

# Funding Proposal

---

## **FP133: Resilience to hurricanes in the building sector in Antigua and Barbuda**

Antigua and Barbuda | Department of Environment, Ministry of Health and Environment,  
Government of Antigua and Barbuda (DOE\_ATG) | Decision B.26/02

21 August 2020



**GREEN  
CLIMATE  
FUND**

# Funding Proposal

|                            |  |
|----------------------------|--|
| Project/Programme title:   | Resilience to hurricanes in the building sector in Antigua and Barbuda |
| Country(ies):              | Antigua and Barbuda  |
| Accredited Entity:         | Department of Environment, Antigua and Barbuda                         |
| Date of first submission:  | <u>2019/11/09</u>  |
| Date of current submission | <u>2019/11/09</u>  |
| Version number             | <u>V.001</u>   |



## Contents

|           |   |
|-----------|---|
| Section A | <b>PROJECT / PROGRAMME SUMMARY</b>                      |
| Section B | <b>PROJECT / PROGRAMME INFORMATION</b>                  |
| Section C | <b>FINANCING INFORMATION</b>                            |
| Section D | <b>EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA</b> |
| Section E | <b>LOGICAL FRAMEWORK</b>                                |
| Section F | <b>RISK ASSESSMENT AND MANAGEMENT</b>                   |
| Section G | <b>GCF POLICIES AND STANDARDS</b>                       |
| Section H | <b>ANNEXES</b>  |

### *Note to Accredited Entities on the use of the funding proposal template*

- Accredited Entities should provide summary information in the proposal with cross-reference to annexes such as feasibility studies, gender action plan, term sheet, etc.
- Accredited Entities should ensure that annexes provided are consistent with the details provided in the funding proposal. Updates to the funding proposal and/or annexes must be reflected in all relevant documents.
- The total number of pages for the funding proposal (excluding annexes) **should not exceed 60**. Proposals exceeding the prescribed length will not be assessed within the usual service standard time.
- The recommended font is Arial, size 11.
- Under the [GCF Information Disclosure Policy](#), project and programme funding proposals will be disclosed on the GCF website, simultaneous with the submission to the Board, subject to the redaction of any information that may not be disclosed pursuant to the IDP. Accredited Entities are asked to fill out information on disclosure in section G.4.

**Please submit the completed proposal to:**

[fundingproposal@gcfund.org](mailto:fundingproposal@gcfund.org)

**Please use the following name convention for the file name:**

“FP-[Accredited Entity Short Name]-[Country/Region]-[YYYY/MM/DD]”

