Integrating digital technologies and participatory tools to support coastal community resilience in Trinidad & Tobago (Tech4CoastalResilience)

Mayaro Community Resilience Plan

April 25, 2025

Acknowledgements

CANARI would like to thank the Fisheries Division, Ministry of Agriculture, Land and Fisheries for their support in conducting action planning in Mayaro, Trinidad, as well as the community and other key stakeholders from the public and private sector for generously giving of their time and sharing their knowledge and perspectives, to develop this community resilience plan.

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Cover photo: Aerial view of landing site along Mayaro Bay, Credit CANARI and Future Fishers 2024

1. Overview

The Mayaro Community Resilience Plan aims to guide coastal planning and resilience actions and identify ways to reduce vulnerability and adapt to climate change and other coastal changes in Mayaro, Trinidad. It is based on the key findings from the vulnerability and capacity assessment in Mayaro conducted from January to June 2024 and the inputs from community residents and other key stakeholders from an action planning workshop in July 2024.

The Plan has been developed under the "Integrating digital technologies and participatory tools to support coastal community resilience in Trinidad and Tobago (Tech4CoastalResilience)" project, which is being implemented from 2023-2025 by the Caribbean Natural Resources Institute (CANARI) in partnership with the Fisheries Division, Ministry of Agriculture, Land and Fisheries and the Department of Marine Resources and Fisheries, Tobago House of Assembly. The project aims to improve the resilience of vulnerable coastal communities to climate change impacts in Trinidad and Tobago (T&T). It is supported by the "Harnessing Innovative Technologies to Support Resilient Settlements on the Coastal Zones of the Caribbean (HIT RESET Caribbean)" programme. HIT RESET Caribbean is funded by the ACP Innovation Fund implemented by the Organization of African, Caribbean and Pacific States (OACPS) and European Union (EU).

2. Approach and methodology

The process to develop the Plan was facilitated by CANARI and the Fisheries Division, Ministry of Agriculture, Land and Fisheries. It was designed to be interactive and participatory, engaging the community in practical exercises and discussions to support action planning for coastal resilience. See Appendix 1 for the agenda for the Mayaro Community Action Planning workshop.

The process engaged fisherfolk, other coastal resource users and community-based organisations (CBOs), including the Guayaguayare, Ortoire and Mayaro Fisherfolk Association (GOMFA) and Southeast Fishing Association (SEFA), Enviro Foundation TT, Future Fishers, Mayaro Village Council and key government agencies including the Institute of Marine Affairs, Office of Disaster Preparedness and Management and Coastal Protection Unit. See Appendix 2 for the list of participants.

The Plan is based on findings from the vulnerability and capacity assessment in Mayaro from January to June 2024. The assessment involved desk review and community scoping, participatory mapping and geographic information systems (GIS), household surveys and development of a historical timeline to collect data and better understand local impacts from climate change and other issues affecting the coast. The findings were further reviewed and validated in the action planning workshop in July 2024. See Appendix 3 for the vulnerability and capacity assessment findings.

3. Priorities for Action

A range of actions to adapt and build coastal resilience have been identified as part of the Plan (see section 5 and Appendix 4 for further details). In particular, key climate-related impacts from coastal erosion, flooding and land slides leading to damage to property and infrastructure, water shortages during dry spells and sargassum influxes were highlighted by participants. The following priorities for action have therefore been identified for Mayaro over the short to medium term (1-6 years):

- Shoreline protection, including revetments/sea walls and restoration of coastal ecosystems (e.g. coconut trees and other vegetation, mangroves, seagrass), to address coastal erosion

- Upgrade drainage and regular maintenance of main access roads, including the Manzanilla-Mayaro Road and Naparima-Mayaro Road, to ensure effective access to/from community and address risks from flooding and landslides/slippages
- Strengthening of local fishing associations to promote a more lucrative and sustainable fishing sector and enable effective co-management
- Safety at sea training, access to required equipment (e.g. GPS, VHF radio) at subsidized costs, and improved early warning systems for fishers
- Provision of fuel subsidy/rebate and social protection measures for fisherfolk to address reduced incomes and rising costs
- Adoption of climate-smart agriculture practices (e.g. hydroponics, flood and drought-resistant crops and livestock, shade houses, agro-forestry), including awareness raising, training and affordable financing for farmers, rural women producers and agri-businesses
- Increased use of rainwater harvesting, storage tanks and water-efficient systems, including renewable energy-powered water pumps, to address unreliable water supply for residents, hotels/guesthouses and other local businesses
- Diversification and development of alternative livelihoods (e.g. apiculture, aquaculture, mariculture, and collection and use of sargassum to create value-added and commercial products), including training and affordable financing for equipment/ materials

Prioritisation was based on the level of impact/risk to the community that the action can address, whether it benefits multiple sectors and community needs, and whether it can be implemented in the short to medium term.

Two of these priorities for action were selected as feasible options for further support under the Tech4CoastalResilience and other current projects given the available timeframe and budget: strengthening of local fishing associations to promote a more lucrative and sustainable fishing sector and enable effective co-management; and provision of a fuel subsidy/rebate and social protection measures for fisherfolk to address reduced incomes and rising costs. CANARI and the Fisheries Division will be following up to refine and implement one action.

4. Use of this Plan

This Plan serves as a guide for coastal planning and resilience actions in the Mayaro community. It should be used and further operationalised by key government agencies, including the Coastal Protection Unit, Fisheries Division, Institute of Marine Affairs, Office of Disaster Preparedness and Management and Mayaro/Rio Claro Regional Corporation, Mayaro Village Council, CBOs and residents in Mayaro, and relevant civil society organisations and the private sector to inform efforts to reduce local vulnerability and adapt to climate and other coastal changes.

Figure 1: Participants at the Mayaro Action Planning Workshop (Source: CANARI 2024)

5. Summary of Mayaro Community Resilience Plan

Note the table below includes only the key climate-related impacts and priorities for action identified and highlighted by participants. The full list of all the identified impacts and actions is in Appendix 4.

** = top priorities

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
Fisheries						
<u>Coastal erosion and increased wave action</u> due to sea level rise, storms, storm surge and high winds Impacts: - Damage to fishing landing sites and facilities and other key coastal infrastructure (e.g. access roads) - Damage to boats, engines and nets/gear - Erosion and loss of beach and reduced beach access - Decline in fish habitats and coastal ecosystems (e.g. mangroves, seagrass beds and reefs), leading to less fish in nearshore areas, due to coastal erosion and	Vulnerable areas: - Fishing landings along Mayaro beach, including Plaisance, St. Ann's, St. Margaret's and Grand Lagoon - Fishing facility at Guayaguayare Vulnerable groups: - Fisherfolk, including boat owners - Households dependent on fishing as main income source - Recreational fishers and fishing charters	- **Shoreline protection, including revetments/sea walls and coastal re-vegetation, to address erosion and loss of beach - Access to insurance for fisherfolk and their boats and engines - Possible relocation of fish landing sites/ facilities if there is significant sea level rise and erosion - Restoration of coastal ecosystems, including mangroves and seagrass beds - Improved development planning and enforcement of laws and regulations pertaining to 'slash and burn' and	- Coastal Protection Unit (CPU)/ Ministry of Works and Infrastructure (co-lead) - Fisheries Division and Forestry Division/ Ministry of Agriculture, Lands and Fisheries (co-lead) - Institute of Marine Affairs (IMA), Environmental Management Authority (EMA) and Town & Country Planning Division/ Ministry of Planning, Economic Affairs and Development (co-lead) - Guayaguayare, Ortoire, Mayaro Fishing Association (GOMFA) (co-lead) - South East Fishing Association (SEFA)	- Technical expertise (coastal engineering, climate adaptation, marine science, ecosystem restoration) - Financing (significant costs to build revetments/sea walls) - Equipment/ SCUBA gear - Materials - Seedlings for restoration - Labour (can be provided by local community groups for restoration)	Short to medium term (1-6 years)	- Reduced costs to fisherfolk for loss of beach access and damage of boats, engines and other fishing gear - Improved health and extent of mangroves and seagrass beds

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
sedimentation; this is compounded by adhoc land development and oil and gas operations		deforestation to reduce sedimentation - Improved use of Environmental Impact Assessments (EIAs) and Certificates of Environmental Clearances (CECs) to reduce negative impacts from oil and gas operations	- Fisherfolk and local community groups - Mayaro/Rio Claro Regional Corporation - Mayaro Village Council - Future Fishers, SpeSeas, CANARI and other NGOs - Insurance providers - Oil and gas companies - The University of the West Indies (UWI) - UN Food and Agriculture Organization (FAO)			
<u>Rising ocean temperatures</u> Impacts: - Decline in size and abundance of certain fish (e.g. Ancho) being caught and income earned - Heavy fishing pressure and impacts of oil and gas operations (e.g. seismic testing and drilling) compounds this decline	Vulnerable groups: - Fisherfolk - Households dependent on fishing as main income source - Recreational fishers and fishing charters	- Shift in fishing practices and locations (e.g. targeting different species, fishing further out in deeper, cooler waters, adopting more sustainable practices like biodegradable fish pots) - **Diversification of livelihoods for fisherfolk and other coastal resource users (e.g. aquaculture, apiculture, mariculture), including training and affordable	- Fisheries Division/ Ministry of Agriculture, Lands and Fisheries (co-lead) - GOMFA/ SEFA (co-lead) - Fisherfolk - Future Fishers, CANARI and other NGOs - Caribbean Fisheries Training and Development Institute (CFTDI) - UWI - FAO - Caribbean Agricultural Research & Development Institute (CARDI)	- Technical expertise (marine science, sustainable fisheries, climate adaptation) - Financing - Equipment - Materials - Labour	Short to medium term (1-6 years)	- Increased number, size and diversity of fish landed in Mayaro - Increased number of livelihood and income-earning options for fisherfolk

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
		financing for equipment/ materials - **Strengthening of fishing associations in Mayaro to promote a more lucrative and sustainable fishing sector and enable effective co-management - **Provision of fuel subsidy/rebate and social protection measures for fisherfolk to address reduced incomes and rising costs - Improved monitoring of changing ocean conditions and fisheries impacts to inform response	- Inter-American Institute for Cooperation on Agriculture (IICA) - Oil and gas companies			
<u>Sargassum influxes</u> Impacts: - Blocked access to fish landing sites - Safety issues for fishers, and damage to boats, engines, nets/other fishing gear at sea	Vulnerable groups: - Fisherfolk, including boat owners - Households dependent on fishing as main income source	- **Safety at sea training, access to required equipment (e.g. GPS, VHF radio) at subsidized costs, and improved early warning systems for fishers - Preventative measures to reduce damage to	- National Sargassum Taskforce (co-lead) - Fisheries Division/ Ministry of Agriculture, Lands and Fisheries (co-lead) - GOMFA (co-lead) - SEFA - Fisherfolk and related businesses	- Technical expertise (marine and fisheries science, disaster response, business development) - Financing - Equipment - Materials	Short to medium term (1-6 years)	- Reduced number of safety incidents reported by fisherfolk - Reduced costs from damage or loss of boats,

