

Country	Antigua and Barbuda
Request ID#	2017000037
Title	Technical Assistance for resilience to climate variability in the building sector of Antigua and Barbuda
NDE	Diann Black-Layne Director, Department of the Environment Ministry of Health and Environment DOE@ab.gov.ag Botanical Gardens, Factory Road, St. John's, Antigua
Proponent	NDE

Summary of the CTCN technical assistance

Hurricanes, floods and droughts are becoming increasingly destructive in Antigua and Barbuda. The recent hurricane Irma left behind three casualties, 1800 evacuated inhabitants and 95 per cent of Barbuda's buildings and infrastructure damaged or destroyed. It is imperative to build back better and ensure that critical public service buildings and emergency services can withstand major local disasters.


The CTCN technical assistance will focus on:

- A. Developing an implementation strategy for the adaptation of existing small to medium public utility facilities using a holistic strategic planning approach based on key sustainable urban planning principles, including separation of the practical works to be contracted out into three themes-industry skillsets: Structural, Electrical and Water;
- B. Technical and strategic input into the ongoing Antigua and Barbuda Government led adaptation policy and planning processes and funding proposals;
- C. Detailed assessment and works preparation for Structural works for up to 30 buildings; and
- D. National capacity building as a crosscutting theme.

Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

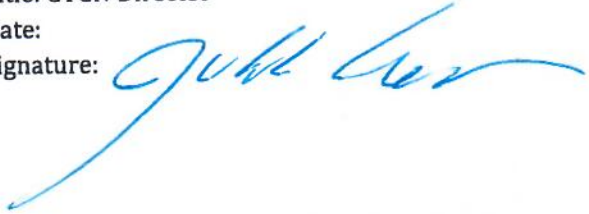
National Designated Entity to the UNFCCC Technology Mechanism

Name: Diann Black-Layne
Title: Ambassador for Climate Change
Date:
Signature: 

Proponent (signature of the Proponent is optional)

Name:
Title:
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UNFCCC Climate Technology Centre and Network (CTCN)

Name: Jukka Uosukainen
Title: CTCN Director
Date:
Signature: 

1. Background and context

Antigua and Barbuda is located in the Americas between the Caribbean Sea and the Atlantic Ocean. Its capital is St. John's and it consists of two main islands Antigua and Barbuda and many smaller islands. Antigua and Barbuda has 100,963 inhabitants (2016) and its main language is English. The GDP of Antigua and Barbuda per capita is \$25,998 (PPP, 2017).

The total area of Antigua and Barbuda is 440 km². The islands are low on humidity and experience droughts outside the rainy season. Both Antigua and Barbuda are low-lying: 70 % of Antigua's area is less than 30 meters above sea level and the majority of Barbuda is only 3 meters above sea level. The rainy season usually takes place from September to November. The average temperature is 27 °C.

Hurricanes strike the islands on an average once a year. Major infrastructure, including power generating stations, is located on the coastline making it highly vulnerable to damage from flooding and storm induced surges. Antigua and Barbuda's water supply is increasingly relying on desalinated water (60-100 per cent) which needs electricity. The grid can be down 2-3 months after a hurricane which means that provision of water is also limited.

On 6 September 2017, a powerful category 5 hurricane, Irma, hit the islands with an over 185 km/h sustained wind speed. There were three casualties and the hurricane damaged or destroyed 95 per cent of Barbuda's buildings and infrastructure, including the fire station, the police station, and the hospital. All of the Barbuda's 1,800 inhabitants were evacuated to Antigua where the wind speeds had been significantly lower (Category 3) and the hurricane did not have as devastating an impact. Reconstruction is estimated to cost at least USD 215 million. As of December, 2017, only 100 people were able to return home to Barbuda due to the lack of healthcare and security services. The IPCC projects that hurricane intensity will increase between 5 and 15% under the mid-range climate scenario.

In January 2018, a UN Environment expert visited Antigua and Barbuda and undertook rapid structural assessments of 18 buildings, 14 on Antigua and 4 on Barbuda. This assessment was designed primarily to support a solar PV installation project, which is one component of a planned building adaptation programme to be implemented over 2019 – 2022. In addition, the assessment was undertaken in communication with the CTCN secretariat and informed the scope and outputs of this technical response plan.