| A. PROJECT/PROGRAMME SUMMARY   |  |   |   |
|--|--|---|---|
| <b>A.1. Project or programme</b>   | Project  | <b>A.2. Public or private sector</b>                                    | Public  |
| <b>A.3. Request for Proposals (RFP)</b>                                  | Not applicable   |   |   |
| <b>A.4. Result area(s)</b>   | <p><b>Mitigation:</b> Reduced emissions from:</p> <input type="checkbox"/> Energy access and power generation:<br><input type="checkbox"/> Low-emission transport:<br><input type="checkbox"/> Buildings, cities, industries and appliances:<br><input type="checkbox"/> Forestry and land use: <p><b>Adaptation:</b> Increased resilience of:</p> <input checked="" type="checkbox"/> Most vulnerable people, communities and regions:<br><input type="checkbox"/> Health and well-being, and food and water security:<br><input checked="" type="checkbox"/> Infrastructure and built environment:<br><input type="checkbox"/> Ecosystem and ecosystem services: |   | <p><b>GCF contribution:</b></p> <p><u>Enter number</u>%<br/> <u>Enter number</u>%<br/> <u>Enter number</u>%<br/> <u>Enter number</u>%</p> <p>34%<br/> <u>Enter number</u>%<br/> 66%<br/> <u>Enter number</u>%</p> |
| <b>A.5. Expected mitigation impact</b>                                   | <i>Indicate t CO<sub>2</sub>eq over lifespan</i>   | <b>A.6. Expected adaptation impact</b>                                  | <p>Direct beneficiaries: ~73,216 people (52% of which are women and 48% of which are men)<br/> Indirect beneficiaries: the entire population of Antigua and Barbuda (equivalent to ~96,000 people).</p>           |
| <b>A.7. Total financing (GCF + co-finance)</b>                           | 46.1 <u>million</u> USD  | <b>A.9. Project size</b>  | Small (Upto USD 50 million)   |
| <b>A.8. Total GCF funding requested</b>                                  | 32.7 <u>million</u> USD  |   |   |
| <b>A.10. Financial instrument(s) requested for the GCF funding</b>       | <input checked="" type="checkbox"/> Grant      32.7 million USD <input type="checkbox"/> Equity <u>Enter number</u><br><input type="checkbox"/> Loan <u>Enter number</u> <input type="checkbox"/> Results-based payment <u>Enter number</u><br><input type="checkbox"/> Guarantee <u>Enter number</u>  |   |   |
| <b>A.11. Implementation period</b>                                       | 6 years  | <b>A.12. Total lifespan</b>   | 50 years  |
| <b>A.13. Expected date of AE internal approval</b>                       | 11/8/2019  | <b>A.14. ESS category</b>   | B   |
| <b>A.15. Has this FP been submitted as a CN before?</b>                  | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>  | <b>A.16. Has Readiness or PPF support been used to prepare this FP?</b> | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>   |
| <b>A.17. Is this FP included in the entity work programme?</b>           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>  | <b>A.18. Is this FP included in the country programme?</b>              | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>   |
| <b>A.19. Complementarity and coherence</b>                               | <p><i>Does the project/programme complement other climate finance funding (e.g. GEF, AF, CIF, etc.)? If yes, please elaborate in section B.1.</i></p> <p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>   |   |   |
| <b>A.20. Executing Entity information</b>                                | Antigua and Barbuda Ministry of Finance  |   |   |
| <b>A.21. Executive summary (max. 750 words, approximately 1.5 pages)</b> |  |   |   |

Historically, Antigua and Barbuda had only been directly hit by relatively low-intensity tropical storms, with those reaching hurricane status seldom strengthening above Category 3 and with one confirmed Category 4. Consequently, building codes in Antigua and Barbuda did not prescribe the construction methods/technologies required to withstand above a Category 3 hurricane. While designing buildings to withstand up to a Category 3 hurricane was sufficient in the past, the increasing intensity and frequency of hurricanes hitting the country is having severe impacts on the built environment and population. Climate change projections under both the RCP4.5 and 8.5 scenarios indicate that, although the total number of storms is not expected to change significantly, there will be an increase in the frequency of high-intensity storms (Category 4 and 5 hurricanes) experienced by Antigua and Barbuda. The increasing intensity of hurricanes is already evident in the country. The return rate of Category 4 hurricanes in the first half of the 20<sup>th</sup> century was 1 in 50 years compared with the latter half of the century, when the return period for Category 4 hurricanes shortened to 1 in 10 years. The only Category 5 hurricanes in recorded history to affect the country have occurred very recently, namely Hurricanes Irma and Maria in 2017. The first of these, Hurricane Irma, was a direct hit on Barbuda and resulted in the destruction of ~95% of all infrastructure on the island. The combined impact of the 2017 hurricanes amounted to ~US\$136 million in damages and ~US\$19 million in post hurricane economic losses, with total recovery costs estimated at US\$222 million. The cost related to loss of revenue to the economy up to 12 months after the hurricane is not included here.