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
- Decrease in catch of certain fish species (e.g. Barracuda) - Decrease in fishing days and related income	- Recreational fishers and fishing charters	boat engines (e.g. cages for propellors and regular maintenance) and nets/gear from sargassum - Access to insurance for fisherfolk and their boats, engines and gear - Diversification and development of alternative livelihoods (e.g. aquaculture, mariculture, collection and use of sargassum to create value-added/commercial products like liquid fertilizer), including training and provision of equipment/ materials	- Office of Disaster Preparedness and Management (ODPM) - T&T Meteorological Service (TTMS) - T&T Coast Guard - Mayaro/Rio Claro Regional Corporation - Mayaro Village Council - Future Fishers, CANARI and other NGOs - CFTDI - UWI - FAO - CARDI - IICA - Finance and insurance providers - Telecommunication service providers	- Labour		engines and gear - Increased number of fisherfolk engaged in alternative livelihoods
Agriculture, Forestry and Land Resources						
<u>Hot, dry spells</u> with rising air temperatures and more variable rainfall Impacts: - Limited water supply - Heat stress and changes in	Vulnerable groups: - Small-scale farmers - Rural women producers and other local agri-businesses	- **Adoption of climate-smart agriculture practices (e.g. hydroponics, drought-resistant crops and livestock, water efficient systems), including	- Agricultural Planning Division/ Forestry Division, Ministry of Agriculture, Lands and Fisheries (co-lead) - Farmers and local agri-businesses (co-lead)	- Technical expertise (climate-smart agriculture, forestry, fire management) - Financing - Equipment	Short to medium term (1-6 years)	- Improved water supply for farmers and agri-businesses - Reduced incidence of heat stress-

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
productivity in crops and livestock - Increased risk of bushfires, leading to loss of crops and livestock and property damage	- Households living in fire-prone areas and dependent on agriculture as main income source - Property owners in fire-prone areas	awareness raising, training and affordable financing for equipment/ materials - Improved forest fire management, including training and use of community fire wardens - Improved access to insurance for farmers, agri- businesses and property owners - Diversification and development of alternative livelihoods (e.g. mariculture, collection and use of agricultural waste and sargassum to create value-added/ commercial products)	- Network of Rural Women Producers T&T (NRWPTT) - National Agricultural Marketing and Development Corporation (NAMDEVCO) - Water and Sewerage Authority (WASA)/ Ministry of Public Utilities - Ministry of Rural Development and Local Government - Mayaro/Rio Claro Regional Corporation - T&T Fire Services - Local community groups - Finance and insurance providers - UWI - CFTDI - FAO - CARDI - IICA	- Materials - Labour		related impacts - Reduced costs for loss and damage from droughts and bushfires - Increased number of farmers engaged in alternative livelihoods
<u>Extreme rainfall</u> and high winds leading to floods and landslides Impacts: - Damage and loss of crops and livestock - Soil erosion and damage to farms and	Vulnerable groups: - Small-scale farmers - Rural women producers and other local agri-businesses - Households dependent on	- **Adoption of climate-smart agricultural practices to reduce loss and damage (e.g. shade houses, flood-resistant varieties, agroforestry), including awareness raising, training and	- Agricultural Planning Division, Ministry of Agriculture, Lands and Fisheries (co-lead) - Farmers and local agri-businesses (co-lead) - NRWPTT - NAMDEVCO	- Technical expertise (climate-smart agriculture) - Financing - Equipment - Materials - Labour -	Short to medium term (1-6 years)	- Reduced costs for loss and damage to farmers and agri-businesses - Increased number of farmers

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
related property/ infrastructure - Loss of income for farmers and related businesses	agriculture as main income source	affordable financing for equipment/ materials - Improved access to insurance for farmers and agri-businesses - Diversification and development of alternative livelihoods (e.g. mariculture, collection and use of agricultural waste and sargassum to create value-added/ commercial products)	- Ministry of Rural Development and Local Government - Mayaro/Rio Claro Regional Corporation - Finance and insurance providers - UWI - CFTDI - FAO - CARDI - IICA			engaged in alternative livelihoods
Tourism						
<u>Coastal erosion</u> with sea level rise, storms and storm surge, and rough seas Impacts: - Erosion and loss of Mayaro Beach and other nearby beaches - Limited access to main coastal road with coastal and inland flooding - Damage and loss of tourism-related property/	Vulnerable areas: - Mayaro Beach - Manzanilla-Mayaro Road - Nariva Swamp Vulnerable groups: - Beachgoers and other visitors - Hotel and guesthouse owners in at-risk areas - Vendors at beaches and nearby areas	- **Restoration of coastal vegetation (coconut trees and mangroves) and strategic use of revetments/sea walls in high-risk areas to reduce erosion and loss of beach - Upgrade of drainage and regular maintenance of Manzanilla-Mayaro coastal road - Improved early warning systems on	- CPU/ Ministry of Works and Infrastructure (co-lead) - Ministry of Trade, Investment and Tourism (co-lead) - Hotel/guesthouse and tour operators (co-lead) - IMA, EMA and Town and Country Planning Division/ Ministry of Planning, Economic Affairs and Development - Forestry Division/ Ministry of Agriculture, Lands and Fisheries	- Technical expertise (coastal engineering, construction, ecosystem rehabilitation, sustainable tourism) - Financing (significant costs for infrastructure upgrade and maintenance) - Equipment - Materials	Short to medium term (1-6 years)	- Reduced costs from loss and damage to local tourism-related businesses - Increased number of tourism-related businesses engaged in alternative tourism

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
infrastructure and tourist attractions - Decline in visitors (e.g. beachgoers, religious groups and other tourists) and income from tourism	- Other local tourism-related businesses - Households dependent on tourism as main income source	extreme weather for visitors and tourism-related businesses - Improved access to insurance for tourism-related businesses - Development of alternative tourism opportunities that are not dependent on beach/ coastal resources (e.g. agrotourism), including training and affordable financing	- ODPM - TTMS - Mayaro/Rio Claro Regional Corporation - Mayaro Village Council - SpeSEAS, CANARI and other NGOs - Local community groups - T&T Incoming Tour Operators' Association (TTITOA) - UWI - Finance and insurance providers - Telecommunication service providers	- Seedlings for restoration - Labour		
Settlements and Infrastructure						
<u>Hot, dry spells</u> with rising air temperatures and more variable rainfall Impacts: - Decline in availability and quality of potable water for residents, hotels/ guesthouses and other local businesses - Heat stress in residents and workers in local businesses	Vulnerable groups include: - Young children, elderly and other persons sensitive to heat and water stress - Households, especially without pipe-borne water or air conditioning/ good ventilation - good ventilation	- Education and awareness raising on climate change, health impacts, particularly from heat and water stress, and local solutions - **Increased use of rainwater harvesting, storage tanks and water-efficient systems, including use of renewable energy-powered water pumps	- WASA/ Ministry of Public Utilities (co-lead) - Mayaro/Rio Claro Regional Corporation (co-lead) - Mayaro Village Council (co-lead) - Ministry of Education - Ministry of Health/ Regional Health Authority - Ministry of Energy and Energy Industries	- Technical expertise (water resources management, renewable energy, engineering, public health) - Financing - Equipment - Materials - Labour	Short to medium term (1-6 years)	- Improved, regular supply of potable water to Mayaro community - Reduced incidence of heat stress and related impacts reported in Mayaro

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
	- Local businesses without pipe-borne water or air conditioning/ good ventilation - Vendors, construction workers and others who spend a lot of time outdoors	- Increased use of energy efficient/ renewable energy-powered air conditioning - Improved community/ district health services to treat heat stress and other health impacts	- Ministry of Planning, Economic Affairs and Development - Property owners - Local businesses, including construction companies - Local schools - Elderly care providers - Global Water Partnership-Caribbean (GWP-C) - Habitat for Humanity Trinidad and Tobago - CARPHA - PAHO			
<u>Coastal erosion, flooding and land slippages</u> with seal level rise, storms and storm surge, and more extreme rainfall Impacts: - Loss of access to main roads to/from Mayaro - Damage to homes, schools and other public buildings, cultural sites and key infrastructure, and	Vulnerable areas: - Manzanilla-Mayaro Road - Naparima-Mayaro Road - Property in erosion- and flood-prone areas - Guayaguayare cemetery Vulnerable groups: - Young children, elderly and persons with	- **Upgrade drainage and regular maintenance of main access roads - Establish Community Emergency Response Team(s) (CERTs) and provide disaster response training and relevant equipment to allow local community to respond effectively to minor events - Reforestation and riverbank rehabilitation to	- Ministry of Works and Infrastructure (co-lead) - Mayaro/ Rio Claro Regional Corporation (co-lead) - Mayaro Village Council (co-lead) - ODPM - EMA and Town and Country Planning Division/Ministry of Planning, Economic Affairs and Development - Forestry Division/Ministry of	- Technical expertise (engineering, disaster response, ecological restoration) - Financing (significant costs for infrastructure upgrade and maintenance) - Equipment - Materials	Short to medium term (1-6 years)	- Reduced number of incidents of loss of access to main roads in Mayaro - Reduced costs for damage of buildings and other community infrastructure

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
risks to lives and livelihoods - Lanslides and land slippages are compounded by 'slash and burn' practices and deforestation	disabilities, who are not mobile - Households - Property owners - Local businesses	address flooding and land slippages - Improved access to insurance for households/ property owners - Improved development planning and enforcement of laws and regulations pertaining to 'slash and burn' and deforestation	Agriculture, Lands and Fisheries - Property owners - Local community groups - CANARI, IAMovement and other NGOs - UWI - FAO - Insurance providers	- Seedlings and plants for reforestation - Labour (can be provided by local community groups for rehabilitation)		

Appendices

Appendix 1:

Integrating digital technologies and participatory tools to support coastal community resilience in Trinidad & Tobago (Tech4CoastalResilience)

Mayaro Community Action Planning Workshop
July 31, 2024

CONCEPT NOTE

Background

The project, "Integrating digital technologies and participatory tools to support coastal community resilience in Trinidad and Tobago (Tech4CoastalResilience)", is being implemented from 2023-2024 by the Caribbean Natural Resources Institute (CANARI) in partnership with the Fisheries Division, Ministry of Agriculture, Land and Fisheries and the Department of Marine Resources and Fisheries, Tobago House of Assembly. It aims to improve the resilience of vulnerable coastal communities to climate change impacts in Trinidad and Tobago (T&T). It is supported by the "Harnessing Innovative Technologies to Support Resilient Settlements on the Coastal Zones of the Caribbean (HIT RESET Caribbean)" programme. HIT RESET Caribbean is funded by the ACP Innovation Fund implemented by the Organization of African, Caribbean and Pacific States (OACPS) and European Union (EU).

CANARI, the Fisheries Division, Ministry of Agriculture, Land and Fisheries and Department of Marine Resources and Fisheries, Tobago House of Assembly are conducting action planning workshops in ten coastal communities – Blanchisseuse, Carli Bay, Icacos, Mayaro, Matelot and Moruga in Trinidad and Castara, Roxborough, Speyside and Scarborough in Tobago – from June to August 2024 under the project. These workshops will involve validating the findings from the vulnerability and capacity assessments conducted in these communities to better understand local impacts from climate change and other issues affecting the coast, and prioritising actions to build local resilience. This will inform efforts to implement specific coastal resilience actions under the project and in the future.

Workshop goal and objectives

The goal of this workshop is to engage community residents in Mayaro and other key stakeholders to review and validate key impacts from climate change and other changes and related vulnerabilities and prioritise strategies to adapt and build coastal resilience.

The specific objectives of the workshop are to:

- review findings from the vulnerability and capacity assessment completed in 2024 in Mayaro in terms of key impacts and vulnerabilities related to climate change and other changes, including for the fisheries and tourism sectors and related livelihoods;
- conduct participatory action planning to improve understanding of and identify ways to reduce vulnerability and adapt to climate change and other changes; and
- prioritise specific strategies to adapt and build coastal resilience in Mayaro.

Workshop venue

The workshop will be held July 31, 2024 from 9:30am – 3:15pm at the Mayaro Resource Centre, Trinidad.

