattresses, etc. - Damage to crops and / or livestock - Leaky roof - No Food and water - Road need fixing, drain need cleaning - Sandbags and tarpaulin needed - Tunnel collapse for flooding - Mud from landslip affecting home - Landslip blocking roadway - fallen tree blocking roadway, obstructing river flow, or fallen electrical lines	- MOSD gave 1 mattress, water, 1 hamper Referred to: MALF, PTRC- HEALTH/ROADS/WS DEPT, DMU - Coordinate with Self Help for repairs - Request MOWT to clean river -Request CMOH to spraying for mosquitoes - Requesting septic tank cleaning -Contacted T&TEC
Dec 2017	59	Flooding (26) Landslip (12) Collapsed House (1) Street Flooding (16) Overflow River (4)	- Mudslide encroached - Mattress, food items, washing machine - Damage to house structure, to septic tanks, to water pumps, to roadways - Breadwinner of home has broken his hand - Several inches of water inside home - Electricity post leaning	- Move soil - Coordinate assistance with NGOs - Coordinate drainage works - Alert WASA - Coordinate with Self Help for repairs - Request MOWT to clean river - Regulate traffic
Dec 2019	235	Flooding (211) Landslip/ Land movements (11) Damaged Roof (10) Collapsed House (1) Fallen Tree (1) High winds causing water damage (1)	- Several inches of water inside the house - Damaged refrigerator, washing machine, TV, stove, damaged mattresses. - Damage to the structure of the house, septic tanks, water pumps, roads. - Damage to crops and / or livestock - Land movement threatening home - Roof is damaged and inside home being affected. -Fallen tree on roof.	Referred to: - MSDFS, - MALF, - Engineer Dept - Coordinate with Self Help for repairs

f) Climate context in the SORB

48. This section summarizes the climate context relevant to the project: trends and future scenarios, impacts on marine and terrestrial resources and on local livelihoods and assets. For a more detailed description please refer to Annex 7 Vulnerability Assessment.

g) Current and observed climate

49. As a result of their location, Trinidad & Tobago experiences two distinct seasonal climatic types:

- Tropical Maritime: warm days and cool nights with rainfall mostly in the form of showers due to daytime convection. This typifies early to mid-dry season months of January to April.
- Modified moist Equatorial: low wind speeds with hot humid days and nights and a marked increase in rainfall, not always convective. During this period, the area comes repeatedly under the influence of equatorial weather systems.

50. The southwestern part of the island receives relatively low annual rainfall (1100 to 1700 mm/year). Most of the rain (about 75%) falls within the wet season that is from around May to December. The prevailing factors for rainfall¹⁴ are the Intertropical Convergent Zone (ITCZ), the major rainfall/cloud forming

¹⁴ Royal Haskoning/DHV, 2003. Drainage & Flood control study for the South Oropouche basin.

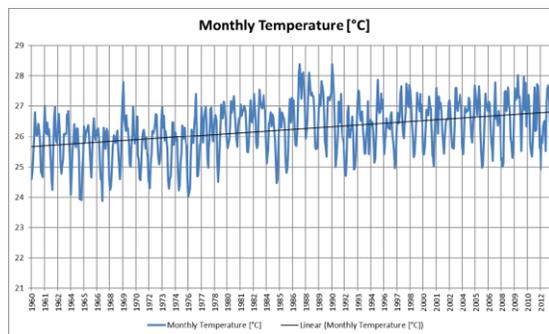
system largely responsible for the wet season; the mid-Atlantic Trough of low pressure responsible for rainfall in the latter part of the wet season; daytime convection, orography, and land size; and tropical cyclones, including depressions, storms, and hurricanes. Because of its southerly position, the island of Trinidad generally is not hit frequently by tropical cyclones, although in the last five years at least three storms made landfall.

51. El Niño is another climate phenomenon that influences the weather in T&T. In general, it tends to be experienced as a drier wet season when El Niño is present and an exceptionally dry, dry-season in the year of the decline. Also, in the year of El Niño decline, the start of the local wet season tends to be earlier and more intense.

Temperature

52. The climate of T&T is tropical, warm, and humid. The daily temperature is reported to be 26.5 °C, with an annual average maximum of 31.3 °C and annual average minimum of 22.7 °C. Recorded temperatures from as early as the 1940s show a gradual increase throughout subsequent decades, but the trend of increase taken for the most recent three decades is considered statistically significant when compared to earlier periods. Observed national data indicates an average warming rate of 0.27°C and 0.17°C degrees per decade for Trinidad and Tobago respectively, based on data from both islands' reference stations the trend in monthly temperatures from January 1960 through to December 2012, with a linear regression trend line showing the increasing trend over time (Clark, 2018).

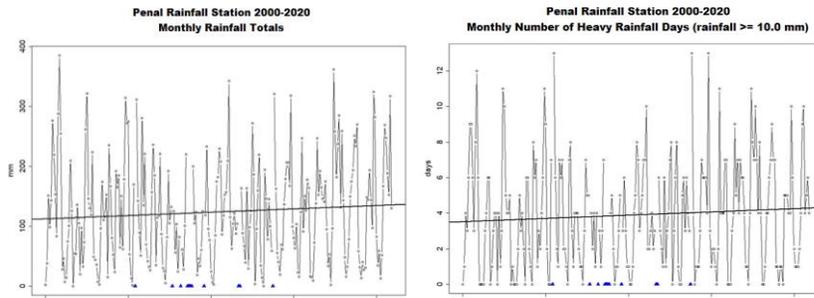
Figure 6. Historical Monthly Temperatures for Trinidad and Tobago over the Period 1960 - 2012



Rainfall

53. Based in data from 69 rain gauges from the Meteorological Services Division and the Water Resources Agency, from 1991-2010 and spatially interpolated using inverse distance weighting (IDW), it can be observed that there is a high spatial variability in rainfall within Trinidad (Clark, 2018). This variability is ranging from 1.500 – 3.000 mm per year. In the middle-north part rainfall amounts of 3.000 mm are the highest. This is mainly caused by the northeast Trade Winds, which carry moist air from the Atlantic Ocean. When the air mass reaches the mountains of the Northern Range and Central Range, the moisture content produces rainfall. This causes a notable differentiation in rainfall from the coastal to the mountain area. During the dry season, rainfalls at the coast reduces to 200- 395 mm, while in the wet station it is 1100-1300mm. The annual rainfall average for the SORB is between 1,300 mm for the lower basin and 1,900-2000 mm for the upper basin area.
54. Regarding the trend of average monthly rainfall, for the Penal rainfall station – the only station of the project area - a slight increase of 5 mm is observed during the recording period from 2000 to 2020. The same increasing trend is observed in the monthly average number of days with heavy rainfall above 10mm.

Figure 7. Monthly rainfall totals and monthly number of heavy rainfall days in Penal 2000 - 2020



Source: Meteorological Service Division, 2021

55. Since 2015, there has been significant flooding within the catchment from large volume rainfall lasting about two to three days. The most recent catastrophic events were in 2017 when more than 200 mm of rainfall fell over three days and in December 2019. Also, one of the most problematic changes reported by the communities and supported by the data is that heavy rainfall events are also taking place during the dry season. Impacts of these events are described further in the next sections.

Tidal range

56. The tidal range at the coast is in the order of about one (1) metre. Drainage of the catchment is partly controlled by the tides which exert effects as far as about ten (10) kilometres inland and cause elevated salinity levels in the watercourses. As a result, mangrove forest proliferated in the lower basin and provided an important area for many birds, including migrating birds, ducks, and the rearing of young scarlet ibis (Bron et al., 2016)¹⁵.

h) Climate change projections

57. The projections used for scenarios in T&T are used by the Caribbean Community Climate Change Centre (CCCCC) and INSMET (Instituto de Meteorología de Cuba - Cuba's Institute of Meteorology), and the Climate Research Unit (CRU)/Universities of East Anglia and Oxford, UK. The data available was PRECIS-downscaled scenarios of a version of the RCM HadCM3 and ECHAM5 climate models forced by the SRES¹⁶ A1B forcing scenario and recast on a 25 x 25 km grid6 spacing.

58. Haskoning (2016) affirms that the climate parameters expected to see a change are rainfall patterns that will affect flooding and water availability and sea level rise will affect the drainage of low-lying areas and threaten coastal lands.

59. The expected impacts of climate change Regional Climate Model PRECIS in the country are:

Temperature

60. Temperatures are expected to rise. Mean annual temperature has increased by around 0.6°C since 1960 in an average rate of 0.13°C per decade. PRECIS predicts a temperature rise by 2050 of 0.6 – 1.0°C and of 1.5 – 2.0 °C by 2080.

¹⁵ Bron, J, 2016. Problem Identification and Analysis Report for the project: Feasibility Studies and Detailed Design Consultancy Services for South Oropouche River Basin, Flood Mitigation and Integrated Watershed Management Project. Client: National Infrastructure Development Company Limited (NIDCO), GoRTT.

¹⁶ Three of the SRES scenarios: the A2 or 'high' emissions scenario used for both GCM and Regional Climate Model (RCM) outputs; the B1 or 'low' emissions scenario; and the A1B scenario - a medium high scenario, where emissions increase rapidly in the earlier part of the century but then plateau in the second half and is usually inferred as a reconciliation between the A2 and B1 scenarios. The latter two scenarios were used for GCM outputs only.

61. General Circulation Model (GCM) projections from a 15-model ensemble indicate that Trinidad and Tobago can be expected to warm by between 0.7°C and 2.2°C by the 2050s and between 1.0°C and 3.7°C by the 2080s. The range of projections across the 15 models for any one emissions scenario spans around 1-2°C.

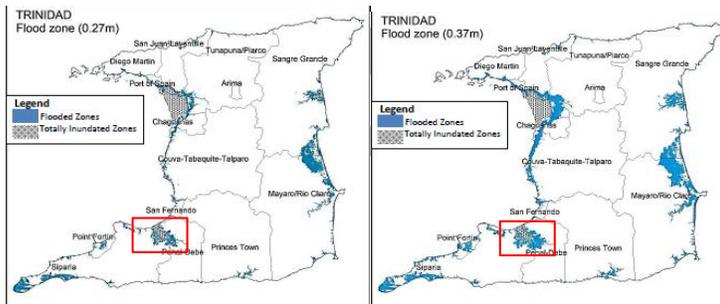
Rainfall

62. The results of the PRECIS Caribe model; runs showing spatial variability of the rainfall decrease per month for both 2050 and 2080. A decrease in rainfall of -1 to -3 mm/day by 2050 and -2 to -6 mm/day by 2080. Annual rainfall volumes are expected to decrease slightly. The wet season is expected to become slightly drier. Dry periods become drier. On the other hand, heavy rainfall events with a less than 10 years return period are expected to become more frequent. Heavy rainfall events with high return periods (>10 years) are expected to occur less frequently.
63. According to Third National Communication – Draft version, the downscaled HadCM3 model for the 2025-2035 decadal period when compared to the current decadal period, 2000-2010, the number of days with little or no rainfall (0.00 mm/day) increases (55 days) and rainfall in the range of 0 to 10 mm/day decreases (-66 days), both of which are indicative of drier and more drought-like conditions.
64. On the other hand, the number of days with more intense rainfall in the range of 10.00 to 20 mm/day increases (11days). **Both conditions demonstrate more extreme rainfall conditions in 2025 to 2035: drier on the one hand and more intense rainfalls on the other.** Similarly, for the 2045-2055 period.

Sea level rise

65. Sea level in this region is projected by climate models to rise. The areas that are most likely to be affected by inundation and coastal erosion from climate-driven future sea level rise for Trinidad 0.27 m for the year 2030 and 0.37 m by 2050 are the coastlines along the eastern Atlantic coast and along the western Gulf of Paria (Third National Communication-Draft, 2019). (See images below). It is possible to observe that in the low basin of the SORB the flood prone areas will increase.

Figure 8. Sea level rise related flood projections: 2030 (0.27m) and 2050 (0.37 m)



Source: Third National Communication T&T-Draft, 2019

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ENSO

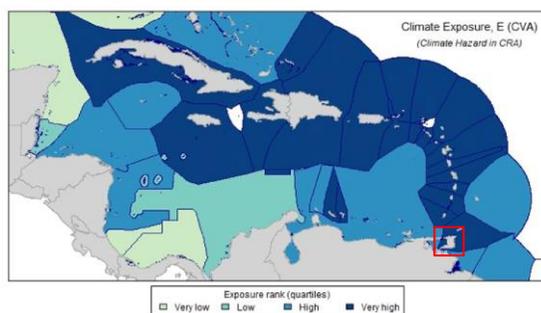
66. McShrine et al (2019) analysed the impact of sea surface temperature anomalies (SSTAs) on Trinidad & Tobago and found a weak ($r^2 < 0.5$) but statistically significant influence on the islands' early and late season rainfall pattern. Both the El Nino Southern Oscillation (**ENSO**) and the Northern Atlantic Oscillation (**NAO**) are **key drivers of climate variability** in Trinidad & Tobago (Clarke et al. 2019). For example, inter-annual variability and extremes associated with the 1997-1998 and 2009-2010 drought events which affected Trinidad (and the wider Caribbean) were associated with the ENSO phenomenon. The intensity of cyclone activity during the hurricane season is also sensitive to the

ENSO, with intensities generally decreasing during the El Niño phase and decreasing during the La Niña phase (Clarke et al. 2019).

Marine Climate Hazards

67. In the Caribbean, the physical effects or hazards of climate change include rising sea surface temperatures, increased extreme weather events, changes in rainfall patterns, sea level rise and flooding, and ocean acidification, in addition to other factors (CEMEEP 2021).
68. Monnereau et al. (2015) compared exposure of the fisheries sector across the various countries of the Caribbean, based on metrics including sea level rise, sea surface temperature change and ocean acidification (Figure 9). It was reported that both the Greater Antillean islands and the main Lesser Antillean Arc, which includes Trinidad and Tobago (less so Barbados) are experiencing highest levels of hazard exposure (shown darkest blue in Figure 9).

Figure 9. Climate Exposure (CVA) or Hazard (CRA) compared across the Caribbean



Climate Exposure (CVA, equivalent to Climate Hazard in CRA) of the fisheries sectors in 33 Caribbean countries or territories. Each country is delimited by its Exclusive Economic Zone (EEZ) boundary. Colors represent relative exposure if Caribbean countries are ranked across 173 countries globally. Redrawn from Monnereau et al. (2015). NB These boundaries are subject to some objections which have been submitted to the UN (CEMEEP 2021).

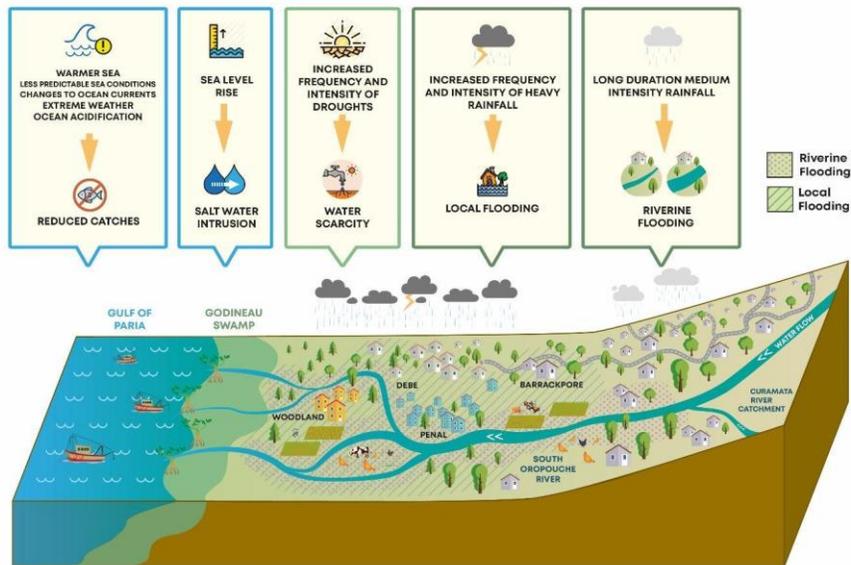
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i) Present and projected climate risks and impacts

69. Numerous socio-ecological impacts of the climate extremes have already been documented in several studies. The report from the Second National Communication of the Republic of Trinidad and Tobago Under the UNFCCC indicated that Trinidad's agriculture, water resources (including coastal habitats) and biodiversity sectors are among the most vulnerable to climate impacts (UNFCCC 2013). Among the multiple hazards to which the twin island republic has been exposed, flooding has been highlighted as the most frequent hazard affecting Trinidad and Tobago in recent years, according to a preliminary report by the Office of Disaster Preparedness and Management (ODPM 2014).
70. Trinidad's coastal ecosystems have been found to be especially fragile (Clarke et al. 2018). A climate change impact assessment was carried out by Ramnarine-Ramsawak, Suite, and Chinchamee (n.d.) on the Oropouche Hydrometric Areas in South-West Trinidad. Of all the natural resources, Trinidad's **riverine systems were found to be especially susceptible to the effects of climate change, including the threats of saline intrusion** which would affect both flora and fauna. The spill-off of the impacts of climate extremes also have economic ramifications, including on local farming and tourism livelihoods. In quantifying the projected macroeconomic impacts of climate projections, Alleng (2014) suggested that mean damage in Trinidad and Tobago may range between USD\$19.5953-36.8614 million per year, depending on the climate scenario.
71. Despite its limited land size, studies have suggested that climate impacts are not experienced at the same severity spatially across Trinidad. These differences in impacts are moderated by several factors, including biogeography (vegetative cover), site geology and community preparation. A study of potential climate scenarios done by the Providing Regional Climates for Impact Studies (PRECIS-

- CARIBE), found that **agriculture in the South and Central Trinidad had heightened levels of vulnerability**, compared with the North of the island (UNFCCC 2013, Clarke et al. 2018, GoRTT 2011).
72. Another study by Ramnarine-Ramsawak, Suite, and Chinchamee (n.d.) on various sections of the Oropouche river region, again found that the South Oropouche region faces higher climate risks than the North, due to higher population pressure in the South. The months of February and July were projected to be the coolest and wettest months for the 2035, 2050 and 2075 reference points (Clarke et al. 2018). **Increases in temperature coupled with lower rainfall or less effective rainfall could result in increased soil aridity and considerable decreases in agricultural yields** (Clarke et al. 2018).
 73. Increased rainfall intensity and sea level rise would have significant adverse effects on **flooding at the basin and local scales, impacting residential, commercial buildings and critical infrastructure**; on the **agriculture sector, due to increased levels of salinity** of soils and the **contamination of freshwater by saltwater intrusion**; and on **fisheries**, due to the damage caused to the accesses to fishing sites. Flooding also impacts on **human health**, through impacts on psychological health, the spread of diseases such as leptospirosis and other waterborne diseases, the disruption to the potable water supply, and the interruption of electricity supply during extreme events.
 74. The increasing droughts predicted for Trinidad will have serious **impacts on the water security** of the population, which today lacks sufficient water in quantity and quality.
 75. Temperature rise, changes in ocean currents, increased frequency of high intensity hurricanes, sea level rise, ocean acidification, flooding and droughts will severely impact **small scale fisheries** (e.g., Oxenford and Monnereau, 2018). Many marine ecosystems that support fisheries are already degraded by overfishing and other activities, and climate change will only add further pressure.
 76. Each of these impacts is described in more detail in the following sections. The figure below summarizes the main climate threats and impacts and aims to visually show the different nature of the vulnerable areas in a highly developed watershed.

Figure 10. Main climate threats and impacts on the SORB



j) Climate impacts on communities and ecosystems

77. The increased frequency and intensity of floods, sea level rise, and the increase in drier conditions due to climate change heavily impact livelihood options, water security, health services and infrastructure of human settlements of vulnerable people in the SORB area. The sections below describe the impacts of floods events and sea level rise as the most devastating impact, and the actual situation of lack of access to water for the population that urgently needs to be addressed considering future climate trends.
78. Vulnerability to hydro-meteorological events has been exacerbated by land-use changes for agriculture, livestock, and urbanization expansion patterns. These processes have led to the degradation of forests, soil erosion and increased sediment yields in rivers and canals and have altered total basin's runoff, peak flows and baseflows. These land alterations are linked to the social and economic changes in the country from the "oil boom" in the 1970s.

k) Land use change in the SORB as a driver for floods

79. There have been major changes in land use within the SORB to facilitate both agriculture and oil exploration. The required infrastructure for accessing drilling sites as well as for controlling saltwater intrusion for agriculture has made major alterations to the natural drainage of the catchments into the Godineau Swamp. Later, improved economic opportunities within the SORB diverted interest from agriculture and led to the subsequent deterioration of the infrastructure. Towns expanded rapidly without a proportional upgrade in the drainage infrastructure, thus making the towns very susceptible to flooding caused by any change in runoff peaks.
80. The limited drainage capacity was further exacerbated by deficiencies in the administration for land use enforcement and the maintenance of the infrastructure. Additionally, the absence of any drainage code for the country that could guide development allowed for arbitrary infrastructure. Many land developers filled the swampy areas to elevations above assumed flood level thus reducing the attenuating capability of these wetlands.

81. The discharge from the towns flows into natural watercourses that are administered by the Central Government, but timely maintenance before the onset of the wet season is not always achieved mainly because of deficiencies in the organizational structure for administering to the drainage infrastructure.

l) Floods impacting households, livelihoods, infrastructure and health

82. Over the 15-year period 2000-2014, the country was impacted by several climate related hazards. Since that time, several major floods have occurred within South Oropouche River Basin (SORB), including a countrywide flood in October 2018, and devastating basin wide floods in 2017 and 2019 during which flood waters remained for several days within many communities.

Photo 1. Flooding in the SORB



Sources: left: flooding in Penal in 2017 (shared by yudottishawa in social networks); right: photo by the South Oropouche Riverine Action Group (SORFAG).

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83. The Office of Disaster Preparedness and Management (ODPM) in its analysis of hazard impact for 2006-2011 (V&Ca, 2019) showed that the most prevalent hazard in Princes Town, Siparia and Penal-Debe based on occurrence was flooding. Each of these districts has different climate hazards distribution and impacts, with Penal-Debe being most impacted both in terms of extent and cost of damages.

84. Flooding in the SORB is triggered by one of two rainfall phenomena, namely short-duration, high intensity rainfall with limited spatial extent, and long-duration, medium intensity rainfall over wide spatial extents. Most of the flood events in the SORB is at the urban center scale and is caused by **short-duration, extreme rainfall, over localized areas**. Records show that they occur on average ten times each year in these regional corporations. These floods last for a few hours, cause **major disruption to the productive sector, and frequently result in damage to property**. Flooding also occurs at the basin level and it is caused by **long-duration rainfall, spatially distributed over the entire basin**. These floods last for several days and have dire **consequences to households, and the productive sector**. The impact of such flooding is exacerbated by the high tides as the rivers are tidal. The floods of 2017 and 2019 were caused by long-duration rainfall.

85. The main results of the Flood Vulnerability and Risk Assessment carried out for this project proposal is shown in Figure 1.24. For further details, please refer to Annex 7. The flood susceptibility map of the SORB made by the Drainage Division in 2016 is shown in Figure 1.12. It can be concluded from the risk analysis by community that 43% of the population of the basin presents high levels (25%) and very high levels of risk (18.5%). This means that practically half of the population of the basin is in this condition.

Table 6. Population at SORB by level of flood risk

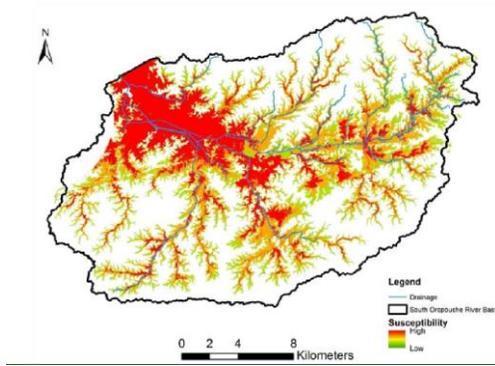
Risk Level	People	Male	Female	%
Very Low	13,153	6,794	6,366	7.30%
Low	36,628	18,717	17,911	20.40%
Intermediate	51,887	26,520	25,366	28.80%
High	45,033	22,980	22,053	25.00%
Very High	33,223	16,671	16,551	18.50%

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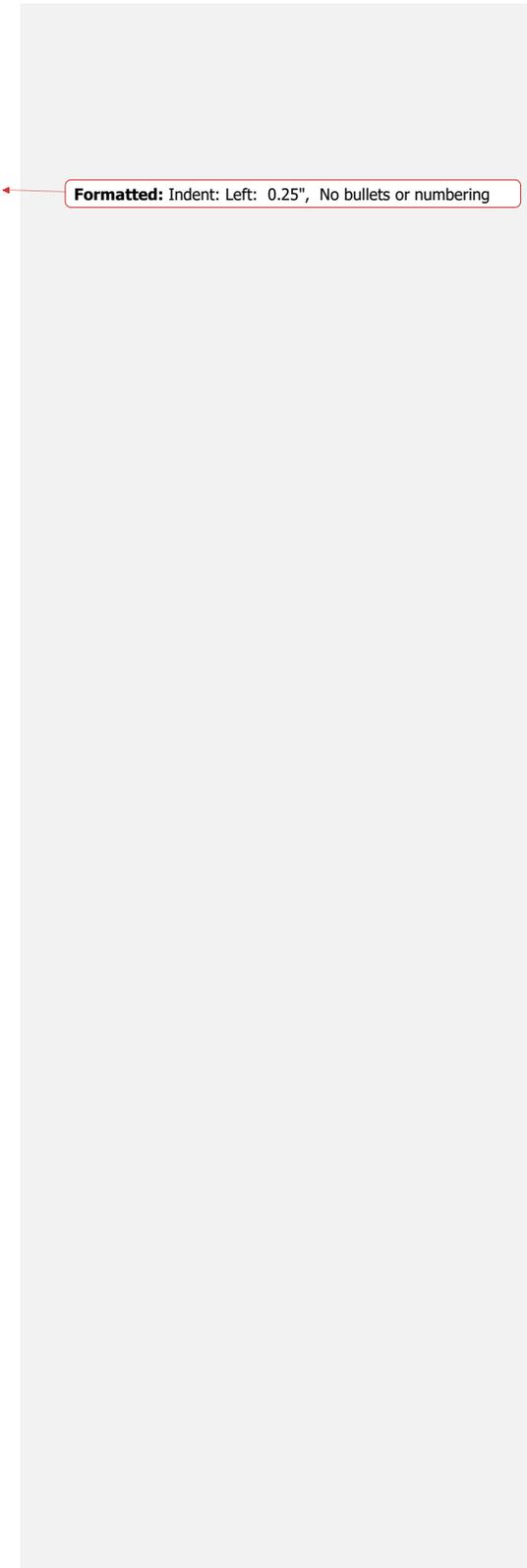
TOTAL	179,930	91,682	88,248	100.00%
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Source: by Viridia Projects based in Population Census 2011, CSO

Figure 11. Flood Susceptibility Map for the SORB



Source: Drainage Division, 2016.



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Figure 124. Flood Vulnerability and Risk Assessment for the SORB

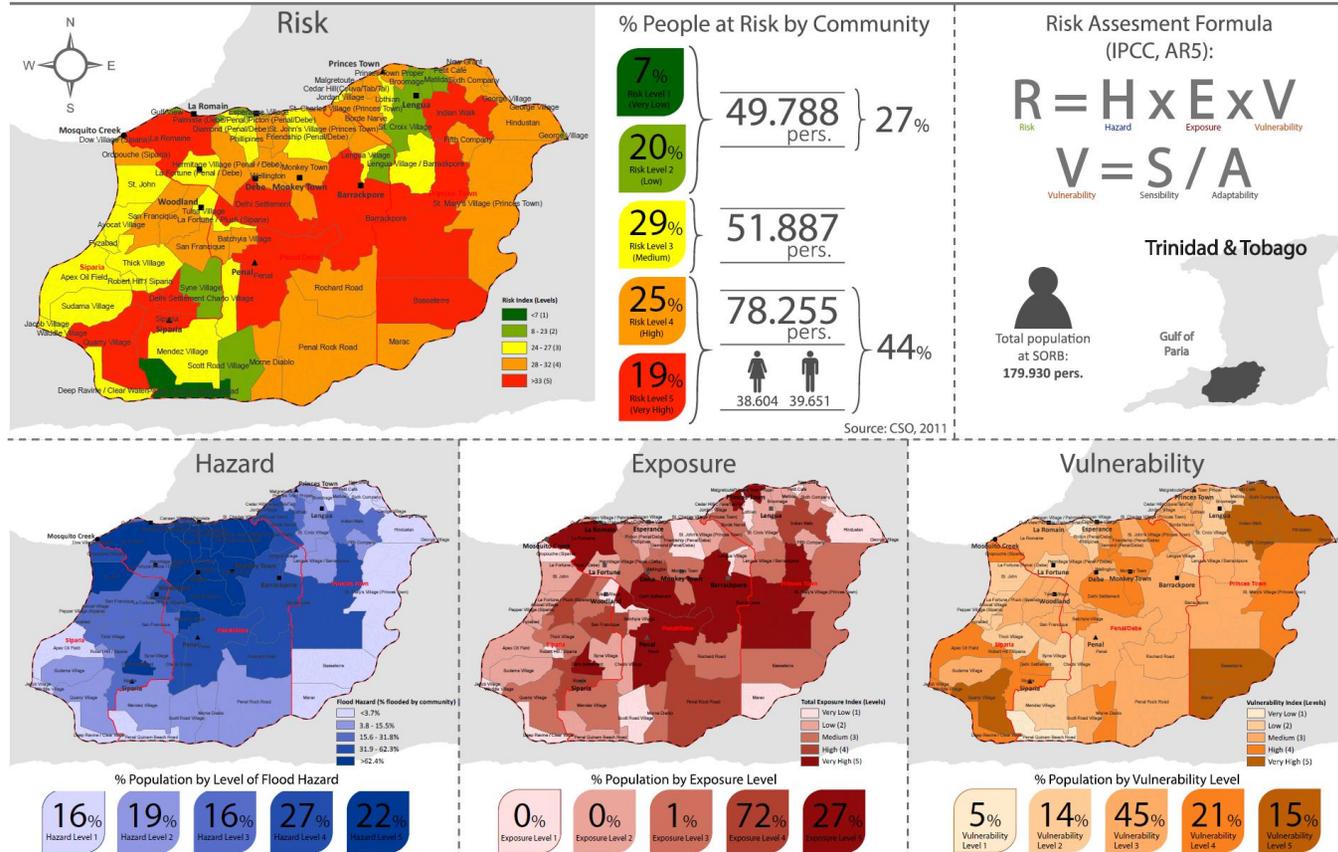
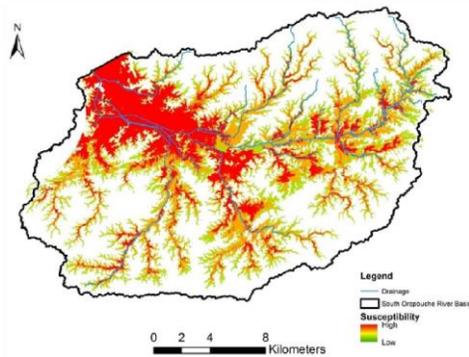


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Figure 11. Flood Susceptibility Map for the SORB



Source: Drainage Division, 2016.

Impacts of flooding on households

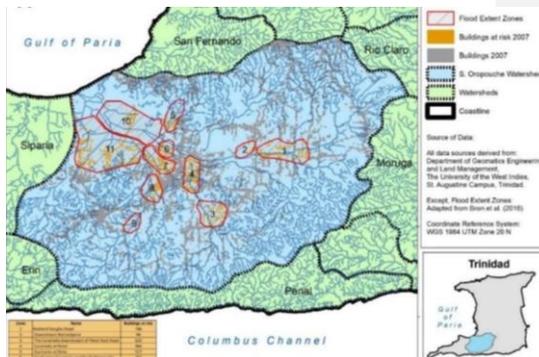
86. The areas subject to the most severe flooding and the households within that may be affected are listed in Table 4. Their locations as per affected buildings in 2007¹⁷ are shown in Figure 132.

Table 4. Areas subject to flooding in the SORB flooding

Map # ¹	Name of settlement	Potential no of households affected**	Map #	Name of settlement	Potential no of households affected**
1	Rochard Douglas Road	786	6	Confluence Curamata and South Orinopouche	261
2	Downstream Barrackpore	98	7	Black Water Channel	1054
3	Curamata downstream of Penal Rock Road	623	8	Coora River at SS Erin Road	978
4	Curamata at Penal	964	9	Coora upstream	57
5	Gucharon at Debe	517	10	Lagoon	552
				Duck Pond	2308

** Determined from the Haskoning study (2016) based on the 50-year flood event. UWI, 2021

Figure 132. Human settlements prone to flooding



¹⁷ It is assumed that these areas are still the most vulnerable to flooding since the situation has not changed.

87. According to Regional Corporations' records, around 1,000 households are affected by floods periodically, which cause severe adverse economic, psychological, and social impacts. During the consultation process carried out during the formulation of this proposal (see Stakeholder engagement report in Annex 2), representatives of the local communities have affirmed that in most cases people do not know how to implement strategies to protect their houses from flooding. Some of them have incorporated some solutions, such as the ones in the pictures below, precarious in most cases. Technical assistance and appropriate materials are needed to ensure better strategies to minimize flood damage.

Photo 2. Solutions found by local communities to protect their households and goods



Pluck Road. Left: A neighbor builds a brick wall to prevent water from entering his house. He has others ready in case he needs to keep raising it as the water level rises. Right: a neighbor has raised all her targets on top of bricks. Not only is this difficult for one person to do because of the weight, but in this case, it is the home of a woman with a wheelchair-bound mother. People with disabilities and their caregivers have great difficulty responding to an emergency. On the other hand, having large appliances precariously high is a safety threat.

88. While commercial buildings affected by floods result in loss of livelihoods, one of the situations reported to be most worrying is that sometimes families do not want to leave their homes because they want to protect their assets and because of emotional reasons. The problem becomes more serious in the case of households with elderly people, young children, and people with disabilities. These issues will be addressed in part by the project through the strengthening of the awareness-raising and capacity building initiatives being developed by the ODPM (Component 5).

89. On the other hand, and as reported in the consultations, communities sometimes find it difficult to contact government agencies that can provide grants for household flood interventions: the Land Settlement Agency (LSA) and the National Commission for Self Help (NCSH). These agencies, on the other hand, tend to have very low budgets for all the demand, and while floodproofing solutions are eligible for one of the NCSH grant lines, most of their funds are for repair. One of the barriers they encounter in making grants is that most of the people applying for grants in the SORB are not landowners.