2. Problem statement

Introduction

It is crucial that Antigua and Barbuda manages the reconstruction of key public buildings by "building back better". Antigua and Barbuda is seeking to avoid major destruction during potential future climate-induced disasters. In order to lead a sustainable reconstruction process that reflects projected climate change impacts, Antigua and Barbuda needs support with assessments and recommendations related to adaptation of infrastructure, disaster resilience of building structures, and availability of key services during and post-emergency situations.

Key topics

The following are important for sustainable reconstruction and disaster resilience:

Ensuring service provision pre, during, and post-emergency situations Key public facilities such as hospitals, police stations, medical centers, fire stations, defense force facilities and other public facilities should be fully prepared for climate-induced disasters such as hurricanes, floods and droughts and should stay operational during disaster events, ensuring their services are readily available so that the people and economy can get back up and running with minimal losses. On one hand it is important to ensure that the key official buildings' structures are disaster resistant and can continue hosting key operations. On the other hand the buildings' service inputs such as food, water and electricity need to be sufficient pre- during and post-disaster events.

Hurricane wind resistant building structures In general, damage due to wind forces is greater at higher elevations on a structure. Typical damages due to high winds include missing or damaged roofing and sides of a building and removal of building materials and covering in walls and roof.

Earthquake resistant building structures Antigua and Barbuda are in a seismically active region. Hence it is important that every opportunity is taken to cost-effectively upgrade the earthquake resistance of public buildings. As an absolute minimum, seismic risk should be considered in the design, planning and implementation of and all building works, for any other reason. This can be done along with broader resilience planning at minimal incremental cost.

Flood protection for building structures In general damage due to the storm surge caused by hurricanes will be greater at lower elevations on a structure. Typical damages due to storm surge include water damages due to flooding, displaced or demolished structure and scouring or undermining of foundations. Additionally, inland flooding also increases.

Energy efficiency The energy needs of public facilities are strongly influenced by the efficiency of energy use. The industry standard approach to energy investments is to first invest in efficiency to reduce the peak and average energy demands. This in turn reduces both energy capital and operating budgets. For the buildings under consideration, the efficiency infrastructure investments can be divided into three broad groups: building (insulation, windows, doors), lighting, and equipment (principally air conditioners). In addition, the embodied energy of the new public facilities should be kept low. The embodied energy can be decreased by using durable building materials and building materials that require small amounts of energy to produce. Also, transportation kilometers of building materials to the construction site increase the embodied energy of buildings.

Independent and renewable energy supply The public facilities of Antigua and Barbuda face two distinct energy supply challenges. First of all the grid electricity is expensive and sourced mainly from central fuel oil generators. Secondly the grid cannot be relied upon in the event of a disaster and so the critical facilities need an independent standby energy source. The best integrated solution to these two challenges are not straightforward: solar PV systems, batteries and standby generator systems are all expensive and have a range of drawbacks.

Water supply Public facilities in Antigua and Barbuda use a combination of municipal water distribution lines, site boreholes, site rainwater harvesting and water tanker delivery. Extended droughts reduce the availability of water, both in the networks and on individual site sources. Water provision needs to be secured during droughts and other emergency situations.

Solar water heating Hot water is a critical resource for public health in a post disaster setting. Solar hot water systems greatly reduce the electrical energy demand for heating water, thereby reducing the demand to be serviced by off-grid electrical systems and increasing self-reliance following extreme instances.

Septic systems In order to maintain functioning in a post-disaster context, all public buildings need a well maintained connection to the municipal water treatment units or fully functional on-site septic tanks.

Policy frameworks supporting disaster resilience Building codes should include requirements for construction to provide life safety, an expected level of building performance and damage control during expected disasters. In the context of Antigua and Barbuda, for example, minimum requirements for determining flood loads and load combinations for buildings, proper roof sheathing attachment to structural members, proper member connections to bearing walls, proper uplift connections and attachments and proper sub-base installation are issues to be taken into account. These requirements are different with different building materials and structures used.