Following a Category 5 hurricane, power and water supply in Antigua and Barbuda can be disrupted for 3 - 24 months, while damage to communication and transport infrastructure disrupts associated services for up to 6 months, with considerable impacts on the country's economy. In addition to the general disruption of economic activities, food and medical imports, which are mostly brought in by ship, are disrupted for several weeks after an extreme event, impacting the health and wellness of local communities. These impacts are exacerbated by the significant damage caused by hurricanes to critical public service infrastructure, which limits the capacity of emergency services as well as the National Office of Disaster Services (NODS) to prepare for and respond to extreme climate events. The capacity of the country to prepare for a hurricane is further constrained by inadequate early warning systems and the absence of formalised communication and early action protocols. Given the projected increase in the frequency of Category 4 and 5 hurricanes, the combined impacts on the economy and wellness of local communities will become increasingly severe in the absence of urgent adaptation interventions.

At present, the country has limited technical and financial capacity to fully address the impacts of Category 4 and 5 hurricanes on critical public service and community buildings through domestic sources of financing – including both private and public sector finance. This is because, although Antigua and Barbuda is considered a middle income country on a per-capita basis, its size and small population means that it lacks the scale required to invest adequately in adaptation. The country also has a high public debt burden which, in 2018, reached ~US\$1.4 billion — more than 88% of the country's GDP. This burden is increased by extreme climate events, with recovery needs reducing economic growth and the ability of the country to repay public debt. Although this debt was expected to decline by 2019, long standing problems in the fiscal and banking sectors remain unresolved, including this public debt as well as persistent large financing gaps, high rates of non-performing loans caused by repeated extreme weather related disasters and the delay in bank resolution. Consequently, the Government of Antigua and Barbuda (GoAB) is requesting GCF grant finance, which will be combined with government co-financing to initiate a paradigm shift within the country's building sector towards climate-resilient sustainable development. Specifically, the proposed project will create an enabling environment for existing infrastructure to be upgraded to withstand the impacts of Category 4 and 5 hurricanes – which have sustained wind speeds of over 200km/h – as well as for all future development to be equipped to withstand these impacts. This transformative change in the country's approach to climate-resilience will be achieved by: i) enhancing the climate resilience of critical public service and community buildings through increasing the structural integrity of these buildings to withstand Category 4 and 5 hurricanes; ii) ensuring the uninterrupted supply of power and water to critical buildings during extreme climate events; iii) mainstreaming climate change adaptation into the building sector as well as public and private financial, insurance and banking sectors; and iv) strengthening climate information services in Antigua and Barbuda to facilitate early action to secure non-category 4 and 5 buildings as early as possible after a hurricane warning has been issued. By focusing initially on critical public service and community buildings, the project will ensure the uninterrupted provision of critical services – including health, fire, rescue and police. This will facilitate rapid recovery after an extreme climate event, reducing economic downtime and improving the lives and welfare of local communities. Furthermore, mainstreaming climate resilience into national building regulations, combined with strengthening the capacity of local authorities, building inspectors, engineers, architects and draughtsmen to adhere to these regulations, will promote the upscaling of adaptation interventions across the country's entire building sector.

Overall, the project will confer direct adaptation benefits to ~73,216 vulnerable people in Antigua and Barbuda, and indirect benefits to the entire population of the country, by reducing the adverse impacts of extreme climate events on human life and enabling the country's major economic sectors to resume business as usual more quickly following these events. Direct health benefits are also expected to incur through the improved provision of clean water, increased operability of clinics during a storm, integration of storm shelters into existing clinics and improved storage for vital medication that are usually damaged by an intense storm. Further benefits are expected across the Caribbean, with Antigua and Barbuda serving as an example of climate-adaptive building practices for Small Island Developing States (SIDS).