Impacts of flooding on agriculture

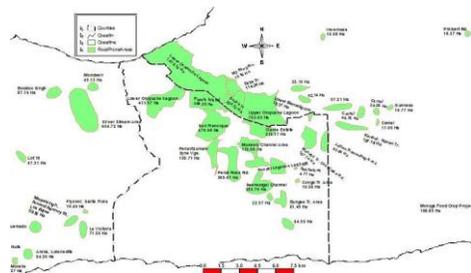
90. The additional negative effect of climate change on the agricultural sector is through the **increased levels of salinity of soils and the contamination of freshwater by saltwater intrusion**.

91. The calculated losses by flooding from June 2017 to November 2020 indicate that losses reached 231 farmers (51% of which are concentrated in 2017) and totaled US\$ 433,458. The two-mayor affected by flooding districts in Victoria County are Debe and Barrackpore. It is estimated that 20% of Debe's 6,460 hectares and 40% of Barrackpore's 11,800 hectares are land areas prone to and affected by flooding. The two districts account for 32% of the county farmers.

92. The districts which are directly impacted by flooding and are in the South Oropouche Riverine Basin include the districts of Penal, Clarke Road, San Francique, and Pluck Road. From 2014 to the present there have been 783 claims because of economic losses which implied compensations provided to the farmers for US\$ 518,079. It is calculated that the compensation represents approximately 75% of the actual loss.

93. Direct reports of the farmers during the field mission in December 2021 revealed that most of the losses have taken place during the last decade. Some of the interviewed had lost 100% of their production 7 years in a row. Some, who have lived and produced in the community for more than 40 years, claim that they have never before seen rains and floods of the magnitude of those experienced in recent years. The impact is even greater when extreme rains occur during the dry season.

Figure 134. Flood prone agricultural areas.



The Curamata River Catchment

94. The Curamata River drains an area of about 70 km² at the confluence with South Oropouche River Basin, making it the largest sub-catchment in the SORB. In the upper catchment, the rainforest is in good condition and fulfills its function of water retention, but it is limited because the soils are clay soils and are saturated during the rainy season. The watercourse has limited capacity along several locations and is the main cause of flooding of many residential areas and farmlands.

95. While upper Curamata water is destructive due to speed, in the lower catchment the destructive effect is due to its height. Several areas in the lower reaches were flooded consecutively in 2017, 2018 and 2019, resulting in damage to property. The most seriously affected farmland was the Poodai lagoon, which is used for cultivation of watermelons during the dry season. To some extent, the flooding was caused by delays in clearing vegetation and other debris in Curamata River and its tributaries. Additionally, the several breaches in the embankment had also not been repaired quickly enough. But undoubtedly, these were unprecedented three years of extreme rainfall that generated runoff of such large volumes to cause spillage of the riverbanks and record flood water depths. In 2021, a hitherto large rainfall event in the middle of the dry season completely destroyed the watermelon crop in Poodai Lagoon causing farmers to lose their main source of income for that year.

Photo 3. Flooding affecting the agriculture sector



Left: Flooding unexpectedly covers the crops of Poodai lagoon during the dry season. Right: dead cattle are found after evidence of saltwater intrusion in the fields in the lower basin.

Impacts of flooding on infrastructure

96. In the SORB, flooding and sea level rise have caused and will continue to cause **damage to infrastructure**: bridges, roads, residential and commercial properties, utilities, access, services, critical infrastructure, historic cultural buildings, and recreational structures, and impacts on wastewater and solid waste management and their infrastructure. In the multi-criteria evaluation system used in the Vulnerability and Capacities Assessment¹⁸, the impact of this risk was rated "high" to "very high" rating. Within the SORB, the specific areas that were ranked as most vulnerable to this damage were the ones shown in Table 4.

Impacts of flooding on health

97. The country vulnerability and capacity assessment report (2019) highlighted that the country will face direct **health impacts** caused by different climate risks such as heatwaves, droughts, floods, and storms. This study as well as the first round of stakeholder's consultation conducted for the development of the Concept Note, also discussed indirect impacts, such as changes in infectious disease patterns, pollution, and conflicts.

98. Direct effects from flooding being already experienced by the affected population increased in psychological effects such as anxiety, violence, and depression due to the loss of property, livestock, crop, and physical assets during flooding. Sometimes stakeholders mentioned consequences being observed for even longer periods, such as increased stress and trauma from permanent loss of homes from inundation through increased seasonal flooding or landslides. Indirect effects include increase in water-borne diseases such as dengue and leptospirosis, which are categorized as high risk (EU, 2019). This study also underlines that the highest risks come from extreme weather events, increase in flash flooding leading to power supply interruption, injury, interruption of routine health service delivery and response. Among the identified most vulnerable communities to the above-mentioned risks are Penal Debe; and Siparia, both part of the SORB area.

Ongoing and planned projects to alleviate flooding in the SORB

99. The reduction of flooding at a basin-wide level requires major infrastructural work including river works, ancillary hydraulic structures and retention and detention facilities. Studies for their sizing are being performed as part of a recently started project at the national level to comprehensively address flooding by undertaking significant drainage infrastructure. The project, which is being done through funding from CAF, is proposing to increase the capacity of the main South Oropouche River in its lower reaches. Flooding along the major tributaries, like Curamata River, Coora River and Papourie River, is believed to be linked to the limited capacity of the main river. Therefore, increasing its capacity would reduce the backwater effects along these channels and so help in reducing flood levels. The coupling of river works with storage facilities in the upper catchments would vastly reduce floods. Additionally, opportunities might exist for utilization of any stored water for irrigation and potable use. Only when these works have been completed would flooding caused by the long duration rainfall be reduced. It should be noted that over the years, one of the major hindrances for developing effective engineering designs is the lack of a reliable hydrometeorological network to accurately describe the hydrology of the river basin.

100. But until such works are fully implemented, significant losses to flood would continue to be experienced by households within flood prone areas. A well-developed, early flood warning system that captures information basin-wide, with a population trained to respond to its bulletins would be an effective tool for at least reducing losses at the household level and minimizing the risk of injury and loss of lives. It will give householders timely alerts of pending high water levels for them to act to secure property, or evacuate, as might be required.

101. At the concept note stage, the Project sought to have this addressed and had initially proposed to develop a comprehensive early flood warning system throughout the basin. Ongoing discussions were held with the major institutions, namely Water Resources Agency (WRA), Ministry of Rural Development and Local Government, Trinidad and Tobago Meteorological Service (TTMS) and Drainage Division about implementing such a system for there was the possibility that these agencies might have secured funding from alternative sources. It has been confirmed that indeed an early flood warning system will be implemented in the basin through the United Nations Development Program

¹⁸ Vulnerability and Capacities Assessment (V&CA), 2019

(UNDP) for a national system that will include the deployment of streamflow stations and crest gauges at several strategic locations within the basin. At least one streamflow station has already been deployed.

102. The capital works for mitigating basin-wide flooding would not directly address the flooding from localized rainfall. Without any intervention, flooding within the built-up areas and agricultural lands would continue and the extent of damage is likely to increase with the predicted increase in rainfall intensity from climate change.

m) Drought exacerbating water scarcity

103. Currently, localized potable water sources for the region are presently insufficient with only about 3 MIGD (million Imperial Gallon per Day) of the 16 MIGD demand being supplied from sources within the basin. This daily shortfall is provided externally from the Caroni Water Treatment Plant in the north of the island and the Navet Water Treatment Plant to the northeast of the basin.

104. The Water Resources Agency confirms that none of the areas with water supply has water 24/7. Representatives of the most vulnerable communities report having access to water only 24h per week, and this is worsened during the dry season, when families might not have access to water for more than 10 days. In these situations, these vulnerable families are obliged to buy water illegally. There are also households with no connection to the network. The Regional Corporations make it a priority to help those who cannot afford sufficient water storage tank to store water during the rainy season, and they supply residents with truck borne water during the dry season. Locations such as Barrackpore Old Trace, Reberio Trace and Katwaroo Branch Trace usually need this service. This reflects the vulnerability of the poor neighborhoods but also the permanent cost for the Regional Corporations. As illustrated by the Penal Debe RC, to service 612 households for 54 days it costed 612,000 TTD (more than 90,000 USD) to provide approximately 2.3 million gallons of water.

105. Studies have shown that local supplies can be augmented from the South Oropouche River network and from aquifers. However, neither of these sources are likely to meet the water demand and so dependence on these external sources are likely to continue¹⁹. In the case of run-of-river water systems, the problem will be in the dry season because the flows become so low to prevent any abstraction in order to meet the stipulated environmental flow requirements.

~~106.~~ Rainwater harvesting is considered an optimal alternative that is well known by the authorities and the communities: rainwater harvesting systems can be seen in some areas of the SORB; also, there have been pilot projects for the installation of these systems (e.g., GWP and NIHERST), and at present the project "Build communities resilience to water challenges" targeted to water impoverished households executed by WRA and the Ministry of Rural Development and Local Government. However, the lack of sufficient funding has prevented from installing it massively as needed (e.g., this latter pilot project has not yet defined the areas of the country where the systems would be installed and, in any case, less than 10 systems could be allocated to the SORB). On another note, none of the initiatives has ever considered the possibility of using these systems for the double purpose of stabilizing supply and mitigate floods.

106.

Photo 4. Photos of rainwater harvesting systems in the upper SORB, field mission December 2021

¹⁹ Formulation and Analysis of Alternatives Report: South Oropouche River Basin Study - Flood Management and Water Supply (Royal Haskoning DHV, December 2016).

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107. There is another side to meeting water needs of customers within the basin and it deals with addressing the water demand. It is a common assumption that at the heart of the problem with securing improved reliability of water to the population is reducing the high fraction of water that leaks from the distribution network. The annual cost country-wide of water leaking from the network has been estimated at about USD \$60M²⁰ and this is mainly due to deficient infrastructure, coupled with lack of capacity to identify leaks and to repair them. The problem with the distribution system to customers within the SORB is likely to be no different than at the national scale. The prediction on rainfall patterns to the end of the century is one of diminishing supply and so it becomes very important to ensure that the water resource is properly used. Inasmuch as the problem of shortfall in demand can be partially solved by bringing into production newly identified water sources, such as from aquifers and surface water intakes and reservoirs, the high fraction of wastage from leakage cannot be overlooked, for the current situation is unsustainable. The impact of not prioritizing fixing this shortfall would likely lead to dire consequences in the near future due to climate change. It, however, needs a well-metered distribution network capable of identifying the quantity of water being supplied matched against its usage by its customers. WASA has divided its water distribution network into sub-units called district metered areas (DMA), for management, but on any one DMA, there are several major unknowns that get in the way of optimal usage of the water supplied: Leaks are not always easily detected unless there are visible signs at road level and so the quantity of water being lost is not accurately known. There is no telling what household consumption patterns within the basin are, and so WASA uses a nationally derived per capita usage, although anecdotal evidence strongly supports a value (unknown) that might be significantly below national averages. There is known irregularities within distribution systems that result in an unknown quantity of water being captured by a few households that may subsequently be sold (via trucks) to lower income households who are unable to get water from the network. The lack of information has greatly stymied WASA's ability to optimally manage the available water and it is the main reason that it has continued to focus on increasing water supply. For example, to address the continued clamour from households for water, decision-makers continue to call for increasing extraction rates from the aquifers by drilling more wells or increasing pumping rates. Such practices are hardly sustainable. But it will continue to be given favourable consideration without instrumentation of the water distribution networks to facilitate water demand management by obtaining the requisite data for understanding the demands, identifying idiosyncrasies and controlling pressures. The situation is not going to be any better with the predicted increased drought frequency. Water demand management will ultimately result in improved management of the aquifers within the basin and so reduce the vulnerability at a basin-wide level. Furthermore, the demonstrated outcome of water demand management as a solution to the water supply problem would act as evidence to embrace such an approach throughout the rest of the country. nationally, will of communities throughout the basin.

n) Impacts of climate change on fisheries

²⁰ Royal HaskoningDHV, 2016. Solution Identification and Impact Assessment Report (DRAFT). For NIDCO, Government of the Republic of Trinidad and Tobago

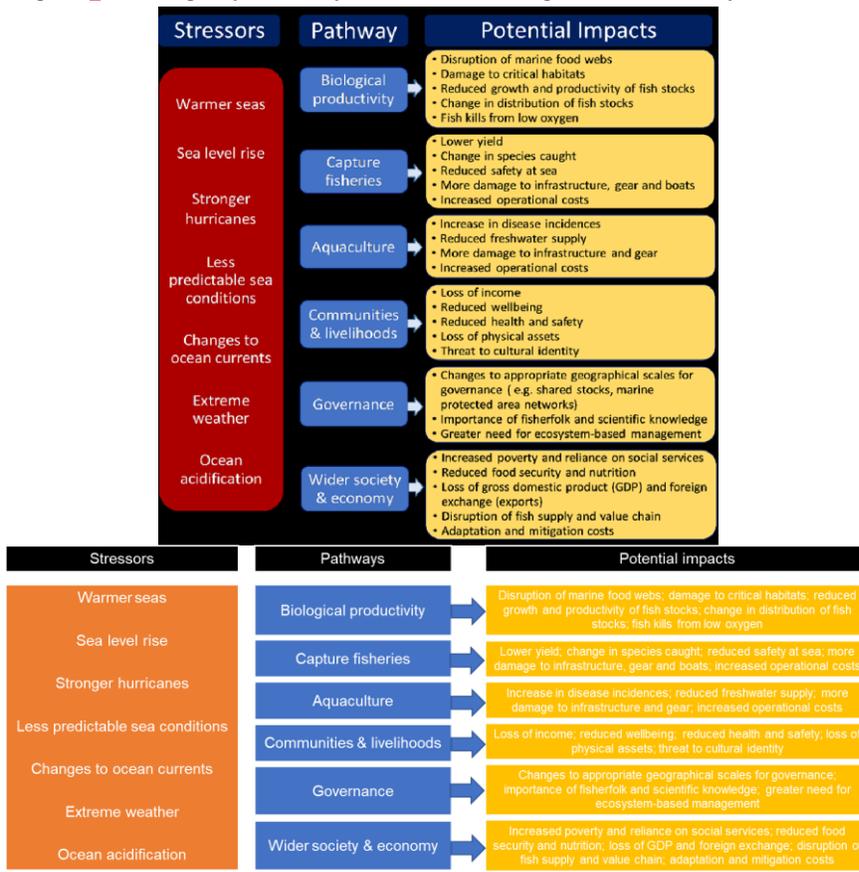
108. The fisherfolk have reported that floods expel large quantities of objects and pollution into the sea in a very short time, causing fish populations to move away. Every time there is a flood event on the mainland, their catches are drastically reduced. They have also reported a sustained decline in catches over time, which is expected to be worsened by the rising sea surface temperatures, coupled with overfishing.

109. Recent studies support these direct observations. Oxenford and Monnereau (2017) review how climate change affects a broad range of species of fish and shellfish that support fisheries in the Caribbean. Figure 154 below shows the various impact pathways of climate change impacts on the fisheries sector. The potential impacts are wide-ranging and affect the physical ocean and biological systems. Fisherfolk and coastal communities are affected by changes to the fish and shellfish populations they depend upon, and also directly by the effects of storms, hurricanes, and sea level rise and coastal flooding. This study has shown that the **Overall Climate Risk of Trinidad and Tobago's fisheries is categorized as Very High.**

109.-

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Figure 154. The range of potential impacts from climate change on fisheries and aquaculture.



o) Barriers to adaptation

110. The main barriers to achieving changes towards a resilient watershed are related to lack of allocation of funding for developing the required infrastructure, shortcomings in regulations and institutions, lack of solid data and information systems, lack of technical capacities and knowledge, cultural barriers, and lack of awareness.
111. There is a marked lack of funding to intervene in effective measures in the basin, not only in terms of structural and non-structural investments, but also in terms of human resources available in the responsible public administrations. Lack of funding has prevented the implementation of water infrastructure works such as drainage system improvement or improved access to water, significant interventions for ecosystem restoration, support to the small-scale agriculture and fisheries sector, or support to inhabitants of small towns to improve their flood preparedness. The bilateral meetings carried out and the results of the survey performed in December 2020 – January 2021 indicated that key stakeholders' opinion is that the lack of funding is the major barrier to adaptation in the watershed.
112. There is a lack of key regulations and a lack of incorporation of the climate change perspective in the existing policies and planning. For example, there is no national drainage code now, although there are plans to formulate one in the national drainage plan mentioned above. Also, there is no updated flood risk map or land use map. Key planning instruments that would help ecosystem resilience are not operational, such as the Godineau Swamp Management Plan, which was never adopted. There is a clear need to take up this work that has already begun and incorporate a climate change perspective into the process. There is a clear lack of capacity, highlighted by both authorities and studies in the area, to improve water governance and implement risk reduction and management, response, and recovery plans.
113. Maintenance seems to be a central problem in the drainage system of the SORB, and it stems from two issues. The first is the lack of resources available for doing the necessary works by the agencies responsible for the infrastructure; the other issue is the ambiguity regarding which agency is responsible for doing the maintenance. This issue reflects deficiencies in the governance structure to deal with flooding, and there perhaps cannot be sustained improvements in flood mitigation without properly addressing maintenance. Within the SORB, as is the case all over the country, it is not only the Drainage Division who administers drains, but also the Highways Division, the Regional Corporations, and the Ministry of Agriculture, to a lesser extent. Initiatives are being made at the country level for enhancing the drainage network governance; however, some progress could be made at the basin scale to address some of the specific local maintenance problems.
114. There is a significant lack of meteorological, hydrological, and tidal data. If, however, the network of instruments proposed by the present proposal is realised, then its information will provide hydrologic descriptors over the entire basin, be sufficient to address the observation of the highly spatially varied rainfall within the basin and so aid in hydrologic analyses for conducting flood studies and feed the national water resource information management system that is currently being developed. But for such to be realised, the data generated by such a network must be complemented by sound technical capabilities within the agencies to model floods, predict and analyze droughts, manage, and analyze data, and promote cost-effective prevention measures. These capacities are currently insufficient.
115. With regards to ecosystems, the relevant institutions with competencies in the coastal and wetlands ecosystems management know the necessities for their rehabilitation; however, activities are not being promoted because of the lack of funding. Also, there is limited knowledge within the population about the importance of these ecosystems in water regulation and other ecosystem services. The knowledge of ecosystem restoration techniques is not spread at the level of having people being able to work in these duties.
116. Vulnerable groups of the agriculture and fisheries sectors are exposed to high risks and have low adaptive capacities to effectively respond to climate risks. The increase in flooding events and the various climate-induced changes in the marine environment compromise the population and potential capture of native fishing species. The farmers and fishers lack of technical capacity and access to

funding to diversify their activity and find alternative livelihoods in the face of increasing floods, salinity and droughts.

117. There seems to be a lack of clarity as to how to incorporate knowledge about climate change and water management and care on the part of the different stakeholders in the basin. Issues such as the causes of flooding, the threats of sea level rise and droughts, the protection of ecosystems, the impacts of discharges into canals by residents and productive sectors, or maintenance of pipeline crossings by the oil and gas sector are just a few examples. This lack of clarity extends to only ad-hoc treatment on the part of national and local authorities to effectively address the management of climate change impacts.

118. There is a lack of a comprehensive approach to climate change in the educational system of Trinidad & Tobago; limited capacity of institutional stakeholders, CSOs, community groups, to address flooding; and lack of accessible and understandable information about climate change for fostering a change of behavior.

Project / Programme Objectives:

General objective:

119. The project aims to increase the resilience of the South Oropouche River Basin's population and ecosystems to flooding, sea level rise and expected increasing water deficit events. The impacts of the mentioned events are already being experienced in the region, but its effects will increasingly impact the infrastructure, health, water security, gender, and livelihoods of the population, as well as the integrity of the basin's ecosystems.

Specific objectives:

120. Strengthen territorial planning and risk management.

121. Strengthen grey and green infrastructure to increase resilience of vulnerable population to floods, sea level rise, and droughts.

122. Enhance vulnerable coastal and wetland ecosystem of the SORB with EbA measures to restore key habitats such as the mangrove areas in the coast and the wetlands in the Godineau swamp.

123. Increase adaptive capacity and diversify livelihoods of vulnerable fisherfolk and farmers to respond to increased climate risks such as flooding, saltwater intrusion, and drought.

124. Raise awareness and build capacities of the stakeholders of the SORB to promote knowledge management among government institutions, community members, vulnerable groups, private sector in climate resilient solutions.

Project / Programme Components and Financing:

Project Components	Expected Concrete Outputs	Expected Outcomes	Amount (US\$)
1. Strengthening of Territorial Planning and Risk Management	1.1. Strengthened institutional and regulatory systems for climate-responsive planning and development.	Strengthened climate responsive planning in decision making in the SORB	332,000
	1.2. Strengthened information, monitoring, and climate information management systems	Reduced exposure to climate-related hazards and threats.	1,900,000
2. Green and grey infrastructure enhanced	2.1. Flood-prone neighborhoods in the SORB with		2,945,137

to increase resilience to floods and droughts	improved water management infrastructure.	Increased resilience of infrastructure at risk in the SORB area. Reduced exposure of vulnerable population to climate-related hazards and threats.	
	2.2. Housing and commercial buildings reinforced against floods.		480,000
3. Vulnerable coastal and wetland ecosystems of the SORB enhanced.	3.1. Key coastal and wetland ecosystems restored.	Increased resilience of coastal and wetland ecosystems	1,440,675
4. Increase adaptation capacity and diversify livelihoods of vulnerable farmers and fishers to respond to increased climate risks	4.1 Resilient farming practices promoted for increased adaptation to climate change impacts.	Diversified and strengthened livelihoods of vulnerable farmers and fishers in the SORB area	599,670
	4.2 Community-led eco-tourism options in the Godineau Swamp promoted.		375,600
5. Stakeholders of the SORB have built their capacities and are aware of climate risks.	5.1. Capacities of stakeholders have been strengthened to respond to climate change impacts in the SORB	Government officials and staff strengthened capacities for decision-making to reduce risk to climate change impacts. Community members and vulnerable groups strengthened capacities to respond to climate change impacts. Increased awareness of CSOs, community members, associations, and the private sector on CC.	125,100
	5.2. Awareness raising and knowledge management reinforced to promote lessons learned dissemination.		160,800
6. Project/Programme Execution cost			857,608
7. Total Project/Programme Cost			<u>9,245,216,790,590</u>
8. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)			783,410
Amount of Financing Requested			10,000,000

Projected Calendar:

Milestones	Expected Dates
Start of Project/Programme Implementation	September 2022
Mid-term Review (if planned)	September 2024
Project/Programme Closing	August 2026
Terminal Evaluation	June 2026

PART II: PROJECT/ PROGRAMME JUSTIFICATION

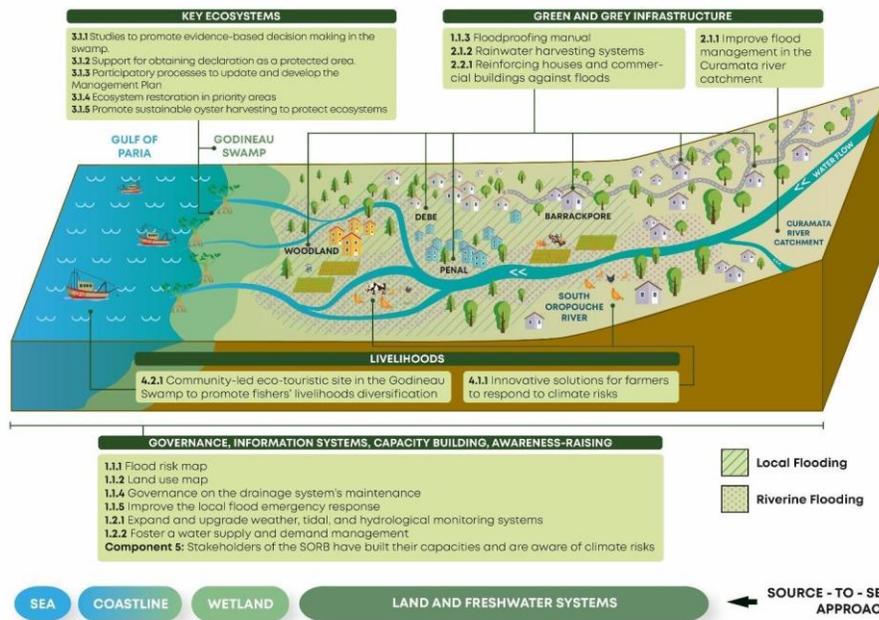
A. Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

125. The measures proposed in the project respond to a thorough analysis of the previous studies carried out in the basin, the needs expressed by the representatives of the communities as part of the consultation process, the consultations conducted with a wide range of ministries and other authorities, including the Ministry of Planning and Development (NDA) (see Section H). Figure 165 shows all the adaptation measures proposed in the project and their location in the basin to visually understand their relationship and the key components of the watershed approach, which was part of the assessment to prioritize the solutions. The watershed approach includes an overall vision that looks at the territory in an integrated way, from upstream to the sea (source-to-sea approach).

126. The formulation process involved working together with the Government to avoid duplication with other planned investments (see Section F). The studies carried out in the catchment for the last decades clearly identify the need for large infrastructure works that require large investments. These are flood defence measures but will take some time to be implemented, and would not cover certain areas, e.g., would not address the local urban flooding or the reinforcement of key ecosystems. Also, it is a rather limited approach to managing floods and one, for far too long, has been the sole approach to flood management in the country. The country is beginning to accept other approaches to flood management including flood prevention (e.g., land zoning to avoid occupation within flood prone areas), flood preparation (e.g., early flood warning systems) and flood mitigation (e.g., floodproofing measures at the household level).

Figure 165. Adaptation measures proposed by the project

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127. The proposal does have some flood defence works at the local level that will complement the long-term major infrastructural work being planned now. But a significant part of the proposal is to address flood prevention, preparation and mitigation works that when implemented will add diversity to the measures for flood management in the basin. These are no-regret measures that will very easily be incorporated into the overall strategy for flood reduction in the basin and will increase the overall flood resilience in the basin. More importantly, these works can be implemented in the short term and, when completed, will be effective in reducing the threat to life and property.

128. Specifically, the project proposes measures at the basin level that will support governance, will improve monitoring and information systems, and community flood early warning systems, and will carry out capacity building, education, and awareness-raising activities (most of component 1 and component 5). Then, it addresses the main vulnerabilities in terms of infrastructure, and provides green and grey solutions to vulnerable urban and rural populations (Component 2), key ecosystems (Activity 1.1.3 and Component 3), and to improve and diversify livelihoods of the most affected communities – fisheries and agriculture – to offer them alternatives to cope with increasing floods, droughts, and sea-level rise (Component 4).

129. It is worth noting that a significant focus of the project is on generating better climate information (10% of the budget) since the lack of reliable information is one of the major deficits to inform adequate planning in the area. This has been one of the main issues that prevent further investments. With this project, early warnings to the population would be improved and the increased availability of hydrometeorological data will inform future infrastructure designs to mainstream the climate change variables.

Project Components

Component 1. Strengthening of Territorial Planning and Risk Management

130. This component includes the outputs aimed at strengthening institutional and regulatory systems for climate-responsive planning and development; strengthening information, monitoring, and climate information management systems; and strengthening and expanding the existing Community Early Warning and Decision-making system to assess and manage climate risks.

Output 1.1. Strengthened institutional and regulatory systems for climate-responsive planning and development.

131. The project has identified important tools and techniques needed to support the flood governance structure and will provide them as outputs for use now. These tools would be even more effective when an improved governance system has been established. The project proposes the following activities:

- i. The development of a flood hazard map that identifies risk levels across the basin.
- ii. Use the map above to develop a land-use map that incorporates a flood risk basis for land zoning policies.
- iii. Building the capacity of residents living within flood-prone areas with knowledge, via a floodproofing manual, that would allow them to take timely and effective actions toward minimizing the potential damage from floods.

Activity 1.1.1 Develop the flood risk map for the SORB

132. Various attempts have been made at mapping flooding within the basin, but they have been deficient in one of several ways that do not give the most recent estimation of flood risk levels at any location. The Penal/Debe Regional Corporation (PDRC) has begun to record flood occurrences and has depictions of the areas affected over the three most recent years (2017, 2018, 2019) with devastating floods. The mapping, however, does not attempt to identify flood extent nor to correlate areas affected with event magnitude. The ODPM has developed a flood susceptibility map based on the natural physical features of the basin. This map depicts the areas that are most likely to be affected by extreme rainfall, but it does not include effects of the built environment, nor does it make any predictions of flood extent for any particular rainfall event. The study performed by Haskoning used all the hydrologic data available at the time along with the natural physical features and the built environment to produce flood extents over the basin at different return periods. This map was developed specifically for justifying proposed infrastructural work and so it contains very specific information for a limited audience. Additionally, the data used was up to 2016 and there was no built-in mechanism for updating the maps.

133. The project proposes to develop a flood hazard map for the SORB that would be effective for several stakeholders:

- It would permit households to assess their flood risk and decide on their course of action on receiving bulletins from the early flood warning system.
- It would permit the operator of the early flood warning system to issue informed bulletins about potential flooding from a rainfall event under observation.
- It would permit the ODPM to use the map for first developing emergency plans, and then to use the map for coordinating first responders and executing evacuation exercises.
- It would permit the Town and Country Planning Division (TCPD) to incorporate flood risk for developing land zoning policies for the SORB and deciding on which activities to permit in particular areas.

134. This activity would more than likely develop an atlas of maps to have the finer level of details required within particular communities. Among other things, the proposal will define the information to be included in each map and the agency or agencies responsible for their use and update.

135. Location: Basin-wide.

136. Beneficiaries: Households in flood-prone areas in SORB; ODPM; TCPD; Regional Corporations; first responders

137. Institutions responsible/stakeholders involved: ODPM, Drainage Division, Regional Corporations, Water Resources Agency (WRA), TCPD.

Activity 1.1.2 Develop the land use map for the SORB

138. The project proposes to develop a land use map that reflects the current reality of the SORB. This is a tool that does not exist at present and is recognized as essential by all governmental actors to improve planning in general, and to deal with floods in particular.
139. It will be elaborated by means of interpretation and classification of images and field trips to verify land uses, vegetation formations and everything that allows obtaining updated data of the terrain.
140. The map will be made known to governmental stakeholders during the different dissemination sessions of other project products and especially during the training sessions planned for these beneficiaries in the activities of Component 5.
141. Location: Basin-wide.
142. Beneficiaries: All governmental stakeholders and population of the basin.
143. Institutions responsible/stakeholders involved: MRDLG, Regional Corporations, Water Resources Agency (WRA), TCPD.

Activity 1.1.3 Manual about floodproofing infrastructure and buildings, specific to the reality of the SORB.

144. Even if structural measures are implemented for the improvement of the drainage infrastructure within SORB, flooding may still occur because of the uncertainties of rainfall and sea levels due to climate change. Additionally, the implementation of such works would most probably occur in phases so that there may be regions that remain unattended for some time. Under these circumstances, the reduction of losses from flooding might be left up to households but their required effort must be supported for it to be effective. For this reason, the project proposes to develop a floodproofing manual containing the following:
- A description of the flood-prone areas within SORB and an indication of expected depths (see Activity 1.1.1).
 - A description of the causes of flooding within SORB illustrated using specific flood events. The consequences of various actions on flooding would be explained.
 - A description of what can happen in the near future due to climate change, in terms of the increased frequency of extreme events and rising sea level.
 - Information on the role and function of each agency involved in flood protection, the assistance each can provide, and how it can be accessed.
 - Information on the community flood early warning system, a description of the meaning of the bulletins, and how households should respond to them.
 - Practical information on a range of floodproofing measures for different house types, including how and where to access resources for implementing the most appropriate measures.
 - A description of the grant facility for floodproofing homes, how it works, how it can be accessed, and the technical support for the implementation of the measures (see Section 2.2.1).
145. It is expected that the manual will be continually updated as more information becomes available. It is aimed to have the first edition produced in Year 1 so that it can contribute toward flood damage reduction in the shortest possible time. Subsequent versions of the manual will benefit from improvements in the flood hazard map and the community flood early warning system that would reflect the effects of any modifications to the drainage infrastructure and on improved understanding of the hydrology of SORB from the expanded hydrometeorological network. Other types of communication materials such as short videos or other graphic formats will be produced so the information is easily understood by community members without tertiary or secondary school experience for it to be beneficial to the wider community.
- [146.](#) One of the measures for reducing the risk of flooding is lifting electrical outlets above the expected flood levels. However, stakeholders have indicated that there may be certain restrictions for doing so, based on the existing regulations for wiring houses. The project proposes to consult with the relevant regulatory agency to obtain their guidelines on how households in flood-prone areas can best reduce adverse consequences to their electrical system.
- [146-147.](#) [It is to be noted that this activity also includes training of officers from the regional corporation who will be directly involved in the web page design and servicing.](#)
- [147-148.](#) Location: Basin-wide.

~~448-149~~. Beneficiaries: Households in flood-prone areas in SORB (will also benefit citizens in other parts of the country).

~~449-150~~. Institutions responsible/stakeholders involved: ODPM, Drainage Division, National Planning Authority, Regional Corporations, Water Resources Agency (WRA), TCPD.

Activity 1.1.42. Support to the governance on the drainage system's maintenance in the SORB -

~~450-151~~. Improper maintenance of the watercourses is the result of two factors, namely the lack of clarity of responsibility to maintenance of the different segments of the drainage network, and the insufficient funds provided by the central government for maintenance. The latter is exacerbated by the fragmented allocation of these funds among the agencies involved, which are the Drainage Division, Highways Division, Regional Corporations, Ministry of Agriculture, Land and Fisheries.

~~454-152~~. The project identified that the development of a centralized watercourse information management system (WIMS) will be key to addressing the issues above. Each agency is to have full access to the WIMS for updating and/or retrieving information as required. The database will be spatial and will include information on the location of each watercourse segment, its responsible agency, a status of the last maintenance activity, a schedule for future maintenance, details of the work required, such as cost and resources. The database is to be so designed as to be compatible with a hydraulic model of choice that is capable of assessing the consequences of a predetermined critical storm at the current state of maintenance of the watercourse network. The formulation of such an information management system is to complement the established arrangement of regular meetings of the relevant agencies, at least in the PDRC. Such an information management system, coupled with the hydraulic model, would assist the agencies in devising an annual maintenance plan for the basin and provide more realistic requests for funding to be considered in the national budget. The system would make for more efficient use of the resources and would allow for the identification of the most impactful works.

~~452-153~~. The project will support the construction of a coordination mechanism to facilitate the informed decision process to distinguish responsibilities for administering to maintenance of drainage and generate a decision tree/guiding document. This mechanism will aim to ensure the sustainability of the initiative, by defining key aspects such as maintenance and update of the GIS database.

~~453-154~~. Location: SORB.

~~454-155~~. Beneficiaries: All agencies involved in flooding

~~455-156~~. Institutions responsible/stakeholders involved: Drainage Division; Water Resources Agency, TCPD, ODPM, MRDLG, EMA, Regional Corporations.