Policy frameworks should also include guidance and minimum requirements for Business/Service Continuity Planning (BCP) including food, water and electricity storage and back-up systems specified for different types of key official facilities such as hospitals, police stations, medical centres, fire stations and defense force facilities, to keep them functional during disaster events.

2018 priority assessment and capacity building needs

Based on the background work and the input from the scoping visit, the following priorities are confirmed for 2018:

- A. Developing an implementation strategy for adaptation of existing small to medium public and public utility facilities using a holistic strategic planning approach based on key sustainable urban planning principles, including separation of the practical works to be contracted out into three themes-industry skillsets: Structural, Electrical and Water;
- B. Technical and strategic input into the ongoing Antigua and Barbuda Government led adaptation policy and planning processes and funding proposals;
- C. Detailed structural assessment and reconstruction works preparation and local capacity development for Structural works for up to 30 buildings;
- D. Detailed assessment and works preparation for Electrical works for up to 30 buildings
- E. Detailed assessment and work preparation for Water works for up to 30 buildings.

CTCN funding limits preclude financing all the above needs. Hence, this plan is based on adequately addressing needs A, B and C only. The Antigua and Barbuda Government will seek alternative resources for D and E.

3. Logical Framework for the CTCN Technical Assistance:

	Week					
	1	2	3	4	5	6
Output 1: Development of implementation planning and communication documents						
<p>Activity 1:</p> <ul style="list-style-type: none"> i) A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan; ii) Based on the work plan, a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (please refer to item iv below and section 14 in the Response Plan); iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered (a template will be provided); iv) A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided). <p>Deliverables - Output 1:</p> <ul style="list-style-type: none"> i) Detailed work plan ii) Monitoring and evaluation plan iii) CTCN Impact Description iv) Closure and Data Collection report 						
Output 2 Implementation strategy for existing small to medium public and public utility facilities						
<p>Activity 2.1: Develop, consult, finalize and publish the strategy and provide follow up advice</p> <p>Scoping work has identified that an early and key adaptation challenge will be cost-effectively upgrading the 100+ existing small to medium sized public and public utility buildings dispersed throughout Antigua and Barbuda. These small structures are built with bearing structures of masonry with lightweight timber and metal sheet roofs and they are in constant service.</p> <p>The majority of such structures are not expected to meet the new Antigua and Barbuda Building Code, which is scheduled for release in 2018. In addition, many of the buildings are now intended to play an increased role in post-disaster response and recovery and so need both increased resilience and the capacity to reliably operate off-grid in</p>						

the post-disaster period.

The competing priorities for building investment in general include:

- Constructing new buildings that adhere to disaster resilience standards and energy efficiency standards;
- Conducting routine building repairs, due to age and ongoing use;
- Increasing high wind resistance, for roofs, doors and windows of existing buildings;
- Increasing earthquake resistance of existing buildings ;
- Reducing building flood risk – via structural improvements and site drainage works of existing buildings;
- Improving energy efficiency, via insulation and window upgrades, efficient lighting and equipment of existing buildings
- Installing mosquito screens on doors and windows and sealing buildings to reduce disease risk of new and existing buildings;
- Developing independent and renewable energy supplies and storage - both electrical and hot water for new and existing buildings ;
- Developing independent water supplies for new and existing buildings ; and
- Ensuring adequate on-site or off-site treatment of wastewater for new and existing buildings.

To create a holistic strategic plan to guide the prioritization for building investment it is important to look at the various parameters that affect urban development, including realistic disaster scenarios, location of the public facilities, access, resilient infrastructure provision, future expansion and population growth etc. For this, it is advisable to use key urban planning principles as guidance.

In addition to the investment options for individual facilities, there is the open question of the degree of centralization and standardization for the government departments and authorities that own or manage large portfolios of small to medium sized buildings. Economies of scale are important in addressing adaptation in such portfolios.

The works for specific priorities may be cost-effectively bundled into specific contracts, as they are closely related and employ the same general skillset. Bundling the works also reduces the disruption of repeated small projects. Based on the scoping work, the following bundle is suggested for this Technical Assistance:

Structural

- Routine building repairs, due to age and ongoing use;
- Increasing high wind resistance, for roofs, doors and windows;
- Increasing earthquake resistance;
- Improving building energy efficiency, via insulation and window upgrades, efficient lightning and

equipment;

- Mosquito screens on doors and windows and sealing buildings; and
- Roof guttering as part of water harvesting.