## B. PROJECT/PROGRAMME INFORMATION

### B.1. Climate rationale and context (max. 1000 words, approximately 2 pages)

#### Context

Antigua and Barbuda forms part of the Leeward Islands in the eastern Caribbean. Most of the population, ~94,400 people, live on the island of Antigua, with a further ~1,600 residing in Barbuda<sup>1,2</sup>. As a small island developing state (SIDS), Antigua and Barbuda is among the most vulnerable countries to extreme climate events such as hurricanes and tropical storms<sup>3,4</sup>. This vulnerability is exacerbated by the country's long-standing macroeconomic and financial problems<sup>5</sup>, with extreme climate events having significant impacts on the lives and livelihoods of local communities, as well as the local economy. In particular, damage to critical public infrastructure — including centralised power and water supplies, roads, hospitals, clinics, emergency services, telecommunications and schools — leads not only to disruptions to economic activity, but also to considerable recovery costs after an event. Moreover, it often takes several months for the country to recover from such disruptions, which leads to considerable declines in economic productivity and quality of life.<sup>6</sup>

#### Climate Rationale

Historically, Antigua and Barbuda has only been hit by relatively low-intensity tropical storms, with those reaching hurricane status seldom strengthening above Category 3. The return rate of Category 4 hurricanes in the first half of the 20<sup>th</sup> century was only 1 in 50 years, and until 2017, the country had never experienced a Category 5 hurricane (Figure 1a). Consequently, building codes in Antigua and Barbuda did not prescribe the construction methods/technologies required to withstand above a Category 3 hurricane. While designing buildings to withstand up to a Category 3 hurricane was sufficient in the past, the increasing intensity of hurricanes hitting the country (Figure 1b) is having severe impacts on the country's built environment and population. For example, Hurricane Irma in 2017 resulted in the destruction of ~95% of all infrastructure on Barbuda, with total recovery costs estimated at US\$222 million<sup>7</sup>. The recent occurrence of several Category 5 hurricanes in the region have also driven up insurance prices in Antigua and Barbuda, this is true even if the event does not make landfall in the country. This trend of increasing intensity of storms within the Caribbean region is projected to continue in the coming century (see analysis below). Urgent adaptation measures for the building sector are therefore needed to address the impacts of climate change on the country. Further details on the climate change risks and impacts for Antigua and Barbuda are described below.

<sup>1</sup> United Nations. World Population Prospects. Available at: <https://population.un.org/wpp/DataQuery/>. Accessed on 8 July 2019.

<sup>2</sup> Government of Antigua and Barbuda. 2011. Population and Housing census.