Activity 1.1.5 Improve the local flood emergency response

~~456-157~~. As described in the Background section, the emergency response needs to improve in the SORB. This activity will provide support to cover the needs identified:

- i. Update the emergency plans of the Regional Corporations with a participatory approach. The project will provide resources to community-based organizations to conduct participatory workshops and map the vulnerabilities at the local level in the event of flooding. Additional technical assistance resources will be provided to facilitate the Regional Corporations to lead this process.
- ii. Socialization of emergency plans with the communities, sharing information on the locations most affected by floods, on the information of households; and on the best ways to coordinate with the local groups.
- iii. Resume awareness raising activities with communities on emergency response (until before the COVID-19 pandemic, the RCs used to conduct them periodically), incorporating updated information on climate change scenarios. These activities will be carried out 3 times per year before the rainy season at the communities' sites.
- iv. Increase exchanges between government agencies involved in the response, to improve coordination of efforts. These exchanges will be organized once per year and will include the participation of private contractors of the area, in charge of cleaning and clearing.
- v. Improve response equipment. Each Regional Corporation may request up to 20,000 USD to strengthen their resources to implement the updated emergency plan. As reported by the Disaster Management Units of the RCs, the types of equipment they would need are dinghies

and training for dinghy operation, outboard engine, boats, life vests, buoys, drones, storage containers, backhoes, among others.

Output 1.2. Strengthened information, monitoring, and climate information management systems.

457-158. The limitations in the existing hydrometeorological database in the SORB have been identified as the major hindrance to developing robust flood defense systems. The deficiencies in this database would not allow for (i) the creation of accurate flood hazard maps; (ii) the development of effective early flood warning systems; (iii) certainty of advice given to households for floodproofing; (iv) reduction of risks taken by farmers; (v) the prediction of the water resources available within the basin. Such shortcomings would also not allow for the quantification of changes in climate and the ability to respond accordingly. The development of a comprehensive hydrometeorological network is therefore critical to the reduction of flood risk within SORB and the development of sound resilient strategies in the face of climate change.

Activity 1.2.1 Expand and upgrade weather, tidal, and hydrological monitoring systems in the SORB.

458-159. Prudent decision-making approaches suggest building flexibility in strategies so that modification can be made as climate conditions change. Correct modifications can only be made with a continuous and complete dataset, for such will allow trends to be more easily observed and would also permit more reliable model predictions for any contemplated interventions.

459-160. A sound hydrometeorological network is therefore very critical for reducing the adverse impacts of flooding in the basin. If such is implemented, it will have a very significant impact by providing hydrologic inputs for: the early flood warning system being developed by the WRA; any future investment for utilization of the physical resources within the basin; design of facilities for agriculture; all future infrastructure development; effective land-use zoning.

460-161. The agencies administering the instruments for the proposed network are the Institute of Marine Affairs, responsible for the tidal gauges; the Meteorological Service Division, responsible for weather stations, including rain gauges; and the WRA, responsible for stage recording stations, rainfall stations, weather stations.

464-162. In consultation with these agencies, it was able to determine the instrument requirement for developing this network. It is essentially the hydrometeorological network proposed by the WRA for a comprehensive early flood warning system, along with the inclusion of a tidal gauge and additional weather stations. The agencies have accounted for the resources required for the installation of the instruments and expect to have continued budgetary allocations to operate and maintain the instruments. The following table shows the type of each instrument, the number, and their estimated costs for the optimal network suggested by these agencies.

Table 5. Components of the hydrometeorological network

Agency in charge	Instrument	Optimal Number	Number Existing	Required Number	Installed Cost (USD \$K)
IMA	Tidal gauge	1	0	1	10
WRA	Stage recorder	5	1	4	100
WRA	High flow equipment	2	0	2	10
WRA	Rain gauge	20	6	14	350
TTMS	Weather station	7	1	6	210
WRA	Crest gauge	6	0	6	5
WRA	Observation wells**	22	9	13	355
WRA	Water Quality	5	0	5	70

** The project proposes to fund two of the 13 required observation wells identified by WRA.

462-163. Other resources normally required for the proper functioning of the network for telemetry transmission, data storage and retrieval, and subsequent dissemination of the information are available

in varying degrees within the agencies and would be sufficient to satisfy data from the proposed network.

~~463-164~~. Location: Basin-wide.

~~464-165~~. Beneficiaries: Direct benefit to the Drainage Division, Regional Corporations, ODPM, Town and Country Planning Division for construction, operation, and maintenance of physical infrastructure, for developing early flood warning systems, for creating flood hazard maps to support land zoning, and for enhancing water capture for water supply.

~~465-166~~. Institutions responsible/stakeholders involved: Water Resources Agency, Meteorological Service, Institute of Marine Affairs/Regional Corporations, Ministry of Rural Development and Local Government, NGOs

Activity 1.2.2 Foster a water supply and demand management.

~~466-167~~. Traditionally, the southwestern region of Trinidad has relatively limited freshwater and the consequence has been an unreliable potable water system. The Water and Sewerage Authority (WASA) is very aware of the current water situation and knows of the importance of reducing the very high fraction of water lost to leakage in its distribution system. However, limitations in resources have posed challenges in their ability to identify where the leakages might be and hence be in a position to carry out the necessary repairs. A major component in improving reliability is the ability to account for water to its distribution network.

~~467-168~~. The project proposes to assist in increasing the reliability of the water supply by contributing to WASA's capability to reduce leaks through the provision of bulk and domestic meters and computational facilities (hardware and software) for data storage and analysis. The project will supply bulk meters for each of WASA's seven district meter areas (DMA) within SORB and will meter all households within a chosen DMA. The gathered information is vital if WASA is to properly manage all its water sources especially under the climate change predictions of more frequent droughts. This would allow it, for example, to better characterize water consumption patterns in south Trinidad, to better quantify the extent to which there is leakage in the system and where such is occurring, to have critical information to modernize its operations through the use of hydraulic models for pressure management, and for considering improvements on its network, to regulate water supply as required to networks and hence reduce quantities extracted from source.

~~468-169~~. The Scott Road DMA has been chosen as the study area. This DMA is serviced by two groundwater wells that pump up to about 750 m³/day. The supply to this DMA is irregular, and at best it is two days per week. Additionally, households on the extremities of this DMA have gone without water for periods of several weeks long. The performance of this activity will directly benefit households within the DMA. It would also allow for better management of withdrawals from the aquifer and would positively impact the other DMAs that use this aquifer for their water source. Insights from water demand management within the Scott Road DMA can inform management approaches for the SORB DMAs and so increase the resilience of the basin to the expected more frequent droughts from climate change. The information from this study will allow WASA to tailor similar systems for the other DMAs in the SORB, and indeed in other regions of the country.

~~469-170~~. Location: Scott Road DMA.

~~470-171~~. Beneficiaries: Direct benefit to about 3,000 persons within the Scott Road DMA. Other DMAs using the same aquifer for its water supply will also benefit.

~~474-172~~. Institutions responsible/stakeholders involved: Water and Sewerage Authority (WASA).

Component 2. Green and grey infrastructure enhanced to increase resilience to floods and droughts.

~~472-173~~. This component includes actions focused on infrastructure enhancement or development, in urban and rural areas. The activities proposed are aimed at reducing the impact of flooding, improving urban drainage in selected most vulnerable flood-prone neighborhoods; promoting the flood-proofing of housing and commercial buildings; and improving water access for the urban and rural population. Activities under this component will need accompanying cultural shifts through social and behavior change education. This will be covered by activities in Component 5.

Output 2.1. Flood-prone neighborhoods in the SORB with improved water management infrastructure.

~~173-174.~~ Many of the drainage problems in the basin require large infrastructure works currently being considered by the Drainage Division. Such works address flooding from the long-duration rainfall that may last several days. The scale of these works is beyond the scope of this project in terms of budget. However, some small-scale interventions could significantly help to alleviate severe flooding in specific locations in some vulnerable neighborhoods. The proposed activities will minimize the impact of floods and will provide support to Regional Corporations to carry out small drainage and rainwater harvesting works that will have the dual benefit of water retention to mitigate the impact of flooding and to increase the availability of water, the supply of which is currently insufficient for the population.

Activity 2.1.1 Improve flood management in the Curamata river catchment.

~~174.~~ The flooding problems within Curamata River Catchment can be adequately addressed by increasing the carrying capacity of the river so that at every section along its length the required flows are maintained within its riverbanks. However, such river works may have adverse flooding consequences, unless a simultaneous expansion of the carrying capacity of downstream watercourses is undertaken. From discussions with the Drainage Division, the scope of works in the current drainage master plan will only provide for the designs of the downstream watercourses. That is to say that there is no firm schedule for undertaking the subsequent construction work for expanding the downstream watercourses to accommodate any increased flows from upstream catchments. The funds for doing the expansion work are significantly larger than can be supported by this project and so alternative solutions to the Curamata River Catchment flooding problems are needed.

~~175.~~

Unless works are done downstream the increase in capacity of Curamata River should be avoided.

~~So, if~~ the preferred solution should ~~therefore~~ be based on reducing peak flows by, ~~as far as possible,~~ maximizing any opportunities for storage of runoff before it discharges into Curamata River and its tributaries. ~~There are two~~ The possible approaches for doing so ~~and these are being proposed in this project. The first one is~~ are the creation of temporary storage by the use of dams with permeable weirs, ~~and. The second is~~ to permit storage in Poodai Lagoon during the wet season, when it is not used for the cultivation of watermelons, but ensuring that it is ~~drained~~ drained in time for dry season planting. Low dams in the upper catchment: In a few places in the upper catchment watercourses cross oil production roads. In some places the roads have been outfitted with small culvert openings that in this current state permit some temporary storage upstream of the road and may already service some peak flow attenuating function. This activity seeks to explore how the damming effects of these roads can be maximized by elevating short lengths (about 100 metres) of the road at these crossings by about 1 metre and selecting appropriate waterway openings to delay drainage of the impounded water.

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a. **Permeable weirs:** Much attention has been given to reducing flooding within PDRC by using detention basins to reduce flooding in the middle to lower reaches of Curamata River (see Figure 1 ~~76~~). The effectiveness of permeable weirs to positively impact flooding within Curamata River Catchment was reported in a study done in 2016 by Haskoning DHV consultants for the Drainage Division. This method, which is at a relatively lower cost than the traditional rigid dam structures, uses gabion baskets, typically about 2 meters high, that are strategically located along tributaries. Several sites are being investigated for these structures.

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b. ~~176.~~ **Use of Poodai Lagoon:** An embankment along Curamata River separates the river from the lagoon and results in the conveyance of greater volumes of water downstream. No attempt at planting is done during the wet season. However, planting starts as the land drains during the dry season. The proposal is to maximize the amount of water that can be stored within the lagoon during the wet season, but to ensure that the lagoon is protected during the dry season. The works will involve the installation of manually controlled gates on the embankment at a set elevation to optimize wet season storage. It will also involve the establishment of an operation system to ensure proper opening and closing of the gates. An automatic gate, which currently drains the lagoon into Curamata River along one of its tributaries will be rehabilitated and integrated into the proposed gate system on the embankment. Where necessary, the embankment will also be rehabilitated.

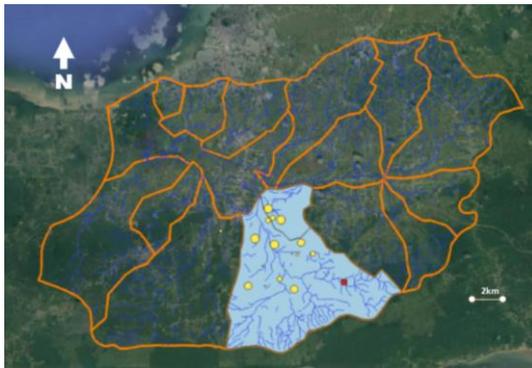
476-177. **Location:** Within upper reaches of the Curamata River network; and along the embankment bordering Poodai Lagoon.

477-178. **Beneficiaries:** Built-up areas around the central PDRC, which is in the lower reach of Curamata River Catchment; farmers in Poodai Lagoon.

179. **Institutions responsible/stakeholders involved:** Regional Corporations, Drainage Division, Ministry of Agriculture.

Figure 176. The Curamata River Catchment

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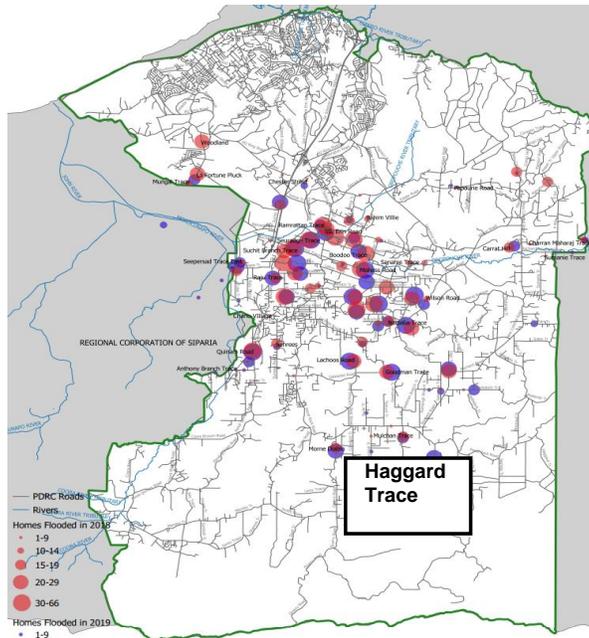


The Curamata River Catchment (blue shade) among the other sub-catchments of the SORB (orange outline). The yellow circles are locations of flooding. The red square is the potential location of detention basins at Haggard Trace.

Figure 187. Concept of a cascade to permeable weirs (left) and an example of a permeable weir made of gabion baskets.



Figure 198. Flood-prone area within Penal Debe Regional Corporation in the lower reach of Curamata River.



Flooding in 2018 and 2019 are colored pink and blue, respectively. The number of households affected are distinguished by the size of the circle. The proposed drainage works target improving the areas within the black rectangle.

Activity 2.1.23 Increase access to water while minimizing the impact of flooding with rainwater harvesting systems in urban and rural areas.

178-180. As mentioned in previous sections, there are deficiencies in the water supply system within SORB and this has ultimately limited the amount of fresh water available to households, as well as water for agricultural uses. The problem is particularly acute during the dry season, both in urban and rural areas. In rural areas, many families are solely dependent on agriculture as a means of earning an income, and water scarcity also affects their food security. Expected impacts of climate change will exacerbate this situation. On the other hand, during the wet season, excess rainfall causes floods, the severity of which is directly related to the increased coverage of impervious surfaces, including rooftops. In at least one Regional Corporation, consideration has been given to collecting in tanks water from these rooftops before it flows into the urban drains so as to reduce floods caused by short duration events within the urban areas. The water collected from the rooftops can then be used to augment the water supply. The idea is interesting because it helps to solve these two problems.

179-181. The project will promote the installation of rainwater harvesting systems as a means of flood reduction and increasing reliability of the water supply. It will aim at providing technical assistance and funds to assess water demand, design and build rainwater harvesting systems for vulnerable groups in the rural areas of the watershed; and to promote strategies for efficient irrigation practices.

180-182. As described in the background section, there have been other initiatives in the country to supply these kinds of systems, but the resources are always insufficient and have not addressed flooding. Complementarity with existing projects is described in Section F.

184-183. The project will promote rainwater harvesting systems consisting of a catchment surface, a conveyance system, and water storage tanks. This system is directed towards individual households as well as the construction in community building or specially constructed catchment surface for

households or communities with no available surface. The activities will entail the building of sloped roofs, when needed, to avoid ponding and non-toxic roof coating. The conveyance system consists of gutters or pipes that deliver rainwater falling on the rooftop to cisterns or tanks. The tanks or cisterns can be built with different materials, such as reinforced concrete, fiberglass, or stainless steel. However, the assumption is that plastic tanks locally available in Trinidad will be used since local companies manufacture these, which come with a filter for debris, first flush system. For water pumping, the project will encourage the use of solar pumps thus promoting renewable energy use.

482-184. An effective rainwater harvesting system to serve the two needs (mitigating the effect of floods and reducing water scarcity) requires knowledge of several components, such as the expected water quality depending on its purpose; desired level of reliability; cost of the system; efficiency of communal systems versus household systems; and the overall impact on flood mitigation.

483-185. To acquire this information, the Project will perform a small study undertaken by a research institution considering the existing system developed by GWP (Global Water Partnership) and NIHERST (National Institute for Higher Education, Research, Science and Technology) for water supply improvement, with possible adaptation to maximize its flood reduction capability.

Figure 2049. System designed by GWP-NIHERST, to be adapted by the project to also mitigate floods.



484-186. The project aims to purchase and install rainwater harvesting systems at 2 large facilities in the SORB, at 3 communal buildings per Regional Corporation (e.g., schools), and at 133 households.

485-187. The criteria recommended by the national agencies to select beneficiaries is listed below:

- No access to WASA water supply/ No stable supply
- Potential to mitigate flooding
- Income level
- Number of persons per household
- Types of persons in households (vulnerability considerations)
- Structure of the home (if it would hold the system)

486-188. Special attention will be given to provide information and capacity building for the maintenance and the water treatment, and so the rainwater harvesting systems will include a pre-filtering and a filtering system. Further disinfection using chlorine tablets or UV via sunlight will be included, should the water be intended for human consumption. The project will liaise with the Public Health Departments at the RCs to carry out this task.

487-189. Location: Specific urban and rural areas identified by the Regional Corporations, suffering from water scarcity and floods.

488-190. Beneficiaries: Urban and rural vulnerable households and farmers affected by flooding and unreliable water supply in the chosen areas.

489-191. Institutions responsible/stakeholders involved: Regional Corporations, Drainage Division, ODPM, WRA-WASA.

Output 2.2. Housing and commercial buildings reinforced against floods.

~~490-192.~~ Given that floods will likely continue to occur due to climate change despite planned infrastructure improvement works in the country - the timing of which is uncertain - there is a need to help flood-affected communities prepare for and recover from the impacts. It is possible to improve their resilience by retrofitting residential and commercial buildings.

Activity 2.2.1 Reinforcing houses and commercial buildings against floods.

~~494-193.~~ This activity proposes to create a grant facility targeted to inhabitants of the most vulnerable flood-prone neighborhoods in Penal, Debe, Barrackpore, Woodland and La Fortune, to reinforce their housing and commercial buildings; and to strengthen the Land Settlement Agency (LSA) and the National Commission for Self Help (NCSH) in practical solutions for floodproofing buildings in the SORB area.

~~492-194.~~ Some of the items that were identified by local specialists and by the local communities to help floodproofing houses and commercial buildings are: door flood locks or gates, waterproofing walls, storm valves, non-return valves; adaptation of electrical installations, accessibility measures for people with disabilities or reduced mobility to remove barriers that prevent them from moving to safer places within their home or evacuating their homes; mechanisms to elevate furniture and other valuable objects to upper floors.

~~493-195.~~ The first step for implementing this activity will be to develop an operations manual that states how the grant will function, including eligibility conditions for obtaining a grant, and the monitoring method. The manual will be produced with the participation of the community, including persons with different vulnerabilities. The outcome from this process would be a list of criteria that define what qualifies for funding and the mechanism by which persons can apply. A first set of criteria recommended by the national agencies to select beneficiaries is listed below:

- Land tenure / Certificate of Comfort from the Land Settlement Agency (LSA) which demonstrates that the LSA is in the process of regularizing the settlement. This would improve the equity of access to the fund.
- Low income.
- Repeated flood damage.

~~494-196.~~ The grants facility will be managed by the UWI as the Executing Entity, with the collaboration of the NCSH, taking advantage of the knowledge and mechanisms that this institution has already in place. The UWI will purchase the equipment to provide to the households. Ceilings to how much a household can access will be determined. At this stage, an estimation of 2,000 per household is considered²¹.

~~495-197.~~ Location: flood-prone neighborhoods in Penal, Debe, Barrackpore, Woodland and La Fortune.

~~496-198.~~ Beneficiaries: Around 238 households (833 people, 50% women) in the selected areas which meet the grant requirements. As per the Gender Action Plan, at least 40% of women-headed households will be prioritized. Since this is a pilot that can be upscaled in this and other flood-prone areas, the number of indirect beneficiaries would be much higher. Around 30 staff from LSA and NCSH will strengthen their capacities on the specific floodproofing needs and best options for the SORB area.

~~497-199.~~ Institutions responsible/stakeholders involved: Siparia and Penal Debe Regional Corporations, Drainage Division, Ministry of Planning, NCSH.

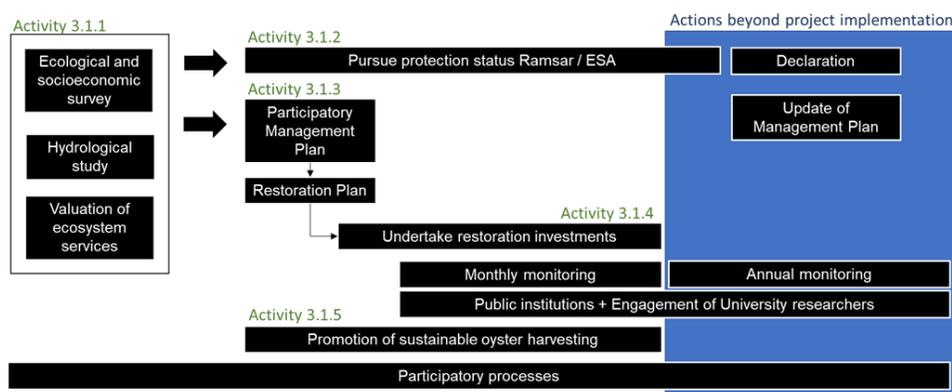
Component 3. Vulnerable coastal and wetland ecosystems of the SORB enhanced.

~~498-200.~~ This component brings together activities to strengthen the Godineau Swamp as the ecosystem playing a key role in the water regulation of the basin. It is critical to strengthen it to provide ecosystem services that minimize the impact of floods and serve as a barrier against saltwater intrusion and erosion, which is expected to be exacerbated by climate change. It will involve carrying out studies, preparing a participatory management plan, engaging and building capacities of key stakeholders and local communities in planning, restoration, and the adoption of best practices to respect the ecosystem, as well as the pursuit of a long-lasting protection status of the area.

²¹ According to FEMA (2009) "Protecting Building Utility Systems from Flood Damage", the cost of wet flood-proofing in the US is likely to be between US\$2.20 and US\$17.00 per square foot of house footprint when considering basement flood-proofing up to a depth of approximately 2.4 m. Additional costs of working hours of a technician to help install the appliances.

499-201. The figure below aims to visually describe the workflows of the different activities that are proposed under this component, how they complement each other and how the sustainability actions are envisaged. The pursuit of the protection status is a long process that needs to be undertaken for the sustainability of the project's actions over time and for providing a more solid framework for the management plan. However, since the usual period of time of this process is usually long, the declaration cannot be guaranteed during the implementation of the Project. Nevertheless, the participatory planning and the restoration investments are proposed to be undertaken in parallel, to ensure obtaining concrete results on the ground. The key governmental stakeholders have expressed their commitment to give continuity to the pursuit of the declaration, the update of the management plan once the declaration has been obtained, the incorporation of the annual monitoring into the regular monitoring programmes of the IMA, and the sustained participatory approach in the decision-making.

Figure 201. Implementation scheme for activities under Component 3.



Output 3.1. Key coastal and wetland ecosystems restored.

Activity 3.1.1 Conduct studies to promote evidence-based decision making in the Godineau swamp.

200-202. The IMA's ecological assessment of the Godineau Swamp in 2002-2004 included a study of the hydrology, vegetation, fauna, and socio-economic aspects of the wetland. Since then, no updates have been carried out and it is critical to do it, as much has changed in the wetland since this last comprehensive assessment. Also, no climate change aspects had been considered.

204-203. The objective of this activity is to conduct the following studies, incorporating the climate change and gender perspectives:

- Ecological and socioeconomic survey. Resource users, floral and faunal species composition and distribution and to determine impacts that must be addressed before restoration efforts
- Hydrological study. Determination of the hydrological regime operating in the wetland - salinity, depth, tidal flow, freshwater input, flushing rates for both wet and dry seasons. A topographic survey may be required to determine elevation in relation to mean sea level. Water level sensor to be installed (Component 1) to determine whether forest is constantly flooded and how far up the river there is saltwater intrusion and tidal influence.
- Valuation of ecosystem services of the swamp.

202-204. The results of these studies, along with the updated land use map (Component 1), will facilitate the selection of priority wetland areas for restoration and the determination of appropriate interventions to restore the wetland plant communities. There are already some elements available for undertaking some of the activities: IMA has Digital Elevation Model (DEM) for the site, 2014 aerial photography and 2020 Google imagery.

203-205. Although the studies will finally determine the priority areas, it can be advanced that they will be located in the tidal marsh areas, the wet pasture that should revert to wetland vegetation once they are left to lie fallow and are flooded occasionally with freshwater, and the mangrove forests.

Activity 3.1.2 Support for obtaining the declaration of the swamp as a protected area.

204-206. A National Wetland Policy was developed in 2001 and a National Wetland Committee was appointed in 2004. At that time, the possibility of listing the Godineau Swamp as a Ramsar site was considered. However other areas in the country such as the Caroni Swamp were eventually prioritized at that time for the process of obtaining the protection status.

205-207. The Godineau swamp is one of the largest wetlands in the country and is a habitat for several species, including birds such as the Scarlet Ibis, which was categorized as an Environmental Sensitive Species (ESS) in 2018. A small fraction of the swamp is a forest reserve, but the remaining larger part of the area has no protection status. The Project proposes to undertake the necessary procedures to obtain the protection status as a Ramsar Site or as an Environmentally Sensitive Area (ESA). This initiative has been supported at the formulation stage by national government stakeholders such as the IMA and the EMA, which will follow-up on the process in the case it takes longer than the period for Project's implementation. The linkage of the management plan of the swamp with a legal figure such as a protected area, is critical for the sustainability of the planning restoration actions over time and thus the Project considers that this activity should be promoted in any case. The budget includes a part-time dedication of a senior consultant for preparing the necessary documents for the request to the corresponding institutions.

Activity 3.1.3 Participatory processes to update and develop the Management Plan for the Godineau swamp

206-208. The objective of this activity is to update and develop the Management Plan for the Godineau swamp, with a participatory process. This would include:

- Incorporate climate change aspects and gender mainstreaming in the new management plan.
- Incorporate the updated information of the socioeconomic and ecological aspects of the swamp, the results of the hydrological study and the valuation of the ecosystem services developed under Activity 3.1.1.
- Undertake consultations and workshops with key stakeholders-surrounding communities, resource users, private sector (energy companies) and government entities (Ministry of Agriculture, Land and Fisheries, Drainage Division, among others).
- Promote local stakeholders' behavioral change and engagement over time.
- Develop a restoration plan as part of the broader management plan.

207-209. The Project would provide resources for hiring a senior consultant to lead the process, for organizing consultations, and for conducting a Knowledge, Attitude and Practices (KAP) survey at the beginning and the end of the process. This activity will be implemented closely with the activities in Component 5 – awareness-raising and capacity building.

208-210. Beneficiaries: inhabitants of the swamp and the community in general. The population of the basin will experience reduced seawater intrusion and flooding through the improved management of the ecosystem.

209-211. Institutions / stakeholders involved: Institute of Marine Affairs (IMA); Coastal Protection Unit of the Ministry of Work and Transport (CPU); Forestry Division of the Ministry of Agriculture, Land and Fisheries; Drainage Division of the Ministry of Works and Transport, Environmental Management Authority (EMA); Siparia, Penal-Debe and Princes Town Regional Corporations, community, and groups within the SORB, CSOs, private sector.

Activity 3.1.4 Restoration of key coastal and wetland ecosystems

210-212. This activity proposes the rehabilitation of priority areas in the Godineau Swamp, based on the conclusions of the studies carried out (Activity 3.1.1) and the participatory management plan for the swamp that will include a restoration plan (Activity 3.1.3).

211-213. The activity will include the hydrological restoration to some of the freshwater and brackish marsh areas of at least 50-75 ha. Vegetation found in the brackish marsh that can withstand saltwater intrusion includes sedges *Eleocharis mutata* and *Cyperus articulatus*. These were dominant species recorded

back in 2004. Other brackish marsh species include *Fimbristylis cymosa*, *F. miliacea*, *Cyperus surinamensis*, *Torulinium odoratum* and *Rhynchospora corymbosa*.

212-214. On the other hand, a portion of the mangrove forest will be restored/ enhanced by removing levee / raised embankments so there is increasing flushing / flow within the system (hydrological restoration) and by removing old oil infrastructure (derricks) that cause oil pollution. The current estimate of mangrove coverage is approximately 691 ha, and the project will improve by approximately 100 ha.

213-215. While a specialized engineering firm is expected to be hired to undertake engineering works (e.g., removing embankments or oil infrastructure), the Project will promote the contracting of local community members as field workers for the rest of the restoration works. Also, a fraction of these workers will be hired for the supervision of the progress of the restoration actions, estimating a follow-up with monthly visits and maintenance during Year 3 and every 4-6 months during Year 4 of the Project's implementation. The Project has a target of hiring at least 30% women as field workers.

214-216. Best practices and lessons learned of the whole process will be gathered under Component 5.

215-217. The Institute of Marine Affairs (IMA) analyses the change in land cover patterns in the Godineau Swamp through aerial photography and satellite imagery. This kind of analysis can help monitor the evolution of vegetation with climate change, and the effect of the restoration measures that would be applied with the project. The IMA has drones that allow mapping of mangrove dieback using photogrammetric techniques. Digital elevation models can be obtained from drone images and videos. The monitoring of the ecosystem evolution will be incorporated into the regular monitoring programmes of the IMA.

216-218. **Location:** Godineau Swamp and coastal area: between 50-75 ha of marshes and 100 ha of the coastal ecosystem.

217-219. **Beneficiaries:** inhabitants of the swamp and the surrounding community in general. This will include the resource users such as farmers and fishers. The population of the basin will experience reduced seawater intrusion and flooding through the improved management of the ecosystem. Around 20 local people (at least 30% women) will be hired as temporary workers for the restoration activities.

218-220. **Institutions / stakeholders involved:** Institute of Marine Affairs (IMA); Coastal Protection Unit (CPU) and the Drainage Division (DD) of the Ministry of Work and Transport; Forestry Division of the Ministry of Agriculture, Land and Fisheries; Environmental Management Authority; Ministry of Energy and Energy Industries, Siparia, Penal Debe and Princes Town Regional Corporations, CSOs, private sector.

Activity 3.1.5 Promote sustainable oyster harvesting to protect ecosystems

219-221. This activity aims to promote sustainable harvesting of oysters and crabs among current resource users – mainly fishers of the SORB - whose current methods involve breaking the mangroves' roots to grab them. The Project understands that no restoration will be sustainable if the resource users continue applying these methods and thus proposes to carry out training and awareness-raising activities to fishers to understand the importance of protecting mangroves and the wetland in the face of climate change and to foster a sustainable harvesting of oysters. Experts will present the different options and will provide technical assistance for those interested in trying with basic modules of 25 cages. The Project estimates that around 10 to 15 fishers will be interested in using this alternative modality. The participation of at least 30% women will be ensured.

220-222. **Location:** Godineau Swamp.

221-223. **Beneficiaries:** fishers with harming oyster harvesting practices.

222-224. **Institutions / stakeholders involved:** Institute of Marine Affairs (IMA); Coastal Protection Unit (CPU); Environmental Management Authority; CSOs.

Component 4. Increase adaptation capacity of vulnerable farmers and fishers to address climate change and climate variability.

223-225. This component targets the most vulnerable population living in the rural areas in the watershed. Communities living in the SORB are greatly dependent on climate-sensitive practices, such as fishing, agriculture, and animal husbandry. The proposed activities aim at enhancing the adaptive capacities of

the targeted groups, by supporting market access and providing technical assistance and affordable finance to test and implement innovative solutions to convert from traditional farming climate-resilient options, promoting diversification of livelihoods, also among fisherfolks.

Output 4.1 Resilient farming practices promoted for increased adaptation to climate change impacts.

Activity 4.1.1 Pilot project of innovative solutions for farmers to respond to climate-related risks

224-226. Dry spells, increased sea water intrusion and increased flooding have a great negative impact in the agriculture sector, especially on vulnerable groups with limited adaptive capacities to effectively respond to these increasing climate-risks. According to estimates of the Ministry of Agriculture 60% of all farmers' land in the SORB are flood-prone areas.

225-227. Through this activity, the project aims to develop a pilot small-scale project with different adaptation solutions packages, which provide a full adaptation solution to the farmers so they can test and implement the scheme. The support provided by the Project will include technical assistance, the provision of the required investments to implement the technology, market development and access as well as technical assistance to select the appropriate technology considering different characteristics of the farmers. The identified adaptation solutions to promote through this scheme are:

- **Hydroponic small-scale pilot project:** Hydroponics is a suitable adaptation technology, which allows farmers to grow plants without soil, hence overcoming the problems of salinity, floods, and the accumulation of pests and diseases. Furthermore, it saves water (savings of 60-80%), contributing to addressing the problem of projected droughts and it is nutrient efficient, reducing the use of pesticides. At the same time, it offers good yields and quality of products and can be grown all year long. The UWI and different local providers have been engaged with research and implementation of hydroponic systems respectively. The following technologies have already been implemented successfully in the region, among others:
 - o Table-Top, Double Table-Top and A-frame Hydroponic Systems: use Deep Flow Technique (DFT), easy to maneuver, saves on water, preassembled, modular design, incorporates vertical farming.
 - o Deep Water Culture: Plants are usually placed to float on a raft structure on top of the nutrient tank, with their roots hanging in the water. This system is commonly used for aquaponics in Trinidad.
 - o Under current system: employs a negative pressure technology to re-circulate nutrient water solution that is highly concentrated with oxygen. Ideal for top-heavy and fruiting plants.

The main advantages of the proposed pilot are the adaptability - the design can be adapted to different conditions and areas, it is allowed for high savings and water efficiency, and nutrient efficiency, reducing pesticide and herbicide use – and the scalability potential: its modular designs facilitate farmers to test and learn about hydroponic systems and easily expand and replicate the modules.

- **Water-resistant varieties pilot project:** Varieties such as dasheen, which are water and drought resistant are already being used in certain areas of Trinidad. Farmers make a profit selling the leaves and the corm of the plant. It has high market potential and profitability.
- **Aquaponics or aquaculture systems:** As for systems disseminated to farmers, the Project will promote hydroponic systems for this initial phase of the project. Hydroponics requires less technical expertise to successfully operate and manage as compared to Aquaponics, so they can build upon Hydroponics then expand to Aquaponics, additionally, Aquaponics systems also cost significantly more to construct because it is essentially 2 components (Aquaculture & Hydroponics) combined into one unit. However, the income earning potential of Aquaponics is much more. Thus, the Project will introduce in a demo site the aquaponics and aquaculture modules so capacities can be built, and farmers are able to build upon in the future.

Aquaponics is a more sustainable farming technique than hydroponics, and it can be more profitable with a greater diversity of crops produced (fish, shellfish and plants) so the project will

build capacity through demonstration/ pilot models at the demonstration facility. Supported farmers can also convert their Hydroponics into Aquaponics by adding in an Aquaculture component.