The funding for implementing the works is anticipated to come from a blend of government funds and international climate adaptation funding. These funds will arrive in the form of annual and project budgets, with different governance processes, funder priorities and schedules. This amalgamation of funds needs to be converted into a feasible and management implementation strategy/strategic plan and set of work plans.

Realistic disaster scenarios will inform the strategy. Antigua and Barbuda in the past few years have experienced the following impacts:

1. A category 5 hurricane (185 km/hour sustained winds)
2. extreme flooding (1-in-50-year event)
3. extended drought (three-year meteorological drought)

Downscaled climate models for the Caribbean using IPCC scenarios indicate that hurricanes could intensify by 5 – 15%, the island will experience more extreme rainfall variability including flooding and extended drought, and 1m sea level rise and increased storm surge.

In this context, the implementer will work with the Antigua and Barbuda Government to develop a risk and cost-benefit approach to adaptation and disaster risk reduction for the existing small to medium sized public and public utility buildings and package this into an implementation strategy/strategic plan document. This will include an outline cost estimate table, broken down by building and intervention.

After the strategy is finalized and published, the implementer will remain on call for advice as it is expected that the process of converting the plan into a set of financed projects and work plans will strike a range of technical, financial and potentially even political challenges.

During missions, the implementer will be accompanied by focal points from Antigua and Barbuda (i.e. Technology Executive Committee) as an on-the job-training. The government of Antigua and Barbuda can support the implementer by providing: (i) local transportation for the expert (and local trainees i.e. TEC), (ii) a meeting room (iii) office space for the implementer during her/his mission, (iv) GIS data, maps, drawings pictures and other relevant information, and (v) support from a social and gender expert.

Activity 2.2: Adaptation proposal, policy, planning and legislative input

Throughout 2018, the Antigua and Barbuda Government will be continuing the process of developing policies, plans and legislation linked to adaptation. The proposed infrastructure investments provide an early opportunity for proof-

testing the adaptation concepts against economic and practical realities, potentially resulting in improved policies, plans and legislation.

The implementer will remain on call in 2018 for advice, with a focus on the practical and technical aspects of adaptation and mitigation as it relates to the continued provision of critical government services through enhancing the resilience of physical infrastructure. Time is also allocated to technically support the Antigua and Barbuda government led development of Green Climate Fund and other funding proposals for urban adaptation and mitigation based on their adaptation plans and the implementation strategy in activity 2.1.

Deliverables - Output 2:

- i) Final draft implementation strategy document/strategic plan
- ii) Cost estimates for strategy implementation
- iii) Technical advice notes and text for adaptation funding proposal, policy, planning and legislative input

Output 3: Structural works preparation for up to 30 buildings and implementation troubleshooting

Activity 3.1. General works preparation

The two goals of the works preparation phase are to a) set up the structural programme for procurement and implementation and b) build the capacity of the national workforce through practical experience under expert guidance. This phase will entail joint work between a senior structural engineering consultant, a local junior civil engineer and Antigua and Barbuda government engineers and technicians.

The desired detailed endpoints for this phase are:

- The generic work scope, method statements and quality standards for increased structural resilience have been developed for insertion into bid documents
- Up to 30 detailed work packages consisting of a works list and a basic site plan have been developed for insertion into bid documents.
- Engineering cost estimates have been developed for each work package and converted into unit rates and costing rules of thumb.
- The Antigua and Barbuda government has used the above inputs in funding proposals and in project plans and procurement documentation.
- Local engineers and technicians have increased their technical capacity and practical experience.
- Basic drawings have been prepared for the parts of the buildings that will be worked on.