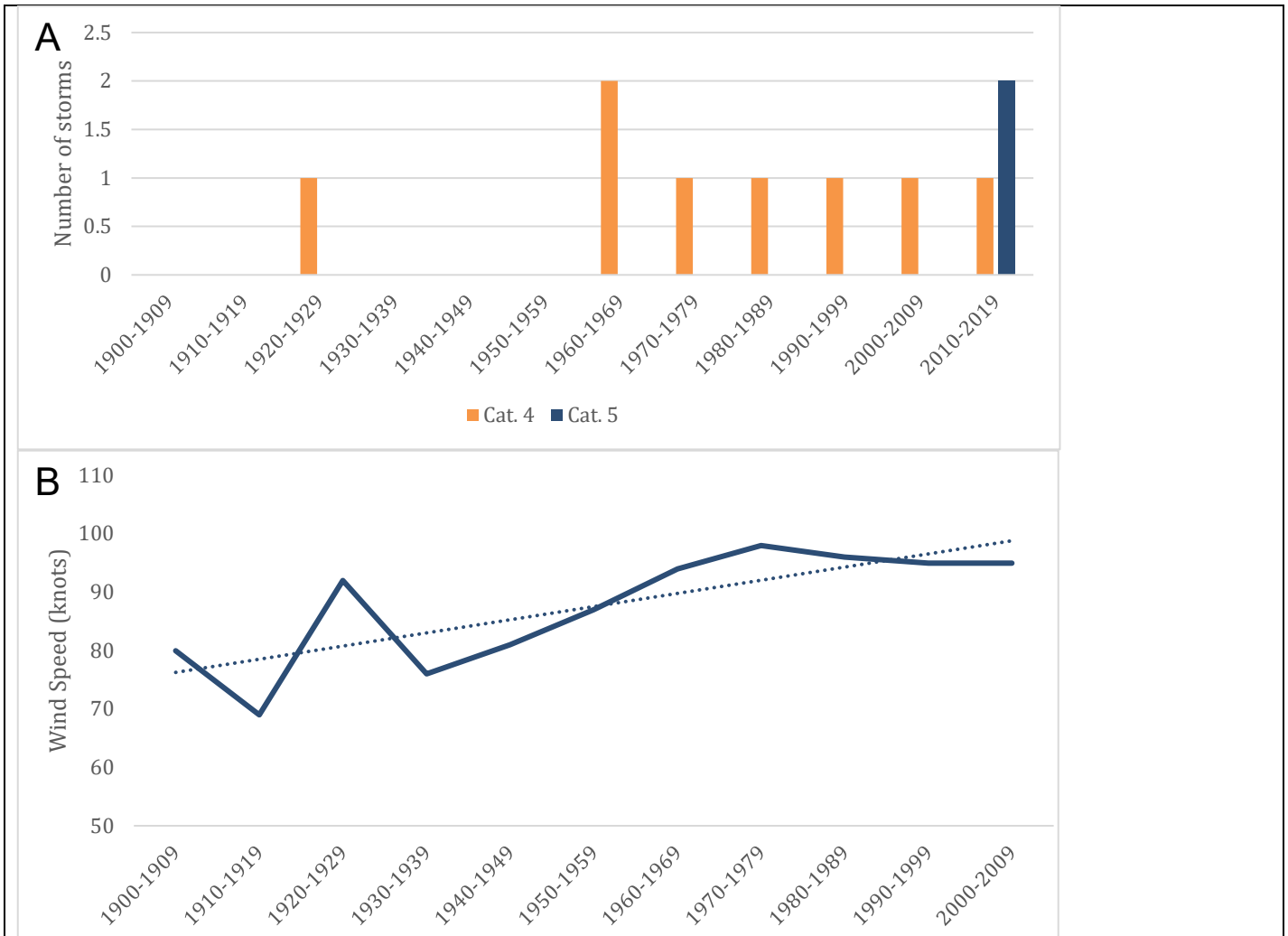
<sup>3</sup> The following explanation clarifies the use of the terms 'hurricanes', 'tropical storms' and 'high-intensity storms' in this Funding Proposal: The Saffir-Simpson Hurricane Wind Scale defines a hurricane as having sustained wind speeds of more than 74 mph (119 kmh), while a tropical storm has sustained wind speeds of less than 38 mph (61 kmh). Hurricanes are therefore likely to result in more damage to infrastructure and loss of life than tropical storms. Additionally, Category 4 and 5 hurricanes are considered to be high-intensity storms because of the associated sustained wind speeds of these hurricanes. According to the Saffir-Simpson Hurricane Wind Scale, Category 4 hurricanes have sustained wind speeds of 130–156 mph (209–251 kmh) while Category 5 hurricanes have sustained wind speeds upwards of 157 mph (252 kmh).

<sup>4</sup> Further details on Antigua and Barbuda's vulnerability to climate threats are presented in Section 3 of Annex 2: Feasibility Study.

<sup>5</sup> Further information on the country's financial challenges are presented in Section B.5 of the Funding Proposal, and specific details on these challenges can be found at the following reference: International Monetary Fund. 2015. Antigua and Barbuda. IMF Country Report number 15/189.

<sup>6</sup> Further information about the geographic, climatic and socio-economic context in Antigua and Barbuda is presented in Annex 2: Feasibility Study (Section 2).

<sup>7</sup> Government of Antigua and Barbuda. Antigua and Barbuda Recovery Needs Assessment.