This activity will entail the following sub-activities:

1. **Data collection** through a rapid assessment, which will be based on secondary data provided from farmers associations, the Ministry of Agriculture and NAMDEVCO, and complementing with primary data collection from farmers on the field. This information will serve to characterize farmers' vulnerability in terms of frequency of flood, income, value of crop production and quantity lost per event, percentage of land flooded, land tenure, among others.
2. **Data analysis and prioritization** of potential farmers to be included in the pilot projects based on vulnerability criterion.
3. **Market outreach:** Approach to target SMEs and potential buyers, telling them about the programme, what are the standards they require. So, there is more than market analysis.
4. **Final technological design for pilot projects:** hydroponics, aquaculture, aquaponics and dasheen pilot projects will be finalized. In the case of hydroponics, the technological design will be refined to ensure it is able to withstand floods. Additionally, a market strategy and if possible, offtake off-take agreements with local institutions/ enterprises will be facilitated to ensure the scheme covers the production but also the market price and provides a true alternative for the farmers. A business plan will also be developed
5. **Training of trainers:** If required, the different participating Institutions (ministry of Agriculture and NAMDEVCO) will be provided with technical sessions to further develop capacities for the
6. **Farmers' outreach and engagement for participation:** field-visits to present the proposed pilot project and the technology packages offered to selected farmers. Engagement of approximately 40 vulnerable farmers in the first stage (year 2), additional 50 farmers in year 3, and 50 more in year 4.
7. **Implementation phase:** farmers accepting to participate in the pilot project will be provided with the investments and technical assistance. The technical assistance will be provided by NAMDEVCO, the Ministry of Agriculture and specialized technicians in the form of farmers field schools as well as the UWI and private local providers. Supported farmers will be required to agree to use their plots and pilot project to organize field farmers schools for the neighboring farmers as well.
8. **Monitoring:** technicians will follow-up the pilot projects and assist regularly the supported farmers, providing capacity building for them and the neighboring farms, and ensuring the successful implementation of the subprojects. The monitoring will also collect data to assess the performance of the promoted pilot projects and understand the challenges and differentiated performance results.

226-228. Location: Vulnerable areas to dry spells and flooding in Siparia, Penal-Debe and Princes Town. Flooding areas include the low-lying area of the watershed, being Woodland and Barrackpore the most affected areas.

227-229. Beneficiaries: Rural vulnerable population with no year-round access to water in the SORB area during the dry season and suffering frequent flooding during the wet season. It is proposed that land ownership should not be a requirement as hydroponics structures could be relocated if farmers were to change the location of their activity.

228-230. Key stakeholders involved for management and support: Ministry of Agriculture, Siparia, Penal-Debe and Princes Town Regional Corporations, Hydroponic Research Unit - UWI, NAMDEVCO.

Output 4.2 Community-led eco-tourism options in the Godineau Swamp promoted.

Activity 4.2.1 Implementation of a community-led eco-touristic site in the Godineau Swamp to promote fishers' livelihoods diversification

The promotion of alternative livelihoods for fisher folks such as ecotourism provide an effective option for diversification in the face of increasing climate change threats.

The Caroni Swamp and the Nariva Swamp in Trinidad have already been converted into eco-touristic sites and provide good examples of economic activities that promote long-term conservation of key ecosystems. The Woodland area within the Godineau Swamp has over 30 vessels managed by fisherfolks, who are already experiencing the risks described in the Context section. As these risks are expected to be more intense and frequent in the future, the proposed activity will provide the Godineau Swamp with public infrastructure to develop a sustainable eco-tourism model for the vulnerable families living in the area as well as provide training, and a small grant facility to promote the livelihood diversification of fisherfolks and a sustainable business model to manage the site and ensure its long-term conservation.

The sub-activities include:

1. Develop a **sustainable ecotourism management and business plan** for the development and management of a community-led ecotourism model in the Woodland area in the Godineau Swamp. To this goal the sustainable ecotourism management plan shall incorporate
 - The appropriate zoning of the ecotourism site.
 - Visitor Site Planning and Design: site planning requires the preparation of an actual plan and topographic map on which all existing and planned ecotourism infrastructure is placed
 - Sustainable Infrastructure Design
 - Revenue-Generating Mechanisms
 - Visitor Impact Monitoring and Management
 - Naturalist Guides

The development of the **business plan** should include a market study, competition analysis, marketing plan and financial projections. Based on the results of the two studies, the final location and most appropriate investments will be prioritized.

2. Construction of a **bird-watching tower**, a **picnic recreational site**, public **toilets**, proper waste disposal facilities and identified key investments for the development of a sustainable ecotourism site in the Woodland area.
3. Implementation of a **small-grant facility to support SMEs development for the operation of the ecotourism site**. The facility will target vulnerable population highly dependent on fishing as a livelihood and experiencing frequent flooding. Eligible vulnerable families will have technical support to develop a business plan aligned to the sustainable business model developed for the sustainable ecotourism development of the site. These families will be supported with training and will be supported with the required investments and technology to diversify their livelihoods and implement the developed business plans. Potential ecotourism activities to be supported with the small-grant facility include the:
 - a. **Purchase of boats** or repair of boats to adequate them for ecotourism tour operation in the Godineau Swamp.
 - b. Construction of **food and drink stalls** in the recreational area considering designs that are able to withstand floods, since this is a flood-prone area.
 - c. Targeted **training and capacity building** to the eligible vulnerable families. To this end, The National Training Agency (NTA) has developed occupational standards and curriculum that have been regionally approved for Tour Guiding, Boat Operations and Safety for Fishers. These training standards will be used to target existing small entrepreneurs, boat builders, tour guides, emergency response personnel and others to develop skills within the community. Institutions that currently work in these locations include the Youth Training and Employment Partnership Programme (YTEPP) through the Community Based Training (CBT) Programmes. Other localized training can be done by the University and IMA. The Certification for the approved use of the Regional Occupational Standards are the Caribbean Vocational Qualifications (CVQs). This Qualification offers quality assurance and portability as the standards and vocational qualifications system are internationally recognized, offering persons trained in the Community to achieve sustainable and well recognized competency development.

Additional training topics might include marketing, business management, life-saving classes, swimming classes, local nature and biodiversity training, commercial cooking and food safety,

compliance with local regulations to ensure long-term conservancy and sustainability of the site.

4. **Marketing strategy:** brand development and a website will be financed to promote the dissemination of information on the newly developed ecotourism site in the Godineau Swamp.
5. **Location:** Godineau Swamp, Woodland area SORB.
6. **Beneficiaries:** Fisher folks (with special focus on low-income women-led households, youth-led households, mono parental households with fishing as the only income generating activity), in the SORB area.
7. **Key stakeholders involved:** This activity will be conducted with the oversight of the Forestry Division, Environmental Management Agency, the Office of the Commissioner of State Land, the Ministry of Agriculture, Land and Fisheries, Siparia, Penal-Debe and Princes Town Regional Corporations.

Component 5. Stakeholders of the SORB have built their capacities and are aware of climate risks.

1. Some of the barriers identified in the watershed are the limited knowledge among the population of climate change impacts and increased risks in the area and the adequate adaptation solutions that could be implemented to cope with this changing climate. Furthermore, the lack of consensus among key institutional stakeholders on what the causes of flooding are and the best way to address it, as well as a limited capacity of institutional stakeholders, CSOs, community groups, to address flooding, salinization and droughts while supporting the uptake of alternative adaptation technologies. To address these barriers, the project proposes to support the educational system of Trinidad & Tobago; and support the dissemination of accessible and understandable information about climate change for fostering a change of behavior to raise awareness and build capacities of the stakeholders of the SORB. Lessons learned during the Project will contribute to support the adoption of best practices.

Output 5.1 Capacities of stakeholders have been strengthened to respond to climate change impacts in the SORB.

Activity 5.1.1 Strengthening capacities of governmental institutions to respond and manage climate-related risks

Sub-activity 5.1.1.1 Strengthening government capacities on flood, drought, sea-level rise, and saltwater intrusion management.

229-231. This activity is focused on strengthening the government institutional capacity of key entities operating in the SORB to manage risks associated with flood, drought, sea-level rise, and saltwater intrusion. The first step will be to conduct a rapid institutional capacity assessment to identify specific areas for strengthening. Priority will be given to measures focused on improving coordination and communication, access to climate information, and building capacity to have a common understanding of observed and expected climate impacts in the SORB and the potential adaptation options to increase the resilience of the most vulnerable population, including the support of alternative livelihood options. It is envisaged that strengthening the institutional capacity of a diverse group of institutions engaged in climate resilience strengthening in the SORB will enable the upscaling of the range of solutions introduced by the project. The modality of the capacity building might take different forms, it could be conducted in the form of peer-to-peer learning, training activities, or participation in specialized courses.

230-232. **Location:** SORB.

Beneficiaries: IMA, the Regional Corporations, EMA, UWI, ODPM, Ministry of Agriculture, Drainage Division.

234-233. **Key stakeholders involved:** Academia and national and local governmental institutions.

Sub-activity 5.1.1.2 Strengthening government capacities on environmental and social safeguards and grievance mechanism

232-234. Through this activity, the project will provide capacity building to relevant government staff at the national and basin level in the identification of social and environmental impacts, international E&S standards, and the adequate social and environmental monitoring of the project-related activities and investments. Although the grievance mechanism and the E&S monitoring of the project will be

guaranteed by CAF and the UWI, support will be provided to governmental actors to continue to guarantee compliance with the E&S safeguards once the project is finished. [The regional corporations have a complaints form through which grievances/complaints may be reported, and may serve to satisfy a first level of engagement. The project will work with them and the Environmental Management Authority \(EMA\), which already has a grievance mechanism in place to streamline the process and ensure proper coordination at the local and national level to ensure a continued response to the potential complaints in the basin and to guarantee the social and environmental sustainability of the Project results.](#) This way, it is expected that key government staff will improve awareness of potential social and environmental impacts of the proposed technologies and strengthen their skills in the appropriate monitoring [and compliance and of social and environmental safeguards-compliance.](#)

[233-235. Location:](#) South Oropouche River Basin, Trinidad & Tobago.

[234-236. Beneficiaries:](#) National and local government staff working in the SORB.

[235-237. Key stakeholders involved:](#) Regional Corporations, Ministry of Agriculture, ODPM, and all interested government institutions working in the SORB.

Activity 5.1.2 Mainstreaming climate change in primary and secondary school classes

[236-238.](#) Currently, the national curricula for primary and secondary education includes different topics with a focus on geography and the environment. Climate change is introduced in secondary school, including global causes and consequences and impacts on a global scale. Nevertheless, the specific risks and impacts at the local level as well as the most appropriate adaptation solutions to increase resilience and withstand climate-related risks are not so well known by teachers and students. Thus, with this activity, the project expects to profit from the knowledge generated by the Project and support teachers with the development of pedagogical resources focusing on climate change and adaptation solutions in the South Oropouche River Basin and provide them with capacity building. It is expected that the increased knowledge will support them in the dissemination of the information among primary and secondary students fostering behavioral change and improved adaptation strategies to cope with the expected impacts of climate change.

[237-239.](#) The proposed sub-activities are:

- Definition of appropriate content and the identification of the most adequate resources to develop for the future training of the teachers. The content will most likely include climate threats, evidence on the observed and expected impacts of climate change regionally, including flooding, increased sea level rise, salinity, and dry spells.
- Development of the pedagogical material and identified resources for the training of teachers. Additionally, it might also include the development or identification of resources to use in the classrooms with the students.
- Online training sessions and workshops for teachers. These sessions will focus on how to utilize the knowledge and capacities acquired for dissemination and to foster behavioral change among students.
- Support to teachers in rolling out and delivering the content to students.

The project will ensure follow-up on how the information provided is being used with a formal assessment to further understand whether the information provided has been useful for teachers or not and how they react and use it so improvements can be made, if necessary.

Output 5.2. Awareness raising and knowledge management reinforced to promote lessons learned dissemination

Activity 5.2.1 Working with ~~pre-16~~ schools in the SORB to raise awareness on climate change-related impacts and solutions

Children play an important role as behavioral change promoters in their own houses and the communities they live in. This activity will focus on supporting ~~pre-16~~[primary and secondary](#) schools in the SORB to raise awareness on climate change impacts in the SORB and appropriate climate solutions that are being implemented in the area. Thus, children will be exposed through direct experience to the solutions the project is promoting such as the installation of weather stations, rainwater harvesting systems, hydroponic

solutions, water resilient varieties that are able to withstand flooding, ecosystem restoration, and ecotourism in the Godineau swamp, among others.

Activity 5.2.2 Promoting awareness-raising on climate change impacts and appropriate solutions among SORB key stakeholders

Sub-activity 5.2.2.1 Community level awareness-raising campaigns.

238-240. Awareness-raising is key to addressing knowledge gaps targeting different stakeholders. Campaigns will comprise topics related to climate change expected impacts and risks, efficient water management, linkages between human-made obstruction to channels through dumping of debris and flooding consequences, maintenance work in channels that could be taken up by community members; the importance of recycling to avoid dumping of debris, the impact of the use of chemical for cleaning dumping, waste, and runoff in watercourses.

239-241. To support activities and behavior change awareness-raising campaigns will target cultural practices and norms, to support the technical recommendations of the adaptation solutions being promoted. Additionally, since many families are reluctant to be evacuated when floods come, a focus will be given to the emotional and cultural reasons about the invasion of privacy, protection of property and inheritance, how people living in the SORB act in crisis to promote understanding of emergency and safety concerns.

240-242. Different communication strategies for the awareness-raising campaigns will target different actors since the incentives to promote behavior change vary among the target stakeholders. The following strategies have been identified during the consultation process to be more effective in targeting the following actors: a) Public information campaigns in schools, or public places, or the radio; b) Community involvement activities, such as contents through partnerships with key NGOs working at the local level; c) Joint presentations and campaigns with government officials aligning the discourse at the national, and local level, including public and key local leaders.

Sub-activity 5.2.2.2 Awareness-raising campaigns for businesses and developers.

241-243. This activity is focused on building awareness of private sector stakeholders such as oil and gas companies and real estate developers of the risks of climate change and the impact of their activities on the resilience of the basin. For these companies, climate change is causing risks to rise exponentially, and incorporating sustainability has become an absolute imperative for long-term investment prospects. The SORB has experienced rapid real estate development in the last decade or so, resulting in increased infrastructure and livelihood exposure to climate risks.

242-244. Targeted meetings and working sessions with the CEOs, board of directors, managers and key decision-makers in the companies will be organized to raise awareness on climate change impacts and the industry-related exacerbation of risks in the area and to discuss potential ways to address the impacts of these activities in the SORB. A focus on improved practices to reduce the impact of the industries on flooding will be promoted along with the alignment of such action with corporate responsibility principles.

Activity 5.2.3 Identification of best practices and lessons learned

243-245. Communication and dissemination activities arising from the implementation of the Project will contribute to supporting the adoption of best practices and the wider reflection at the Project level and dissemination to a wide variety of stakeholders of lessons learned.

244-246. To this end, the Project will promote a series of case studies, and proper identification throughout a learning agenda and learning plan. After the definition of the learning plan, the identified and prioritized learning questions will be supported. Sub-activities will potentially include:

- **Case studies** of promoted strategies: From year 2 onwards, the identification of best practices on the proposed strategies and technologies will be identified and further assessment through case studies.
- **Lessons learned**: identification of problems or challenging situations during implementation and distilled lessons will also be identified and documented through the systematization of experiences, which will enable a reflection process with the involved stakeholders and the lessons that can be shared and disseminated.

245-247. **Location:** Siparia, Penal-Debe, and Princes Town Regional Corporations.

246-248. Beneficiaries: Communities within the SORB area in Siparia, Penal-Debe, and Princes Town.

247-249. Key stakeholders involved: Ministry of Planning, Penal-Debe and Princes Town Regional Corporations, NGOs, other Regional Corporations of the country, donors and funding institutions working in adaptation strategies, CAF.

Activity 5.2.4 Design of communication material and dissemination of lessons learned

248-250. The communication material includes the preparation of short films highlighting activities that contribute to flooding, on the impacts of flooding, sea-level rise and droughts, and the development of promotional material and campaigns that can be shared through social media. This could be developed in alliance with schools and other key stakeholders in the SORB to ensure local knowledge and engagement being promoted.

249-251. The Project will hold **annual Reflection workshops** with a wide variety of stakeholders, including **public officials, NGOs working in the area**, and beneficiaries, to assess the progress of the Project and get feedback on improvements that could be made, and potential partnerships for the upcoming activities.

250-252. Lessons learned, case studies, and good practices identified during project implementation will be developed in different communicational formats, such as videos, short-interviews films, and one-pagers with key highlights to be widely disseminated among stakeholders working in flooding adaptation strategies, and climate change adaptation to dry spells and seawater intrusion.

251-253. Location: Siparia, Penal-Debe, and Princes Town Regional Corporations.

252-254. Beneficiaries: Communities within the SORB area in Siparia, Penal-Debe, and Princes Town.

253-255. Key stakeholders involved: Siparia, Penal-Debe and Princes Town Regional Corporations, National government, CSOs, private sector, Chambers of Commerce, Trinidad and Tobago Society of Planners, Trinidad and Tobago Association of Planners, APETT, Association of Real Estate Agents, Trinidad and Tobago Institute of Architects, and the Trinidad and Tobago Green Building Council.

B. Describe how the project / programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

Economic benefits of the Project

254-256. The overall economic benefits of the project include increased and more stable incomes, protected assets, job creation, increased productivity and cash savings as a result of improved adaptive capacities and reduced exposure to floods, droughts and saltwater intrusion of the vulnerable population in the SORB area.

255-257. Component 1, through the strengthening of institutional and regulatory systems (Output 1.1) and the improvement of the climate and water information monitoring and management system (Output 1.2), aims to develop different information tools that will complement or integrate various activities within the Project. These information tools will allow for better organisation among stakeholders and effectiveness of programmes as they will allow for localization and prioritization of policies and activities; this will create a scenario with better prevention, mitigation, planning and response to climate risks and thus reduced exposure and economic costs associated with their impacts.

256-258. Component 2 will improve infrastructure in flood-prone neighborhoods in the SORB in urban and rural areas to reduce the impact of flooding and improve access to water. On the one hand, flood management in the Curamata river basin will be improved (Output 2.1.1), with small interventions expected to have a large impact on water retention and proper drainage, which will generate indirect economic benefits by avoiding the costs of emergency response related to extreme events and the economic losses associated with them. Improved flood-proofing of housing and commercial buildings (Output 2.2.1) will benefit the vulnerable population by protecting their assets and reducing exposure

and economic costs due to property loss and will save State resources in loss subsidies to the affected population as the cost of preventive investment is lower than the cost of subsequent damage. Improved access to water for the urban and rural population (outcome 2.1.2) due to the installation of rainwater harvesting systems, retention ponds at household and community level, will result in an economic benefit by reducing flooding costs and at the same time, water supply costs for household owners and community center users, and in rural areas, in addition to lowering exposure to loss of goods due to lack of water or flooding, water is also transported, which will reduce the time spent carrying water, a task often undertaken by women.

257-259. Component 3, coastal and wetland ecosystem restoration (outcome 3.1) would contribute to mitigating the impact of flooding by creating a natural barrier against sea level rise and saltwater intrusion; this activity will increase income and productivity in the area by reducing losses in agriculture, fisheries, and trade due to climatic hazards and ecosystem degradation and would also create the opportunity for new recreational and even ecotourism practices. In agriculture, avoiding flooding, saltwater intrusion and soil erosion will result in an economic benefit due to productivity gains. Fisheries will benefit from reduced pollution and degradation of wetlands, which are important nurseries providing organic material for fish and support for fish farming.

258-260. Component 4 will create the opportunity to adopt new livelihood practices for farmers and fishermen by providing technical and commercial assistance and affordable financing in innovative activities. The pursuit of new practices aims to build resilience to climate change of small-scale community producers and thus reduce the likelihood of needing social assistance from the government. The implementation of hydroponic systems (outcome 4.1) will increase agricultural productivity and thus income, as well as save on irrigation water and avoid loss of goods due to flooding. For fishermen, livelihood diversification through ecotourism (outcome 4.2) will result in new jobs and increased income.

259-261. Component 5 will strengthen capacities among stakeholders, both institutions and community inhabitants and will seek to raise awareness of climate risk (outcome 5.1) and develop communication and dissemination strategies (outcome 5.2) that will reduce the economic impact of disasters by educating on how to prevent floods and act during emergencies, reducing the cost of climate change hazards on livelihoods, infrastructure, and population. In addition, this component aims to ensure that the knowledge and reaction will last beyond the current project period to ensure the sustainability of each of the activities and thus save future interventions.

260-262. A cross-cutting benefit for all component results is the creation of indirect employment due to the implementation of planned works and capacity building activities.

Environmental Benefits of the Project

264-263. Structural interventions discussed in Components 1 and 2 focus on providing both long- and short-term positive impacts. Activity 1.1.3 which revolves around governance support gives direct environmental benefits of flood alleviation through basic structural maintenance works, while Activity 1.1.2 will provide individuals with the type of information needed to better implement options for flood proofing their homes and businesses, which will be more effective and environmentally sustainable than the short-term usage of options such as sandbagging. Activities 2.1.1 and 2.1.2 under the remit of Component 2 which addresses infrastructure to increase resilience is directly connected to reducing flood impacts.

262-264. The development of a Management Plan for the Godineau Swamp under Component 1 will provide both direct and indirect environmental benefits in the short- and long-term. It will ensure that the Swamp's resources are used sustainably, the ecological integrity of the Swamp is protected, biodiversity is conserved, activities that have a negative impact on the Swamp are precluded, and the Swamp's hydrology is properly maintained. The development of a Management Plan through a participatory approach lends for the possibility of the successful sustainable management of the Swamp's resources, as top-down legislative approaches are challenging to enforce and manage in developing countries. Nonetheless, the development of a Management Plan could also provide a possible pathway for the legal recognition of the Swamp as a protected area allowing for prosecutions in the event of environmental violations.

263-265. Component 2 prescribes activities related to rainwater harvesting that can effectively reduce the impacts associated with stormwater runoff and reduce potential impacts associated with increasing pressures placed on freshwater systems to meet growing demands.

264-266. The implementation of an initial study prior to the implementation of water harvesting will allow for the filling of knowledge gaps so that any provision of information to the residents of SORB will be relevant. Residents will be educated on the appropriate measures for the management of the systems to reduce any health or environmental risks. Any impacts will be addressed through the Certificate of Environmental Clearance process whereby the Environmental Management Authority (EMA) would require each impact be determined and mitigated prior to the grant of approval.

265-267. In the case of Component 3, the restoration of mangroves can improve the carbon sequestration capability of the Godineau Swamp, and increase the availability of habitats, nurseries, and spawning grounds for both crustaceans and fish which are intrinsically linked to the livelihoods of the residents of the SORB. Additionally, mangrove restoration will ultimately reduce the risks of storm surges, improve coastal protection, and reduce erosion, maintain the biodiversity of the Swamp, and improve water quality. Reduction of negative impacts associated with mangrove restoration programmes as outlined in Component 3 will be avoided through the involvement of the Institute of Marine Affairs (IMA) and the Coastal Protection Unit of the Ministry of Works and Transport. This would address some of the reasons why some restoration programmes fail including a lack of knowledge of the site hydrology, poor site and species selection and the absence of long-term monitoring and management.

266-268. Actions related to more sustainable practices in Component 4 provide several environmental benefits. For example, hydroponics systems will reduce the amount of water used by farmers, which will contribute to reducing droughts. As it is nutrient efficient, it will also minimize the use of pesticides.

Social Benefits of the Project

267-269. Components 1 and 5, through regulatory and institutional improvements combined with awareness and communication campaigns, will allow the population not only to have more information and capabilities, but also a greater degree of involvement and empowerment in relation to floods and the decisions made in relation to them.

268-270. The infrastructure works of Component 2 will significantly contribute to enhancing the population's quality of life by improving the living environment. The rainwater harvesting systems will also increase hours-availability for productive or domestic tasks, by reducing the time spent in carrying water, a task usually performed by women. In addition, the infrastructure will benefit to reduce the damages and losses of properties and assets of vulnerable population.

269-271. In component 3, restoration of mangroves will imply the improvement of the ecosystem services. The hydroponic systems in component 4 will benefit the population with better health, by reducing the use of pesticides and the possibilities of water run off pollution. Overall, it is expected that the reduced impact of flooding will also benefit SORB population's spread of diseases such as leptospirosis and other waterborne diseases, the disruption to the potable water supply, and the interruption of electricity supply during extreme events.

270-272. Additionally, the project will contribute to reducing mass migration or population displacement due to loss of livelihoods, production, and other prolonged economic impacts. Also, the project will contribute to reduce psychosocial effects on flood victims and their families considering the deep impacts that generate the loss of loved ones, especially on children; reduce the stress due to loss of property and livelihoods.

Gender Assessment

- **Gender Baseline**

271-273. In the context of Trinidad and Tobago, like so many other places, any experience examined in terms of gender, must be understood as intersectional. As Leo-Rhynie (1998)²², established, class, race, ethnicity and more (e.g., religion, cultural customs, age) are consistently drawn into relevance due to the history of slavery, indentureship and colonization that entrenched hierarchies along these lines.

272-274. In terms of the specific region in Trinidad and Tobago, the South Oropouche Basin, national trends persist, and are in fact intensified. Siparia and Penal/Debe were among the regions that scored the lowest in the gender inequality index compared to other regions in the country. This trend also applies

²² Leo-Rhynie, Elsa A. 1998. "Socialisation and the Development of Gender Identity: Theoretical Formulations and Caribbean Research". In Caribbean Portraits: Essays on Gender Ideologies and Identities. Ed: Christine Barrow. Ian Randle Publications.

to Princes Town, with the municipality recording the lowest rate of female participation in the workforce in its last available Economic Profile. Siparia has a higher-than-average female labor force participation rate – 50.3%, while Penal/Debe had the second lowest female labor force participation rate in the country (43.7%). In the case of Princes Town, the municipality has the lowest rate of female participation in the workforce.

273-275. Regarding target groups in the project, in the County of St Patrick East there are 1,192 agricultural and livestock producers, from that 161 are women; in the district of Debe there are 460 farmers, including 62 women; and in the district of Princes Town there are 995 farmers, including 200 women. According to FAO²³, in the fishery sector the participation of women is not well documented; however, and as supported by the stakeholders' consultations, women in this sector are more likely involved in the processing and marketing activities. FAO estimates put the total number of women involved in the fisheries sector at 1,350 in the country.

- *Gender differences aggravated by climate change*

274-276. A February 2021 Gender Analysis of Trinidad and Tobago, prepared by the UNDP and the Government of Trinidad and Tobago, reinforces the country's extreme vulnerability to climate events and the compounded risks to vulnerable populations such as women as a demographic group because women "have less secure economic standing than men, disasters increase the risk of reinforcing, perpetuating, and increasing existing gender inequalities in Trinidad and Tobago"²⁴. The report cites the opportunity cost of care work, both within the home and in the community, unemployment or underemployment of women in the labor market even though women and girls enroll in higher numbers in education, the gender division of labor which influences women's and men's career choices, and low levels of women in political leadership as factors that constitute women's increased vulnerability to climate change events and that undermine their capacity to adapt and to be resilient in comparison to men.

275-277. The project consultation process identified specific vulnerabilities for women related to climate change effects in the SORB such as spike in domestic violence, the stakeholders pointed out "we do have a rise in domestic violence and 90%, even probably 98% if I may say, go unreported, so we don't know the definite and the magnitude of the impact because most of the heads of households are males and they depend on farming as their livelihood".

- *Gender considerations in the project*

276-278. The 2021 gender analysis report makes twelve recommendations to rectify these shortcomings which suggests that there is a will to strive for gender responsive action.

277-279. The gender responsive approach will be mainstreamed in the entire project activities, including the specific sections addressing the gendered vulnerabilities complicated by climate impacts in the different manuals; design of training; the implementation of technical assistance to ensure women participation and care for the children so they can attend; appropriate language and gender considerations in the communication, dissemination; gender assessment tools to collect information from women and men as well as including sex-differentiated climate change risk impacts, needs and demands on women and vulnerable groups and awareness activities, among others. The decision making by women will be strengthened in participatory processes such as the development of the Godineau Swamp Management Plan by using specific methodologies that promote equitable participation and voice inclusion.

278-280. The investments in urban areas will address women's specific needs by reducing the risk of productive and family assets loss and reduction of health issues that usually increase the burden of caretaking by women. Women will be actively targeted in the diversification of productive activities (fishing, agriculture) that will benefit them by offering an alternative to stabilize their income and their food security. They will be particularly engaged in capacity building activities related to ecosystem restoration and conservation which are also expected to increase the opportunities for future jobs. Women's skill sets in education and awareness-raising activities will be capitalized in Component 5

²³ FAO. Fishery and Aquaculture Country Profiles- The Republic of Trinidad and Tobago.

²⁴ UNDP NDC Support Programme. 2021. Trinidad and Tobago Gender Analysis: Executive Summary. Government of the Republic of Trinidad and Tobago.

activities. Through the climate monitoring system and expansion of the community flood early warning system, the project can provide a more equitable information access, improve the response capacity, and reduce the vulnerability of women who are usually more affected by floods impacts and are in charge of people with disabilities, elderly and children.

C. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.

279-281. The project proposes a combination of investments in different technologies, including hard adaptation measures, such as grey and green infrastructure and soft adaptation (e.g., capacity building, awareness raising, and flood governance strengthening) that are combined to address in an integral manner the impacts of flooding, droughts and increased sea level rise providing benefits for the most vulnerable population in the area. The Project has included the following consideration to ensure cost-effectiveness:

280-282. Prioritization of no-regret and low regret options²⁵ and cost-effective technologies for adaptation assessed in the study conducted by the Inter-American Development Bank (IDB) in Trinidad and Tobago "Understanding the economics of climate adaptation in Trinidad and Tobago" (2014) ²⁶.

- Support for the strengthening of flooding governance, which includes the meteorological alert system under component 1 and mangrove restoration (component 3) fall into the category of "high impact" and "no regret".
- Capacity building activities are generally no regret options since they entail low investment with proven long-term effectiveness and sustainability of actions as well as benefits that would be justified under all future scenarios, since it addresses key issues already being experienced in the SORB. Furthermore, social awareness and institutional training as well as the introduction of retention ponds obtained the highest score in terms of cost-effectiveness assessment under the multi-criteria analysis in the above-mentioned study.
- Activities such as rainwater harvesting systems, infrastructure and building reinforcement, and sustainable drainage systems, are also included in the analysis of the IDB study and obtained a high score as cost-effective actions to prioritize in the country.

284-283. Proactive and preventive approach to address flooding, drought, and increased sea level rise: The proposed measures contribute to avoid associated increasing losses and economic costs compared to the current approach of reactive measures such as evacuation, subsidies to farmers and people affected by flooding, among others.

282-284. Reduced costs of investments, low maintenance costs and increased associated co-benefits:

- Activities such as the improvement of the early warning systems (Component 1) builds on previous work done by a partnership of non-government and government institutions and complement the required investment to expand and enhance the EWS. This kind of systems do not only contribute to disaster risk management but also contribute to social-capital and community network development and has a low associated operation and maintenance cost.
- Component 2 will address identified drainage issues by investing in small detention basins, and small drainage works in specific identified locations, which entail a relatively small investment and can maximize the benefits to avoid flooding in the identified areas. Through this component, the strengthening of housing and commercial buildings to withstand floods also represents a low investment adaptation solution that entails high benefits of avoided asset losses and the losses related to the stop of an income-generating activity for the flooded households. The development

²⁵ Low regrets options deliver benefits now and across a wide range of future scenarios of climate change and may incur in an additional cost to offset climate change risks but costs are small in comparison to the benefits of avoiding future costs. No regret options are investments that would be justified under all plausible future scenarios, including the absence of human-induced climate change

²⁶ This study assesses the existing climate hazards calculates their economic effects, proposes actions to address the identified risks, and analyses their economic costs and benefits of each adaptation measure, reaching to a weighted result for each of them. Link available at <https://publications.iadb.org/en/publication/16851/understanding-economics-climate-adaptation-trinidad-and-tobago>.

of rainwater harvesting systems that will also be promoted through component 2 will build upon the experience of other institutions with a proven design and improve the technology to make it also effective for flooding. Community involvement and training will contribute to maintenance and long-term sustainability avoiding the high costs associated with the procurement of water by the government, long distances, or payment to commercial providers.

- Component 3 includes ecosystem-based adaptation solutions that have been proven to require not only a low initial investment but also low maintenance costs, making them efficient and effective. This measure not only contributes to avoiding costs but also supports key ecosystem services, and associated benefits of environmental health such as increased biodiversity.
- Activities such as capacity building and awareness raising (component 5) require a minimum investment and entail associated benefits to not only address climate-related impacts, but also, to improve health and water-borne diseases, contribute to improve chemical pollution derived from pesticides use and water run-off, contribute to address social and cultural behaviors that tend to neglect vulnerable groups such as women and youth, and contribute to understand the importance of emergency responses that can prevent loss of lives, among others.
- Component 4 will avoid high costs for farmers and the government due to losses in the agriculture production by promoting innovative solutions that are proven to save high quantities of water, reduce pollution and high return on investment (ROI). Without the proposed adaptation solutions to vulnerable groups of agriculture and the promotion of income-diversifying solutions among fisher-folk, they would continue to depend on government subsidies due to climate-related events.

283-285. The project sought to leverage local resources and previous experiences by:

- Leveraging human and technical resources from the public sector: for the implementation of activities, the project will rely on existing structures while strengthening them and ensuring the mainstreaming of climate change and adaptation solutions. This contributes to sustainability while ensuring consideration of climate change aspects in future interventions.
- Considering additional infrastructure and activities required, complimentary to current and planned investments and projects aimed at improving water management in the country
- Ensuring complementarity with other projects and programmes run by public institutions promoting community involvement, training and communication strategies based on local practices, culture, and social norms to effectively promote behavior change.