Target group

The workshop will target 20-30 participants, including fisherfolk, hotel and tour operators, other coastal resource users and community-based organisations in Mayaro. The project partners and government and civil society organisations involved in fisheries, coastal and marine management, climate change and disaster risk management in Mayaro will also be engaged. This includes:

- key government agencies involved in adaptation, disaster risk management and coastal and marine resource management, including Fisheries Division, Institute of Marine Affairs, Office of Disaster Preparedness and Management and the Mayaro/Rio Claro Regional Corporation;
- civil society organisations, including fisherfolk organisations, environmental non-governmental organisations (NGOs), women's, youth and other community groups; and
- private sector, including fisherfolk and hotel and tour operators.

Approach

The workshop will be facilitated by CANARI in collaboration with the Fisheries Division, Ministry of Agriculture, Land and Fisheries. It will be designed to be interactive and participatory, engaging the community in practical exercises and discussions to support action planning for coastal resilience.

Outputs

A local action plan for building coastal resilience will be developed based on the key findings from the vulnerability and capacity assessment in Mayaro and the inputs from community residents and other key stakeholders. Specific strategies to adapt and build coastal resilience in Mayaro will also be identified to be further implemented under the project.

Travel and meals

CANARI will cover the costs of the venue and meals for all participants. Local travel to Mayaro may also be covered for civil society representatives where needed.

Provisional Agenda

July 31, 2024	
9:30 am	Registration of participants
10:00 am	Opening remarks, welcome and introductions Overview of the project and workshop objectives
10:45am	Presentation and Q&A – VCA findings for Mayaro community Group discussion – Validating VCA findings for Mayaro community
12:00 pm	**Lunch**
1:00 pm	Introduction to participatory scenario planning Interactive exercise – Participatory Scenario Planning for Mayaro community
2:15 pm	Group discussion – Prioritising strategies to adapt and build coastal resilience of Mayaro community
3:05 pm	Wrap up and next steps for project
3:10 pm	Closing remarks
3:15 pm	**End of workshop**

For more information, please contact CANARI at Ainka Granderson, Resilience Programme Manager at ainka@canari.org or Kerresha Khan, Technical Officer at kerresha@canari.org or call 638-6062

Appendix 2: Participants List for the Mayaro Action Planning Workshop

NO.	FULL NAME	ORGANISATION	TITLE	EMAIL
1	Gia Gaspard Taylor	Network of Rural Women Producers Trinidad and Tobago (NRWPTT)	President	president@nrwptt.net
2	Shavita Drickpaul	National Reforestation and Watershed Rehabilitation Programme	Secretary	-
3	Sandra Ramnarine	National Reforestation and Watershed Rehabilitation Programme	-	-
4	Allistar Michel	Fish Family United	Secretary	md@hecateres.com
5	Evana Douglas	Future Fishers	Technical Coordinator for Research	evana@futurefishers.org
6	Whitney Jennings	Future Fishers	Research and Data assistant	whitney@futurefishers.org
7	Richard Stanley	Fish Family United	Treasurer	-
8	Peter Kalicharan	Office of Disaster Preparedness and Management (ODPM)	-	-
9	Eric Mackie	ODPM	Regional Coordinator	emackie@mmsgov.tt
10	Ravi Ramdeen	Enviro Foundation TT	Project Coordinator	envirofoundationtt@gmail.com
11	Jude Armoogan	Coastal Protection Unit	Surveying Assistant	juarmoogan@mowt.gov.tt
12	Christopher Alexis	Institute of Marine Affairs (IMA)	Research Officer	calexis@ima.gov.tt

NO.	FULL NAME	ORGANISATION	TITLE	EMAIL
13	Rodney Smart	ODPM	CEO	rsmart@mns.gov.tt
14	Leonson Francis	Fisherman	Fisherman/ Boat Owner	Lensonfrancis15@gmial.com
15	Bryan Lezama	Guayaguayare, Ortoire and Mayaro Fisherfolk Association (GOMFA)	President	lezamabryan@hotmail.com
16	Lima Blackman Almorales	Southeast Fishing Association (SEFA)	Member	limablackman@gmail.com
17	Bernadette Fonrose	GOMFA	Secretary	Bernadettefonrose1@hotmail.com
18	Abraham Metoo	GOMFA	Vice President	-
20	Hanaa Bhagratty	Environmental Management Authority (EMA)	Environmental Investigator 1	hbhagratty@ema.co.tt
21	Colin Romain	EMA	ERI Officer 1	cromain@ema.co.tt
22	Renata Jagdeen	EMA	EPO 1	rjagdeen@ema.co.tt
23	Alicia Franklin	Fisheries Division	Fisheries Assistant	alifrank1972@gmail.com
24	Recardo Mieux	Fisheries Division	Fisheries Officer	rmieux@gov.tt
25	Alana Stanley	GOMFA	-	Caribbeanbrowning09@gmail.com
26	Clive Mentor	GOMFA	-	-
27	Cherry Ann Henry	GOMFA	-	-
28	Ralph Metoo	GOMFA	-	-

NO.	FULL NAME	ORGANISATION	TITLE	EMAIL
29	Ainka Granderson	Caribbean Natural Resources Institute (CANARI)	Resilience Programme Manager	ainka@canari.org
30	Kerresha Khan	CANARI	Technical Officer	kerresha@canari.org
31	Anastacia Lee Quay	CANARI	Administrative Officer	anastacia@canari.org

Appendix 3. Mayaro Vulnerability and Capacity Assessment

Overview of community

An overview of the Mayaro community is provided below, including the geography, demographics, socio-economic activities, and previous assessments in the area of relevance to climate change.

Mayaro, Trinidad
Geography Mayaro is a town located on the south east coast of Trinidad. The area is bounded on the east by the Atlantic Ocean and the south by the Columbus Channel. The Mayaro Bay on its east coast is defined by the headlands of Point Radix to the north and Galeota Point to the south, and is one of the longest stretches of beach in Trinidad at 11.5km in length (Kishore *et al.,* 2005). To the north is the Nariva Swamp, which is the largest freshwater swamp in Trinidad and Tobago (T&T). The swamp has been designated as a Ramsar site and environmentally sensitive area (ESA), including a protected forest reserve and wildlife sanctuary.
Socio-economic activities • Mayaro serves as a hub for the south east, including a hospital, fire station, banks, primary and secondary schools, market, restaurants and recreational facilities. It grew from a small fishing village to a town from the 1970s to 2000s largely due to offshore oil and gas development and the influx of persons seeking employment in this sector. • The main economic activities currently include tourism, agriculture (fishing and farming) and oil and gas sector jobs. • There are approximately 104 fishers operating 52 vessels at Mayaro (Fisheries Division/Ministry of Agriculture, Land and Fisheries [MALF], 2022). The main fishing method used is beach seines, with gillnet landings also important (both fillet and monofilament). Whitemouth croaker, bachin and weakfish (locally called 'salmon') are the main species landed by the beach seines (Fisheries Division/MALF, 2015). Bonito and kingfish are the main species landed by fillet, while carite, mixfish and cavalli are the main species landed by the monofilament gillnets (Fisheries Division/MALF, 2015). • There are many guesthouses, hotels and resorts, which provide jobs in catering, cleaning and landscaping for community members. • In 2020-2021 the COVID-19 pandemic resulted in country-wide restrictions being implemented. This negatively impacted many sectors including tourism and agriculture[1].
Demographic information • The population of Mayaro is 2,791 with 49.35% males and 53.27% females and 53.27% of the population are employed based on 2011 census (Central Statistic Office, 2011). • The area has an influx of visitors (locals and foreign) on a seasonal basis during February to April and July to August for holiday home and hotel stays.
Past assessments • In 2015, a Mayaro-Guayaguayare Coastal Study was carried out by the Coastal Protection Unit – Ministry of Works and Transport to appraise and design sustainable coastal protection measures to address ongoing coastal erosion and coastal flooding issues through stakeholder consultations[2]. • In the national vulnerability assessment done for T&T, Mayaro was identified as an area with specific vulnerabilities to inland flooding, sea level rise, rough seas, storms and storm surge,

[1] https://www.cepal.org/sites/default/files/events/files/presentation_1_-_assessment_of_the_social_and_economic_impact_of_covid-19_on_trinidad_tobago.pdf
[2] https://www.mowt.gov.tt/Divisions/Coastal-Protection-Unit/Projects/Mayaro-Guyaguayare

leading to damage to access and major roads, transportation links such as ports and jetties, sea defences, offshore and onshore industrial infrastructure, residential infrastructure, utilities and plants including for sewage (Clarke *et al.,* 2019).

- An assessment of coastal erosion was done in 2021 for the Third National Communication of the Republic of Trinidad and Tobago to the United Nations Framework Convention on Climate Change[3].

Methodology

The vulnerability and capacity assessment (VCA) in Mayaro was conducted from January to June 2024 by CANARI, Fisheries Division and a field team of three persons.

Participatory geographic information systems (P-GIS) and historical timeline tools were applied in Mayaro in a one-day workshop on January 30, 2024. Production of maps based on information gathered in the workshops was supported by a GIS expert who digitised and input maps into GIS. The field team then conducted 75 surveys over six weeks from April to June 2024. Surveys targeted fisherfolk, including fishers, fish processors and vendors, and selected households and individuals that are representative of various demographics, livelihood activities and sectors and vulnerable groups identified in the P-GIS and historical timeline exercise.

The field team included members of the Mayaro Fishing Association, who operate in the community and are fisherfolk leaders, and other civil society representatives from Disabled Peoples International – T&T Chapter and a local environmental NGO. The field team collectively encompassed a mix of competencies, including in fisheries and socio-economic/community development, to ensure a holistic approach and effective implementation. They received specific virtual training on conducting household surveys as part of the VCA in April 2024.

Figure 1: Photos of the vulnerability and capacity assessment workshop in Mayaro, Trinidad on January 30, 2024.

Source: CANARI (2024)

Key climate change impacts and vulnerabilities for Mayaro

The specific findings from the applications of the three VCA tools in Mayaro in 2024 are detailed below.