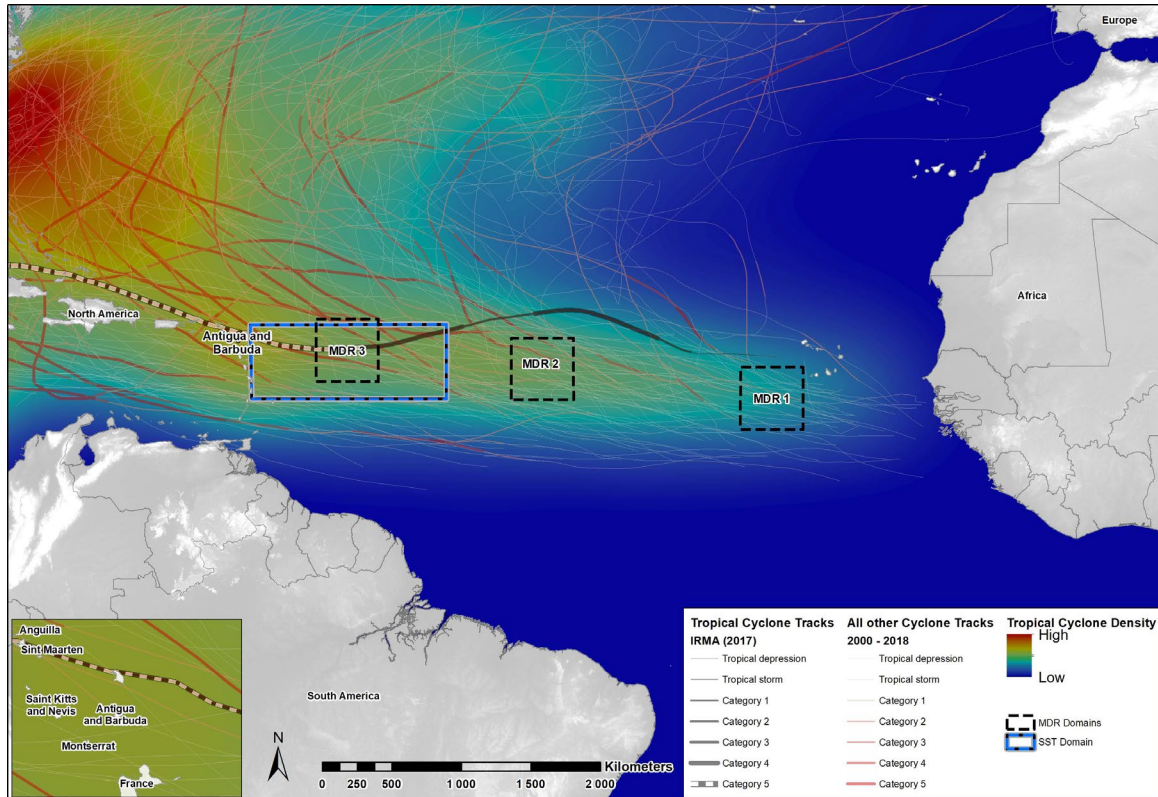
**Figure 1.** A: Historical data showing the frequency of Category 4 and 5 hurricanes in Antigua and Barbuda between 1900 and 2019. While the data is too sparse to conduct a statistical trend analysis, there is a noticeable increase in the frequency of Category 4 hurricanes in the latter half of the century, with the first ever Category 5 hurricanes observed in 2017. B: Historical data showing the average wind speeds of tropical storms and hurricanes in the Eastern Caribbean. Although not statistically significant, an increasing trend has been observed in the average wind speed of storms in the region.