Project/ Programme Components	Expected Concrete Outputs	Project strategy	Alternative Options for the Same Outputs	Detailed (If applicable)
1. Strengthening of Territorial Planning and Risk Management	1.1. Strengthened institutional and regulatory systems for climate responsive planning and development.	<p>Develop different complementary and integrative information tools, useful for Project developers and community residents:</p> <p>1.1.1. Develop the flood risk map for the SORB</p> <p>1.1.2 Develop the land use map for the SORB</p> <p>1.1.3 Manual about floodproofing infrastructure and buildings, specific to the reality of the SORB</p> <p>1.1.4 Support to the governance on the drainage system's maintenance in the SORB</p> <p><u>1.1.5 Update the local emergency response plan</u></p>	<p>Use existing maps at the national level.</p> <p><u>Municipal emergency response plan</u></p>	<p>Creating and updating SORB maps instead of using existing maps has the advantage that it considers the aspects of climate change and being only from the target area they have more disaggregation. Regarding the use of existing maps, currently there are no SORB areas and the acceleration of changes in the environment shows the rapid outdated of the maps, which can lead to wrong or less efficient decisions.</p> <p>Without the manual, the community would not have direct access to important information to act against climate change and increased flooding.</p> <p>Creating coordination mechanisms supported by the Watercourse information management system (WIMS), giving trainings and workshops on Project activities with institutions that already have a presence in the basin ensures long-term sustainability and beyond the Project. It also enables better informed and coordinated decisions to be made.</p> <p>Without this activity, the rest of the activities would be difficult to develop given the lack of coordination and mismanagement between institutions.</p> <p>Each municipality has its own emergency response plan but they do not have the inputs for local prioritization. With a local plan, the plan is reinforced and updated and would provide the inputs to have objective criteria to prioritize the most vulnerable at the community level. This input can then be disseminated among all organizations that respond to emergencies at the municipal level so that an organized common plan is created.</p>
	1.2. Strengthened information, monitoring, and climate information management systems	<p>Develop a continuous and complete database as an input for decision-making in flexible and localized strategies:</p> <p>1.2.1 Expand and upgrade weather, tidal, and hydrological monitoring systems in the SORB</p> <p>1.2.2 Foster a water supply and demand management</p>	<p>Develop a simple upstream monitoring system for early warning of floods.</p> <p>counterfactual - no information on demand</p>	<p>Based on experiences in other parts of the world, a monitoring system can be put together with few measuring instruments used upstream in the river basin, thus the capital investment cost would be lower. But this alternative system is not complementary to the existing monitoring system. This new system has several instruments that allow more sophisticated prediction models and the data provided serves as input for other activities of the Project, not only for early warning.</p> <p>With climate change, times of drought will worsen, and it is necessary to improve the water distribution system, locate where the greatest leaks are and avoid them and put reinforcements where they are most needed. The alternative would be that there is no information and continue to act without knowing the actual consumption.</p>
2. Green and grey infrastructure enhanced to increase resilience to floods and droughts	2.1. Flood-prone neighborhoods in the SORB with improved water management infrastructure	<p>Improvement or development of infrastructure in urban and rural areas to reduce the impact of floods and improve access to water:</p> <p><u>2.1.1 Improve flood management in the Curamata river catchment: permeable</u></p>	<p><u>Construction of traditional rigid dam structures such as dikes, embankments, detention and</u></p>	<p><u>Although traditional rigid dam structures have great results in mitigating the impact of floods, they carry large capital investment costs and these structures can also lead to other unwanted environmental impacts. Permeable landfills will be built to reduce flooding in the middle and lower reaches of</u></p>

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Project/ Programme Components	Expected Concrete Outputs	Project strategy	Alternative Options for the Same Outputs	Detailed (if applicable)
		<p><u>weirs and use of Poodai Lagoon.</u></p> <p>2.1.2 Increase access to water while minimizing the impact of flooding with rainwater harvesting systems in urban and rural areas.</p>	<p><u>retention basin. Investment in improving the drainage system.</u></p> <p>1. Investment in large flood arrest infrastructures 2. Investments in the water distribution system 3. Different rainwater harvesting systems depending on whether it is urban or rural: ground surface, bedrock surfaces or roof method: ground surface, bedrock surfaces or roof method.</p>	<p><u>the Curamata River, their effectiveness has already been studied and has a relatively lower cost.</u></p> <p><u>Through the installation of manually controlled gates, the establishment of an operating system and the rehabilitation of an automatic gate on the embankment that separates the river from the Poodai lagoon, the amount of water that can be stored within the lagoon during the season will be maximized, humid without neglecting it in the dry season.</u></p> <p>The disadvantages of alternatives 1 and 2 are that they carry large capital investment costs and solve either only the problem of flooding or lack of water supply. Rainwater harvesting systems technology combats both problems. The best method is the roof one since it involves less installation and maintenance costs, as well as ensuring better water quality. The disadvantage is the space it occupies and that the cost increases according to the use of water and therefore 3 types are proposed: community and domestic with a drinking water filter to supply households that do not have space in the home and those that do; domestic in a large number of homes that collect a large volume of rainwater in urban neighborhoods in highly flooded areas.</p>
	2.2. Housing and commercial buildings reinforced against floods.	2.2.1 Create a grant system for the structural reinforcement of houses and commercial buildings against flooding:	Flood Home Insurance System or Flood Loss Subsidy System	Compared to the alternative, the cost of losses (not just the material) is higher than the cost of preventing flood losses. In addition, insurance companies do not agree to insure communities with such risk of loss due to floods. There are already 2 subsidy programs for damage repair, this activity will work a pilot in conjunction with one of these organizations and will provide information, supplies and training to ensure the continuation of the prevention program once the project is finished.
3. Vulnerable coastal and wetland ecosystems of the SORB enhanced.	3.1. Key coastal and wetland ecosystems restored.	<p>Strengthen the Godineau swamp as the ecosystem that plays a key role in regulating the water of the basin:</p> <p>3.1.1 Conduct studies to promote evidence-based decision making in the Godineau swamp.</p> <p>3.1.2 Support for obtaining the declaration of the swamp as a protected area.</p> <p>3.1.3 Participatory processes to update and develop the Management Plan for the Godineau swamp</p>	Hire external consultants to carry out a new study of the Godineau swamp	Disadvantage of the alternative: The resources already used and the experience of the organizations already involved in the study of the swamp are not taken advantage of Godineau swamp.

Project/ Programme Components	Expected Concrete Outputs	Project strategy	Alternative Options for the Same Outputs	Detailed (if applicable)
		3.1.4 Restoration of key coastal and wetland ecosystems 3.1.5 Promotion of sustainable oyster harvesting	1. Nutrition of beaches to avoid coastal erosion 2. Rock cladding as tough defenses against saltwater intrusion and flooding 1. Maintain traditional mangrove oyster fishing 2. Ban oyster fishing in mangroves	Compared to these two alternatives, wetland restoration has a much higher environmental impact, more impact on restoring and protecting coastal resources, more impact on the livelihoods and resilience of the coastal community. And the initial investment and maintenance are less. Disadvantages include the need to reclaim space in places that often have high development potential and is a solution to coastal flooding and erosion that takes time to establish, and benefits are slow to manifest. If the traditional mangrove oyster fishery is maintained, the mangrove will continue to be damaged, and it would go against ecosystem restoration activities. But at the same time, prohibiting fishing would end the economic activity of families that have no other ways of life. Sustainable harvesting of mangrove oysters allows families to continue their economic activity without damaging the mangroves as the mangrove roots are replaced by sustainable structures close to them.
4. Increase adaptation capacity of vulnerable fishers and farmers to address climate change and climate variability	4.1 Resilient farming technologies promoted to increase adaptation to climate change impacts.	4.1.1 Pilot project of innovative solutions for farmers to respond to climate-related risks: Hydroponics and water-resistant crops (Dasheen)	1. Install desalination plants 2. Increase the amount of water that reaches the aquifers 3. Improve the efficiency of irrigation canals (use of continuous drip irrigation systems) 4. Implement the rotation of salt tolerant crops.	Hydroponics is a suitable adaptation technology, which allows farmers to grow plants without soil, thus having control over the growing environment and avoiding uncertainties in the hydric and nutritional status of the soil, thus overcoming problems of salinity, flooding and accumulation of pests and diseases. It is a system with great adaptability; the design can be adapted to different weather conditions. In addition, it saves water (savings of 60-80%), helping to address the problem of projected droughts and is efficient in nutrients, reducing the use of pesticides. At the same time, it offers good yields and quality products and can be grown all year round. Water-resistant crops will be exploited by producers who are unwilling to change their long-established form of production to the custom of working the land. Dasheen withstands both floods and droughts and has a growing market supported by government programs. The rest of the alternatives have a high investment cost and do not face the problem of flooding. Or are they activities that cost a lot of water.
	4.2 Fishers resilient livelihood options promoted to increase adaptation to climate change impacts.	4.2.1 Implementation of a community-led eco-touristic site in the Godineau Swamp to promote fishers' livelihoods diversification and conservation	1. Sustainable fishing practice 2. Aquaculture 3. Installation of on-farm fish processing	The national experiences of the ecotourism space in Caroni swamp and Navira Swamp show there are great benefits for families since it allows families to make productive use of the Swamp and at the same time promoting its conservation and increased local knowledge. Another advantage is that it allows the diversification of livelihoods since they use their own boats for this activity and for traditional fishing. Aquaculture entails high costs and technical requirement, while the eco-tourism strategy entails lower operation and maintenance costs and less training for its operation. The operation and maintenance costs would be covered by the entry fee, thus entailing lower risks. Disadvantage of alternative 1: it involves studies, data and statistics that are not available. And a sufficient spatial separation. Although they face a decline in the fish population, it is not the main problem faced by fishermen. Although aquaculture is profitable and there is experience from several companies in the country, it requires a high capital investment and has operating costs that can be high. Overproduction lowers the price of fish and requires home space and technical know-how. Alternative 3, though adds value to the price of the merchandise and offers more employment opportunities, especially for women. A good installation is necessary that

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Project/ Programme Components	Expected Concrete Outputs	Project strategy	Alternative Options for the Same Outputs	Detailed (if applicable)
				complies with all the safety and hygiene conditions. The freeze preservation method is preferred and at the same time the one that requires the highest initial investment cost and inputs. If the other methods are not well used they can lead to health problems.
5. Stakeholders of the SORB have built their capacities and are aware of climate risks.	5.1. Capacities of stakeholders have been built to cope with climate change impacts in the SORB	5.1.1 Strengthening capacities of governmental institutions to respond and manage climate- related risks 5.1.2 Mainstreaming climate change in primary and secondary school classes	Hire external consultants Curriculum update	<p>This activity is necessary to plant the support installed the strengthening of capacity capacities of key stakeholders and ensure the sustainability of all activities when the Project is completed. That it is key that the entities that remain over time have sufficient tools to ensure environmental and social sustainability.</p> <p>Hiring an outside external consultant carries high consulting costs that may justify more training and meetings but that would be more expensive. It is also less sustainable because although it achieves community strengthening, it does not sufficiently strengthen local authorities.</p> <p>It is proposed to train teachers online so that they to reach a larger audience y have the teaching tool and to ensure the training can be replicated over the years. The alternative of updating the curriculum requires more time, organization and bureaucracy. And would not be achievable within the project timeline.</p>
	5.2. Communication and dissemination strategies have been implemented towards reducing vulnerability.	5.2.1 Working with pre-16 schools in the SORB to raise awareness on climate change- related impacts and solutions 5.2.2 Promoting awareness- raising on climate change impacts and appropriate solutions among SORB key stakeholders 5.2.3 Identification of best practices and lessons learned 5.2.4 Design of communication material and dissemination of lessons learned	Implementation of the work at the municipal level instead of the schools to ensure the participation of the authorities. Hire external consultants	<p>Against Comparing the alternative options assessed, the proposed strategy has the advantage of targeting the local stakeholders, there would be municipal coverage instead of watershed coverage means greater participation of other communities and would have greater coverage of the area, but the project would not be decentralized and would have moved away from the communities. The municipal management costs are would have been higher and the availability of the implementation of the activity would depends on the will of the local authorities. In contrast, working directly with children has a multiplier effect in households and would prepare future generations for climate change.</p> <p>Awareness of the impacts of climate change and appropriate solutions among stakeholders, especially in the private sector, is important to avoid creating new or more reduce flood vulnerabilities.</p> <p>It is important to share teachings lessons learned so that the knowledge it created is captured and disseminated in other institutions, thus they This way, more people than those directly reached would be able to benefit and take advantage of the experiences and a participatory scenario is created that improves enqagement and stakeholder participation, ncludes more the community.</p>

D. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national adaptation plan (NAP), national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

284-286. Trinidad and Tobago's National Development Strategy 2016-2030 was built on significant consultations within all spheres of Trinidad and Tobago to determine the challenges faced by the country and establish the thematic areas that require national attention as the country moves along a pre-determined developmental pathway. Theme V – Placing the Environment at the Centre of Social and Economic Development allowed for the articulation of goals that align with the outcomes of components of this project including the strengthening of environmental governance and management systems, climate change vulnerability assessment, and improvement of natural resource management.

This Strategy explicitly mentions DRM and Climate Change Adaptation among the highest priorities²⁷.

285-287. The project will support five out of the six national environmental priorities set by the National Environmental Policy (2018) for Trinidad and Tobago: Priority 1 – Protecting Environmental and Human Health through Pollution Control; Priority 2 – Sustainably Managing Assets; Priority 3 – Improving the Local Environment; Priority 5 – Fostering an Environmentally Responsible Society; and Priority 6 – Addressing Climate Change and Environmental and Natural Disasters.

286-288. The project also allows Trinidad and Tobago to address some of their national goals and key thematic sectors that require consideration under various policies in addition to the National Environmental Policy (2018). These policies including the National Policy and Programmes on Wetland Conservation for Trinidad and Tobago (2002), National Protected Areas Policy (2011), National Forest Policy (2011), National Climate Change Policy (2011), National Wildlife Policy (2013), National Tourism Policy (2010), and National Integrated Water Resources Management Policy (2005). Policy documents not yet approved by the Cabinet of the Government of Trinidad and Tobago but still represent valuable guides in determining priority areas for Ministerial interest also cover some of the components of this project. These draft policies include the Draft Ecotourism Policy, Draft Integrated Coastal Zone Management Policy, Draft Comprehensive Disaster Management Policy, and Draft Hazard Mitigation Management Policy.

287-289. Regarding the above mentioned National Climate Change Policy (2011), the present proposal is aligned with the objectives of conserving and building resilience of human and natural systems to adapt to the adverse impacts of climate change, including through capacity building; protection of the natural environment and human health; enhanced agricultural production and food security; educating the wider public on the potential impacts of climate change and the recommended adaptation strategies; and conserving and guaranteeing a sustainable supply of potable water.

288-290. Trinidad and Tobago's nationally implemented plans also have matching components with the project. These are the National Biodiversity and Strategy Action Plan (2017), Draft National Flood Response Plan, National Response Framework (2014), National Protected Areas Systems Plan for Trinidad and Tobago (2018), National Hazard Mitigation Plan (2014) and the National Action Plan Programme to Combat Land Degradation in T&T: 2006-2020.

289-291. This proposal is also aligned to the efforts that the country through the ODPM is undertaking for updating its governance framework for Disaster Risk Management. Nowadays, the country lacks from a comprehensive disaster risk management legislation, since the Disasters Measures Act (Ch. 16:50, Act 47 of 1978) – the only regulation governing disaster related issues at national level – is focused on disaster response; and there is a general absence of DRM responsibilities explicitly defined on sectorial

²⁷ Government of the Republic of Trinidad and Tobago, 2016. "Vision 2030- The National Development Strategy of Trinidad and Tobago 2016-2030".

and territorial regulations²⁸. To give a solution to this, the ODPM is working on the revision of past draft legislation documents to obtain a new comprehensive bill that incorporates, among others, some of the elements gathered by the present proposal at the watershed level: building capacity of disaster management stakeholders, information sharing, early warning systems, public awareness, and resilience²⁹.

E. Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

290-292. The project will be executed by the University of the West Indies through its St. Augustine Centre for Innovation and Entrepreneurship (STACIE), who will ensure adherence to that all laws, policies and regulations of the Government of Trinidad and Tobago.

294-293. The Project will comply with all the applicable national regulations regarding management of the environment, the industrial relations, health and safety, public health and protection of rivers and waterways. It will comply with all relevant government policies such as its water resources management policy and adhere to all standards for construction and building. It will also comply with CAF' safeguards and AF Environmental and Social and Gender Policies.

292-294. The relevant legislation and regulations are as follows:

1) Legislation Applicable to All:

Environmental Management Act Chap. 35:05 of 2000 and its subsidiary legislation: Certificate of Environmental Clearance Rules, 2001, Certificate of Environmental Clearance (Designated Activities) Order, 2001 (As amended), Air Pollution Rules, 2014, Noise Pollution Control Rules, 2001, and Water Pollution Rules, 2019	
Town and Country Planning Act Chap. 35:01	State Land (Regularisation of Tenure) Act of 1998
Planning and Facilitation of Development Act, 2014.	Waterworks and Water Conservation Act Chap. 54:41
Occupational Safety and Health Act Chap. 88:08	Water and Sewerage Act Chap. 54:40
Public Health Ordinance Chap. 12:04	Agricultural Small Holdings Tenure Act Chap. 59:53
Disasters Measures Act Chap. 16:50	Summary Offences Chap. 11:02
State Lands Act Chap. 57:01	Minimum Wages Act, 1976
Municipal Corporations Act Chap. 25:04	Children's Act, 2012
Workmen's Compensation Act, 1960	Retrenchment and Severance Benefits Act, Chap. 88:13
Maternity Protection Act, 1998	Industrial Relations Act, Chap. 88:01
Minimum Wages Order, 2010	

2) Legislation per types of interventions:

Project Components	Type of interventions	Applicable Legislation
1	Assessments, strengthening, and participatory processes	Environmental Management Act Chap. 35:05 -- Town and Country Planning Act Chap. 35:01 -- Disasters Measures Act Chapter 16:50 -- Certificate of Environmental Clearance Rules, 2001 -- Certificate of Environmental Clearance (Designated Activities) Order, 2001 -- Municipal Corporations Act Chap. 25:04 -- The Freedom of Information Act, 1996 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 - Minimum Wages Order, 2010 - Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
	Installation and operation of monitoring	Waterworks and Water Conservation Act Chap. 54:41 -- Disasters Measures Act Chap. 16:50 -- Water and Sewerage Act Chap. 54:40 - Environmental Management Act Chap 35:05 -- Certificate of Environmental Clearance (Designated Activities) Order, 2001 --

²⁸ IDB, 2020. "Index of Governance and Public Policy in Disaster Risk Management (IGOPP): National Report for Trinidad and Tobago". Technical Note N° IDB-TN-02002.

²⁹ ODPM website, section "Policies, Plans and Legislation": www.odpm.gov.tt

	equipment and systems	Certificate of Environmental Clearance Rules, 2001 -- Noise Pollution Control Rules, 2001 -- Water Pollution Rules, 2019 -- The Freedom of Information Act, 1996 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976
2	Public works – detention basins, permeable weirs, urban drainage.	Water and Sewerage Act Chap. 54:40 -- Waterworks and Water Conservation Act Chap. 54:41 -- Agricultural Small Holdings Tenure Chap.59:53 -- Certificate of Environmental Clearance Rules, 2001 -- Certificate of Environmental Clearance (Designated Activities) Order, 2001 -- Town and Country Planning Act Chap. 35:01 -- State Lands Act Chap. 57:01 -- Forests Act Chapter 66:01 -- Forests Amendment Act, 1999 -- Municipal Corporations Act Chap. 25:04 -- Planning and Facilitation of Development Act, 2014 -- Malaria Abatement Act Chap. 28:50 -- Environmental Management Act Chap. 35:05 -- Water Pollution Rules, 2019 -- Noise Pollution Control Rules, 2001 -- Disasters Measures Act Chap. 16:50 -- Occupational Health and Safety Act, 2004 -- Summary Offences Chap. 11:02 -- Demolition of Unsafe Structures Act Chap. 35:55 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
	Rainwater harvesting systems and reinforcement of buildings	Water and Sewerage Act Chap. 54:40 -- Waterworks and Water Conservation Act Chap. 54:41 -- Public Health Ordinance Chap. 12:04 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
3	Ecosystem restoration	Waterworks and Water Conservation Act Chap. 54:41 -- Water and Sewerage Act Chap. 54:40 -- State Lands Act Chap. 57:01 -- Plant Protection Act Chap. 63:56 -- Control of Importation of Live Fish Act Chap. 67:52 -- Fisheries Act Chap. 67:51 -- Forests Act Chap. 66:01 -- Forests Act 66:01 -- Forests Amendment Act, 1999 -- Public Health Ordinance Chap. 12:04 -- Town and Country Planning Act Chap. 35:01 -- Environmental Management Act Chap 35:05 -- Litter Act Chap. 30:52 -- Conservation of Wildlife Act Chap. 67:01 -- Plant Protection Regulations, 1997 -- Agricultural Fires Act Chap. 63:02 -- Sawmills Act Chap. 66:02 -- Fisheries Management Bill, 2020 -- Noise Pollution Control Rules, 2001 -- Environmentally Sensitive Species Rules, 2001 -- Environmentally Sensitive Areas Rules, 2001 -- Marine Areas (Preservation and Enhancement Act) Chap. 37:02 -- Recreation Grounds and Pastures Act Chap. 41:01 -- Malaria Abatement Act Chap. 28:50 -- Summary Offences Chap. 11:02 -- Petroleum Act Chap. 62:01 -- Animals (Diseases and Importation) (Amendment) Act, 2020 -- Animals (Diseases and Importation) (Amendment) Regulations, 2018 -- Water Pollution Rules, 2019 -- Municipal Corporations Act Chap. 25:04 -- Pipelines Act Chap. 35:51 -- Malicious Damage Act, Chap. 11:06 -- Pesticides and Toxic Chemicals Act Chap. 30:03 -- Mongoose Act Chap. 67:55 -- Control of the Importation of Live Fish Act Chap. 67:52 -- Certificate of Environmental Clearance (Designated Activities) Order, 2001 -- Certificate of Environmental Clearance Rules, 2001 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
	Capacity building	Environmental Management Act Chap 35:05 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
4	Hydroponics systems	Plant Protection Act Chap. 63:56 -- Pesticides (Registration and Import Licensing) Regulations, 1987 -- Fertilizers and Feeding Stuffs Act Chap. 63:55 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
	Aquaculture / aquaponics systems	Fisheries Act Chap. 67:51 -- Animals (Diseases, Importation, Health and Welfare) Act by Animals (Diseases and Importation (Amendment) Act, 2020 -- Control of Importation of Live Fish Act Chap. 67:52 -- Animal (Importation) Control Regulations -- Fisheries Management Bill, 2020 -- Fertilizers and Feeding Stuffs Act Chap. 63:55 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits

		Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
	Ecotourism	Fisheries Act Chap. 67:51 -- Recreation Grounds and Pastures Act Chap. 41:01 -- Environmental Management Act Chap. 35:05 -- Tourism Development Amendment Act, 2006 -- Water Pollution Rules, 2019 -- Certificate of Environmental Clearance (Designated Activities) Order, 2001 -- Certificate of Environmental Clearance Rules, 2001 -- Noise Pollution Control Rules, 2001 -- Municipal Corporations Act Chap. 25:04 -- Malicious Damage Act, Chap. 11:06 -- State Lands Act Chap. 57:01 -- Plant Protection Act Chap. 63:56 -- Forests Act 66:01 -- Forests Amendment Act, 1999 -- Conservation of Wildlife Act Chap. 67:01 -- Plant Protection Regulations, 1997 -- Agricultural Fires Act Chap. 63:02 -- Environmentally Sensitive Species Rules, 2001 -- Environmentally Sensitive Areas Rules, 2001 -- Animals (Diseases and Importation) (Amendment) Act, 2020 -- Animals (Diseases and Importation) (Amendment) Regulations, 2018 -- Water Pollution Rules, 2019 -- Public Health Ordinance Chap. 12:04 -- Town and Country Planning Act Chap. 35:01 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004
5	Institutional strengthening, education, capacity building	Education Act Chap. 39:01 -- Environmental Management Act Chap. 35:05 -- The Freedom of Information Act, 1996 -- Workmen's Compensation Act, 1960 -- Maternity Protection Act, 1998 -- Minimum Wages Order, 2010 -- Industrial Relations Act, Chap. 88:01 -- Retrenchment and Severance Benefits Act, Chap. 88:13 -- Children's Act, 2012 -- Minimum Wages Act, 1976 -- Occupational Health and Safety Act, 2004

F. Describe if there is duplication of project with other funding sources. If any.

1. The SORB is of high priority for the country and thus several studies are being developed and various investments are being envisaged at present by the government. Therefore, the development of this proposal has aimed to carefully identify the existing or planned initiatives by always coordinating with the Ministry of Planning and Development and CAF and working closely with each of the government agencies with responsibilities in each of the topics, in bilateral and multilateral meetings and workshops. It can be affirmed that the participatory approach of this project formulation (see section H and Annex 2 Stakeholder engagement report) has guaranteed that all the activities have been proposed by the local communities and the government agencies, building upon what is already in place in the country. A significant effort was made during the field mission to review again with stakeholders all the activities to ensure that all past, present, and future initiatives related to each of the project themes are considered. Important work was carried out with the Regional Corporations to determine to what extent they had planning tools to deal with floods and to verify with them and with several other agencies what the gap is in terms of resilient investment needs and emergency response.
2. This project builds on the existing efforts to boost action to increase community resilience as a matter of urgency. The main elements of complementarity of the project's actions, by component, are described below.

<p><i>Component 1</i></p> <p>Various attempts have been made at mapping flooding within the basin, but they have been deficient in one of several ways that do not give the most recent estimation of flood risk levels. The scope of the flood hazard map has been discussed with several actors including the Regional Corporations and ODPM and the Ministry of Planning who have confirmed its usefulness and urgent need.</p> <p>The land use map for the SORB and the manual for floodproofing buildings do not exist and no other initiatives are planning to make it. The three Regional Corporations have expressed the need of updating the emergency response plans. Although the project funded by UNDP "Strengthening Community Flood Early Warning Systems (CFEWS) in Trinidad and Tobago" will address emergency response issues in the country, including the SORB, it has been confirmed that the coordination activities and the investments in emergency response equipment would not be provided by it.</p> <p>To understand how much this project could support the expansion of the hydrometeorological network in the SORB, the project team held several multilateral meetings with WRA, the Meteorological Service and IMA, to ensure that the project is not providing gauges that other funding sources are or will provide.</p>
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In the same vein, the concept note had initially proposed to develop a comprehensive **early flood warning system** throughout the basin. Discussions were held with the major institutions, namely WRA, Ministry of Rural Development and Local Government, the Meteorological Service, and the Drainage Division about implementing such a system for there was the possibility that these agencies might have secured funding from alternative sources. It was confirmed that indeed an early flood warning system at the national level will be implemented in the basin through the United Nations Development Program (UNDP) and thus this activity was eliminated from the project because it was overlapping.

With regards to **water supply and demand management**, there is an ongoing pilot project in Northwest of Trinidad for bulk and domestic meters. The strategic intent of WASA is universal metering so having pilot areas allow having very valuable information. As reported by WASA, getting consumption data in the South is extremely useful. This activity will be executed in coordination with this agency, which has as well an ongoing programme to explain to the population the implications and the importance of the metering.

Component 2

An important work was made in 2003 to characterize the needs and the possibilities for enhancing **Drainage and Flood control** in the watershed. This study has been taken as a knowledge basis in this proposal (see Background section). Also, it should be noted that very recently, in 2019, CAF commissioned a "Rapid assessment for the rehabilitation and improvement of drainage infrastructure in Trinidad". The objective of this study was to assess the no-regret and short-term measures for a rapid rehabilitation of the drainage infrastructure on Trinidad after the October 2018 flood event. In addition to this, the mid- and long-term measures were assessed in order to further improve the drainage infrastructure and flood management on the island. The recommendations for the case of the SORB were: 1) in the long term, to increase the capacity of the New Cut Channel and of the upstream tributaries and to construct a bypass near the river mouth; 2) in the short term, to build embankments. These are grey infrastructure investments whose budget exceeds the possibilities of this project. In addition, these large investments are being considered by the government for loan applications with multilateral agencies. At the time of the submission of this proposal, the engineering firm was supporting the government in the preparation of the bidding of the works in the New Cut Channel. Based on this knowledge, the preparation of the present proposal has prioritized the focus on smaller-scale complementary interventions and sought to promote ecosystem-based adaptation interventions.

From the beginning of the formulation process, the project team held meetings with the engineering firm that is designing these grey infrastructure investments to verify that the proposed activities, especially the activities related to **improving water management in the Curamata River Catchment** which involves dealing with small-scale drainage interventions, are useful and complementary to the interventions that are being planned.

Rainwater harvesting is well known by the authorities and the communities: rainwater harvesting systems can be seen in some areas of the SORB; also, there have been pilot projects for the installation of these systems (e.g., GWP and NIHERST), and at present the project "Build communities resilience to water challenges" targeted to water impoverished households executed by WRA and the Ministry of Rural Development and Local Government. However, the lack of sufficient funding has prevented from installing it massively as needed (e.g., this latter pilot project has not yet defined the areas of the country where the systems would be installed and, in any case, less than 10 systems could be allocated to the SORB). On another note, none of the initiatives has ever considered the possibility of using these systems for the double purpose of stabilizing supply and mitigate floods. Therefore, this project will fill an important gap. On another note, special attention will be given to provide information and capacity building for the maintenance and the water treatment. The project will liaise with the Public Health Departments at the RCs, with large experience in the matter, to carry out this task.

The grant facility for **floodproofing buildings and commercial buildings** will be implemented in alliance with Land Settlement Agency (LSA) and the National Commission for Self Help (NCSH) to eligible households in the SORB. These agencies provide grants for household flood interventions, but they tend to have very low budgets for all the demand, and while floodproofing solutions are eligible for one of the NCSH grant lines, most of their funds are for repair. The proposed grants facility will be managed by the UWI as the Executing Entity, with the collaboration of the NCSH, taking advantage of the knowledge and mechanisms that this institution has already in place. Around 30 staff from LSA and NCSH will strengthen their capacities on the specific floodproofing needs and best options for the SORB area.

Component 3

The relevant institutions with competencies in the coastal and wetlands **ecosystems** management know the necessities for their rehabilitation; however, activities are not being promoted because of the lack of funding. The Institute of Marine Affairs (IMA) and the Coastal Protection Unit of the Ministry of Works and Transport are involved in ensuring the success and sustainability of wetland restoration. Godineau Swamp Management Plan was never finished and adopted. There is a clear need to take up this work that has already begun and incorporate a climate change perspective into the process. The Institute of Marine Affairs (IMA) analyses the change in land cover patterns in the Godineau Swamp through aerial photography and satellite imagery. This

kind of analysis can help monitor the evolution of the vegetation with climate change, and the effect of the restoration measures that would be applied with the project. The project will cover some initial supervision of the results of the restoration, but this will be coordinated with the IMA and then these tasks will be incorporated into the regular monitoring programmes of the IMA. The competent authorities have confirmed that there is no other funding envisaged for undertaking any of these activities.

Component 4

The investments in innovative solutions for farmers have been designed in conjunction with the Ministry of Agriculture, NAMDEVCO and the Faculty of Food and Agriculture of the UWI. These agencies have confirmed that there is no overlap with any other initiative and that the project would complement efforts. The project will find support in the existing government-funded extension services. It will seek synergies with at least the following projects:

- CDKN (Climate & Development Knowledge Network) project "Climate impacts and resilience in Caribbean agriculture"³⁰: Using innovative technology, the University of the West Indies (UWI), has connected with farmers to "climate proof" the agriculture sector.
- FAO's Climate Change Adaptation of the Eastern Caribbean Fisheries Sector Project (CC4FISH)³¹. In T&T, this project undertook a Vulnerable Capacity Assessment, different activities to reinforce resilience of the fishery sector, and provided support to the Trinidad Fisheries Division.

In the case of the establishment of an ecotouristic site at the Godineau Swamp, the IMA, the Forest Division and the Regional Corporations have confirmed there is no other initiative with this objective.

Component 5

In terms of strengthening capacities in climate change, lessons learned can be taken from the "Climate ACTT: Action by Civil society in Trinidad and Tobago to build resilience to climate change"³². At the moment, there is no other project developing capacity building, awareness raising, and educational activities related to climate change and targeted to the SORB. The project will take as a basis all the ongoing initiatives being developed by teachers and schools and will support in broadening the understanding of the climate change issues.

G. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

293-295. The Project will develop a knowledge management strategy at the start of the intervention to ensure effective use and dissemination of the information and data generated by the Monitoring and Evaluation System and the best practices and lessons learned captured under component 5. The Project includes among its activities in Component 5 the development of communication material as well as identification of best practices and lessons learned to guarantee knowledge generation.

294-296. An initial mapping of all key stakeholders has been performed during the formulation stage (see Annex 2). The knowledge management strategy will update the stakeholders map at the inception stage to ensure all relevant stakeholders, including additional stakeholders that might not have been identified during formulation are targeted and engaged with the project learning activities. Different audiences require different knowledge products to capture their attention. Thus, the KM strategy will identify the most adequate communication material to reach the different targeted stakeholders. A list of potential knowledge material might include short videos, leaflets, one-pagers, infographic, and multimedia resources to ensure knowledge is disseminated adequately targeting different learning needs.

296-297. Additional dissemination activities will be identified while designing the learning agenda at the inception of the project, and annually developing the learning plans, which will include targeted activities to ensure all targeted stakeholders can learn and use the lessons derived from the project. The following dissemination and capacity building activities have already been included under component 5 and the M&E of the project: peer to peer learning between key government staff supported by specialists from the university, development of training material, embedding climate change and risk reduction planning to address flooding in the school curricula or through extra-curriculum activities

³⁰ CDKN website: https://cdkn.org/project/climate-impacts-and-resilience-in-caribbean-agriculture-assessing-the-consequences-of-climate-change/?loclang=en_gb

³¹ FAO's website: <http://www.fao.org/in-action/climate-change-adaptation-eastern-caribbean-fisheries/project-overview/en/>

³² CANARI (Caribbean Natural Resources Institute): <https://canari.org/climateactt/>

targeting initial and middle school students, learning workshops to critically examine evidence from the implementation and the M&E data system for adaptive management and further planification of activities. Sharing of best practices will be promoted through these activities and at the community level through participatory approaches and stakeholders' engagement process, with targeted activities to discuss the implementation of Project activities during field-visits and promote capacity building sharing information on best practices and lessons learned. All activities targeting vulnerable population such as farmers, fisher folks, women and youth, vulnerable urban neighborhoods for the development or redesign of resilient infrastructure or the climate-proofing of assets have a strong technical assistance component associated to ensure knowledge dissemination and appropriation of the adaptation measures at the community level. Ecosystem restoration activities will also be developed with a community-level approach, where community members will be trained to support rehabilitation efforts, which will in turn contribute to the longer-term sustainability of the Project. Knowledge products will be developed featuring the successful strategies used at the community level to disseminate knowledge and reinforce a virtuous cycle of learning and capacity building.

296-298. The learnings coming from the project will also serve to inform the above-mentioned planned capacity building activities, this way strengthening the use of key lessons learned for improving implementation.

297-299. Among planned activities in Component 5 (Activity 5.2.2 Identification of best practices and lessons learned, and dissemination activities.) an annual reflection workshop has been planned. These annual workshops will gather representatives from different stakeholders' groups to assess the progress of the project, identify lessons learned and best practices. All knowledge generated will be discussed among different stakeholders during this event, which will gather the information generated by the Project, including mid-term evaluation results, case studies and final evaluation findings and lessons learned. Additional targeted presentations to key government stakeholders will also be considered in case not everyone is willing to participate in the larger dissemination activities to promote evidence-based decision making and a learning culture of adaptation strategies in the SORB area.