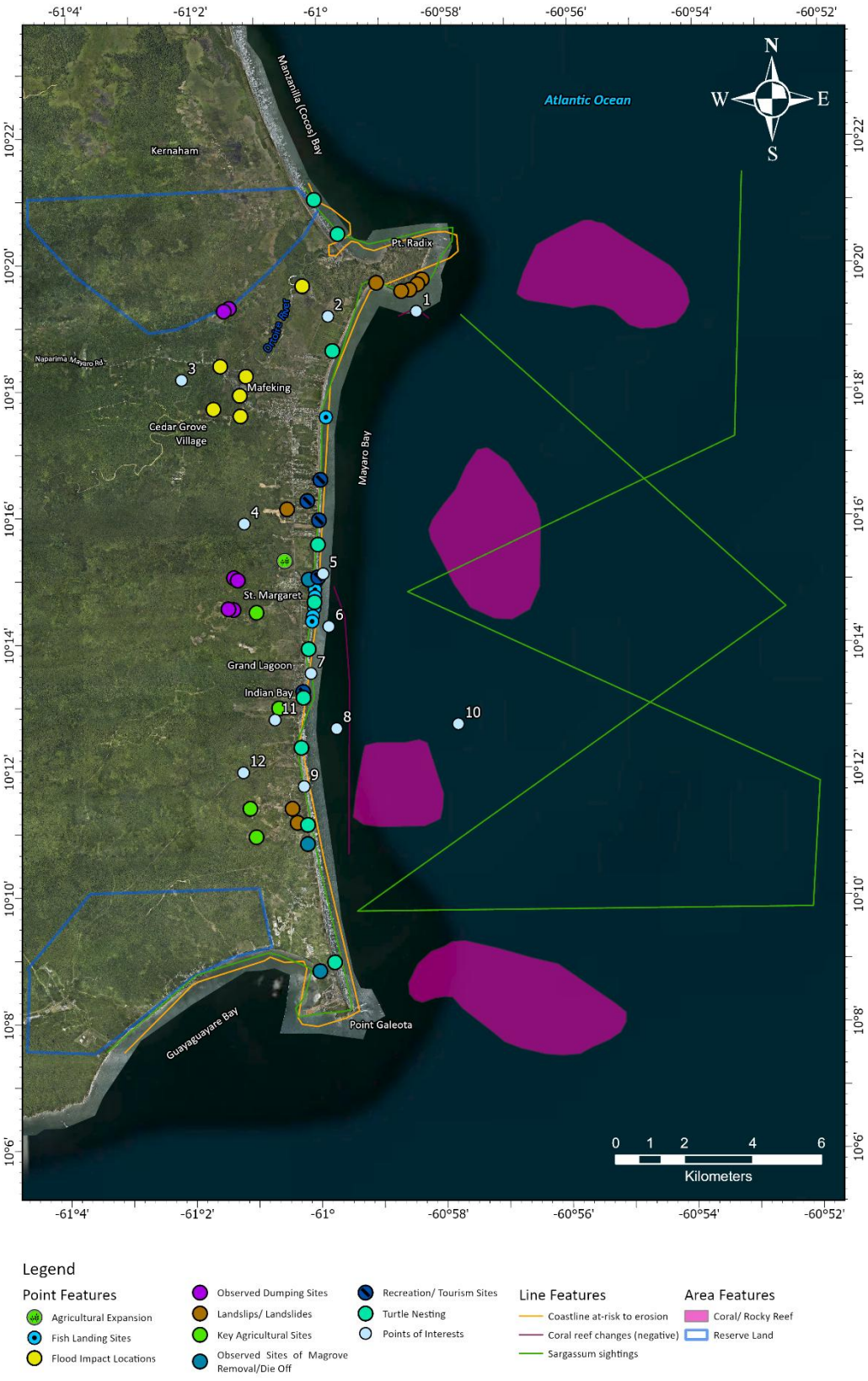
[3] https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/92154806_Trinidad%20and%20Tobago-NC3-1-THIRD_NATIONAL_COMMUNICTION_TRINIDAD_AND_TOBAGO.pdf

Participatory mapping and GIS findings

During the mapping exercise, community stakeholders identified and mapped a range of climate-related hazards and impacts that they had experienced, or which will pose a significant risk to the community of Mayaro, as well as specific vulnerable areas and groups (see Figure 2). These hazards included:

- Coastal erosion, which has impacted the fish landing sites, Guayaguayare cemetery and other important sites, and led to coastal changes
- Sargassum influxes (locally called 'seaweed') impacting tourism and fisherfolk, including their boat engines, nets and other gear. This is compounded by a lack of support/ compensation for fisherfolk post-influxes and other disasters.
- Poor waste management and pollution, which is impacted by more intense rainfall that increases the flow of effluents
- Degradation of mangroves and deforestation due to improper agricultural development that further exposes coasts and hillsides
- Changes in plant growth patterns/ seasonality with impacts on farmers and related businesses
- Unreliable water supply and water shortages with longer dry spells
- Landslides/ land instability due to extreme rainfall and soil erosion, leading to infrastructure damage and decreased soil productivity
- Lack of planning and adhoc development of infrastructure that causes land degradation and exacerbates the risk of flooding and landslides facing the community. Ad hoc development seemingly increased during COVID-19.

Figure 2: Digitised participatory map of Mayaro. The map was developed through discussions with community stakeholders on key climate change hazards and related impacts and vulnerabilities.



Source: CANARI (2024).

Local knowledge provided by stakeholders in Mayaro, Trinidad during the *Workshop for the Vulnerability and Capacity Assessment of Mayaro* (January 30, 2024). Map created using: EPSG:4158 coordinate system, Surveys and Mapping Division, Ministry of Agriculture, Land and Fisheries (2014 Aerial Orthomosaic) and Esri World Imagery, *ArcGIS Online* (available at: https://services.arcgisonline.com/arcgis/rest/services/World_Imagery/MapServer, accessed February 25, 2025).

Points of interest

#	Description
1	Small patches of reef experience bleaching due to chemicals
2	All ravines and minor rivers empty here
3	Inner Mafeking
4	Cedar Grove Village
5	Region Road area in Ecclesville affected by major deforestation due to agricultural lands (planting of Chadon Beni [Culantro])
6	Illegal development/ agriculture on Reserve land
7	River used for recreation used in Grand Lagoon impacted by sargassum
8	Fishers catch seine and sell on site or carry out to nearby areas e.g. Sangre Grande fishing landing site/vending site
9	Water comes up straight up to beach houses when tide is high
10	Coastal erosion observed. Coastline no longer accessible in some parts. On high tide, water levels reach as far as properties. No observed salt-water intrusion
11	Negative impacts to coastal ecosystems experienced in the Indian Bay to Grand Lagoon area including reduced coral, changes in coral nurseries, reduced/spotty seagrass beds, siltation and decline in fisheries.

Historical timeline findings

The historical timeline was utilised to identify key climatic and other changes in the Mayaro community over a 50-year period, the related impacts and any responses. It highlighted trends and changes in impacts over time in different dimensions such as:

- the environment (e.g. changing weather and ocean patterns, changing fish stocks, changes in mangroves etc.);
- socio-economics (e.g. changes in fishing practices, changes in the main livelihoods and income sources); and
- governance (e.g. changes in fisheries and coastal management laws and policies, changes in management practices).

Some of the key changes and impacts noted in the Mayaro community are increases in deforestation on some private lands where the landowners go beyond what is approved in their permit, and increases in 'slash and burn' for agricultural purposes. Soil erosion due to land development and ad hoc development in general. Increases in agricultural pests, such as the swarms of locusts and beetles that impact coconut trees, as well as Giant African Snail that impacts agriculture. There has also been an increase in flooding events with the flood gates at Kernahan Village not being active and this leading to drainage issues in the Nariva Swamp and surrounding area.

See Table 1 below for the noted decadal changes in the impacts within the Mayaro community.

Table 1: Decadal changes from 1950 to 2024 within the Mayaro community

DECADE	KEY IMPACTS
1950s	• Relocation of families to Plum Mitan and surrounding area as part of agricultural development scheme • Erosion and improper drainage from land development and ad hoc development in general • Flooding and issues with flood gates in Kernahan (not active at this time)
1960s - 70s	• Increase in squatting and 'slash and burn' agriculture leading to deforestation and erosion. E.g. in the Cocal Estate more people moved into swampy areas to increase rice farming • Reclaimed land began to be used - shift from rice farming to watermelon and peppers • Tropical Storm Alma. caused significant damage, disrupting road access, businesses and livelihoods including selling of produce (1974) • Industrial fire at complex at Galeota Point (1976)
1980s	• Flooding due to an issue with pump being used, which affected road access and the overall hydrology of the Nariva Swamp • Proliferation of watermelon crops in the Kernahan and Ortoire area leading to further soil erosion
1990s	• Coastal erosion within Manzanilla
2000s	• Dredging of the waterways in the Cocal area leading to issues with flooding and displacement of plant and animal species • Sargassum impacts (2011-2013) - Bonito numbers dropped and there was a decrease in fish sales. Also, a decrease in fishing efforts occurred due to presence of sargassum. • Increase in deforestation in Cocal Estate and as farmers applied to get permission to cut trees (permit needed for private lands). Sometimes farmers and landowners go beyond the permit. • Government produces and sells timber from state lands, but then area impacted by wildfires and focus on reforestation. Felt that wildlife reserves also needed. • Pests increase as locust routes change based on climate change, beetles and other diseases spread in coconut trees and Giant African Snail impacts agriculture (2018) • There is also a change in crop seasonality due to climate change e.g. shift in Poui season • Increase in air temperatures and heat stress • Issues with water access in remote areas
2020-current	• In 2020-2021, COVID-19 pandemic negatively impacted key sectors and local livelihoods related to tourism and agriculture due to restrictions • Due to climate change, fishing areas have changed e.g. shifted 60 miles out • Increased price of gas led to an increase in fish processing locally; fishing further out also means more gas needed and increased costs • Increase in flooding, including major flooding in November 2022 when main Manzanilla-Mayaro Road was washed away as well as Pt. Radix Road. Coastline (including coconut trees) and cliffs in areas also eroded.

	• Increase in urban development has further compounded erosion of beach and degradation/loss of mangrove and other coastal vegetation • Higher tides and sea level rise leads to coastal erosion and impact coastal infrastructure. E.g. Calmapas Village and its fishing depot impacted by coastal erosion and sea level rise. Calmapas Road near fishing depot impacted and washing away. • Coastal Protection Unit working in Calmapas (2023) and renovating sea wall and other coastal protection works in Guayaguayare (2024). Removed boulders but bridge across impeded. No more chip-chip due to works and so loss of livelihoods. • Continuous seismic surveys for oil and gas exploration impacting fishing

Source: CANARI (2024).

Potential coping and adaptation strategies highlighted during the historical timeline exercise include: seawalls or other coastal protection being built to minimise damage from coastal erosion; greater community involvement and sharing of local knowledge; and monitoring and evaluation in all projects in the community to better understand what works and can be scaled up.

Survey findings

A total of 80 surveys were administered in Mayaro as part of the VCA, with 41 percent of respondents being female, 54 percent male and 5 percent not stating their gender. 24 percent of respondents were aged 18-29, 26 percent were aged 30-39, 22 percent were aged 40-49, 12 percent were aged 50-59 and 13 percent were aged 60 and over. There were also 3 percent of respondents who did not state their age.

46.3 percent of respondents had their primary source of income as "other", including the energy sector, tourism/other private sector enterprises, being self-employed (including food sales) and part-time work in the Community-Based Environmental Protection and Enhancement Programme (CEPEP). 22.5 percent of respondents indicated that the agricultural sector was their primary source of income, 20 percent indicated the public sector and 11.3 percent indicated the fisheries sector.

In terms of secondary sources of income, 28.6 percent of respondents indicated they worked in the agriculture sector, while 16.7 percent indicated fisheries, 4.8 percent indicated public sector and 17.9 percent identified other sources. It should be noted though that 29.8 percent of respondents did not answer in relation to their secondary income source. See Table 2.

54% of the survey respondents who indicated their primary income source as "other" were male and 43% were female, while there were fairly even numbers of men versus women working in the agriculture and public sectors.

Table 2: Sources of income for Mayaro survey respondents.