The list of the targeted buildings for detailed work package development is as follows:



1. Hannah Thomas Hospital, Barbuda
2. Police Office, Barbuda
3. Fire Station, Barbuda
4. Mount St John's Medical Centre (MSJMC), Antigua
5. Royal Police Force of Antigua and Barbuda (RPFAB) Headquarters, Antigua
6. St John's Fire Station, Antigua
7. All Saints Clinic, (part of the All saints complex), Antigua
8. All Saints Fire Station, (part of the All saints complex), Antigua
9. All Saints Complex Police Station, (part of the All saints complex), Antigua
10. Royal Antigua & Barbuda Defence Force, Antigua
11. Clarevue Psychiatric Hospital, Antigua
12. Fiennes Institute, Antigua
13. National Office of Disaster Services (NODS), Antigua
14. Department of Environment Office, Antigua
15. Meteorological Office, Antigua
16. Antigua State College, Antigua
17. Her Majesty's Prison, Antigua
18. Bendals Clinic, Antigua
19. Bolans Clinic, Antigua
20. Fiennes Institute, Antigua
21. Good Shepherd Home for Children, Antigua
22. Holberton Hospital - Childrens Ward, Antigua
23. Holberton Hospital - Hospice, Antigua
24. Nyahbinghi Theocracy School, Antigua
25. Old Road Clinic, Antigua
26. Parham Clinic, Antigua
27. Potters Clinic, Antigua
28. Swetes Clinic, Antigua
29. Victory Centre, Antigua
30. Willikies Clinic, Antigua

The implementer shall undertake an initial mission to meet the key stakeholders and inspect a representative sample from among the up to 30 buildings. From that visit the following items will be developed;

- A draft bid package (Employer Requirements section only) covering the generic work scope, method statements and quality standards.
- A guidance note for the local team for the data collection, detailed assessment and cost estimation work for up to 30 buildings.

During her/his missions the implementer will be accompanied by focal points from Antigua and Barbuda so as to provide on-the-job-training. The government of Antigua and Barbuda can support the implementer by providing: (i) local transportation for the expert (and local trainees i.e. TEC), (ii) a meeting room for the training lecture, (iii) office space for the implementer during her/his mission, (iv) GIS data, maps, drawings pictures and other relevant information, and (v) support from a social and gender expert.

Activity 3.2: Local capacity building, site inspections and site work package development

The implementer shall undertake a second mission to progress the work packages. Visit activities will include:

- Consultation on the draft bid package.
- On-site training of the local engineer and the Antigua and Barbuda government team for site inspections and development of the 30 work packages.
- Accompaniment of the local teams as they progress the first inspections and development work.

The local junior civil engineer will be responsible for the detailed inspection of all 30 facilities and compilation of the draft work packages. Thereafter the senior engineer shall remotely review and edit the work packages once they are drafted.

Activity 3.3 Implementation troubleshooting

The implementer will remain on call in 2018 for remote advice during the procurement and implementation works.

Deliverables - Output 3:

- A draft bid package (Employer Requirements section only) covering the generic work scope, method statements and quality standards
- Standard structural drawings covering only the matters to be addressed
- Training guidance and material on structural inspections and works estimations
- Structural inspection and work estimation reports for up to 30 buildings (developed by the local engineer and reviewed by the implementer)
- Technical advice notes for the 2018 procurement and implementation activities

4. Resources required and itemized budget:

Please provide an *indicative overview* of the resources required and itemized budget required to implement the CTCN technical assistance, including for M&E-related activities, using the table below. Important to note that minimum 1% of the budget should explicitly target gender-specific activities related to the technical assistance (please see section 10 for further information on gender). Once the Response Plan is completed, a Response Implementation partner(s) will be selected by the Climate Technology Centre (CTC). A detailed activity-based budget for the CTCN assistance will be finalized by the CTCN and selected Implementer.

Activities and Outputs	Input: Human Resources (Title, role, estimated number of days)	Input: Travel (Purpose, national vs. international, number of days)	Inputs: Meetings/events (Meeting title, number of participants, number of days)	Input: Equipment/Material (Item, purpose, buy/rent, quantity)	Estimated cost	
					Minimum	Maximum
Output 1: Development of implementation planning and communication documents						
Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.	2 days		2 teleconferences		USD 1600	USD 2000
Output 2: Implementation strategy for existing small to medium public and public utility facilities						
Activity 2.1: Develop, consult, finalize and publish the strategy and provide follow up advice	Senior advisor, 20 days	3 international missions, 5 days each,	10 short working meetings: 6 over the three missions and 4 teleconferences		16000 USD + 12000 Tr	20000 USD + 12000 Tr
Activity 2.2: Adaptation proposal, policy, planning and legislative input	Senior advisor, 10 days	Travel is inc. in 2.1	2 teleconferences		8000 USD	10000 USD