298-300. Coordination among key government stakeholders at the national and local level will be promoted through dedicated sessions held once a year. In these sessions, the project team will share information on the activities conducted, the progress and key lessons learned, and best practices identified. These sessions will also serve to ensure alignment of all planned activities at the project level with the work of national and local governmental institutions for the following year and ensure the findings, lessons learned, and best practices being identified with the project can be disseminated among key government officials and staff working in these topics.

H. Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy and Gender Policy of the Adaptation Fund

299-301. The formulation of this project has been led by the Ministry of Planning and Development - the Designated Authority to the Adaptation Fund -, and CAF, Development Bank of Latin America. The stakeholder engagement process is described in detail in Annex 2 - Stakeholder engagement report.

300-302. A Kick-off workshop in November 2020 was attended by 72 participants (44% women), from governmental and non-governmental organizations. Following this event, bilateral interviews with key stakeholders were organized and prioritized in conjunction with CAF and the Ministry of Planning, NDA of the Adaptation Fund in Trinidad and Tobago. These are listed in the table below.

Table 6. First round of bilateral interviews with key stakeholders (Dec 2020-Jun 2021)

Environmental Management Authority (EMA)	Water and Sewerage Authority/ WRA
Penal Debe Regional Corporation	Regional Administration South (MALF)
Office of Disaster Preparedness and Management	Siparia Regional Corporation
Coastal Protection Unit (MoWT)	Institute of Marine Affairs (IMA)
T&T Meteorological Service	Puzzle Island Farmers Association

Drainage Division (MoWT)	Woodland Fisherfolk Association
Princes Town Regional Corporation	Global Water Partnership (GWP) and NIHERST
The Penal Debe Foundation	Ministry of Rural Development and Local Government
Engineering Division (MALF)	Extension, Training, and Information Services Division (MALF)
Estate Management and Business Development Company Ltd (EMDB)	Faculty of Agriculture - University of the West Indies (UWI)
Forestry division (Ministry of Agriculture, Land and Fisheries – MALF)	

304-303. After this first round of bilateral interviews, further meetings were held with these same stakeholders to allow definitions on the different adaptation measures.

302-304. On 22 April 2021, a Validation Workshop was held to validate with all relevant stakeholders the identified climate risks, the baseline conditions, main barriers to alleviate flooding in the watershed; additional climate threats and impacts experienced by the affected population; and to validate the proposed draft activities and interventions, as well as the prioritization of areas to implement the Project and the institutional arrangements foreseen. There were 58 attendees (43% women)³³.

Table 7. Organizations attending the Concept Note Validation Workshop

Type	Ministry/Division/Agency/Organization
CSO	Adopt a River
	South Oropouche Riverine Flood Action Group
	The Penal Debe Foundation
	Woodland Fisherfolk Association
Private Sector	Penal Debe Chamber of Commerce
	Witteveen+Bos (engineering firm)
Local Govt	Penal Debe Regional Corporation
	Siparia Regional Corporation
	Penal Debe Regional Disaster Management Unit
	Princes Town Regional Corporation
	Ministry of Works and Transport - Drainage Division
	Ministry of Agriculture, Land and Fisheries
	Ministry of Agriculture, Land and Fisheries - Engineering Division
	Ministry of Agriculture, Land and Fisheries - Regional Administration South
	Ministry of Agriculture, Land and Fisheries - Forestry Division
	Ministry of Energy and Energy Industries
National Govt	Ministry of Finance
	Ministry of Rural Development and Local Government
	Ministry of National Security - Office of Disaster Preparedness and Management (ODPM)
	Ministry of Planning and Development
	Ministry of Planning and Development - Environmental Management Authority (EMA)
	Ministry of Sport and Community Development/Community Development Division
	Ministry of Works & Transport - Coastal Protection Unit
	Ministry of Public Utilities - Water Resources Agency (WRA) - Water and Sewerage Authority (WASA)
	Ministry of Public Utilities - Trinidad and Tobago Meteorological Service
	NAMDEVCO (National Agricultural Marketing and Development Corporation)
NIDCO (National Infrastructure Development Company)	

303-305. The main issues addressed by the participants revolved around the need to work with developers; concrete proposals for short-term flood intervention; the complexity related to the fact that the problems occur in several jurisdictions; the need for enforcement of the law; the importance of community empowerment; the possibility of building detention ponds upstream; the suggestion to adapt existing manuals and codes to the reality of the SORB. Regarding investments in water infrastructure, comments were made on the availability of data on flooded houses; the suitability of rainwater

³³ This figure does not include the participants from the Consortium supporting the development of the Concept Note, integrated by Viridia Projects and the University of the West Indies (UWI).

harvesting systems and the need for training for their proper operation; problems with oil extraction infrastructure; problems of saline intrusion; possible mechanisms to manage grants for housing reinforcement. In discussing livelihoods and ecosystems, participants were interested in promoting restoration, aquaculture, and ecotourism activities. They mentioned concern about the mangroves growing upstream and the decimated crabs' population. All the applicable comments from the stakeholders were taken into account in the development of the proposal.

304-306. At the time of preparation of the concept note, the COVID-19 pandemic situation in Trinidad and Tobago was very serious. The country had entered a new lockdown due to the large number of cases. The state of emergency, which began on Sunday, May 16 - for a 15-day duration - was extended for a period of three months³⁴. Therefore, the planned field trip to the SORB was suspended. Due to the pandemic, all project exchanges during the Concept Note stage were virtual. However, the high level of participation of different types of actors, despite the situation, was remarkable.

305-307. After the endorsement by the Adaptation Fund Board in October 2021, a new virtual workshop was held to update all relevant stakeholders on the formulation process: information needs for the detailed description of project activities; vulnerability assessment, environmental and social risk identification and mitigation measures, gender assessment and gender action plan; and potential field trip of the formulation team to the project area. This workshop was attended by 52 participants (40% women). A second round of bilateral interviews was held with the stakeholders listed in Table 7.

Table 8. Second round of bilateral interviews with key stakeholders (October-December 2021)

Princes Town Regional Corporation	Water and Sewerage Authority/ WRA
Penal Debe Regional Corporation	Institute of Marine Affairs (IMA)
Office of Disaster Preparedness and Management	UWI Hydroponics Unit
Ministry of Agriculture, Land and Fisheries - Fisheries Division	NAMDEVCO (National Agricultural Marketing and Development Corporation)
T&T Meteorological Service	Witteveen+Bos (engineering firm)
Drainage Division (MoWT)	Ministry of National Security - Office of Disaster Preparedness and Management (ODPM)

306-308. Even though the pandemic was still active in Trinidad and Tobago and globally, CAF and the Ministry of Planning considered that a formulation and validation mission could be undertaken respecting all security measures. The University of the West Indies was the host for the meetings in Port-of-Spain and visits to the SORB were organized in coordination with the Regional Corporations and the South Oropouche Riverine Action Group. During the week of the 6 to 10 December, meetings were held with all relevant national institutions, local organizations, farmers, fishers, and affected households in the most vulnerable areas of the basin. Please refer to Annex 2 – Stakeholder engagement report - for the detailed agenda and notes, and Annex 8 of the Activity description factsheets, for the photographic records of the visits.

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

307-309. As described in section F when explaining the non-duplication and complementarity of the project with other funding sources, the formulation of this proposal has taken into account the present and planned investments in the SORB and has carefully identified the activities that are complementary to the country's efforts and planning and has ensured that the project activities can deliver adaptation results by themselves. None of the proposed activities depend on any other investments to be made by other sources or stakeholders. The proposed activities focus on targeted groups and areas to ensure that the adaptation results are verified. When addressing issues with the national institutions, the proposed activities have a precise and stringent scope so that the objectives of the project are clear, and their outputs and outcomes can be monitored.

³⁴ Trinidad Express, 19 May, 2021: "3-month extension for SoE": https://trinidadexpress.com/news/local/3-month-extension-for-soe/article_f0db0e1a-b905-11eb-a5fd-d71724cfec04.html

308-310. To increase the resilience of the SORB population and ecosystems to flooding the project activities are organized in five distinct components.

Component 1. Strengthening of Territorial Planning and Risk Management.

309-311. *Baseline:* There is a lack of incorporation of the climate change perspective in the existing policy and planning. Also, maintenance is a central problem in the drainage system of the SORB, due to the ambiguity in terms of roles and responsible institutions. Today, warning times are too short to permit substantial reaction for reducing flood damage cost. There is a significant lack of meteorological, hydrological, and tidal data to feed the community flood early warning system (CFEWS) soon to be implemented in the Regional Corporations. Also, the Regional Corporations and the communities have reported a lack of awareness of the local emergency plans, lack of coordination, and lack of sufficient equipment to face large rainfall events.

310-312. *With AF funds:* The project will strengthen territorial planning and risk management, by developing technical documents that will help to better face the increasing flood events, will facilitate governance in the maintenance of drainage infrastructure; will facilitate local planning processes, will strengthen information, monitoring and climate information management systems that will feed the Community Flood Early Warning and Decision-making system. It will support the Regional Corporations to update the emergency plans with a participatory approach, raise awareness and increase their resources for responding to the emergency events.

Component 2. Green and grey infrastructure enhanced to increase resilience to floods and droughts.

311-313. *Baseline:* There is a marked lack of funding to intervene in effective measures in the basin.

312-314. *With AF funds:* The project will help to enhance infrastructure for increasing resilience to both floods and droughts, via flood reduction structures in a particular catchment and improved management of the water; will increase access to water while minimizing the impact of flooding with rainwater harvesting systems; and will promote the adaptation to floods of residential and commercial buildings.

Component 3. Vulnerable coastal and wetland ecosystems of the SORB enhanced.

313-315. *Baseline:* Key planning instruments that would help ecosystem resilience, such as the Godineau Swamp management plan are not operational and, although it has been confirmed with the national agencies that there would be institutional support to providing to this site a protection status, there is no planned concrete initiative in this direction. There is no characterization of the ecosystem services of the swamp and of the actual hydrology regime related to this area. There is a marked lack of funding to intervene in effective measures to reinforce key ecosystems. There is room to further promote the Ecosystem-based adaptation approach, which is well known by the relevant institutions with competencies in the coastal and wetlands ecosystems management. There is limited knowledge within the population about the importance of these ecosystems in water regulation and other ecosystem services. The knowledge of ecosystem restoration techniques is not spread at the level of having people being able to work in these duties. Also, oyster harvesting practices used nowadays by the local people are harmful to the mangrove ecosystem.

314-316. *With AF funds:* The project will facilitate the development of studies to know the swamp, its hydrology and its ecosystem services, will bolster local planning processes to increase resilience of key ecosystems that are key for the water regulation of the watershed and the vulnerable people depending on them, it will fund the rehabilitation of these ecosystems in the face of increasing flooding effects and sea level rise, including saline intrusion, will provide capacity building to increase technical knowledge and will provide alternative ways of oyster harvesting to protect the mangroves from the actual activity.

Component 4. Increase adaptation capacity of vulnerable fishers and farmers to address climate change and climate variability.

315-317. *Baseline:* Vulnerable groups of the agriculture and forestry sector are exposed to high risks and have low adaptive capacities to effectively respond to climate risks such as dry spells, increased sea water intrusion and increased flooding. The increase in flooding events and probably the increase of sea surface water temperature compromises the population and potential capture of native fishing species. The fisherfolk lack of technical capacity and access to funding to diversify their activity and find alternative livelihoods.

316-318. *With AF funds:* The project will help to increase the adaptation capacity of vulnerable fishers and farmers to address climate change and climate variability, by providing technical assistance and funds

to promote livelihood diversification for income and food security, and climate-resilient practices in resilient agriculture, aquaponics, aquaculture, and ecotourism.

Component 5. Stakeholders of the SORB have built their capacities and are aware of climate risks.

317-319. Baseline: There is a lack of a comprehensive approach to climate change in the educational system of Trinidad & Tobago; limited capacity of institutional stakeholders, CSOs, community groups, to address flooding; and lack of accessible and understandable information about climate change for fostering a change of behavior.

318-320. With AF funding: Barriers will be overcome through raising awareness and building capacities of the stakeholders of the SORB in sustainable climate change resilient actions and decision-making to reduce their risk to climate change impacts. Activities related to learning and dissemination from the implementation of the Project will contribute to support the adoption of best practices.

J. Describe how the sustainability of the project/ programme outcomes has been taken into account when designing the project/ programme.

319-321. The design of the Project includes several elements to ensure actions and benefits of the intervention continue after it ends. The main sustainability and replicability considerations aim to ensure that the local population, the institutions, and the policy environment are supportive of an effective adaptation to the increasing impacts of flooding, saltwater intrusion, and dry spells in the SORB area. The main elements that will contribute to this include:

- **Capacity building for key government institutions** to strengthen climate change knowledge, the use of hydro-climatic information for decision-making, flood, drought, and saltwater intrusion management with appropriate adaptation strategies, which will enable the local institutions to continue implementing similar actions, after the Project ends.
- **Capacity building for key government staff:** dedicated capacity building for key national and local government staff from different institutions related to environmental and social management systems, social and environmental monitoring of the project-related activities and investments, and the grievance mechanism will contribute to guarantee the key stakeholders are aware of potential social and environmental impacts of the proposed technologies, and strengthen their skills in the appropriate monitoring and social and environmental compliance assurance.
- **Capacity building and awareness raising for the local population:** the project considers different strategies targeting the local population, among which, awareness raising campaigns, capacity building activities for the implementation of the adaptation measures, incorporation of climate change and disaster risk reduction as extracurricular activities targeting children at school age. All these strategies will strengthen capacities in vulnerable populations, enhancing their knowledge about climate change, main impacts, and efficient measures to prevent and manage flooding, efficient use and harvesting of water, and promote cultural change.
- **Maintenance of small works:** Rainwater harvesting systems as well as retention ponds at the household and community level will include capacity building for the use and proper maintenance in the long-term. For communal works the Project will require before accessing funds, the commitment to develop a community plan, which regulates rights and responsibilities of the community that will use the installed system to avoid conflicts and guarantee long-term operation and maintenance.
- **Partnership with key governmental institutions** to ensure resources are allocated for the long-term maintenance and operation of the investments made. Additionally, the implementation of activities involving key government institutions contributes to guarantee ownership and sustainability once the Project comes to an end.
- **Strengthening of regulations and the flooding management governance:** The Project strongly supports the strengthening of the enabling environment contributing to develop a stronger flood governance structure and improved water management, mainstreaming climate change considerations and its impact in the drainage, and building code. It promotes regulatory changes that will make it possible to support flooding management in the long-term, protecting and restoring key ecosystems exposed to the impacts of climate change in the region.

- **Participatory process:** the participatory approach that has been embedded from the design stage and will be applied throughout project implementation will contribute to enhanced stakeholders ownership, which is expected to reinforce the sustainability of the results and longer-term impact of investments.
- **Engagement of key ministries and governmental staff throughout the implementation through a Steering Committee and Sectoral Technical Committees.** The proposed implementation arrangements consider the creation of a Steering Committee with higher level decision-making government officials of key ministries. Additionally, Sectoral Technical Committees will involve key technical staff for the review, technical overseeing and for providing recommendations on the planned activities and investments in the basin. This process is expected to reinforce the ownership and engagement for longer-term institutional sustainability.

322. The following table identifies the main considerations for sustainability of the results of the Project:

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Outputs delivered by the Project	Sustainability
1.1. Strengthened institutional and regulatory systems for climate responsive planning and development.	<p>Flood hazard maps, emergency response plans and land use maps need to be updated.</p> <p>The ODPM and Regional Corporations as well as the WRA will have resources for updating the maps/ flood emergency response plans after Project has finished. At the moment there is a mechanism for doing the updates of the maps, although it might be improved with the support of the technical assistance provided by the Project. Capacity building has also been considered in Component 5 to ensure Regional Corporation capacities are strengthened, including training on the use of tools such as GIS.</p> <p>The establishment of a coordination mechanism to identify priorities and better determine the required drainage maintenance to be conducted to alleviate and prevent flooding in the area will be key to sustain in time a longer-term space for meeting and consensus. The information system on water courses will support the prioritization and decision-making since it will ensure the funding for drainage maintenance is allocated with a holistic picture for prioritization. The coordination mechanism will determine which institutions, and by which means they will update the GIS database periodically.</p>
1.2. Strengthened information, monitoring, and climate information management systems	<p>The government institutions will sign agreements with the Project for the transfer of all procured instruments and will provide a commitment letter where they shall assign a specific department for the proper operation and maintenance of all the procured weather and hydrometeorological instruments to ensure long-term maintenance.</p>
2.1. Flood-prone neighborhoods in the SORB with improved water management infrastructure	<p>The infrastructure work to be included in the Poodai Lagoon and the Curamata River will be accompanied with a proper operation and maintenance system coupled with the rest of the activities of improved coordination to guarantee improved governance of the drainage and water courses. These activities will ensure in the longer-term better information available for the prioritization of resources allocation to the maintenance of key water courses and drainages that are essential to prevent flooding.</p>
2.2. Housing and commercial buildings reinforced against floods.	<p>The sustainability of the activities of floodproofing buildings and infrastructure will be guaranteed by the capacity building that the Project will conduct with the Land Settlement Agency (LSA) and the National Commission for Self Help to build capacities on the appropriate technologies to floodproof dwellings on flood-prone areas in the SORB, which will be included in the Manual (that will also be delivered by the Project. The grant facility will be implemented in alliance with these two institutions to eligible households in the SORB. The LSA is a government institution with regular funding that has a programme called the housing and repair programmes with grants given to beneficiaries who do not own the land but do have a certificate of comfort. With this they provide technical services to people whose houses are under repair though it is not specific to floods.</p> <p>The National Commission for Self Help Limited is a governmental nonprofit entity that assists in alleviating poverty and improving the quality of life for Trinidad. This agency has also a program, which provides funding to vulnerable communities assisting citizens in repairing their homes, including roofs, walls, to fix the toilet and bad. The main criterion for granting the funds is: land tenure property, income, poverty threshold, foundation build. The agency assesses the petitions and provides technical assistance as well as funding for the repairs. They have another program: Emergency repair and construction assistance grant. It is given in the case</p>

	<p>of someone house has flooded out and it is structural damage, they give material to repair that structure.</p> <p>The project will work with both institutions and strengthen their capacities to ensure that once the funding of the Project for promoting flood-proofing of dwelling is no longer available, the criteria and adequate technologies assessed and included in the Flood-proofing manual are still available options that both institutions will continue to foster among households requesting assistance to repair / flood proof their houses. This way, it will be ensured that two continuous funding windows in the country (one for those that do not own the land, and the other one for citizens that have ownership of the land) are available and can build on the good experience and learnings of flood-proofing infrastructure.</p>
3.1. Key coastal and wetland ecosystems restored.	<p>The project will include as part of the Godineau Swamp Management Plan the installation of a Monitoring and Evaluation System to monitor the changes and benefits of the restoration activities. This work will be done under the oversight and continued support of the IMA, which will continue to maintain the achieved benefits and ensure information dissemination to allocate more funding if needed to continue the work and investments prioritized in the investment plan. The availability of information, including the valuation of the ecosystem services of the Swam will provide the evidence-base to promote more investment in ecosystem-based adaptation solutions.</p>
4.1 Resilient farming technologies promoted to increase adaptation to climate change impacts.	<p>Once capacity is properly built the farmers should be able to operate and manage their systems successfully by the time the project has come to an end. Capacity building is therefore key. This is also why it is important for the demonstration models to be established under the guidance of a practicing expert so that proper hands-on training can be provided to farmers.</p> <p>To guarantee longer term operation and maintenance of the hydroponic systems an agreement with beneficiary farmers will be signed. Such an agreement will state that the systems are to be used for the purpose it was intended for, additionally, that the systems cannot be sold and that if the farmer no longer wishes to utilize the system, that it be surrendered back to the project team so that it can be distributed elsewhere. The costs of maintenance of the promoted systems are not high thus it is expected that the proper training and capacity building received during the Project cycle, coupled with the evidence of the benefits of the market strategy and selling of the production will show the farmers the proposed benefits of keeping the systems operational.</p>
4.2 Community-led eco-tourism options in the Godineau Swamp promoted.	<p>The Management Plan of the Godineau Eco-tourism site together with the business plan will ensure to identify a proper financial mechanism that allows to charge a sufficient fee to the tour operators and food and beverage trucks to have a sufficient profit and will also identify the maintenance fee that should be kept for the maintenance of the eco-touristic site, which will be kept by the government to ensure the site is well conserved and keeps operational once the Project has finalized.</p>
5.1. Capacities of stakeholders have been built to cope with climate change impacts in the SORB	<p>The capacity building component will support the implementation of the different activities ensuring that community members as well as governmental staff are well trained in the developed adaptation solutions, environmental and social management framework, including climate finance and adaptation project designs. The goal of this component is to ensure the capacities of key stakeholders are strengthened to continue the implementation, operation, and maintenance of all the adaptation solutions as well as to be able to keep designing adequate projects to leverage funding and deepen the benefits. During the stakeholders consultation different NGOs working in the area and community-based organizations identified that primary and secondary education is key in terms of knowledge dissemination. Children are key players in disseminating climate change information and technologies, thus part of the sustainability strategy is to improve the knowledge and develop resources on local climate change risks (flooding, saline intrusion, and droughts) as well as appropriate adaptation solutions among teachers so they can roll it out in their classes, generating a multiplier effect. The resources will be developed online so they can be continuously disseminated and reach a bigger audience.</p>
5.2. Awareness raising and knowledge management reinforced to promote lessons learned dissemination	<p>Awareness raising strategies as well as identification of lessons learned, development of knowledge products and dissemination of those learning among different stakeholders is also a key aspect considered in the project to ensure longer term sustainability.</p>

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project/ programme.

320-323. A preliminary analysis of the Project's impacts and risks as per the AF's Environmental and Social Principles in compliance with the Fund's Environmental and Social Policy (revised in March 2016) is presented below. A detailed impact assessment and mitigation plan will be developed for the Full Proposal. Overall, this project has been classified as a **Category B** project/ program according to the E&SP of the AF, as the potential impacts are few, small in scale and not extremely widespread, reversible, or easily mitigated.

Checklist of environmental and social principles	Further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
<i>Compliance with the Law</i>	Further assessment required	All applicable proposed projects need to comply with the legislation of Trinidad and Tobago. The EMA grants approvals via the Environmental Management Act (2000) under which there are subsidiary legislation which covers the types of approvals and regulatory requirements projects need. These pieces of legislation include the Certificate of Environmental Clearance Rules (2001), Certificate of Environmental Clearance (Designated Activities) Order, 2001 (As amended), Air Pollution Rules (2014), Noise Pollution Control Rules (2001), and Water Pollution Rules, 2019. The recommended projects/ actions which develop from the Components 2 and 3 would require environmental and drainage approvals from the EMA and Drainage Division. Component 3 any future protective designation of the Godineau Swamp can be achieved under the Environmentally Sensitive Areas Rules (2001) and Environmentally Sensitive Species Rules (2001) via implementation of recommendations made under the management plan will require that any proposed activities following designation to comply with the Rules made under the Environmental Management Act. This would legally restrict the types of activities which can be undertaken in the Swamp necessary for compliance. Drainage works under Component 2 will lie with other regulatory agencies including the EMA and TCPD (or the planned National Planning Authority in lieu of TCPD) to provide conditional approvals for. Therefore, there will be some legal requirement to be met for each development with stormwater management engineering works.
<i>Access and Equity</i>	Further assessment required	Beneficiaries were identified during extensive stakeholder engagement. This was imperative in the engagement process as it allowed for groups which may not often have had the opportunity to raise some of their concerns with flooding in the SORB on a national scale.
<i>Marginalized and Vulnerable Groups</i>	Further assessment required	Vulnerable groups have been identified for the project at this stage. There is no specific legislation in Trinidad and Tobago to address any means by which Venezuelan refugees can have a legal redress for ownership of properties. In the provision of grants to homeowners and business-owners, it has been determined that holders of Certificates of Comfort from the Land Settlement Agency will have equivalent access to funds. Therefore, there is a potential for such persons to indicate they are being denied the same rights being granted to members of the community that are affected by flooding.
<i>Human Rights</i>	No further assessment required	Human rights will be further protected through the implementation of activities that will raise awareness and build capacity of homeowners and business-owners within the basin. Given that there are no proposed projects which will negatively impact human rights, there is no further need for assessment for this criterion.
<i>Gender Equity and Women's Empowerment</i>	Further assessment required	The proposed projects present gender and women's empowerment sensitive activities.

<i>Core Labour Rights</i>	Further assessment required	Trinidad and Tobago has ratified the eight core conventions of the ILO and has legislation to address these conventions. These legislative measures will govern all Components and the work of the EE throughout the project.
<i>Indigenous Peoples</i>	No further assessment required	There are no known Indigenous communities currently residing within the SORB watershed, even though there are artefacts from previous generations. There is no further assessment required for compliance.
<i>Involuntary Resettlement</i>	No further assessment required	There have been no proposed activities that require the resettlement of persons, but rather the redesign of only vacant flood prone land, and thus no further assessment is needed.
<i>Protection of Natural Habitats</i>	Further assessment required	There are no project components which require any unjustified conversion of habitats recognized for their legal protected status or by communities, and high in conservation value. In fact, the components recognize the conservation value of the Godineau Swamp and therefore it is proposed that the Swamp is afforded designation as a wetland of international importance under the Ramsar Convention and designated as an Environmentally Sensitive Area under the Environmentally Sensitive Areas Rules (2001). The development of a Management Plan, modification of the hydrology, conduct of baseline studies and valuation of ecosystem services are all actions intended to further protect the Swamp.
<i>Conservation of Biological Diversity</i>	Further assessment required	Some of the proposed project's interventions will consider nature-based solutions intended to provide for human well-being and positively impact the biodiversity of the Godineau Swamp - an important measure as Trinidad and Tobago ratified the Convention of Biological Diversity in 1996 and developed the National Biodiversity Strategy and Action to specifically plan for the country's sustainable use of biodiversity. Component 3 which involves the restoration of coastal and wetland ecosystems, will involve activities that include re-growth of mangroves and restoration of marshes. The potential impacts of the activities cannot be fully explored at the Full Proposal stage and therefore baseline studies will be needed and determine final designs and interventions, even though the intended result will be of direct benefit to the ecosystem and indirectly, positively impact the surrounding communities.
<i>Climate Change</i>	No further assessment required	There are no provisions for projects within the SORB to target sectors that generate GHG. Where civil works may be required, the movement of vehicles will not significantly contribute to the emissions.
<i>Pollution Prevention and Resource Efficiency</i>	Further assessment required	There is a potential risk that measures may cause some pollution through the implementation of Components 1, 2, 3 and 4. Even though risks have been assessed as fully as possible at the Full Proposal stage, studies are needed to determine final interventions related to Components 1, 2 and 3. This can further potentially decrease the risks associated with these actions. Measures to reduce potential risks have also been proposed at this stage and will require implementation and monitoring.
<i>Public Health</i>	Further assessment required	The potential risks have been assessed and are confined to only to the rainwater harvesting activities of Component 2. These risks are low and can be managed through proper training and maintenance of harvesting systems.
<i>Physical and Cultural Heritage</i>	Further assessment required	There are no proposed projects that will have an impact on the archaeological sites within the SORB. However, the proposed Management Plan development for the Godineau Swamp recognizes the important of this cultural find and through the participatory process, this will be incorporated into the management objectives for the Swamp. Any proposals from the Plan will be subject to future compliance requirements where needed to properly ascertain the potential impacts or risks associated with the activity.
<i>Lands and Soil Conservation</i>	Further assessment required	The promotion of potentially improved valuable ecosystem services is proposed through Components 1, 2 and 3. However the final interventions will be subject to further specialized studies which will determine final interventions. Risk measures have been proposed to mitigation the impacts determined, however decisions made with the use of baseline information can promote reduced risks. While the proposed projects provide the opportunity for the promotion of soil conservation, improved protection to lands and soils and conservation of valued ecosystem services within the SORB watershed, the inherent potential impacts, and risks of each of these projects have not been thoroughly assessed at this stage.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme implementation.

324-324. Upon the request of the Government of Trinidad & Tobago, CAF is the Regional Implementing Entity (RIE) for the project. The Executing Entity is the University of the West Indies (UWI), through its St. Augustine Centre for Innovation and Entrepreneurship (STACIE) as the internal execution unit.

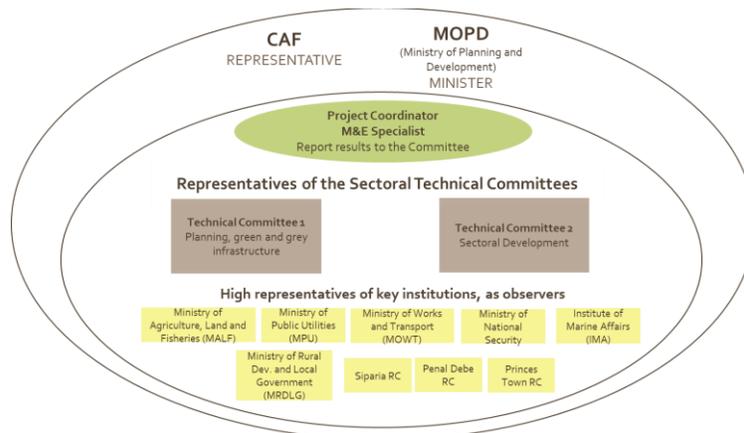
322-325. Key stakeholders related to climate impacts in the SORB at the national and the local level identified and described in the context/background section will also be involved in the implementation of the project under the scheme depicted below.

323-326. The project will have two levels of coordination: a level of strategic coordination that will include a Steering Committee and two Technical Committees, and an operational structure to manage the coordination of the accredited entity, the executing entity, and the operational team / project management unit (PMU).

1. Strategic coordination level

Steering Committee

324-327. Maximum decision-making authority, it will be led by high representatives from CAF and high representatives from the NDA (Ministry of Planning and Development) and will include as observers representatives of the different governmental institutions key for the management of the climate-related issues in the SORB. The Project Coordinator and the M&E Specialist will participate in the meetings with the main objective of reporting results to the Committee.



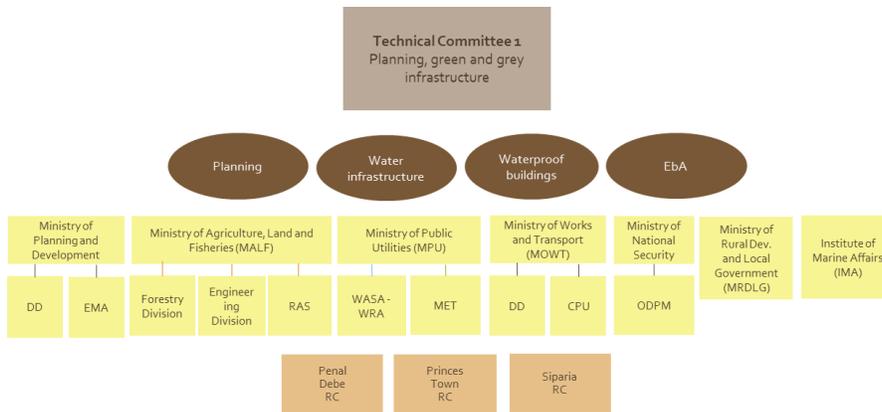
325-328. The Steering Committee will be in charge of:

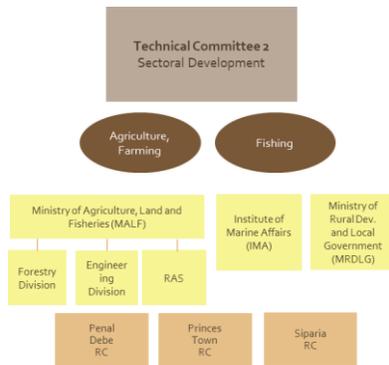
- Reviewing and approving the consolidated Annual Operating Plan.
- Reviewing and approving the consolidated Annual Procurement Plan.
- Reviewing and approving the PPR – Project Performance Report.
- Approving changes to the project's procurement plans, with possible variations in procurement among the project's Outputs, for amounts greater than 10%. Changes in procurement plans for amounts below this threshold will be approved by CAF and reported to the Committee at each meeting.
- Evaluating project performance.

- Reviewing and approving the mid-term and final evaluations of the project and providing comments and recommendations.
- Arbitrating conflicts that may arise during implementation.
- Receiving reports from the project coordination on a six-monthly and annual basis, during its sessions, and be informed on the progress of the annual report to be submitted to the Adaptation Fund.
- Inviting key stakeholders to participate in the selection process of the Project Operational Team according to the TORs approved by the MOPD as NDA.
- Verifying compliance of the Project's implementation.
- Providing strategic guidance aligned with the national climate change policy and local actions.

Technical Committees

326-329. There will be two Technical Committees that will provide advice on technical aspects and will inform on progress of the execution to the Steering Committee: one that will advise and report on the Planning and green and grey infrastructure interventions; and one that will advise and report on the Sectoral development interventions related to the agriculture, farming, and fishing sectors. While the Steering Committee will be composed by high representatives of the institutions (Ministers, secretaries, majors), the Technical Committees will be integrated by technical referents of institutions related to each of the thematic areas. The figures below show the proposed participation.





327-330. The Sectoral Technical Committees will be in charge of:

- Providing advice and overseeing the consolidated Annual Operational Plan.
- Providing advice and overseeing the consolidated Annual Procurement Plan.
- Providing advice and overseeing the PPR – Project Performance Report and provide recommendations.
- Providing advice and overseeing changes to the programme's procurement plan with variations in procurement among project outputs, in amounts exceeding 10%.
- Providing advice and overseeing Project's performance.
- Providing advice and overseeing information required for mid-term and final project evaluations.
- Providing advice and overseeing on a quarterly and annual basis, the progress of the annual report to be submitted to the Adaptation Fund.

2. Operational structure

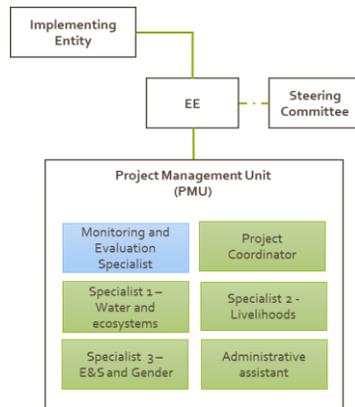
Implementing entity (AE)

329-331. CAF will hold the role of the Implementing Entity of the Programme, based on its experience of successfully carrying out similar Programme activities in the LAC region. CAF will maintain day-to-day oversight responsibility for project supervision and have direct responsibility for fulfilling the duties and obligations of an AF Implementing Entity. It will be responsible for financial management and accountable for the use of AF resources under the project. It will provide technical and administrative backstopping to the Operational Team (see below) to ensure results-oriented management and proper administration of funds. The IE functions involve the provision of monitoring and evaluation services. CAF will have permanent coordination with project staff and dialogue with project stakeholders.