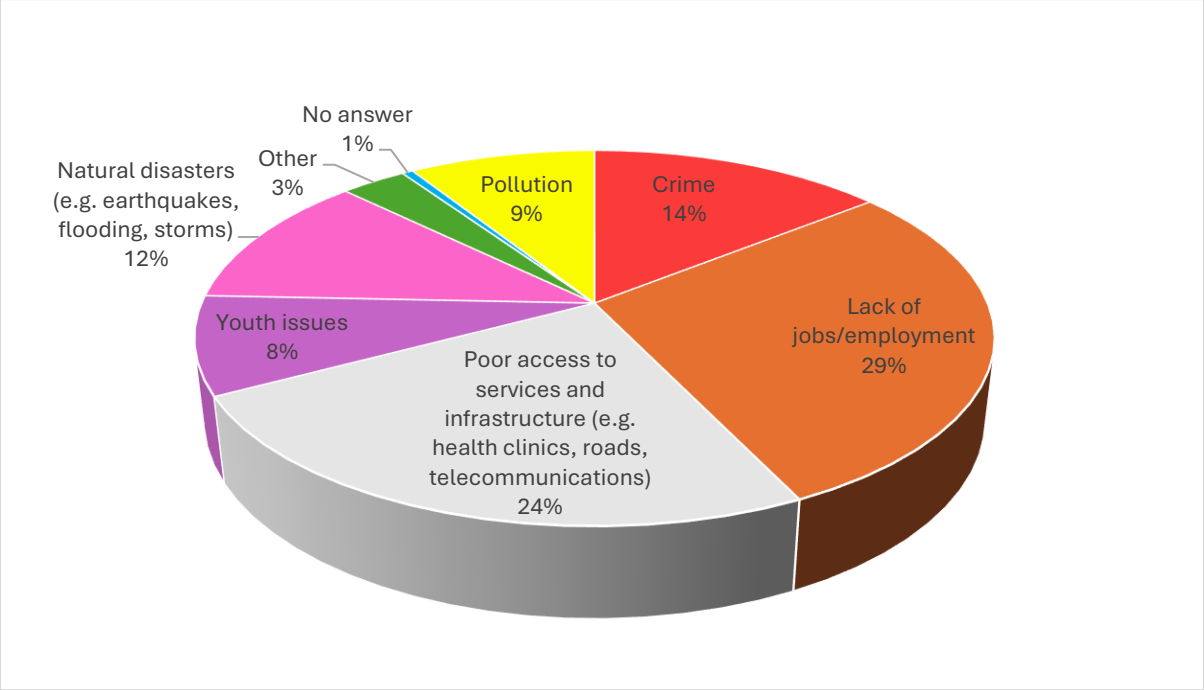
Source of income	Agriculture (%)	Fisheries (%)	Public sector (%)	Tourism (%)	Other (%)	No answer (%)
Primary source	22.5	11.3	20	0	46.3	0

Secondary source	28.6	16.7	4.8	2.4	17.9	29.8

Source: CANARI (2024).

A lack of jobs/employment was the main problem identified by respondents (29 percent), followed by poor access to services and infrastructure (e.g. health clinics, roads, telecommunications) (24 percent) and crime (14 percent). Natural disasters (12 percent), pollution (9 percent) and youth issues (8 percent) were also highlighted as issues affecting respondents' households or livelihoods. See Figure 3.

Figure 3: Main problems impacting Mayaro respondents



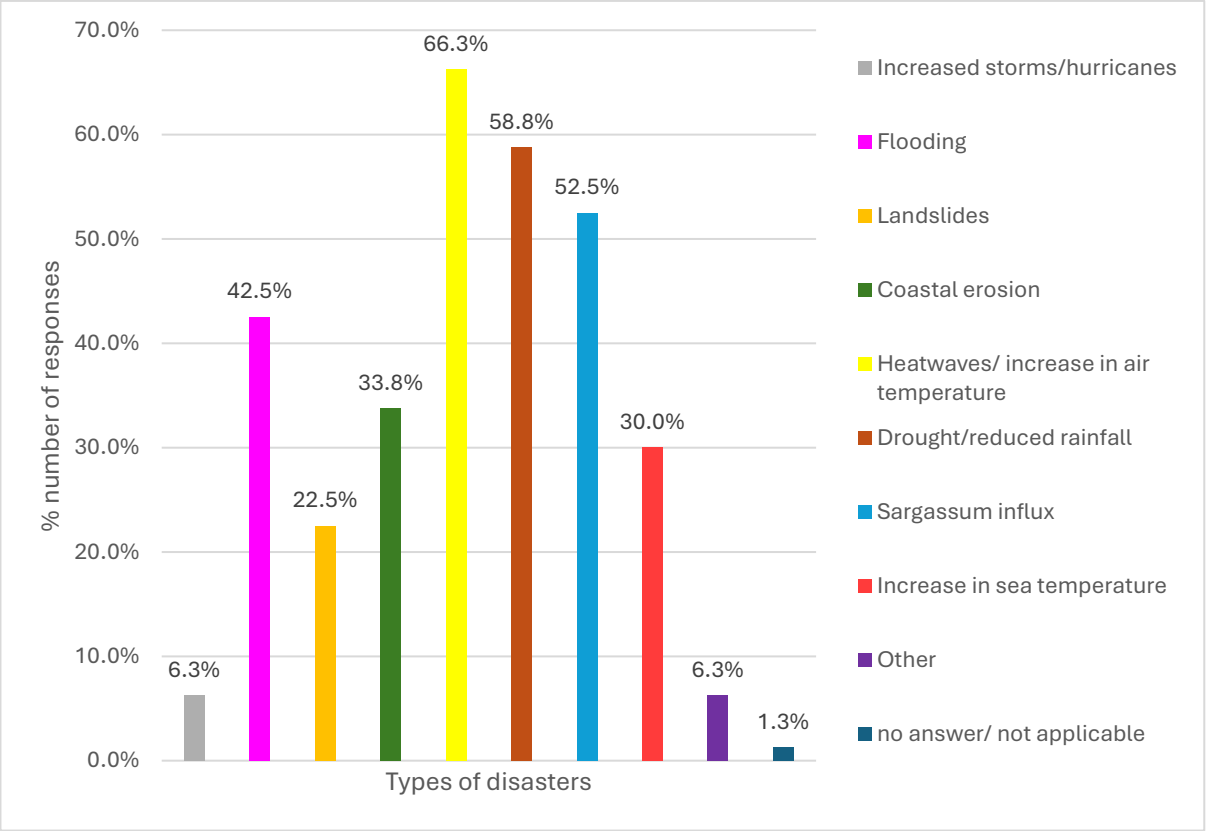
Source: CANARI (2024).

<u>Climate and other hazards affecting Mayaro households/livelihoods since 2010</u>

Heatwaves/ increase in air temperature were identified by respondents as the climate-related hazard most affecting households or livelihoods (66.3 percent), followed by drought/reduced rainfall (58.8 percent), sargassum influxes (52.5 percent), flooding (42.5 percent) and coastal erosion (33.8 percent). Respondents also identified hazards such as increase in sea temperature (30 percent), landslides (22.5 percent) and increased storms/hurricanes (6.3 percent) as posing key threats to their household or livelihood. See Figure 4.

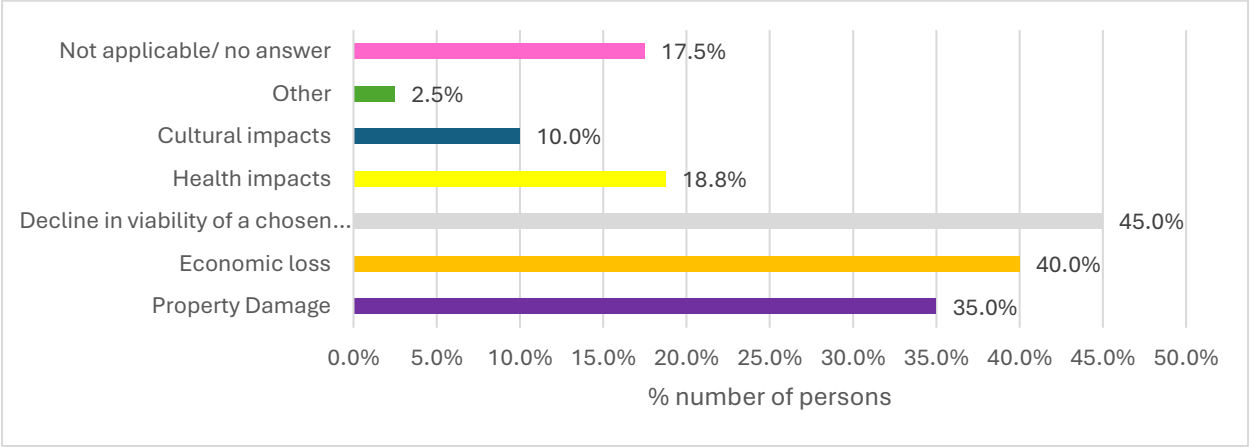
In terms of resulting impacts from these hazards, a decline in the viability of their chosen livelihood (e.g. fishing, agriculture, etc) and economic loss were indicated at 45 percent and 40 percent respectively by survey respondents. Property damage was noted at 35 percent as well as health impacts at 18.8 percent and cultural impacts at 10 percent respectively. 2.5 percent of respondents noted other impacts such as costs due to buying water and damage to households from falling trees. No answer was given by 17.5 percent of respondents. See Figure 5.

Figure 4: Climate and other hazards affecting households and livelihoods in Mayaro.



Source: CANARI (2024).

Figure 5: Impacts from climate and other related hazards identified by Mayaro stakeholders.



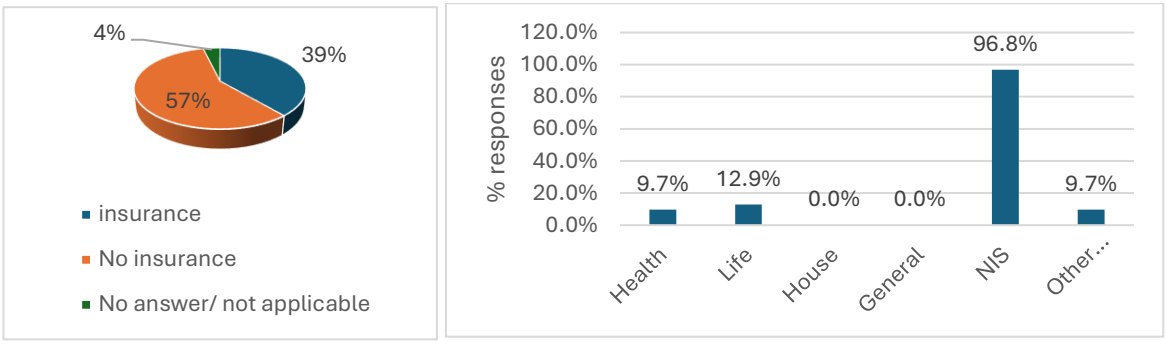
Source: CANARI (2024).

Recovery time and adaptation strategies

Of those surveyed, 38 percent indicated they had recovered from the identified hazards and their impacts in less than 6 months, while 26 percent had taken 24 months or more to recover and 5 percent took 12-24 months and 6-12 months respectively. Interestingly, 33 percent of respondents indicated that they never recovered from the identified hazards. 16 percent of those who recovered indicated that they did so using self-help/personal funds and 5 percent had increased income streams by doing additional work.

57 percent of survey respondents had no insurance to reduce risks and support recovery when needed. Of the 39 percent that had insurance, 96.8 percent had NIS, 12.9 percent possessed life insurance and 9.7 percent health insurance (Figure 6).

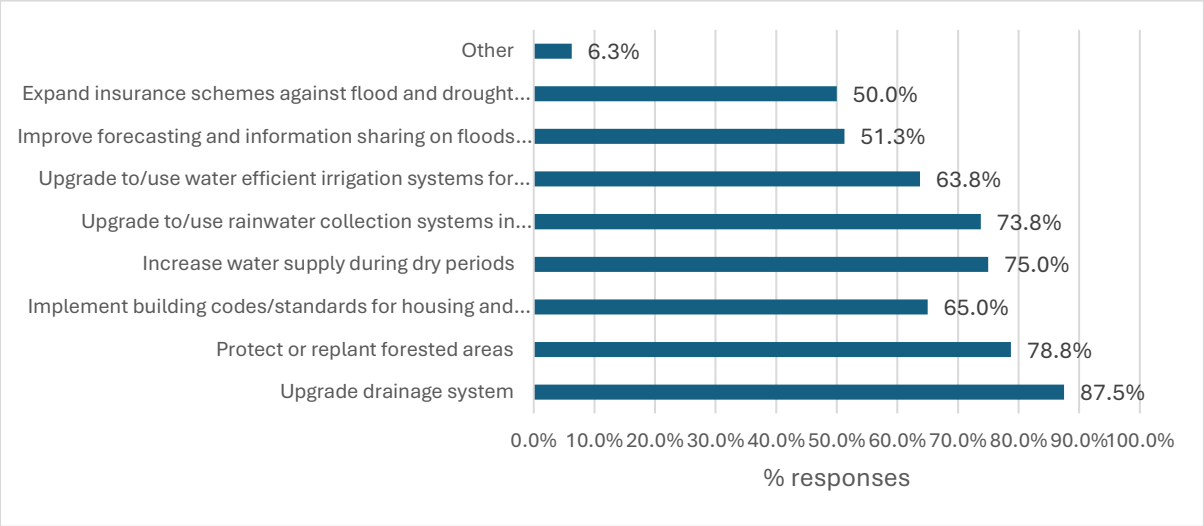
Figure 6: Survey respondents insurance status and type of insurance for Mayaro, Trinidad.