Output 3: Structural works preparation for up to 30 buildings and implementation troubleshooting				
Activity 3.1: General works preparation	Senior structural engineer, 10 days. Junior engineer 5 days	1 international mission 7 days	5 days of working and site meetings + 2 teleconferences	8000USD + 2500 + 4000 Tr
Activity 3.2: Local capacity building, site inspections and site work package development	Senior structural engineer, 10 days. Junior engineer 25 days	1 international mission 7 days	5 days of working and site meetings + 2 teleconferences	10000 USD + 15000 + 4000 Tr
Activity 3.3: Implementation troubleshooting	Senior structural engineer, 5 days	Nil	5 teleconferences	4000USD
Estimated range of costing for the entire Response Plan				
				80,600USD
				95,750 USD

5. Profile and experience of experts

Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan.

Experts required	Brief description of required profile
Please use the same titles for all experts as applied in section 4.	Please provide a short description of expertise and experience needed (education, sectors of expertise, years of experience, country experience, language requirements, etc.).
Senior advisor	Civil, or structural engineer, at least 20 years of total experience, experience related to construction, disaster damage assessments, sustainable energy, adaptation policy, tropical climate zones/small island states, fluency in English
Senior structural engineer	Senior level structural engineer, at least 10 years of total experience, experience in structural engineering of public buildings, damage assessment of disaster damage of public buildings, hurricane, flood and earthquake resistant structures, building energy efficiency, tropical climate zones/small island states, fluency in English
Junior civil engineer	Civil engineer, at least 2 years of post-graduate experience, experience in structural engineering of public buildings, tropical climate zones/small island states, fluency in English

6. Intended contribution to impact over time

The intended impact of the technical assistance is to build the resilience of the structures and the services of critical service buildings to major local disasters including level 5 hurricanes, floods and droughts. The goal is that the recommendations of this technical assistance would support a reconstruction where the reconstructed key public buildings would have disaster resilient structures with resistant major building parts and resilient building materials.

7. Relevance to NDCs and other national priorities

Currently, buildings are extensively damaged during extreme climate events and this threatens and interrupts lives, the economy and national security. Antigua and Barbuda suffered devastating losses in 2017 due to the impacts of the Hurricane season. Hurricane Irma was the strongest hurricane recorded in the Atlantic, and Hurricane Maria was the fastest intensifying on record – Maria strengthened from a Category 1 to a Category 5 hurricane in less than 18 hours. This is consistent with IPCC projections of the Caribbean. The post disaster recovery needs assessment concluded that the total damage of the hurricanes Irma and Maria for Antigua and Barbuda totalled EC\$ 367.5 million (US\$ 136.1 million), while losses amount to approximately EC\$ 51.2 million (US\$ 18.9 million). Recovery needs amount to EC\$ 600.1 million (US\$ 222.2 million).

Built structures and emergency services suffered severe losses.