Executing Entity (EE) and the Operational Team

329-332. The University of the West Indies (UWI) will be the EE of the project. The Operational Team within the EE -a Project Management Unit (PMU)- will have a dedicated team to guarantee all components and activities are carried out according to the project design. It will articulate with the monitoring and evaluation activities (covered by CAF as IE) to ensure that all expected results will be achieved on time and within budget.

330-333. This PMU will have a Project Coordinator, a Monitoring and Evaluation Specialist, a Water Sector and EbA Specialist, a Livelihoods (Agriculture, farming and fishing) Specialist, and an Environmental and Social Safeguards Specialist. The latter will be responsible for overseeing the implementation of the ESMF and the Gender Action Plan in liaison with CAF's Coordination of Environmental and Social Assessment and Monitoring (CESAS) and CAF's Gender Coordination. The PMU will work closely with the administrative areas within CAF.



334-334. The PMU will ensure that the Project's implementation proceeds smoothly through well-written work plans, Terms of Reference and carefully designed administrative arrangements that meet CAF and AF requirements. The PMU responsibilities include the following tasks:

- Follow-up of the achievements of the Project outcomes, outputs, and objectives.
- To manage day-to-day implementation of the Project, coordinating activities by the rules and procedures of CAF/AF.
- To provide overall administration, while acting as an independent and unbiased guarantor of cooperation and information exchange.
- To provide technical input as appropriate to the outcomes.
- To facilitate staff recruitment and procurement processes.
- To ensure, together with CAF, to coordinate with the stakeholders and other relevant regional programmes.
- To ensure, together with CAF, to convene quarterly Project Implementation Meetings (PIMs) to review progress in implementing work plans.
- To ensure, together with CAF, that specified tasks are outsourced to suitable sub-contracted providers or national and international consultants through competitive bidding processes. PMU responsibilities in this regard include development of bidding documents and terms of reference and monitoring the overall progress of these processes.
- To organize Project-level meetings and workshops, e.g., inception workshop, etc.
- To monitor financial progress reports and the financial balance provided by CAF's operational systems.
- To prepare overall Project reporting.
- Planning and monitoring the technical aspects of the Project, including regular field visits and periodic reporting.
- Ensuring advanced funds are used following agreed work plans and Project budget.
- Preparing and adjusting commitments and expenditures to be authorized by CAF. Guaranteeing timely disbursements, financial recording and reporting against budgets and work plans.
- Managing and maintaining budgets, including tracking commitments, expenditures and planned expenditures against budget and work plan.
- Maintaining productive, regular, and professional communication with other Project stakeholders to ensure the smooth progress of Project implementation.

B. Describe the measures for financial and project / programme risk management.

Risk no.	Identified risks	Type	Likelihood of occurrence	Impact level	Mitigation measures
1	Insufficient financial resources to implement project activities.	Financial	Low	High	A detailed budget will be developed during the Full Proposal preparation. The project's implementation will be supervised to identify promptly financial breaches.
3	Long term maintenance costs of infrastructure work	Financial	Low	Medium	The infrastructure works to be carried out have a low maintenance cost. In addition, the ecosystems-based solutions have been favored for the project to avoid them. Project beneficiaries will be trained in the maintenance of the interventions. Institutional arrangements to ensure resources allocation for medium scale works and the meteorological stations will be required.
4	Uncertainty regarding the intensity of climatic events that may affect the project interventions, including housing and infrastructure.	Environmental	Low	High	The proposed works designs incorporate the relevant climate scenarios to ensure the proposed measures can cope with the projected impacts of the targeted extreme climate events.
5	Elections and change of public authorities	Political	High	Medium	There is a high degree of involvement of the relevant ministries at the technical level. Furthermore, the implementation arrangements include technical monitoring committees to mitigate this risk.
6	Low stakeholder interest/participation	Social	Low	High	Extensive stakeholder consultation and involvement have been ensured since the concept note development stage.
7	Identification of suitable consultant/consulting firms to provide the required services.	Human Resource/ Consultant deficit	Medium	Low	Clear ToRs will be prepared, and procurements will be disseminated in the appropriate working networks. The executing entity is a higher education institution, which has the advantage to be connected to specialists regionally in the required services.
8	The capacity of stakeholders (communities and government) to continue actions	Institutional / Social	Low	Medium	Capacity building of stakeholders and government has been ensured as part of the implementation.

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C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

332-335. For the 5 components, 9 outputs and 24 activities and 4 sub-activities the risks associated with the activities and outputs were screened against the 15 principles of the AF's E&SP. Considerations were given to implementation arrangements and roles/ responsibilities of bodies which were necessary in preparation of the ESMP. Both the Evidence base risk identification and ESMP were prepared following extensive consultations with stakeholders and clear project activities definitions. Once risks were identified for each activity, the potential impact of the risk should it materialize was determined. Overall characterization was determined for each component using the identified risks and associated impacts. The characterization assessed whether social and environmental impacts were diverse, widespread, reversible, significant, small scale and few.

333-336. Based on the results of the Component Categorization, there are no components that will have widespread, irreversible and significant impacts. Components 4 and 5 were categorized as minimal risk (Category C) because the nature of their activities related to capacity building, training, knowledge management, and alternative livelihoods which are not expected to generate any significant environmental and social impacts. Components 1, 2 and 3 were categorized as medium risk (Category B) due to their activities related to infrastructure works such as the permeable weirs, drilling of observation wells and hydrological modification of the Swamp.

334-337. All components were found to have impacts relative to Principle 2 Access and Equity. Measures to address this include the development of a Communications Plan prior to the commencement of the activities. The Plan must be approved by the EE and will address information dissemination; messaging; channels; roles of community members, leaders, and organizations; appropriate types of communication for different groups, gender, age, and the differently abled; participation of community members in activities; grievances and gender targets.

335-338. Impacts related to Principle 3 Marginalized and Vulnerable Groups were associated with Components 1 and 2. The ESMP proposes that the Communication Plan be utilized to address the issuance of adequate and appropriate information and addressing grievances should any arise. To reduce potential impacts on the vulnerable groups which were identified as the disabled, women, children and the elderly, improved emergency response access will be more fitting in responding to the needs of the differently abled and elderly during flooding events. Management of impacts related to construction of grey infrastructure will be done through the monitoring of mitigation measures outlined in the conditions of the CEC and the EMA will hold external oversight for compliance, while the Environmental and Social Safeguards Specialist will also provide internal oversight within the EE.

336-339. Principle 5 Gender Equity and Women's Empowerment was relevant only for Component 3 whereby there may not be equitable participation of women in the activities relative to the development of the Management Plan for the Godineau Swamp. The Senior Social Specialist to be hired for Component 3 will be required to prepare a Communications and Participatory Strategy which will contain all activities related to the Component and strategies for maximizing participation within the SORB to be approved by the EE prior to the onset of activities. The Strategy will set gender participation targets for workshops, meetings and interviews and will ensure that the involvement of women in the SORB for the development of the Management Plan is facilitated.

337-340. The impacts associated with Principle 10 Conservation of Biological Diversity were applicable to Components 2 and 3. To address this, the ESMP recommends that determinations for final designs of interventions only be made after the completion of baseline studies, while technical standards be strictly adhered to. The EMA will also have external oversight for the implementation of the CEC conditions ensuring minimal impacts and consideration will be given as to when interventions will be conducted to minimize impacts.

338-341. Impacts related to Principle 12 of the ES&P which addresses Pollution Prevention and Resource Efficiency were found to be applicable for Components 1, 2, 3 and 4. For these activities, these impacts were determined to be temporary and moderate in significance and confined to pollution prevention. To address this, the ESMP recommends that interventions be made following the completion of baseline studies, minimizing the areas disturbed during the implementation of interventions, and the application of the conditions of the CEC for which the EMA will externally monitor. The Environmental and Social Safeguards Specialist will also implement and monitor mitigating conditions on behalf of the EE.

339-342. Component 2 presented impacts related to Principle 13 Public Health. These impacts were assessed to be low and related to potential contamination of water in rainwater harvesting systems. The impact will be managed through the proper training and dissemination of appropriate level messaging addressed in the Communications Plan. Where communal systems are constructed the EE's Water Sector Specialist will have oversight in ensuring proper maintenance contracts are provided to a contractor.

340-343. Principle 15 Land and Soil Conservation demonstrates that there are impacts relative to the activities of Components 1, 2 and 3. The implementation of the conditions of the CEC for which the EMA will externally monitor and scheduling of activities outside the rainy periods will minimize the potential impacts. Determinations of final intervention will only be made following the completion of information gathering and baseline studies and recommendations will be strictly adhered to.

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan, in compliance with the ESP and the Gender Policy of the Adaptation Fund.

341-344. For the monitoring and evaluation of the Project, a Monitoring and Evaluation Specialist will be hired by CAF to be based in Trinidad, working closely with the Project Management Unit and the Executing Entity.

342-345. The M&E specialist will ensure the adequate implementation of the monitoring and evaluation plan, including the design of appropriate data collection tools, capacity building, oversight and quality assurance in data collection, data processing and collation as well as reporting.

343-346. Activity progress tracking and output data collection will be conducted at least quarterly. Field visits will be conducted to have a better understanding of the progress of the proposed activities and outputs delivered and for ensuring quality of the works performed. Biannually the M&E specialist will collate data and produce monitoring reports to be shared with the PMU coordinator and the rest of the team. The reports will ensure tracking progress against planned targets for timely identification of deviations and the adequate application of corrective measures.

344-347. The M&E Specialist will be in charge of ensuring baseline data is collected before activities kick-start on key expected outcomes. A mid-term evaluation as well as a final evaluation will be conducted by an independent external consultant, complying with the AF evaluation framework and guidelines - such as the Guidelines for Project/Programme Final Evaluation. Outcome data collection for monitoring purposes will be collected annually, with the appropriate data collection tools and instruments to be developed by the M&E specialist and field data collection conducted by the field technicians.

345-348. The M&E specialist will compile all the required inputs to fill in annually the Project Performance Report (PPR) complying with the AF Evaluation Framework and reporting requirements. The specialist will track progress of the indicators and compare to planned targets in the results framework, sharing recommended actions with the PMU and all relevant stakeholders.

346-349. The Environmental and social specialist will be responsible for the follow-up and implementation of the mitigation measures identified in the E&S management plan and the gender action plan in compliance with the ESP and the Gender Policy of the AF. The ESS will provide the information of the implementation status, including the corrective actions that might have been taken if applicable for the PPR.

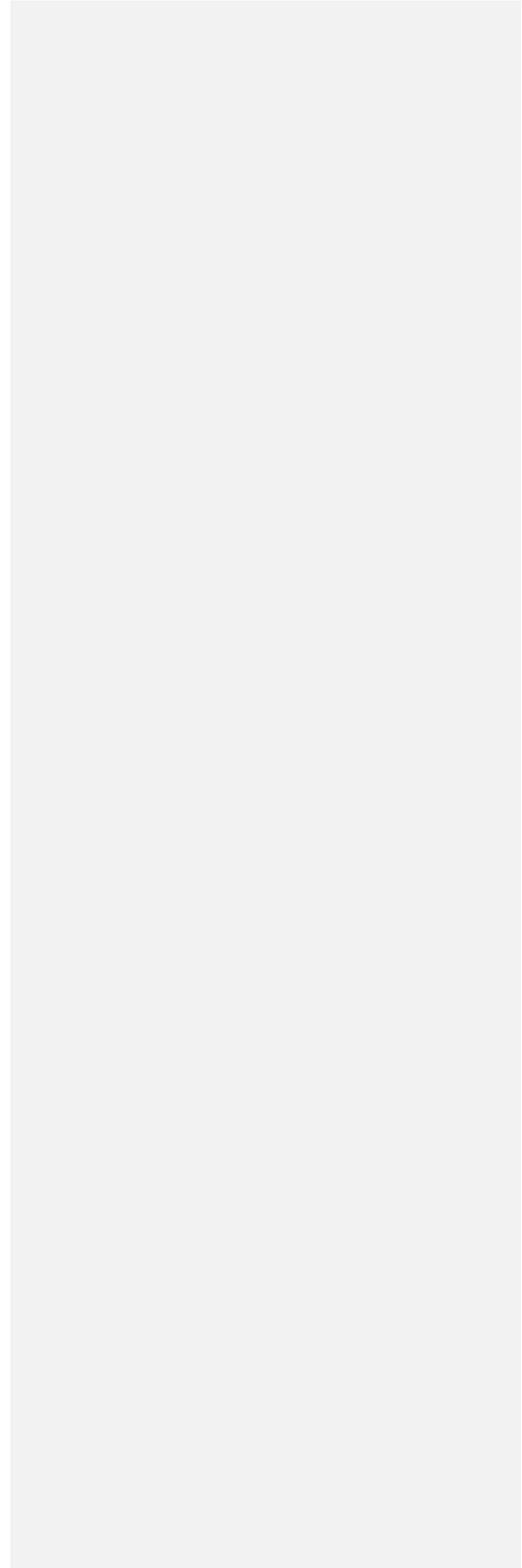
Monitoring and Evaluation Plan

M&E activity	Responsible parties	Budget USD	Frequency
1. Kick-off workshop	CAF	20,000	Within two months after signing the agreement
2. Inception Report	M&E specialist	None	Within two months of the kick-off Workshop. The inception report shall include a brief description of the kick-off workshop and planned activities for the following period.
3. Baseline data collection and study	External consultant	25,000	Within the first six months of the start of the Project

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4. Monitoring progress of project activities and indicators	PMU specialists/ Field technicians to collect data	Field visits, including data collection costed in the budget	Quarterly data collection for activity progress tracking – output and outcome tracking Monthly field visits to different activities Biannual progress tracking of result framework indicators
5. Supervision of environmental, social and gender safeguards	Environmental and Social Safeguards specialist	None – ESS included in budget	Quarterly data collection for activity progress tracking – output tracking of the gender action plan. Quarterly progress tracking of the ES management plan and gender action plan.
6. Biannual internal reports and Project Performance Reports to be submitted to the AF (PPR)	PMU specialists Field technicians to collect data M&E specialist to collate and develop progress reports	20,000	Biannual Management progress reports (no later than two months after the end of the semester). PPR to be submitted annually (no later than two months after the end of the reporting year). The first PPR shall be submitted one year after the beginning of project execution (initiation workshop date). The last PPR will be submitted no later than two months after the end of the reporting year.
7. Annual Field missions	CAF PMU specialists M&E specialist	24,000	Annual
8. Audits	CAF	160,000 (40,000 per year)	Annual
9. Independent mid-term evaluation	CAF PMU Independent evaluator / evaluation team M&E specialist to oversee the evaluation – quality assurance & compliance with AF evaluation framework	30,000	In year 2 or when half of the funds are executed, whichever occurs first.
10. Independent final evaluation	CAF PMU Independent evaluator / evaluation team M&E specialist to oversee the evaluation – quality assurance & compliance with AF evaluation framework	40,000	Year 4. Two months before project closure, to be submitted no later than 9 months after project completion.
11. English translation of mid-term and final evaluations	CAF	15,000	Years 2 and 4.
12. Project Completion Report	PMU CAF M&E specialist to oversee the evaluation – quality assurance & compliance with AF evaluation framework	None	One month before project closure.
13. Closing workshop	National and regional coordinators CAF	20,000	Last month of project implementation
Total		354,000	

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E. Include a results framework for the project proposal, including milestones, targets and indicators, including one or more core outcome indicators of the Adaptation Fund Results Framework, and in compliance with the Gender Policy of the Adaptation Fund.

Result	Indicators	Baseline	Final Target (end of project)	Means of verification	Responsible party/ Frequency	Risks and assumptions
Goal of the project increase the resilience of the South Oropouche River Basin's (SORB) population and ecosystems to flooding, sea level rise and increased dry spells.	Number of beneficiaries (total)	0 (no Adaptation Fund project in this area)	197,540 people living in the SORB	Primary data collection – M&E system of the Project	Data collection: Field technicians, PMU/UWI and CAF	Estimation of total number of direct beneficiaries considering AF core indicators guidelines of targeted people (yes) and intensity of the support high.
	Direct beneficiaries, of which:	0	9,758 direct beneficiaries			
	Males 0 Females 0 Indirect beneficiaries, of which: Males 0 Females 0	0 0 0 0	4,869 (male) 4,889 (female) 98,572 (male) 98,968 (female)	197,540 indirect beneficiaries Primary data collection – M&E system of the Project	Reporting: PMU/UWI and CAF M&E specialist Targeted means people can be identified by the project as receiving direct support, can be counted individually and are aware they are receiving support in some sort. For indirect beneficiaries the estimation was made considering they should be targeted or not targeted beneficiaries, but with intensity of support medium. For estimation of people, household interventions have been multiplied by 3,5 persons per household (average for the SORB in the latest census -2011)	
Avoided decrease in income of supported fisherfolks and farmers households in the SORB	201 registered vessels in the area. Fisherfolks living in the SORB depend mainly on fishing as their main source of income. Decreasing catchments as well as frequent flooding negatively impacts their income.	194 families (46 fisherfolks and 148 farmers – 30% women-led families) avoid decrease in income due to climate-related risks	Primary data collection – household survey M&E system of the Project	Data collection: baseline, mid-term and endline – External evaluation.	Risk of worldwide crises such as covid might negatively impact the proposed diversification of income.	

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		<u>(Income level to be collected at baseline)</u> <u>In the SORB area there are two Counties with farmers: St. Patrick East and Victoria. Approximately 8,000 farmers are in flood-prone areas. They produce vegetable and root crops, cocoa, livestock, and watermelon primarily. Consulted farmers reported they triple their investment for planting watermelon and vegetables. When flooding occurs, they lose 100% of their investment.</u> <u>(Data of exposed farmers and income level to be updated at baseline)</u>				
	Natural assets protected or rehabilitated	The Godineau Swamp is a degraded key ecosystem in the SORB. The conversion of land for agriculture, livestock farming, and housing threatens the ecological functioning of the swamp. Oyster harvesting has negatively impacted mangroves.	175 ha. of key coastal and wetland ecosystems rehabilitated 17,8 ha. of land with sustainable production practices (organic water resilient crops)	Studies, mapping exercises, environmental monitoring systems, Project documents	Baseline, and bi-annual monitoring End of Project Evaluation	Water resilient crops are produced with organic farming. Prioritized restoration practices are implemented in 175 ha. of the Godineau Swamp.
Component 1: Strengthening of Territorial Planning and Risk Management						
Outcome 1 Strengthened climate responsive planning in decision making in the SORB	Number of institutions actively using and making informed decisions based on the developed maps, systems and plans which mainstream climate change consideration	Institutions do not have local data of the SORB nor updated systems, plans or information to make climate informed decisions for responsive planning.	15 institutions actively using and making decisions based on the developed maps and systems which mainstream climate change considerations in the SORB	Key informant Interviews Mid-term and End of Project Evaluation Monitoring data	External evaluation consultant	Evidence on use and incorporation in decision-making of the information provided through the supported tools.
Output 1.1 Strengthened institutional and regulatory systems for climate responsive planning and development.	Flood risk map for the SORB developed Land use map for the SORB developed Manual for floodproofing buildings for the SORB developed	0 local flood risk map. Outdated national level flood risk map and land use map. No guidelines or information available for floodproofing buildings or infrastructure targeted to the SORB climate-risks.	1 Flood risk map for the SORB developed Land use map for the SORB developed Manual for floodproofing buildings for the SORB developed	Project documents and deliverables (maps, plans) Monitoring data collected by the Project	Data collection: Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	Risks of lack of information to properly develop local level maps. As the EE is the UWI, it is expected they will be able to overcome this risk as they have the expertise and a wide network of associated experts regionally.

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	<p>Coordination mechanism developed to support the governance on the drainage system's maintenance</p> <p>Watercourse information management system developed to support decision-making in drainage maintenance</p> <p>Number of local flood emergency response plans updated with climate change risks</p>	<p>Shared responsibility in drainage maintenance by different institutions, lack of clarity and information on planned maintenance and priority drainage to clean to prevent flooding.</p> <p>Emergency response plans at the Regional Corporation level are outdated and lack key considerations of climate change risks.</p>	<p>Coordination mechanism developed to support the governance on the drainage system's maintenance</p> <p>Watercourse information management system developed to support decision-making in drainage maintenance</p> <p>3 local flood emergency response plans updated with climate change risks (Siparia, Princess Town and Penal Debe)</p>			<p>Assumption: the facilitation of a shared information system and the facilitation of the project for identification of responsibilities will contribute to establish the virtual coordination mechanism.</p>
Output 1.2 Strengthened monitoring, and climate information management systems	<p>Number of weather, tidal and hydrological systems installed in the SORB.</p> <p>Number of households with water metering installed to foster improved water management.</p>	<p>Weather, tidal, and hydrological monitoring systems in the SORB expanded (zero tidal gauge, 1 stage recorder, zero high flow equipment, 6 rain gauges, 1 weather station, zero crest gauge, 9 observation wells, zero water quality instruments)</p> <p>No household nor bulk metering in the SORB area</p>	<p>Weather, tidal, and hydrological monitoring systems in the SORB expanded (1 tidal gauge, 5 stage recorders, 2 high flow equipment, 20 rain gauge, 7 weather stations, 6 crest gauge, 2 observation wells and 5 water quality instruments)</p> <p>894 households benefited with the metering installation.</p>	Project documents and deliverables installed. Monitoring data collected by the Project	<p>Data collection: Field technicians, PMU/UWI and CAF</p> <p>Reporting: PMU/UWI and CAF M&E specialist</p>	<p>The optimal number of instruments has been provided by the specialist governmental agencies. The hydrometeorological network expansion covers the gap between existing instruments and the optimal number. Risk of lack of interest of the households to install the metering. The project has included an activity to ensure proper information and awareness raising is conducted before installing the metering.</p>
Component 2: Green and grey infrastructure enhanced to increase resilience to floods and droughts						
Outcome 2 Increased resilience of green and grey infrastructure at	Number of physical assets produced, developed, improved, or strengthened to withstand floods or droughts.	Rainwater harvesting systems:	<p>Physical assets strengthened to withstand droughts</p> <ul style="list-style-type: none"> 144 rainwater harvesting systems developed to increase water supply in the targeted areas to 	Key informant Interviews Mid-term and End of Project Evaluation	Data collection: Field technicians, PMU/UWI and CAF	Assumption: Interest of farmers, fisherfolks and the community to adopt the proposed technologies.

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risk to floods and droughts		<p>Approximately 50% of the population³⁵ in Trinidad have rainwater harvesting systems. Households in the SORB have between 24 to 40 hours of water availability per week.</p> <p>Agriculture/aquaculture/aquaponics/ water resilient crops systems to withstand floods, droughts and salinity: From consulted farmers only 2 are hydroponic producers. However, the number of hydroponic producers in the area is unknown.</p>	<p>withstand impacts of climate change</p> <p>Physical assets developed to withstand floods:</p> <ul style="list-style-type: none"> • 100 soilless hydroponic systems • 3 aquaponic pilot systems • 3 aquaculture pilot systems • xx permeable weirs in the Curamata river catchment • Physical assets strengthened to withstand floods • Poodai lagoon embankment embankment with improved infrastructure infrastructure for water management • 238 households strengthened to withstand floods 	<p>Monitoring data of Project deliverables</p> <p>Field visits</p>	<p>Reporting: PMU/UWI and CAF M&E specialist</p>	<p>Risk of lack of enough land to install the technologies. To overcome this risk the Project has included communal technologies or soilless modules that are transportable if required.</p>
Output 2.1 Flood-prone neighbourhoods in the SORB with improved water management infrastructure.	<p>Number of communities with improved water management system</p> <p>Number of permeable weirs constructed to alleviate flooding in the Curamata river basin</p>	<p>Poodai lagoon has damaged gates which do not allow for water management.</p>	<p>Poodai lagoon community with improved water management systems – 30 farmers benefited.</p> <p>At least xx permeable weirs constructed in the Curamata river catchment – xx families benefited.</p>	<p>Monitoring data of Project deliverables</p> <p>Field visits</p>	<p>Data collection: Field technicians, PMU/UWI and CAF</p> <p>Reporting: PMU/UWI and CAF M&E specialist</p>	

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³⁵ Baseline estimations based on Dean, Jonathan & Deare, Fredericka & Kydd, Keizel & Ward-Robinson, Jennie & Hunter, Paul. (2012). Rainwater harvesting in rural Trinidad; a cross sectional, observational study. Journal of Water, Sanitation and Hygiene for Development. 2. 241. 10.2166/washdev.2012.102.

Output 2.2 Housing and commercial buildings reinforced against floods	Number of rainwater harvesting systems installed Number of households and commercial infrastructure reinforced to withstand floods	Baseline information on number of households in the targeted area with rainwater harvesting systems to be updated before activities kick-start. Baseline information on number of flood-proofed households in the targeted area to be updated after baseline data collection before activities kick-start	2 rainwater harvesting systems in large facilities (3,000 gals each); 9 in communal systems (e.g., schools -2,000 gals each); 133 in households (1,000 gals each). 238 households reinforced to withstand floods	Sample survey Monitoring data of Project deliverables Field visits	Baseline and bi-annual data collection: Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	Most vulnerable households to be prioritized in drought-prone areas. Selection of households for the rainwater harvesting systems that have the dual purpose of increase access to water and catchment of water to prevent flooding will be based on engineering model criteria to ensure the impact on reduced flooding is also achieved.
Component 3: Vulnerable coastal and wetland ecosystems of the SORB enhanced.						
Outcome 3 Increased resilience of coastal and wetland ecosystems	Hectares of key coastal and wetland ecosystem restored	No investments or restoration has been conducted in the Godineau Swamp.	175 ha. of key coastal and wetland ecosystems restored	Specialized studies, mapping exercises, environmental monitoring systems, Project documents	Data collection baseline, annual monitoring and endline. Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF	Restoration activities are aligned to the identified needs prioritized in the Godineau Swamp Management Plan.
3.1. Key coastal and wetland ecosystems restored.	Number of studies to promote evidence-based decision making in the Godineau swamp Number of Management Plan for the Godineau swamp updated Restoration investments made in the Godineau Swamp	A management plan was initiated but it is outdated and was never fully finalized. No restoration investments have been made in the last decades.	2 studies to promote evidence-based decision making in the Godineau swamp. Management Plan for the Godineau swamp updated Restoration investments completed in the Godineau Swamp	Monitoring data of Project deliverables Field visits Survey and KII	Data collection: Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	Risk: challenge to estimate ecosystem services valuation. Participatory process and community training linked to the restoration and long-term conservation of the ecosystem.

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	<p>to withstand climate related risks.</p> <p>Number of trained community members to implement the restorations in the Swamp.</p> <p>Number of fishers benefited with sustainable oyster harvesting systems.</p>		<p>20 community members trained and engaged for ecosystem impacts monitoring (30% women)</p> <p>Sustainable oyster harvesting systems installed for 16 fishers (20% women)</p>			
Component 4: Increase adaptation capacity of vulnerable fishers and farmers to address climate change and climate variability						
Outcome 4 Diversified and strengthened livelihoods for vulnerable farmers and fisher folks in the SORB area	Percentage of targeted farmers and fishers in the SORB with sustained climate-resilient alternative livelihoods.	The targeted population will be those that have not diversified livelihoods, frequently flooding and most vulnerable.	175 households with sustained climate-resilient alternative livelihoods.	Sample survey Field visits Evaluation	Data collection (BL, midterm and End of Project): Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	Adoption rate of sustainable livelihood options 90% (175 households). Spillover effects are also expected.
4.1 Resilient farming technologies promoted to increase adaptation to climate change impacts. Community-led eco-tourism options in the Godineau Swamp promoted.	Number of resilient farming technologies implemented for farming Number of farmers with resilient farming technologies implemented	Only one registered farmer in the area has incorporated hydroponics.	148 resilient farming technologies implemented, of which: - 100 farmers with hydroponic systems installed (30% women) - 44 farmers with water resilient crops cultivated (30% women) - 4 farmers with aquaponics / aquaculture systems (30% women)	Monitoring data of Project deliverables Field visits Survey and KII	Data collection: Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	

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4.2 Community-led eco-tourism options in the Godineau Swamp promoted.	Number of ecotouristic sites developed. Number of vulnerable families with additional livelihoods provided by the newly developed ecotouristic site.	No ecotourism is developed in the Godineau Swamp. Fisherfolks in the area are only dependent on fishing as their main source of livelihood.	1 ecotouristic site developed. 30 fisherfolks (20% women)	Monitoring data of Project deliverables Field visits Survey and KII	Data collection: Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	Interest of fisherfolks has been confirmed
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Component 5: Stakeholders of the SORB have built their capacities and are aware of climate risks

Outcome 5: Government institutions strengthened capacities for decision-making to reduce risk to climate change impacts. Outcome 5b: Increased awareness of CSOs, community members, and associations, on CC.	Number of trained staff of government institutions with strengthened capacities (from limited to high) for decision-making to reduce risk to climate change impacts of droughts, saltwater intrusion, and flooding. % of SORB community members and vulnerable groups with increased awareness of climate risks and appropriate adaptation solutions	Trained staff of government institutions with limited to moderate capacities for decision-making to reduce risk to climate change impacts of droughts, saltwater intrusion, and flooding. Limited awareness on climate change impacts and adaptation appropriate technologies	50 trained staff of government institutions with strengthened capacities for decision-making to reduce risk to climate change impacts of droughts, saltwater intrusion and flooding. 20% of SORB community members and vulnerable groups with increased awareness	BL, Mid-term, Final Evaluation Key Informant Interviews	Data collection (BL, mid-term and End of Project): Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	Capacity level to be measured before trainings, workshops in a 4 points scale (very limited / limited / moderate / high capacity) in the different topics to be disseminated.
5.1. Capacities of stakeholders have been built to cope with climate change impacts in the SORB	Number of national and local government staff trained on local climate risks and appropriate technologies to respond to floods, droughts, and saltwater intrusion. Number of schoolteachers trained on local	Government staff with limited access to trainings on local climate change impacts and appropriate adaptation solutions Primary and secondary school teachers with limited training on local climate change impacts and appropriate adaptation technologies.	50 national and local government staff trained 300 schoolteachers trained	Monitoring data of Project deliverables Field visits Survey and KII	Data collection: Field technicians, PMU/UWI and CAF Reporting: PMU/UWI and CAF M&E specialist	

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	climate risks and appropriate technologies to respond to floods, droughts, and saline intrusion.					
5.2. Awareness raising and knowledge management reinforced to promote lessons learned dissemination	<p>Number of pre-16 school students with awareness raised on adaptation technologies being implemented in the SORB</p> <p>Number of community members reached through local workshops on climate change</p> <p>Percentage of SORB community members reached through radio and social media campaigns on climate change.</p> <p>Number of working sessions conducted with the private sector (oil& gas, developers) to raise awareness on the impact of their activities on flooding and to disseminate the project activities.</p> <p>Number of case studies to identify best practices=and lessons learned for the project</p> <p>Number of communication material</p>	<p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p>	<p>450 pre-16 school students with awareness raised on adaptation technologies being implemented in the SORB</p> <p>240 community members reached through local workshops on climate change</p> <p>39,468 community members (20%) reached with information campaigns.</p> <p>6 working sessions conducted with private sector (90 private sector stakeholders reached)</p> <p>4 case studies developed</p> <p>3 communication material A project website developed</p>	<p>Monitoring data of Project</p> <p>Deliverables</p> <p>Attendance lists</p> <p>Communication material</p>	<p>Data collection: Field technicians, PMU/UWI and CAF</p> <p>Reporting: PMU/UWI and CAF M&E specialist</p>	<p>Development of communication material should ensure depicting gender voice balance. One of the case studies should especially assess the differentiated impacts of climate change experienced by women in the SORB and the differentiated benefits generated for women implementing the technologies of the project.</p> <p>Workshops and working sessions will ensure to be conducted in hours and days where women can assist and include babysitting personnel to promote women participation and reduce the risk of women not being able to attend.</p> <p>The design of the information campaigns will ensure gender differentiated benefits that are addressed with the adaptation technologies promoted by the project and the differentiated climate-related impacts for women and men.</p>

	Number of key stakeholders participating on workshops to exchange lessons learned	0	Over 200 SORB stakeholders participate in workshops (50% women)			
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F. Demonstrate how the project aligns with the Results Framework of the Adaptation Fund

³⁶ Project Objective(s)[1]	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Strengthen territorial planning and risk management in the SORB for climate responsive planning in decision making	Institutions actively using and making informed decisions based on the developed maps, systems and plans which mainstream climate change consideration (Flood risk map, land use maps, emergency response plans, hydrometeorological information generated)	Outcome 1: Reduced exposure to climate-related hazards and threats	1.Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	2,232,000
Capacities of stakeholders have been built to cope with climate change impacts in the SORB	Number of targeted government institutions with strengthened capacities (from limited to high) for decision-making to reduce risk to climate change impacts of droughts, saline intrusion and flooding.	Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	125,100
Stakeholders access technical assistance to cope with climate change impacts in the SORB	No. of staff trained from targeted institutions to adequately respond to climate-related events in the SORB by gender	Output 2.1: Strengthened capacity of national and sub-national centers and networks to respond rapidly to extreme weather events	2.1.1 No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender)	
Awareness raising and knowledge management reinforced to promote lessons learned dissemination	% of SORB community members and vulnerable groups with strengthened capacities to respond to climate change impacts.	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses. 3.2. Percentage of targeted population applying appropriate adaptation responses	160,800
Communication and dissemination strategies have been implemented towards reducing vulnerability.	Number of communication materials developed	Output 3.1: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1 No. of news outlets in the local press and media that have covered the topic	

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Strengthen grey and green infrastructure to increase resilience of vulnerable population to flooding and droughts in the SORB	Number of physical assets produced, developed, improved, or strengthened to withstand floods or droughts.	Outcome 4 Increased adaptive capacity within relevant development sector services and infrastructure assets	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress.	3,425,1	Formatted: Font: 8 pt
Flood-prone neighborhoods in the SORB with improved water management infrastructure	Number of physical assets or infrastructure constructed or reinforced to withstand climate-related events (different indicators per type of physical asset)	Output 4: Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts, including variability	4.2.1 No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by sector and scale)		Formatted: Font: 8 pt
Housing and commercial buildings reinforced against floods.					Formatted: Font: 8 pt
Increased resilience of coastal and wetland ecosystems	Hectares of key coastal and wetland ecosystem restored	Outcome 5 Increased ecosystem resilience in response to climate change and variability-induced stress	5. Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	1,440,675	Formatted: Font: 8 pt
Key coastal and wetland ecosystems restored in the SORB.	Restoration investments made in the Godineau Swamp to withstand climate related risks.	Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability	5.1. No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale)		Formatted: Font: 8 pt
Diversified and strengthened livelihoods for vulnerable farmers and fisherfolks in the SORB area	Percentage of targeted farmers and fishers in the SORB with sustained climate-resilient alternative livelihoods.	Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	6.2. Percentage of targeted population with sustained climate-resilient alternative livelihoods		Formatted: Font: 8 pt
Resilient farming technologies promoted to increase adaptation to climate change impacts.	Number of resilient farming technologies implemented for farming	Output 6: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.2.1. Type of income sources for households generated under climate change scenario	975,270	Formatted: Font: 8 pt
Community-led eco-tourism options in the Godineau Swamp promoted.	Number of farmers with resilient farming technologies implemented Number of eco-touristic sites developed. Number of vulnerable families with additional livelihoods provided by the newly developed eco-touristic site				Formatted: Font: 8 pt

The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology, but the overall principle should still apply

G. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

4. The detailed budget, notes, assumptions, unit costs and calculations have been provided per year and per activity in an Excel file in Annex 1 Detailed Budget. The table below shows a summary.