Source: CANARI (2024).

In terms of the priorities for addressing the impacts from floods, drought and other land-based hazards in Mayaro, 87.5 percent indicated that an upgrade in the drainage system should be prioritised, 78.8 percent indicated there was a need to protect or replant forested areas, 75 percent indicated a need for an increase in the water supply during dry periods and 73.8 percent indicated a need to upgrade to/use rainwater collection systems in households (Figure 8).

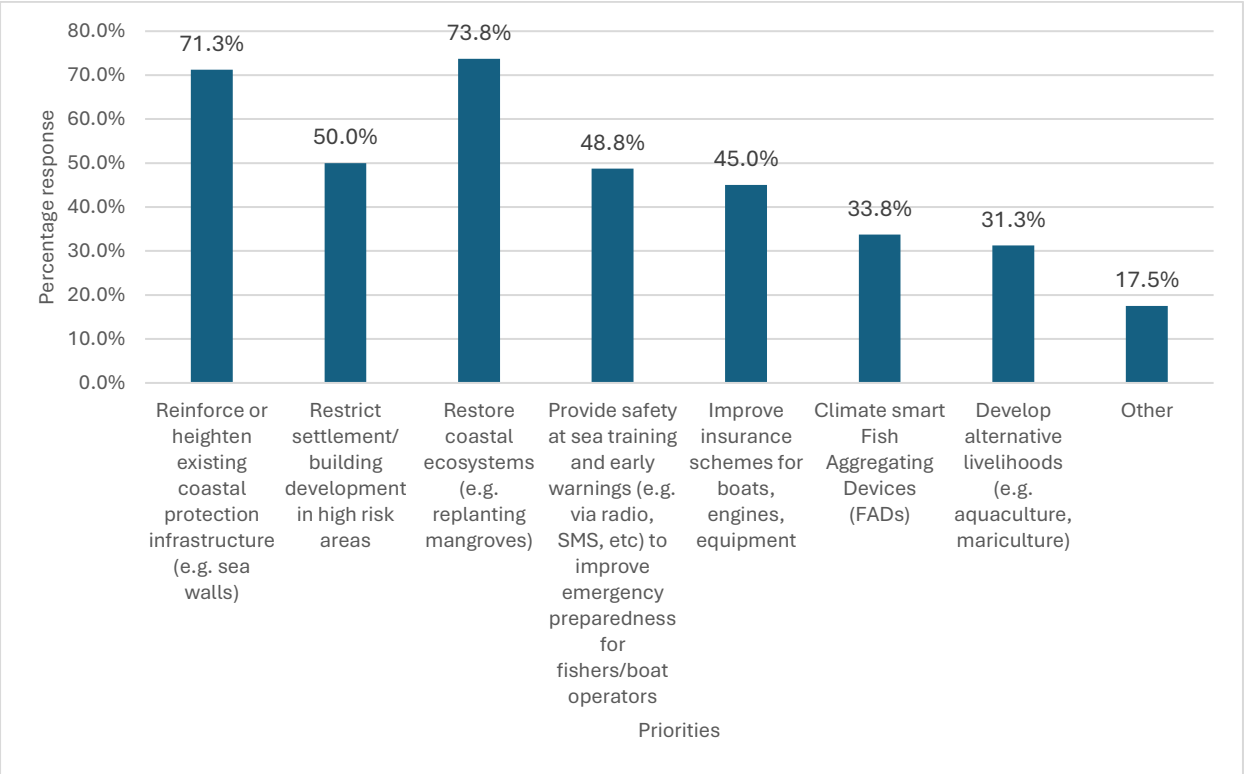
Figure 8: Priorities identified by respondents to address impacts in the wider community related to floods, drought and other hazards, Mayaro, Trinidad.



Source: CANARI (2024).

In terms of the priorities for addressing the impacts from the eroding or changing coast on households and livelihoods in Mayaro, 73.8 percent indicated restoration of coastal ecosystems, 71.3 percent indicated the reinforcement or heightening of existing coastal protection infrastructure (e.g. seawalls), 50 percent indicated restricting settlements/building development in high risk areas and 48.8 percent felt that safety at sea and early warning systems to improve disaster preparedness for fishers/boat operators should be prioritised (Figure 7).

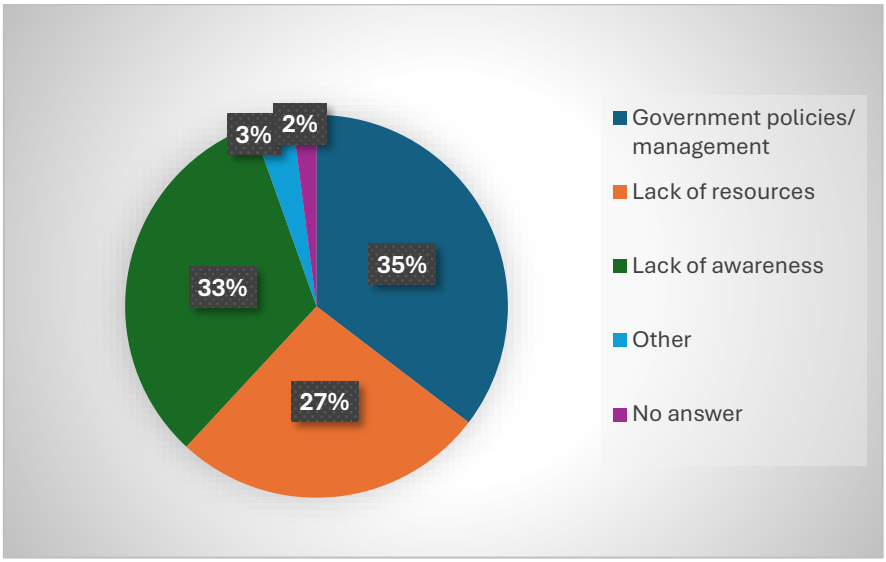
Figure 7: Priorities for addressing impacts from the eroding or changing coast in Mayaro, Trinidad.



Source: CANARI (2024).

In terms of the main barriers to implementation of adaptation measures in Mayaro, 35 percent of respondents indicated there were weak government policies/management, 33 percent indicated a lack of awareness and 27 percent indicated a lack of resources (Figure 10).

Figure 10: Main barriers to putting in place measures to address the impacts identified in Mayaro.



Source: CANARI (2024)

Summary of findings

A summary of the key climate change impacts, vulnerabilities and adaptation priorities is outlined in Table 3.

Table 3: Key climate change impacts, vulnerabilities and adaptation priorities identified by Mayaro stakeholders using the vulnerability and capacity assessment tools.

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
Coastal and marine biodiversity and ecosystems			
• Coastal erosion • Sargassum influxes • Flooding • Landslides and land instability • Extreme/ intense rainfall	• There has been an increase in coastal erosion due to sea level rise and rougher seas, damaging households, guesthouses and other infrastructure along the coast. The coastal erosion has also impacted the cemetery in Guayaguayare which is being washed away. • Increases in sargassum influxes have impacted coastlines and caused damage to fishing boats and nets. • There has been increased degradation of mangroves with coastal erosion and increased urbanisation that impacts fisherfolk	• The coastline of Mayaro, including, mangroves and beach areas that extend to the coast, and associated biodiversity. • Fisherfolk in Mayaro and those dependent on the fisheries sector for their livelihoods (e.g. fishers, boat owners, vendors) including their family members dependent on their income. • Hotel/guesthouse owners with property along the coast.	• Restoring and replanting mangroves as fish nurseries and for coastal and biodiversity protection. • Improved waste management and clearing of sargassum and garbage along shorelines and mangroves. E.g. Underwater and coastal clean ups to remove litter affecting coastal habitats. • Proper management of inland domestic waste and flow of effluents • Better communication between energy/oil and gas sector and all stakeholders about the use of Environmental

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
	due to reduced fish catch and biodiversity. • Additionally, offshore drilling from the oil and gas sector impacted marine biodiversity (chip chips, crabs) and lead to loss of habitats.		Impact Assessments (EIA) and Certificates of Environmental Clearances (CEC).
Livelihoods and socio-economic practices			
• Coastal erosion • Flooding • Landslides and land instability • Extreme/ intense rainfall • Sargassum influxes • Increases in temperature • Drought/dry spells	• Fisheries sector is less productive, with more equipment/costs needed to catch the same number of fish as in the past. • Major flooding due to extreme rainfall and an increase in infrastructural and land development with a lack of planning in terms of infrastructural development. • Flooding in the community also leads to loss of crops and impacts agriculture. • Increases in sargassum influxes have impacted fisherfolk damaging nets and boat engines. Fisheries sector is less productive, with more equipment/costs needed to catch the same number of fish as in the past. Influxes also impact on tourism due to smell from rotting sargassum and unsightly beaches. • Improper agricultural practices lead to land degradation and deforestation, resulting in landslides and soil erosion and a decrease in soil productivity. • Changes in plant growth patterns/ seasonality and crop	• Fisherfolk in Mayaro and those dependent on the fisheries sector for their livelihoods (e.g. fishers, boat owners, vendors) including their family members dependent on their income. • Farmers and those dependent on the agricultural sector. • Hotel/guesthouse owners and tourism-related enterprises.	• Coastal protection (e.g. seawalls and restoring mangroves and other coastal vegetation). • Improved flood protection, including use of sandbags and improved drainage, to reduce the impact on agricultural crops and access for fisherfolk. • Enforced land use regulations to reduce the impacts of unregulated development and deforestation due to agricultural practices. • Increased use of rainwater harvesting and water efficient systems on farms and local businesses to improve water access. • Collection and use of sargassum to create value-added/ commercial products to diversify local livelihoods.

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
	productivity with rising temperatures and more unpredictable rainfall with impacts on farmers and related businesses. • Unreliable water supply and water shortages with longer dry spells.		
Settlements and infrastructure			
• Coastal erosion • Flooding • Landslides and land instability • Extreme/ intense rainfall • Increases in temperature • Drought/dry spells	• Damage and loss of coastal property and infrastructure (including cemetery) due to coastal erosion with sea level rise and rough seas. • This damage is compounded by the lack of beach infrastructure (toilets and shower), food stalls and other community infrastructure to support income generation, and lack of proper lighting in some fishing landing areas. • Increased flooding and landslides/land instability have impacted access to the community and to markets, damaged roads and other urban infrastructure, and restricted transport and flooding. • Heat stress with rising temperatures and hot, dry spells. • Unreliable water supply and shortages with longer dry spells; need to purchase bottled water and added costs for this.	• Households located in at risk areas. • Fisherfolk and those dependent on fisheries sector. • Farmers and those dependent on the agricultural sector. • Hotel/guesthouse owners and tourism-related enterprises. • Beachgoers and residents who use beach facilities.	• Establishment of modern beach infrastructure and other community infrastructure, taking into account coastal erosion and other hazards. • Installation of lights near fishing landing areas to improve use and security. • Increased use of air-conditioning and constructing buildings to improve ventilation. • Increased use of rainwater harvesting and water efficient systems to improve water access.

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation

Source: CANARI (2024).

Stakeholder Validation

A validation exercise was conducted in Mayaro as part of the action planning workshop on July 31, 2024, to review and verify the key climate change impacts and vulnerabilities identified in the VCA from January to June 2024 and note if there was any further information to add.