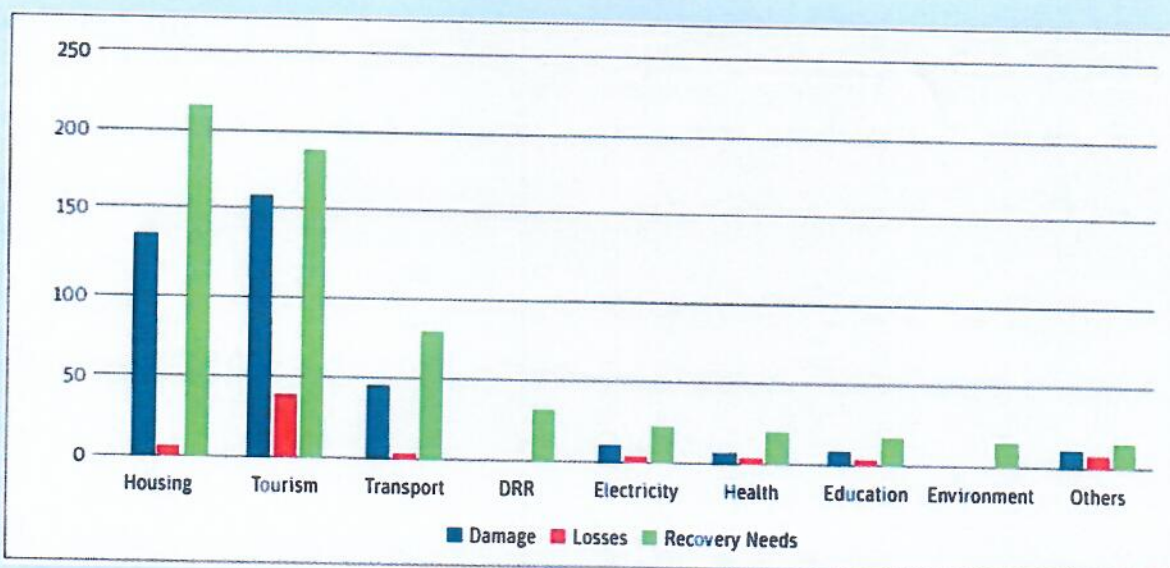


Figure 1. Damage, Losses and Recovery Needs by sector (M EC\$) (Source: World Bank draft PDNA, 2017)

These damages are beyond the Government of Antigua and Barbuda's financial capacity to repair and restore, resulting in a backlog of repair and maintenance activities that: i) further increases the buildings' vulnerability to extreme climate events; and ii) impairs the delivery of critical services during and following extreme climate events. The vicious cycle of continually degrading buildings and insufficient funds for repairs and maintenance will result in ongoing non-delivery of critical services during and following extreme climate events.

Reducing maintenance costs, climate proofing buildings and maintaining continuous services will reduce the expected losses and damages for any given extreme climate event. This is a national priority

for the country. Climate resilience goals are reflected in the country's Nationally Determined Contribution (NDC) and Medium Term Development Strategy as well as the National Poverty Reduction Strategy, among others.

Climate-proofing critical service buildings will improve the Government of Antigua and Barbuda's capacity to take out insurance cover against extreme climate events. This would also contribute to one of the country's targets outlined in their NDC, namely insuring all buildings in Antigua and Barbuda.

The technical assistance is in line with Antigua and Barbuda's INDC Conditional Adaptation Target 2: By 2030, all buildings are improved and prepared for extreme climate events, including drought, flooding and hurricanes. TNA and NAPs have not been completed in Antigua and Barbuda.

8. Linkages to relevant parallel on-going activities:

Antigua and Barbuda has GEF Trust Fund resources, GEF SCCF and Adaptation Fund funded projects ongoing in the area of climate adaptation, a GCF Readiness grant and a concessional loan (USD 115 M) from Abu Dhabi Fund for Development. The Global Climate Change Alliance (GCCA) Project on Climate Change Adaptation (CCA) and Sustainable Land Management (SLM) in the Eastern Caribbean, with the OECS Commission serving as Executing Entity, with two components: 1) Effective and sustainable land management frameworks and practices, and 2) Specific physical adaptation pilot projects in relevant areas or sectors.

Additionally, Antigua and Barbuda is preparing two proposals to the GCF: 1) *Resilience to hurricanes, floods and droughts in the building sector in Antigua and Barbuda* that is under development and 2) *Transitioning Antigua and Barbuda's off-grid diesel generation to low-carbon wind, solar, battery and hybrid renewable energy systems for critical services* that has already been submitted. The CTCN Technical Assistance will have a key role in the preliminary assessments and recommendations for 30 public buildings included in the "Resilience to hurricanes, floods and droughts in the building sector in Antigua and Barbuda" GCF proposal that will concentrate on implementation of disaster resistant building methods and installation of disaster resistant service inputs.

The "Transitioning Antigua and Barbuda's off-grid diesel generation to low-carbon wind, solar, battery and hybrid renewable energy systems for critical services" concept note for the Green Climate Fund includes energy audits for key essential and emergency service facilities to provide in-depth analysis (e.g. demand curve, special requirements, retrofit opportunities) and provide stand-alone solar, stand-alone wind and solar hybrid, and wind-diesel generator hybrid systems for hospitals, schools, clinics, reverse osmosis plants, police stations, Antigua and Barbuda Defense force and community hurricane shelters. The CTCN Technical Assistance will support this intervention by helping prepare the targeted buildings for energy investment.