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Outputs	Activities	Budget-account description	Type-of-deliverable	TOTAL AMOUNT (USD)	Total-amount-per activity (USD)	Notes-and-assumptions
1-1	1-1.1- Develop the flood risk map for the SORB	Local-consultant	Studies	50.000	50.000	Local-consultant to be hired for the development of the flood hazard map
	1-1.2- Develop the land use map for the SORB	Local-consultant	Studies	50.000	50.000	Local-consultant to be hired for the development of the land use map
	1-1.3- Manual about floodproofing infrastructure and buildings, specific to the reality of the SORB	Professional Services— Companies/Firm	Manual	40.000	70.000	Contract a consultancy firm to prepare the manual
		Professional Services— Companies/Firm	Communication material	16.500		Specialized enterprise to develop communication materials for the dissemination of the contents of the Manual: 3 short videos or other graphic formats estimated at a cost of 6,000 USD each
		Workshops/Training	Workshops	6.700		Four 1-day Workshops for 30 participants for the dissemination of the Manual among local community members
		Travel	Attendance-by communities	6.000		Funds for ensuring the attendance of community members, including children if necessary for equal participation. In general, the workshops will be held at the communities' places, but this is considered in case of difficulties.
	1-1.4- Support to the governance on the drainage system's maintenance in the SORB	Professional Services— Companies/Firm	Watercourse information management system (WIMS)	40.680	56.000	Specialized company to develop the centralized watercourse information management system (WIMS)
		Professional Services— Companies/Firm	Coordination mechanism	11.200		Consultancy services to accompany in the preparation of the coordination mechanism for the use and maintenance of the WIMS
		Workshops/Training	Workshops	4.120		Two 2-day Workshops for 15 participants (in years 2 and 3) to train the key institutions in the use and maintenance of the WIMS
	1-1.5- Improve the local flood emergency response	Local-consultant	Updated emergency plans	15.000	106.000	Consultancy services to support the Regional Corporations to update their emergency plans

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		Workshops/Training	Participatory process and awareness-raising	27.450		Socialization of emergency plans with the communities, resume awareness-raising activities with communities on emergency response, exchanges between government agencies to improve coordination of efforts.
		Equipment	Emergency response equipment and machinery	63.550		Purchase response equipment – RCs' Disaster Management Units have preidentified some equipment needs such as rescue boats.
1-2	1-2.1 Expand and upgrade weather, tidal, and hydrological monitoring systems in the SORB	Equipment	Monitoring equipment	1.000.000	1.000.000	Acquisition of monitoring equipment: tidal gauge, stage recorders, high flow equipment, rain gauges, weather stations, crest gauges, observation wells, water quality.
	1-2.2 Foster a water supply and demand management	Equipment	Bulk and domestic meters and computational facilities	900.000	900.000	Procurement and installation of Bulk and domestic meters and DMA Creation: Procurement and installation of boundary valves. Procurement of leakage detection equipment and software (NETBASE Water Distribution Management System)
2-1	2-1.1 Improve flood management in the Curumato river catchment	Professional Services— Companies/Firm	Final designs	50.000	2.000.000	Specialized company to perform the final designs of the works
		Professional Services— Companies/Firm	Works	1.950.000		Specialized company to carry out the works
	2-1.2 Increase access to water while minimizing the impact of flooding with rainwater harvesting systems in urban and rural areas.	Local consultant	Design of the adaptation of the system to increase flood mitigation potential	10.000	945.137	Local consultant to design of the adaptation of the NIHERST-GWP system to increase flood mitigation potential
		Equipment	Rainwater harvesting systems	935.137		Purchase and installation of rainwater harvesting systems at 2 large facilities in the SORB, at 3 communal buildings per RC, at 132 households.
2-2	2-2.1 Reinforcing houses and commercial buildings against floods	Workshops/Training	Training	4.120	480.000	Strengthen capacities of the LSA and the NCSH
		Equipment	Floodproofing equipment	475.880		Grant facility – the PMU will purchase equipment based on requests by eligible beneficiaries. Funds will be targeted to the SORB, taking advantage of the knowledge and mechanisms that NCSH has in place. The average investment considered is 2000 USD/household, which includes materials and the working hours of a technician to help install the appliances.
3-1	3-1.1 Conduct studies to promote evidence-based decision making in the Godineau swamp.	Professional Services— Companies/Firm	Studies	350.000	350.000	Specialized companies to develop: 1) Ecological and socioeconomic survey (estimated 250,000 USD); 2) Hydrological study (estimated 50,000 USD); 3) Valuation of ecosystem services (estimated 50,000 USD).

	3.1.2 Support for obtaining the declaration of the swamp as a protected area.	Local consultant	Technical Assistance	16.800	16.800	Senior Local Consultant (20%) to initiate the necessary procedures to obtain the protection status (Ramsar, ESA, or whatever is determined). This consultant will be the same as the one who will carry out the process of preparing the Participatory Management Plan.
	3.1.3 Participatory processes to update and develop the Management Plan for the Godeineau swamp	Local consultant	Technical Assistance	67.200	71.775	Senior Local Consultant (80%) to carry out the process of the Participatory Management Plan including the Restoration Plan. This consultant will be the same as the one who will carry out the initiation of the procedures to obtain the protection status of the area.
		Workshops/Training	Workshops	4.575		Three 1-day workshops in years 2 and 3 for the validation of the process.
	3.1.4 Restoration of key coastal and wetland ecosystems	Professional Services— Companies/Firm	Works	850.000	916.000	Specialized engineering firm to undertake engineering works in the swamp for the restoration activities.
		Field workers	Works	36.000		20 field workers part-time (50% dedication) for 3 months for restoration works.
		Field workers	Periodic supervision	30.000		10 field workers part-time (25% dedication) for the supervision of the progress of the restoration activities.
	3.1.5 Promotion of sustainable oyster harvesting	Workshops/Training	Training	6.100	86.100	Training and awareness-raising activities to fishers to avoid breaking mangroves' roots and to foster a sustainable harvesting of oysters.
		Equipment	Sustainable harvesting equipment	80.000		Promote sustainable harvesting of oysters and crabs among current resource users. Basic module of 25 cages is assumed to be of interest of 4 fishers in Year 2, 6 in Year 3 and 6 in Year 4.
4-1	4.1.1 Pilot project of innovative solutions for farmers to respond to climate-related risks	Travel	Assistance to trainings	1.500	599.670	15 extension officers to be trained by Agriculture Specialist of the Project sitting at the Executing Entity. Design of data collection instrument and train the extension officers to collect data.
		Travel	Data collection	6.000		120 days of travel for data collection (3 people for 4 weeks). Farmer data collection: description of crops, main climate hazard, farm assets. Baseline situation.
		Professional Services— Companies/Firm	Final designs of pilot solutions	15.000		Final designs of the different pilot solutions to promote. UWI Research Unit, or any other company would be contracted to finalize the different systems (hydroponic technology to withstand floods, aquaponics, dasheen) prototypes. Contracted company to finalize designs and models.
		Workshops/Training	Training of trainers	4.500		10 sessions of Training of Trainers for technicians of the Ministry of Agriculture in technologies promoted by the Project.
		Field technicians	Training of trainers	850		10 sessions of training provided by specialists in the proposed adaptation solutions.
		Travel	Farmers outreach	6.000		120 days of travel for farmers outreach (3 people for 4 weeks).

		Equipment	Modules hydroponics	230.000		Procurement of modular systems, inputs and required investments. Assumption, average cost of hydroponic system 2,300 USD. Demonstration models included
		Equipment	Pilot systems- (Dasheen)	35.600		Demonstration plots of Dasheen to be installed in 4 farmers' plots reaching with field schools to additional 10 more farmers in each area.
		Refreshments and childcare	Field schools	16.000		Farmers field schools MoA – Dasheen (12 sessions). Costs of refreshments and childcare for the field schools during a whole year.
		Equipment	Modules Dasheen	212.000		Procurement of modular systems, inputs and required investments. Assumption, average cost of water resilient system (dasheen) 5,300 USD.
		Equipment	Demonstration Modules Aquaculture	9.000		Demonstration plot – modular systems Aquaculture. Assumption, average cost of aquaculture system 3,000 USD.
		Equipment	Demonstration Modules Aquaponics	10.500		Demonstration plot – modular systems Aquaponics. Assumption, average cost of aquaponic system 3,500 USD.
		Field technicians	Technical Assistance	36.720		Implementation phase: Installation on the selected farmers' sites, technical assistance to farmers and capacity building.
		Refreshments and childcare	Farmers field schools – Hydroponics / aquaponics	16.000		Farmers field schools – Hydroponics / aquaponics Lump sum budget for childcare: 400 USD/year
4-2	4.2.1 Implementation of a community led eco-touristic site in the Godineau Swamp to promote fishers' livelihoods diversification and conservation	Professional Services – Companies/Firm	Study	30.000	375.600	Godineau Swamp sustainable eco-tourism management plan and business plan including market study.
		Professional Services – Companies/Firm	Final design, materials, and installation – lump sum	170.000		Feasibility study, final designs and construction of bird watching tower, public toilets, waste disposal and recreational site with pic-nic tables
		Local consultant	Salary	11.200		Technical assistance to support 30 SMEs business plans for vulnerable families in the area
		Professional Services – Companies/Firm	Investments	120.000		Grant facility to implement investments of the approved business plans. Average investment required per family 4,000 USD.
		Professional Services – Companies/Firm	Training	38.400		Capacity building and training. Courses on Vocational training and swimming, naturalist guides/boat operators, first aid and emergency safety, commercial food preparation, business management. Budget for childcare to facilitate attendance.
		Professional Services – Companies/Firm	Website and brand development	6.000		Company contracted to develop Website and brand

5-1	5.1.1 Strengthening capacities of governmental institutions to respond and manage climate-related risks	Professional Services— Companies/Firm	Training packages	30.000	61.100	2 training packages for government institutions with different modalities and topics for national and local governmental stakeholders.
		Workshops/Training	Peer-to-peer learning exchanges	18.300		Peer-to-peer exchanges-2 peer-to-peer exchanges per year, from year 2 in the SORB where local and national technicians can exchange on-site and visit the progress of the planned/implemented works.
		Workshops/Training	Capacity building on E&S safeguards, gender, grievance mechanism	12.200		E&S safeguard and gender workshops. Capacity building on E&S safeguards, gender, grievance mechanism provided by the E&S specialist of the PMU.
		Travel	Travel	600		Travel allowance for two people of the PMU to provide training in E&S safeguards
5-1	5.1.2 Mainstreaming climate change in primary and secondary school classes	Professional Services— Companies/Firm	Pedagogical resources	19.000	64.000	Development of the content of the training resources by the MoE together with the Project Management Unit and the capacity building technical committee. Development of the pedagogical resources (on-line training sessions)
		Professional Services— Companies/Firm	Videos	19.000		2 Videos developed for the training of teachers
		Workshops/Training	Workshops for teachers	16.000		4 workshops for teachers in the SORB
		Professional Services— Companies/Firm	Resources for students	10.000		Resources for the students
5-2	5.2.1 Working with pre-16 schools in the SORB to raise awareness on climate change-related impacts and solutions	Workshops/Training	Sensitization on climate change and the project to selected schools	—	40.500	Sensitization on climate change and the project to selected schools. No cost since it would be conducted by the PMU.
		Workshops/Training	15 Tour visits for 30 students in the SORB	40.500		15 tour visits for 30 students to get exposure to the different adaptation technologies being implemented with the project
	5.2.2 Promoting awareness-raising on climate change impacts and appropriate solutions among SORB key stakeholders	Workshops/Training	Awareness-raising	24.400	42.200	Awareness-raising activities organized with local NGOs at the community level
		Professional Services— Companies/Firm	Information campaign	8.650		Information campaign to disseminate good adaptation practices in the social media, radio etc.
		Workshops/Training	Awareness-raising	9.150		Engagement and awareness-raising of developers, oil and gas working sessions with key stakeholders to discuss how to improve the situation and reach agreements on how to reduce the impacts of their activities in the SORB
	5.2.3 Identification of best practices and lessons learned	Local consultant	Case studies	24.000	24.000	Case studies (1 with focus on gender and climate change)
	Professional Services— Companies/Firm	Communication material	1.600	54.100	Communication material to promote the activities of the project and disseminate knowledge	

	5.2.4 Design of communication material and dissemination of lessons learned	Professional Services— Companies/Firm	Video	38.500		Videos and communication material (1 with focus on gender and climate change)
		Professional Services— Companies/Firm	Website of the project	5.000		Website of the Project with up-to-date information on the different activities and for dissemination of the different products
		Travel	Travel allowance	3.000		15 people from the UWI— government participating in the Annual workshop
		Workshops/Training	50 people workshops	16.000		50 people attendance (from communities, government, NGOs, UWI). Costs of attendance for the people from the community including childcare.
-	-	-	-	8.258.192	8.258.082	
-	Project coordinator	Local consultant	-	168.000	-	Project coordinator— full time.
-	Specialist 1— Water and ecosystems	Local consultant	-	134.400	-	Full time.
-	Specialist 2— Livelihoods	Local consultant	-	134.400	-	Full time.
-	Specialist 3— E&S and Gender	Local consultant	-	80.640	-	Part time (60%).
-	Administrative assistant	Local consultant	-	96.000	-	Full time.
-	Local travel costs of the PMU	Travel	-	32.600	-	Local travel costs of the PMU
-	Office supplies	Office supplies	-	12.600	-	Office supplies
-	Bank costs	Bank costs	-	20.000	-	Bank costs. Estimated at 0.05% of all transfers.
-	UWI administrative costs	Administrative fees	-	167.968	-	This includes costs such as Procurement team; manage project accounts to ensure alignment with budgetary allocations; Space requirements; Internet connection; Furniture; Legal assessments; Contracts. Costs to be shared between Engineering Institute and central UWI.
-	TOTAL PMC	-	-	857.608	-	
-	Total project (components + PMC)	-	-	9.215.790,00	-	

Outputs	Activities	Budget account description	Type of deliverable	TOTAL AMOUNT (USD)	Total amount per activity (USD)	Notes and assumptions
1.1	1.1.1. Develop the flood risk map for the SORB	Local consultant	Studies	50,000	50,000	Local consultant to be hired for the development of the flood hazard map

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	1.1.2 Develop the land use map for the SORB	Local consultant	Studies	50,000	50,000	Local consultant to be hired for the development of the land use map	Formatted: Right
	1.1.3 Manual about floodproofing infrastructure and buildings, specific to the reality of the SORB	Professional Services – Companies/Firm	Manual	40,000	70,000	Contract a consultancy firm to prepare the manual	Formatted: Right
		Professional Services – Companies/Firm	Communication material	16,500		Contract a specialized enterprise to develop communication materials for the dissemination of the contents of the Manual: 3 short videos or other graphic formats estimated at a cost of 6,000 USD each	Formatted: Right
		Workshops/Training	Workshops	6,700		Four 1-day Workshops for 30 participants for the dissemination of the Manual among local community members	Formatted: Right
		Travel	Attendance by communities	6,800		Travel costs for ensuring the attendance of community members, including children if necessary for the participation of women. In general, the workshops will be held at the communities' places but this is considered in case of difficulties. Travel for 30 persons to attend 4 workshops.	Formatted: Right
	1.1.4 Support to the governance on the drainage system's maintenance in the SORB	Professional Services – Companies/Firm	Watercourse information management system (WIMS)	40,680	56,000	Specialized company to develop the centralized watercourse information management system (WIMS)	Formatted: Right
		Professional Services – Companies/Firm	Coordination mechanism	11,200		Consultancy services to accompany in the preparation of the coordination mechanism for the use and maintenance of the WIMS	Formatted: English (United Kingdom)
		Workshops/Training	Workshops	4,120		Two 2-day Workshops for 15 participants (in years 2 and 3) to train the key institutions in the use and maintenance of the WIMS	Formatted: Right
	1.1.5 Improve the local flood emergency response	Local consultant	Updated emergency plans	15,000	106,000	Consultancy services to support the Regional Corporations to update their emergency plans	Formatted: Right
		Workshops/Training	Participatory process and awareness raising	27,450		Socialization of emergency plans with the communities, resume awareness raising activities with communities on emergency response, exchanges between government agencies involved in the response, to improve coordination of efforts.	Formatted: Right
		Equipment	Emergency response equipment and machinery	63,550		Purchase response equipment - RCs' Disaster Management Units have preidentified some equipment needs such as rescue boats.	Formatted: Right
1.2	1.2.1 Expand and upgrade weather, tidal, and hydrological monitoring systems in the SORB	Equipment	Monitoring equipment	1,000,000	1,000,000	Acquisition of monitoring equipment: tidal gauge, stage recorders, high flow equipment, rain gauges, weather stations, crest gauges, observation wells, water quality. Estimation of 25% execution in Year 1 and 75% in Year 2.	Formatted: Right
	1.2.2 Foster a water supply and demand management	Equipment	Bulk and domestic meters and computational facilities	900,000	900,000	Procurement and installation of Bulk and domestic meters and DMA Creation: Procurement and Installation of boundary valves. Procurement of leakage detection equipment and software (NETBASE Water Distribution Management System)	Formatted: Right
Sub-total component 1				2,232,000	2,232,000	-	Formatted: Right
2.1	2.1.1 Improve flood management in the	Professional Services – Companies/Firm	Final designs	50,000	2,000,000	Specialized company to perform the final designs of the works	Formatted: Table
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	Curamata river catchment	Professional Services – Companies/Firm	Works	1,950,000		Specialized company to carry out the works	Formatted: Right
	2.1.2 Increase access to water while minimizing the impact of flooding with rainwater harvesting systems in urban and rural areas.	Local consultant	Design of the adaptation of the system to increase flood mitigation potential	10,000	945,137	Local consultant to design of the adaptation of the NIHERST-GWP system to increase flood mitigation potential	Formatted: Right
		Equipment	Rainwater harvesting systems	935,137		Purchase and installation of rainwater harvesting systems at 2 large facilities in the SORB, at 3 communal buildings per RC, at 133 households.	Formatted: Right
2.2	2.2.1 Reinforcing houses and commercial buildings against floods	Workshops/Training	Training	4,120	480,000	Strengthen capacities of the LSA and the NCSH	Formatted: Right
		Equipment	Floodproofing equipment	475,880		Grant facility - the PMU will purchase equipment based on requests by eligible beneficiaries. Funds will be targeted to the SORB, taking advantage of the knowledge and mechanisms that NCSH has in place. The average investment considered is 2000 USD/household, which includes materials and the working hours of a technician to help install the appliances.	Formatted: Font: (Default) Arial Formatted: Right
Sub-total Component 2				3,425,137	3,425,137		Formatted: Font: (Default) Arial
3.1	3.1.1 Conduct studies to promote evidence-based decision making in the Godineau swamp.	Professional Services – Companies/Firm	Studies	350,000	350,000	Specialized companies to develop: 1) Ecological and socioeconomic survey (estimated 250,000 USD); 2) Hydrological study (estimated 50,000 USD); 3) Valuation of ecosystem services (estimated 50,000 USD).	Formatted: Right Formatted: Right
	3.1.2 Support for obtaining the declaration of the swamp as a protected area.	Local consultant	Technical Assistance	16,800	16,800	Senior Local Consultant to initiate the necessary procedures to obtain the protection status (Ramsar, ESA, or whatever is determined). This consultant will be the same as the one who will carry out the process of preparing the Participatory Management Plan. It is estimated that he/she will dedicate 20% of a full-time contract to this activity (3.1.2), and the remaining 80% to the development of the Plan (3.1.3), during years 2 and 3.	Formatted: Right
	3.1.3 Participatory processes to update and develop the Management Plan for the Godineau swamp	Local consultant	Technical Assistance	67,200	71,775	Senior Local Consultant to carry out the process of the Participatory Management Plan including the Restoration Plan. This consultant will be the same as the one who will carry out the initiation of the procedures to obtain the protection status of the area. It is estimated that he/she will dedicate 20% of a full-time contract to the previous activity (3.1.2), and the remaining 80% to the development of the Plan (3.1.3), during years 2 and 3.	Formatted: Font: (Default) Arial Formatted: Right
		Workshops/Training	Workshops	4,575		Three 1-day workshops in years 2 and 3 for the validation of the process	Formatted: Right
3.1.4 Restoration of key coastal and wetland ecosystems	Professional Services – Companies/Firm	Works	850,000	916,000	Specialized engineering firm to undertake engineering works in the swamp for the restoration activities.	Formatted: Right	
	Field workers	Works	36,000		20 field workers part-time (50% dedication) for 3 months for restoration works.	Formatted: Right	

		<u>Field workers</u>	<u>Periodic supervision</u>	<u>30,000</u>		10 field workers part-time (25% dedication) for the supervision of the progress of the restoration activities; in total, dedication will be 8 months during Year 3 and 2 months during Year 4.	Formatted: Right
	3.1.5 Promotion of sustainable oyster harvesting	<u>Workshops/Training</u>	<u>Training</u>	<u>6,100</u>	86,100	Training and awareness-raising activities to fishers to avoid breaking mangroves' roots and to foster a sustainable harvesting of oysters. Presentation of the best alternatives and technical assistance to use them. 1-day Workshops and training activities will be held twice per year in Years 2 and 3.	Formatted: Right
		<u>Equipment</u>	<u>Sustainable harvesting equipment</u>	<u>80,000</u>		Promote sustainable harvesting of oysters and crabs among current resource users. Basic module of 25 cages is assumed to be of interest of 4 fishers in Year 2, 6 in Year 3 and 6 in Year 4.	Formatted: Right
Sub-total Component 3			1,440,675	1,440,675		-	Formatted: Font: (Default) Arial
4.1	4.1.1 Pilot project of innovative solutions for farmers to respond to climate-related risks	<u>Travel</u>	<u>Assistance to trainings</u>	<u>1,500</u>	599,670	15 extension officers to be trained by Agriculture Specialist of the Project sitting at the Executing Entity. Design of data collection instrument and train the extension officers to collect data	Formatted: Right
		<u>Travel</u>	<u>Data collection</u>	<u>6,000</u>		120 days of travel for data collection (3 people during 4 weeks). Farmer data collection: description of crops, main climate hazard, farm assets, Baseline situation.	Formatted: Right
		<u>Professional Services – Companies/Firm</u>	<u>Final designs of pilot solutions</u>	<u>15,000</u>		Final designs of the different pilot solutions to promote based on the data gathered and required adjustment of technologies to withstand flood. Assumption that UWI Research Unit, or any other company would be contracted to finalize the different systems (hydroponic technology to withstand floods, aquaponics, dasheen) prototypes that will be promoted with the Project. Contracted company to finalise designs and models for Hydroponic, Aquaculture and Aquaponic systems (Total: \$15,000) for the design of the 3 system models - Aquaculture, Hydroponics and Aquaponics.	Formatted: Right
		<u>Workshops/Training</u>	<u>Training of trainers</u>	<u>4,500</u>		10 sessions of Training of Trainers for technicians of the Ministry of Agriculture in technologies promoted by the Project (hydroponics, aquaponics and aquaculture modules resistant to floods)	Formatted: Font: (Default) Arial
		<u>Field technicians</u>	<u>Training of trainers</u>	<u>850</u>		10 sessions of training provided by specialists in the proposed adaptation solutions	Formatted: Right
		<u>Travel</u>	<u>Farmers outreach</u>	<u>6,000</u>		120 days of travel for farmers outreach (3 people during 4 weeks)	Formatted: Right
		<u>Equipment</u>	<u>Modules hydroponics</u>	<u>230,000</u>		Procurement of modular systems, inputs and required investments. Assumption, average cost of hydroponic system 2,300 USD. The demonstration Hydroponics, Aquaculture and Aquaponics models was also included	Formatted: Right
		<u>Equipment</u>	<u>Pilot systems- (Dasheen)</u>	<u>35,600</u>		Demonstration plots of Dasheen to be installed in 4 farmers's plot reaching at least with field schools conducted in the farmer plot to additional 10 more farmers in each area.	Formatted: Right
		<u>Refreshments and childcare</u>	<u>Field schools</u>	<u>16,000</u>		Farmers field schools MoA - Dasheen (12 sessions). Costs of refreshments for the field schools during a whole year. Lump sum budget for childcare: 400 USD/year	Formatted: Right

		Equipment	Modules Dasheen	212,000		Procurement of modular systems, inputs and required investments. Assumption, average cost of water resilient system (dasheen) 5,300 USD	Formatted: Right
		Equipment	Demonstration Modules Aquaculture	9,000		Demonstration plot - modular systems Aquaculture. Assumption, average cost of aquaculture system 3,000 USD. Both the Aquaculture and Aquaponics systems will be done as demonstration modular system models at the demo site for capacity building.	Formatted: Right
		Equipment	Demonstration Modules Aquaponics	10,500		Demonstration plot - modular systems Aquaponics. Assumption, average cost of aquaponic system 3,500 USD. Both the Aquaculture and Aquaponics systems will be done as demonstration modular system models at the demo site for capacity building.	Formatted: Right
		Field technicians	Technical Assistance	36,720		Implementation phase: Installation on the selected farmers' sites, technical assistance to farmers and capacity building. Assumption 3 field technicians visiting twice a week during 18 months different farmers for the implementation of the hydroponic systems, technical assistance and capacity building.	Formatted: Right
		Refreshments and childcare	Farmers field schools - Hydroponics / aquaponics	16,000		Farmers field schools - Hydroponics / aquaponics Lump sum budget for childcare: 400 USD/year	Formatted: Right
4.2	4.2.1 Implementation of a community-led eco-touristic site in the Godineau Swamp to promote fishers' livelihoods diversification and conservation	Professional Services – Companies/Firm	Study	30,000	375,600	Godineau Swamp sustainable eco-tourism management plan and business plan including market study.	Formatted: Right
		Professional Services – Companies/Firm	Final design, materials and installation -lump sum	170,000		Feasibility study, final designs and construction of bird watching tower, public toilets, waste disposal and recreational site with pic-nic tables	Formatted: Right
		Local consultant	Salary	11,200		Technical assistance to support 30 SMEs business plans for vulnerable families in the area	Formatted: Right
		Professional Services – Companies/Firm	Investments	120,000		Grant facility to implement investments of the approved business plans. Average investment required per family 4,000 USD. Associative projects will be fostered.	Formatted: Right
		Professional Services – Companies/Firm	Training	38,400		Capacity building and training. Vocational training and swimming classes (350 USD average price swimming lessons, 300 USD average price naturalist guides/boat operators, 300 USD average price training in first aid and emergency safety, 300 USD commercial food preparation, 300 USD business management). Calculations for 120 courses: 30 swimming courses + 20 naturalist courses + 30 first aid + 10 food prep + 30 business mgt courses Budget for childcare to facilitate attendance to courses: 2000 USD lump sum	Formatted: Font: (Default) Arial
		Professional Services – Companies/Firm	Website and brand development	6,000		Company contracted to develop Website and brand	Formatted: Right
Sub-total Component 4				975,270	975,270	-	Formatted: Font: (Default) Arial
5.1	5.1.1 Strengthening capacities of	Professional Services – Companies/Firm	Training packages	30,000	61,100	3 training packages for government institutions with different modalities and topics for national and local governmental stakeholders.	Formatted: Font: (Default) Arial

	governmental institutions to respond and manage climate-related risks	Workshops/Training	Peer-to-peer learning exchanges	18,300	64,000	Peer to peer exchanges. 2 peer to peer exchanges per year, from year 2 in the SORB where local and national technicians can exchange on-site and visit the progress of the planned/implemented works and visit the implemented works (rainwater harvest systems, ecosystem restoration, hydroponic, drainage works, etc)	Formatted: Right
		Workshops/Training	Capacity building on E&S safeguards, gender, grievance mechanism	12,200		E&S safeguard and gender workshops. Capacity building on E&S safeguards, gender, grievance mechanism provided by the E&S specialists of the PMU.	Formatted: Right
		Travel	Travel	600		Travel allowance for two people of the PMU to provide training in E&S safeguards	Formatted: English (United States) Formatted: Right
5.1.2	Mainstreaming climate change in primary and secondary school classes	Professional Services – Companies/Firm	Pedagogical resources	19,000	64,000	Development of the content of the training resources by the MoE together with the Project Management Unit and the capacity building technical committee. Development of the pedagogical resources (on-line training sessions)	Formatted: Right
		Professional Services – Companies/Firm	Videos	19,000		2 Videos developed for the training of teachers	Formatted: Right
		Workshops/Training	Workshops for teachers	16,000		4 workshops for teachers in the SORB	Formatted: Right
		Professional Services – Companies/Firm	Resources for students	10,000		Resources for the students	Formatted: Right
5.2	5.2.1 Working with pre-16 schools in the SORB to raise awareness on climate change-related impacts and solutions	Workshops/Training	Sensitization on climate change and the project to selected schools	-	40,500	Sensitization on climate change and the project to selected schools. No cost since it would be conducted by the PMU. Working sessions in the selected schools of the SORB to talk about climate change and the adaptation solutions being implemented conducted by the PMU specialists	Formatted: Right
		Workshops/Training	15 Tour visits for 30 students in the SORB	40,500		15 tour visits for 30 students (estimation 90 USD per student per tour visit) to get exposure to the different adaptation technologies being implemented with the project	Formatted: Right
	5.2.2 Promoting awareness-raising on climate change impacts and appropriate solutions among SORB key stakeholders	Workshops/Training	Awareness raising	24,400	42,200	Awareness raising activities organized with local NGOs at the community level	Formatted: Right
		Professional Services – Companies/Firm	Information campaign	8,650		Information campaign to disseminate good adaptation practices in the social media, radio etc.	Formatted: Right
		Workshops/Training	Awareness raising	9,150		Activity for the engagement and awareness raising of developers, oil and gas - working sessions with key stakeholders to discuss how to improve the situation and reach agreements on how to reduce the impacts of their activities in the SORB	Formatted: Font: (Default) Arial Formatted: Right
	5.2.3 Identification of best practices and lessons learned	Local consultant	Case studies	24,000	24,000	Case studies (1 with focus on gender and climate change)	Formatted: Right
	5.2.4 Design of communication material and dissemination of lessons learned	Professional Services – Companies/Firm	Communication material	1,600	54,100	Leaflet / banner / printed material / infographic / one pagers, Communication material to promote the activities of the project and disseminate knowledge	Formatted: Right
		Professional Services – Companies/Firm	Video	28,500		Videos and communication material (1 with focus on gender and climate change)	Formatted: Right

Financial administration of project funds and accounting services	160.000
Translations	31.000
Project oversight. Include visits to project sites to verify quality of deliverables, and overseeing independent evaluations	100.000
Audits (USD 40,000/year)	160.000
Baseline data collection (sample survey), Independent Mid Term Review, Endline data collection (sample survey), Independent Terminal Review, Inception Report, Final Project Report (PPR (5,000 per year), AF Environmental, Social and Gender Policy fulfilment	212.410
Technical support and backstopping by personnel from CAF	80.000
Total	783.410

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H. Include a disbursement schedule with time-bound milestones.

H.

-	Upon signature of Agreement	One Year after Project Start a)	Year 2b)	Year 3	Total
Scheduled date	June 2022	June 2023	June 2024	June 2025	-
Project Funds	1.727.962	3.479.723	2.983.233	1.024.873	9.215.790
Implementing Entity Fees	210.000	181.500	164.410	227.500	783.410
Total	1.937.962	3.662.023	3.147.643	1.252.373	10.000.000

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-	Upon signature of Agreement	One Year after Project Start a)	Year 2b)	Year 3	Total
Scheduled date	June 2022	June 2023	June 2024	June 2025	-
Project Funds	1.727.962	3.480.935	2.983.233	1.024.873	9.216.590
Implementing Entity Fees	210.000	181.500	164.410	227.500	783.410
Total	1.937.962	3.662.435	3.147.643	1.252.373	10.000.000

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PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

<i>(Enter Name, Position, Ministry)</i>	<i>Date: (Month, day, year)</i>
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B. Implementing Entity certification

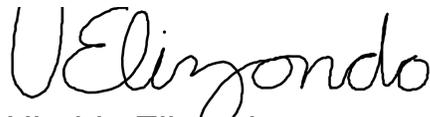
Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

<p>I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (.....list here.....) and subject to the approval by the Adaptation Fund Board, <u>commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund</u> and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.</p>	
<p><i>Name & Signature</i> Implementing Entity Coordinator</p>	
<i>Date: (Month, Day, Year)</i>	<i>Tel. and email:</i>
<i>Project Contact Person:</i>	
<i>Tel. And Email:</i>	

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

B. Implementing Entity certification *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address*

I certify that the national project proposal "**Multisectoral Adaptation Measures to Climate Change in the South Oropouche Basin for River Flood Relief**" has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans and subject to the approval by the Adaptation Fund Board, commit to implementing the project in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project.



Ubaldo Elizondo
Implementing Entity Coordinator

Date: *January / 08 / 2022*

Tel. and email: *uelizondo@caf.com*

Project Contact Person: *Carolina Cortés*

Tel. And Email: *+593987883698 / acortes@caf.com*

**PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION
BY THE IMPLEMENTING ENTITY**

A. Record of endorsement on behalf of the government¹

***Project: Multisectoral Adaptation Measures to Climate Change in
the South Oropouche Basin for River Flood Relief***

<p><i>Signature</i></p> <p><i>Name: Ms. Joanne Deoraj</i></p> <p><i>Position: Permanent Secretary</i></p> <p><i>Ministry: Ministry of Planning and Development</i></p>	<p>Date: January 5th 2022</p> 
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⁶ Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.



ADAPTATION FUND

Letter of Endorsement by Government

Government of the Republic of Trinidad and Tobago Ministry of Planning and Development

5th January 2022

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement of the Full Proposal "**Multisectoral Adaptation Measures to Climate Change in the South Oropouche Basin for River Flood Relief**"

In my capacity as designated authority for the Adaptation Fund in Trinidad and Tobago, I confirm that the above national full project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Trinidad and Tobago.

Accordingly, I am pleased to endorse the above full project proposal with support from the Adaptation Fund. If approved, the project will be implemented by CAF Latin American Development Bank.

Sincerely,

Ms. Joanne Deoraj
Permanent Secretary
Ministry of Planning and Development