Below is a summary of additional updates shared by community residents and other stakeholders:

- The impacts of more intense/heavy rainfall may not be well captured as surveys were done in the dry season.
- Fisherfolk take more risks in going out to sea even as there are more extreme weather events and rougher seas especially during the rainy season. Additionally, there are reduced fishing days and ability to catch fish during the rainy season where there are more storms and heavy rainfall.
- New generation is not interested in working land (farming) or sea (fishing), with out-migration to other areas and localised “brain drain”.
- Sargassum influxes impact fishing significantly as high value species (e.g. barracuda) are negatively affected.
- There is a need to better monitor and understand ocean temperatures, and ocean currents and the flow of nutrient rich water, and how these impact fish catch.
- There is also a need to monitor potential pollutants, including effluents, from local tourism enterprises.
- There are several retirees in the community, and their specific vulnerabilities and concerns need to be taken into account, including about a lack of action by the authorities in addressing key issues.
- There should be a recognition of the potential influence of politics in survey responses as we’re coming up to national elections in 2025.

Appendix 4. Mayaro Community Resilience Plan

Bold = priority impacts and actions; ** = top priorities

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
Fisheries						
<u>Coastal erosion and increased wave action</u> due to sea level rise, storms, storm surge and high winds **Impacts:** - **Damage to fishing landing sites and facilities and other key coastal infrastructure (e.g. access roads)** - **Damage to boats, engines and nets/gear** - **Erosion and loss of beach and reduced beach access** - **Decline in fish habitats and coastal ecosystems (e.g. mangroves, seagrass beds and reefs), leading to less fish in nearshore areas, due to coastal erosion**	**Vulnerable areas:** - **Fishing landings along Mayaro beach, including Plaisance, St. Ann's, St. Margaret's and Grand Lagoon** - **Fishing facility at Guayaguayare** **Vulnerable groups:** - **Fisherfolk, including boat owners** - **Households dependent on fishing as main income source** - **Recreational fishers and fishing charters**	- ****Shoreline protection, including revetments/sea walls and coastal re-vegetation, to address erosion and loss of beach** - **Access to insurance for fisherfolk and their boats and engines** - **Possible relocation of fish landing sites/ facilities if there is significant sea level rise and erosion** - **Restoration of coastal ecosystems, including mangroves and seagrass beds** - **Improved development planning and enforcement of laws and regulations pertaining to 'slash and burn' and**	- **Coastal Protection Unit (CPU)/ Ministry of Works and Infrastructure (co-lead)** - **Fisheries Division and Forestry Division/ Ministry of Agriculture, Lands and Fisheries (co-lead)** - **Institute of Marine Affairs (IMA), Environmental Management Authority (EMA) and Town & Country Planning Division/ Ministry of Planning, Economic Affairs and Development (co-lead)** - **Guayaguayare, Ortoire, Mayaro Fishing Association (GOMFA) (co-lead)** - **South East Fishing Association (SEFA)** - **Fisherfolk and local community groups**	- **Technical expertise (coastal engineering, climate adaptation, marine science, ecosystem restoration)** - **Financing (significant costs to build revetments/sea walls)** - **Equipment/ SCUBA gear** - **Materials** - **Seedlings for restoration** - **Labour (can be provided by local community groups for restoration)**	**Short to medium term (1-6 years)**	- **Reduced costs to fisherfolk for loss of beach access and damage of boats, engines and other fishing gear** - **Improved health and extent of mangroves and seagrass beds**

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
and sedimentation; this is compounded by adhoc land development and oil and gas operations		deforestation to reduce sedimentation - Improved use of Environmental Impact Assessments (EIAs) and Certificates of Environmental Clearances (CECs) to reduce negative impacts from oil and gas operations	- Mayaro/Rio Claro Regional Corporation - Mayaro Village Council - Future Fishers, SpeSeas, CANARI and other NGOs - Insurance providers - Oil and gas companies - The University of the West Indies (UWI) - UN Food and Agriculture Organization (FAO)			
<u>Rising ocean temperatures</u> Impacts: - Decline in size and abundance of certain fish (e.g. Ancho) being caught and income earned - Heavy fishing pressure and impacts of oil and gas operations (e.g. seismic testing and drilling) compounds this decline	Vulnerable groups: - Fisherfolk - Households dependent on fishing as main income source - Recreational fishers and fishing charters	- Shift in fishing practices and locations (e.g. targeting different species, fishing further out in deeper, cooler waters, adopting more sustainable practices like biodegradable fish pots) - **Diversification of livelihoods for fisherfolk and other coastal resource users (e.g. aquaculture, apiculture, mariculture), including training and affordable financing	- Fisheries Division/ Ministry of Agriculture, Lands and Fisheries (co-lead) - GOMFA/ SEFA (co-lead) - Fisherfolk - Future Fishers, CANARI and other NGOs - Caribbean Fisheries Training and Development Institute (CFTDI) - UWI - FAO - Caribbean Agricultural Research & Development Institute (CARDI) - Inter-American Institute for Cooperation on Agriculture (IICA)	- Technical expertise (marine science, sustainable fisheries, climate adaptation) - Financing - Equipment - Materials - Labour	Short to medium term (1-6 years)	- Increased number, size and diversity of fish landed in Mayaro - Increased number of livelihood and income-earning options for fisherfolk

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
		for equipment/ materials - **Strengthening of fishing associations in Mayaro to promote a more lucrative and sustainable fishing sector and enable effective co-management - **Provision of fuel subsidy/rebate and social protection measures for fisherfolk to address reduced incomes and rising costs - Improved monitoring of changing ocean conditions and fisheries impacts to inform response	- Oil and gas companies			
<u>Sargassum influxes</u> Impacts: - Blocked access to fish landing sites - Safety issues for fishers, and damage to boats, engines, nets/other fishing gear at sea	Vulnerable groups: - Fisherfolk, including boat owners - Households dependent on fishing as main income source	- ** Safety at sea training, access to required equipment (e.g. GPS, VHF radio) at subsidized costs, and improved early warning systems for fishers - Preventative measures to reduce	- National Sargassum Taskforce (co-lead) - Fisheries Division/ Ministry of Agriculture, Lands and Fisheries (co-lead) - GOMFA (co-lead) - SEFA - Fisherfolk and related businesses	- Technical expertise (marine and fisheries science, disaster response, business development) - Financing - Equipment	Short to medium term (1-6 years)	- Reduced number of safety incidents reported by fisherfolk - Reduced costs from damage or loss of boats,

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
- **Decrease in catch of certain fish species (e.g. Barracuda)** - **Decrease in fishing days and related income**	- **Recreational fishers and fishing charters**	**damage to boat engines (e.g. cages for propellors and regular maintenance) and nets/gear from sargassum** - **Access to insurance for fisherfolk and their boats, engines and gear** - **Diversification and development of alternative livelihoods (e.g. aquaculture, mariculture, collection and use of sargassum to create value-added/commercial products like liquid fertilizer), including training and provision of equipment/ materials**	- **Office of Disaster Preparedness and Management (ODPM)** - **T&T Meteorological Service (TTMS)** - **T&T Coast Guard** - **Mayaro/Rio Claro Regional Corporation** - **Mayaro Village Council** - **Future Fishers, CANARI and other NGOs** - **CFTDI** - **UWI** - **FAO** - **CARDI** - **IICA** - **Finance and insurance providers** - **Telecommunication service providers**	- **Materials** - **Labour**		**engines and gear** - **Increased number of fisherfolk engaged in alternative livelihoods**
<u>Extreme and variable rainfall</u> Impacts: - Damage to Guayaguayare fishing facility and other landing sites, boats,	Vulnerable groups: - Fisherfolk - Households dependent on fishing as main income source	- Access to insurance for fisherfolk and their boats, engines and gear - Safety at sea training, access to required equipment (e.g. GPS, VHF radio) at	- Fisheries Division/ Ministry of Agriculture, Lands and Fisheries (co-lead) - GOMFA (co-lead) - SEFA - Fisherfolk and related businesses	- Technical expertise (fisheries science, disaster response, business development) - Financing	Short to medium term (1-6 years)	- Reduced costs from damage or loss of boats, engines and gear - Reduced number of

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
engines and gear due to storms, rough seas and flooding - Safety issues at sea for fisherfolk with storms, rough seas and strong winds - Decrease in fishing days and related income due to weather conditions and equipment damage - Water shortages and issues accessing potable water for ice and cleaning and processing fish during dry spells/droughts	- Recreational fishers and fishing charters	subsidized costs, and improved early warning systems for fishers - Diversification and development of alternative livelihoods (e.g. apiculture, aquaculture, mariculture), including training and provision of equipment/ materials - Increased use of water storage tanks and rainwater harvesting, and access to ice and refrigeration for fisherfolk, at fishing facility and other key landing sites	- ODPM - TTMS - T&T Coast Guard - Mayaro/Rio Claro Regional Corporation - Mayaro Village Council - Future Fishers, CANARI and other NGOs - CFTDI - UWI - FAO - CARDI - IICA - Finance and insurance providers - Telecommunication service providers	- Equipment - Materials - Labour		safety incidents reported by fisherfolk - Increased number of fisherfolk engaged in alternative livelihoods - Increased access to water and ice for fisherfolk at fishing facility and other key landing sites
Agriculture, Forestry and Land Resources						
<u>Hot, dry spells</u> with rising air temperatures and more variable rainfall **Impacts:** - **Limited water supply** - **Heat stress and changes in productivity in crops and livestock**	**Vulnerable groups:** - **Small-scale farmers** - **Rural women producers and other local agri-businesses** - **Households living in fire-prone areas and**	- ****Adoption of climate-smart agriculture practices (e.g. hydroponics, drought-resistant crops and livestock, water efficient systems), including awareness raising, training and**	- **Agricultural Planning Division/ Forestry Division, Ministry of Agriculture, Lands and Fisheries (co-lead)** - **Farmers and local agri-businesses (co-lead)**	- **Technical expertise (climate-smart agriculture, forestry, fire management)** - **Financing** - **Equipment** - **Materials** - **Labour**	**Short to medium term (1-6 years)**	- **Improved water supply for farmers and agri-businesses** - **Reduced incidence of heat stress-related impacts**

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
- Increased risk of bushfires, leading to loss of crops and livestock and property damage	dependent on agriculture as main income source - Property owners in fire-prone areas	affordable financing for equipment/ materials - Improved forest fire management, including training and use of community fire wardens - Improved access to insurance for farmers, agri- businesses and property owners - Diversification and development of alternative livelihoods (e.g. mariculture, collection and use of agricultural waste and sargassum to create value-added/ commercial products)	- Network of Rural Women Producers T&T (NRWPTT) - National Agricultural Marketing and Development Corporation (NAMDEVCO) - Water and Sewerage Authority (WASA)/ Ministry of Public Utilities - Ministry of Rural Development and Local Government - Mayaro/Rio Claro Regional Corporation - T&T Fire Services - Local community groups - Finance and insurance providers - UWI - CFTDI - FAO - CARDI - IICA			- Reduced costs for loss and damage from droughts and bushfires - Increased number of farmers engaged in alternative livelihoods
<u>Extreme rainfall</u> and high winds leading to floods and landslides Impacts:	Vulnerable groups: - Small-scale farmers - Rural women producers and	- **Adoption of climate-smart agricultural practices to reduce loss and damage (e.g. shade houses, flood-	- Agricultural Planning Division, Ministry of Agriculture, Lands and Fisheries (co-lead)	- Technical expertise (climate-smart agriculture) - Financing - Equipment	Short to medium term (1-6 years)	- Reduced costs for loss and damage to farmers and agri-businesses