9. Anticipated follow up activities after this technical assistance is completed:

National focal points (i.e. TEC) will be trained through practical lectures and on-the-job training related to structural damage assessments, adaptation of building sites to resist the effects of flooding and other matters related to resilience of key public buildings and their service inputs to level 5 hurricanes, major floods and drought. The goal of the training is to provide local professionals with sufficient skills to undertake similar assessments and activities in the other 100+ public buildings.

The goal of the outputs from this technical assistance is to enable the Antigua and Barbuda government to smoothly progress from early project development onto funding confirmation and project implementation.

The resiliency approach to construction of public buildings in Antigua and Barbuda can further inspire other small island states in the region and in other parts of the world to revise their building codes and construction practices in order to support disaster resiliency of key emergency services.

10. Gender and co-benefits:

Imbedded in design of the activities:	<p>The recommendations deriving from structural and building site assessments will take into account the accessibility and user friendliness of all groups of people including gender, vulnerable groups, youth and persons with disabilities.</p> <p>The government of Antigua and Barbuda will provide the consultants support from a social and gender expert who will ensure gender mainstreaming of all activities during implementation of the technical assistance.</p> <p>When selecting consultants, CTCN will consider equally candidates of both genders. Similarly, the government of Antigua will aim to have a gender balance when selecting national focal points for the on-the-job trainings.</p>
Gender and co-benefits intended as result of the activities:	<p>The goal of the gender mainstreamed recommendations deriving from structural and building site assessments is to ensure that the reconstruction of key public buildings and their service inputs will take into account accessibility and user friendliness of both genders as well as youth and disabled people. As medical facilities are also targeted, it is expected that the activities will contribute to increased maternal health.</p> <p>Representation of both genders in the on-the-job trainings will ensure that professional capacity related to resilience of public buildings will be built for both women and men.</p>

11. Main in-country stakeholders in implementation of the technical assistance activities:

Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance
Diann Black-Layne, Director, Department of the Environment	NDE and request applicant
Ministry of Finance	Evaluating tradeoffs and endorsing final reports and recommendations
Development Control Authority	Recipient of the on-the-job trainings; Capacity building for building inspectors to improve climate adaptation assessments
Ministry of Public Works and Housing	Maintenance of public assets
Focal points from Technical Executive Committee (TEC)	Recipient of the on-the-job trainings
Government of Antigua and Barbuda	Upon signing data sharing agreements, the Government of Antigua and Barbuda will provide the Implementer with available topographic information / elevation, pictures, maps, drawings and other relevant information where possible

12. SDG Contributions:

Instructions: Please complete the grey section below for a maximum of three SDGs that will be advanced through this TA. A complete list of SDGs and their targets is available here:

<https://sustainabledevelopment.un.org/partnership/register/>.

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	
	7.3 - By 2030, double the global rate of improvement in energy efficiency	
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among countries	
11	Make cities and human settlements inclusive, safe, resilient and sustainable	The technical assistance aims to pave the way for "building back better" key public buildings and their service inputs in urban areas of Antigua and Barbuda.
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	The technical assistance aims to build the adaptive capacity of key public buildings and their service inputs in

		urban areas in Antigua and Barbuda to withstand level 5 hurricanes, major floods and droughts.
	13.2 - Integrate climate change measures into national policies, strategies and planning	
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	The technical assistance aims to improve the capacity of national professionals to undertake structural and building site assessments of key public buildings in order to improve the resilience of reconstructed public buildings in Antigua and Barbuda.
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	

13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

Please tick off the relevant boxes below	Primary	Secondary
<input type="checkbox"/> 1. Decision-making tools and/or information provision	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 2. Sectoral roadmaps and strategies	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 3. Recommendations for law, policy and regulations	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 4. Financing facilitation	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 5. Private sector engagement and market creation	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 6. Research and development of technologies	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 7. Feasibility of technology options	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 8. Piloting and deployment of technologies in local conditions	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 9. Technology identification and prioritisation	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.