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
- **Damage and loss of crops and livestock** - **Soil erosion and damage to farms and related property/ infrastructure** - **Loss of income for farmers and related businesses**	**other local agri-businesses** - **Households dependent on agriculture as main income source**	**resistant varieties, agroforestry), including awareness raising, training and affordable financing for equipment/ materials** - **Improved access to insurance for farmers and agri-businesses** - **Diversification and development of alternative livelihoods (e.g. mariculture, collection and use of agricultural waste and sargassum to create value-added/ commercial products)**	- **Farmers and local agri-businesses (co-lead)** - **NRWPTT** - **NAMDEVCO** - **Ministry of Rural Development and Local Government** - **Mayaro/Rio Claro Regional Corporation** - **Finance and insurance providers** - **UWI** - **CFTDI** - **FAO** - **CARDI** - **IICA**	- **Materials** - **Labour** -		- **Increased number of farmers engaged in alternative livelihoods**
<u>Saltwater intrusion</u> with sea level rise Impacts: - Decline in productivity of crop and livestock farming along coast, including salinization of groundwater and decline in livestock feed	Vulnerable groups: - Small-scale farmers - Aquaculturists and river fishers - Rural women producers and other local agri-businesses - Households dependent on agriculture as	- Adoption of climate-smart agricultural practices to address saltwater intrusion (e.g. expansion of coconut palm production), including awareness raising, training and affordable financing for equipment/ materials - Clearing/excavation of waterways and	- Agricultural Planning Division/ Forestry Division, Ministry of Agriculture, Lands and Fisheries (co-lead) - Farmers, aquaculturists and local agri-businesses (co-lead) - Ministry of Works and Infrastructure (co-lead) - Ministry of Rural Development and Local Government	- Technical expertise (climate-smart agriculture, watershed management, ecosystem rehabilitation) - Financing - Equipment - Materials - Labour	Medium term (4-6 years)	- Reduced loss and damage from saltwater intrusion - Increased number of farmers engaged in alternative livelihoods

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
- Clogged and brackish waterways affecting aquaculture and river fishing	main income source	riverbank rehabilitation - Diversification and development of alternative livelihoods (e.g. mariculture, collection and use of agricultural waste and sargassum to create value-added/ commercial products)	- Mayaro/Rio Claro Regional Corporation - NAMDEVCO - NRWPTT - Local community groups - UWI - FAO - CFTDI - CARDI - IICA - Finance providers			
Tourism						
<u>Coastal erosion</u> with sea level rise, storms and storm surge, and rough seas **Impacts:** - **Erosion and loss of Mayaro Beach and other nearby beaches** - **Limited access to main coastal road with coastal and inland flooding** - **Damage and loss of tourism-related property/ infrastructure and tourist attractions**	**Vulnerable areas:** - **Mayaro Beach** - **Manzanilla-Mayaro Road** - **Nariva Swamp** **Vulnerable groups:** - **Beachgoers and other visitors** - **Hotel and guesthouse owners in at-risk areas** - **Vendors at beaches and nearby areas** - **Other local tourism-related businesses**	- ****Restoration of coastal vegetation (coconut trees and mangroves) and strategic use of revetments/sea walls in high-risk areas to reduce erosion and loss of beach** - **Upgrade of drainage and regular maintenance of Manzanilla-Mayaro coastal road** - **Improved early warning systems on extreme weather for visitors and tourism-related businesses**	- **CPU/ Ministry of Works and Infrastructure (co-lead)** - **Ministry of Trade, Investment and Tourism (co-lead)** - **Hotel/guesthouse and tour operators (co-lead)** - **IMA, EMA and Town and Country Planning Division/ Ministry of Planning, Economic Affairs and Development** - **Forestry Division/ Ministry of Agriculture, Lands and Fisheries** - **ODPM** - **TTMS** - **Mayaro/Rio Claro Regional Corporation**	- **Technical expertise (coastal engineering, construction, ecosystem rehabilitation, sustainable tourism)** - **Financing (significant costs for infrastructure upgrade and maintenance)** - **Equipment** - **Materials** - **Seedlings for restoration** - **Labour**	**Short to medium term (1-6 years)**	- **Reduced costs from loss and damage to local tourism-related businesses** - **Increased number of tourism-related businesses engaged in alternative tourism**

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
- **Decline in visitors (e.g. beachgoers, religious groups and other tourists) and income from tourism**	- **Households dependent on tourism as main income source**	- **Improved access to insurance for tourism-related businesses** - **Development of alternative tourism opportunities that are not dependent on beach/ coastal resources (e.g. agrotourism), including training and affordable financing**	- **Mayaro Village Council** - **SpeSEAS, CANARI and other NGOs** - **Local community groups** - **T&T Incoming Tour Operators' Assocation (TTITOA)** - **UWI** - **Finance and insurance providers** - **Telecommunication service providers**			
<u>Hot, dry spells</u> with rising air temperatures and more variable rainfall Impacts: - Heat stress among visitors and tourism-related businesses - Water shortages and issues accessing potable water - Increase in need for air conditioning/ cooling systems and energy costs for hotels, guesthouses and tourism-related businesses with rising air temperatures	Vulnerable groups: - Beachgoers and other visitors, especially young children and elderly sensitive to heat - Hotel and guesthouse owners - Tour operators - Vendors and other local tourism-related businesses - Households dependent on tourism as main income source	- Awareness raising and improved early warning systems on heatwaves and related impacts - Improved community/ district health services to treat heat stress and other health impacts - Increased use of energy efficient/ renewable energy-powered air conditioning, including incentives/ rebates from government - Increased use of water storage tanks,	- Ministry of Trade, Investment and Tourism (co-lead) - Hotel/guesthouse and tour operators (co-lead) - Mayaro/ Rio Claro Regional Corporation - Mayaro Village Council - Ministry of Health/ Regional Health Authority - Ministry of Education - WASA/Ministry of Public Utilities - Ministry of Energy and Energy Industries - ODPM - TTMS - TTITOA	- Technical expertise (health, climate adaptation, sustainable tourism) - Financing - Equipment - Materials - Labour	Short to medium term (1-6 years)	- Reduced incidence of heat stress among visitors and tourism-related businesses - Reduced costs for use of air conditioning/ cooling systems among tourism-related businesses - Increased use of water

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
- Increase in need and costs for installing and maintaining water tanks and water-efficient appliances due to water shortages		rainwater harvesting and water-efficient systems in tourism-related businesses	- Telecommunication service providers - Caribbean Regional Public Health Agency (CARPHA) - Pan-American Health Organisation (PAHO)			storage tanks and rainwater harvesting among tourism-related businesses
<u>Sargassum influxes</u> Impacts: - Major influxes on beach are unsightly and rotting sargassum has strong odour (hydrogen sulphide gas), resulting in health issues and decline in visitors and income from tourism - Blockage of access to/from sea turtle nesting sites - Damage to electronic equipment and machinery (e.g. corrosion of copper) from hydrogen sulphide gas	Vulnerable groups: - Beachgoers - Elderly, infants and others who suffer from respiratory diseases - Hotel/ guesthouse owners along coast - Other local tourism-related businesses - Households living near coast and dependent on tourism as main income source	- Regular beach clean-ups to avoid pile-up of large amounts of sargassum - Improved monitoring of influxes to inform response - **Collection and use of sargassum to create value-added/ commercial products (e.g. liquid fertiliser), including piloting to identify the most relevant uses and products	- National Sargassum Taskforce (lead) - Ministry of Trade, Investment and Tourism (co-lead) - Hotel/guesthouse and tour operators (co-lead) - Mayaro/ Rio Claro Regional Corporation - Mayaro Village Council - IMA and EMA/ Ministry of Planning, Economic Affairs and Development - Ministry of Health/ Regional Health Authority - ODPM - NAMDEVCO - Local community groups - UWI - FAO - CARDI - IICA	- Technical expertise (marine science including sargassum, climate adaptation, business development) - Financing (significant costs for research and commercial-isation of sargassum-based products) - Equipment - Labour (can be provided by local community groups for clean-ups, monitoring and collection)	Short to medium term (1-6 years)	- Reduced length of time that sargassum stranded on beach - Increased number of value-added/ commercial products from sargassum locally
Settlements and Infrastructure						

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
Hot, dry spells with rising air temperatures and more variable rainfall Impacts: - Decline in availability and quality of potable water for residents, hotels/ guesthouses and other local businesses - Heat stress in residents and workers in local businesses	Vulnerable groups include: - Young children, elderly and other persons sensitive to heat and water stress - Households, especially without pipe-borne water or air conditioning/ good ventilation - good ventilation - Local businesses without pipe-borne water or air conditioning/ good ventilation - Vendors, construction workers and others who spend a lot of time outdoors	- Education and awareness raising on climate change, health impacts, particularly from heat and water stress, and local solutions - **Increased use of rainwater harvesting, storage tanks and water-efficient systems, including use of renewable energy-powered water pumps - Increased use of energy efficient/ renewable energy-powered air conditioning - Improved community/ district health services to treat heat stress and other health impacts	- WASA/ Ministry of Public Utilities (co-lead) - Mayaro/Rio Claro Regional Corporation (co-lead) - Mayaro Village Council (co-lead) - Ministry of Education - Ministry of Health/ Regional Health Authority - Ministry of Energy and Energy Industries - Ministry of Planning, Economic Affairs and Development - Property owners - Local businesses, including construction companies - Local schools - Elderly care providers - Global Water Partnership-Caribbean (GWP-C) - Habitat for Humanity Trinidad and Tobago - CARPHA - PAHO	- Technical expertise (water resources management, renewable energy, engineering, public health) - Financing - Equipment - Materials - Labour	Short to medium term (1-6 years)	- Improved, regular supply of potable water to Mayaro community - Reduced incidence of heat stress and related impacts reported in Mayaro
Coastal erosion, flooding and land slippages with seal level rise, storms	Vulnerable areas: - Manzanilla-Mayaro Road	- **Upgrade drainage and regular	- Ministry of Works and Infrastructure (co-lead)	- Technical expertise (engineering,	Short to medium	- Reduced number of incidents of

Community impacts & risks	Vulnerable areas & groups	Actions to adapt/build resilience	Roles and responsibilities (Lead/supporting actors)	Required resources	Time frame	Indicators of Success
and storm surge, and more extreme rainfall Impacts: - Loss of access to main roads to/from Mayaro - Damage to homes, schools and other public buildings and key infrastructure, and risks to lives and livelihoods - Lanslides and land slippages are compounded by 'slash and burn' practices and deforestation	- Naparima-Mayaro Road - Property in erosion- and flood-prone areas - Guayaguayare cemetery Vulnerable groups: - Young children, elderly and persons with disabilities, who are not mobile - Households - Property owners - Local businesses	maintenance of main access roads - Establish Community Emergency Response Team(s) (CERTs) and provide disaster response training and relevant equipment to allow local community to respond effectively to minor events - Reforestation and riverbank rehabilitation to address flooding and land slippages - Improved access to insurance for households/ property owners - Improved development planning and enforcement of laws and regulations pertaining to 'slash and burn' and deforestation	- Mayaro/ Rio Claro Regional Corporation (co-lead) - Mayaro Village Council (co-lead) - ODPM - EMA and Town and Country Planning Division/Ministry of Planning, Economic Affairs and Development - Forestry Division/Ministry of Agriculture, Lands and Fisheries - Property owners - Local community groups - CANARI, IAMovement and other NGOs - UWI - FAO - Insurance providers	disaster response, ecological restoration) - Financing (significant costs for infrastructure upgrade and maintenance) - Equipment - Materials - Seedlings and plants for reforestation - Labour (can be provided by local community groups for rehabilitation)	term (1-6 years)	loss of access to main roads in Mayaro - Reduced costs for damage of buildings and other community infrastructure