**Climate change risks**

Hurricanes and tropical storms are the main climatic hazards affecting Antigua and Barbuda. Since 1995, the country has experienced 15 hurricanes and 14 tropical storms. Most of these storms ranged from Category 1 to 3 in magnitude, with the notable exceptions of Hurricanes Luis in 2005 (Category 4), and Irma and Maria in 2017, which were the only Category 5 hurricanes that have affected the country and region in recorded history.<sup>8</sup> The frequency and intensity of these storms is strongly correlated to: i) high sea surface temperature (SST) in the major development region (MDR); ii) decreasing vertical wind shear (VWS) in the mid-troposphere during depression development; and iii) changes in the La Niña phase of the El Niño Southern Oscillation (ENSO). In the lead up to Hurricane Irma in 2017, the SST anomaly from baseline climatic conditions was shown to be in the order of 1°C in the region to the south-east of Antigua and Barbuda. Hurricane Irma was fluctuating between Category 2 and 3 strength before being deflected west south-west by a high-pressure system back over the area of warmer ocean<sup>9</sup>. This increased SST gave energy to the depression, contributing to its development into a Category 5 hurricane. The analyses below use these parameters to demonstrate the expected increase in the intensity of hurricanes over the next century.

<sup>8</sup> Details on the return periods of hurricanes and tropical storms within a range of 15 to 105 nautical miles are presented in Section 2 of Annex 2: Feasibility Study.

To determine how climate change is likely to result in more favourable conditions for hurricane development, two factors were assessed, namely: i) SST over the oceans in the lead up pathway for most hurricanes affecting Antigua and Barbuda; and ii) VWS in three 4° x 4° locations in the MDRs (Figure 2). An analysis of the projected ENSO cycle under future climate scenarios was not undertaken because of the uncertainty in the relevant literature<sup>10</sup>.

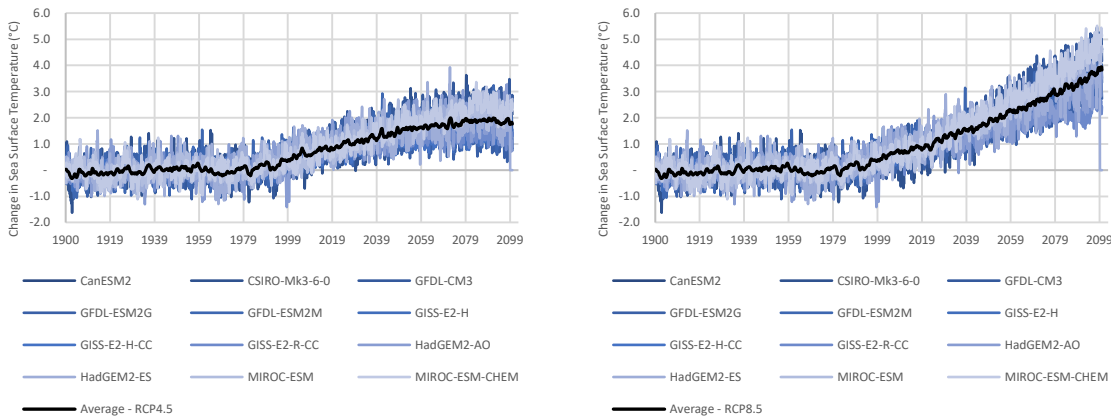


**Figure 2.** Vertical wind shear (VWS) and sea surface temperature (SST) domains used for the analysis of major development regions (MDRs) for hurricanes that affect Antigua and Barbuda. Lines show the historical trajectories of hurricanes.

Climate change projections under both the RCP4.5 and 8.5 scenarios<sup>11</sup> indicate that, although the total number of storms is not expected to change significantly, there will be an increase in the frequency of high-intensity storms (Category 4 and 5 hurricanes) experienced by Antigua and Barbuda. Furthermore, a 20% slow-down in storm translation speed over land for Atlantic storms has been observed. These speeds are likely to continue decreasing under future conditions of climate change, resulting in heavier rainfall events and increased flood risk.<sup>12</sup> The changes in hurricane patterns are as a result of the projected changes in SST and VWS, which were assessed in the MDRs where most extreme climate events affecting the country develop (Figure 2 above). The results from this assessment show that under RCP8.5, SST in the 50<sup>th</sup> percentile is likely to increase from the baseline conditions by 2°C in 2050 and nearly 4°C by 2100 (Figure 3) in the SST MDR.

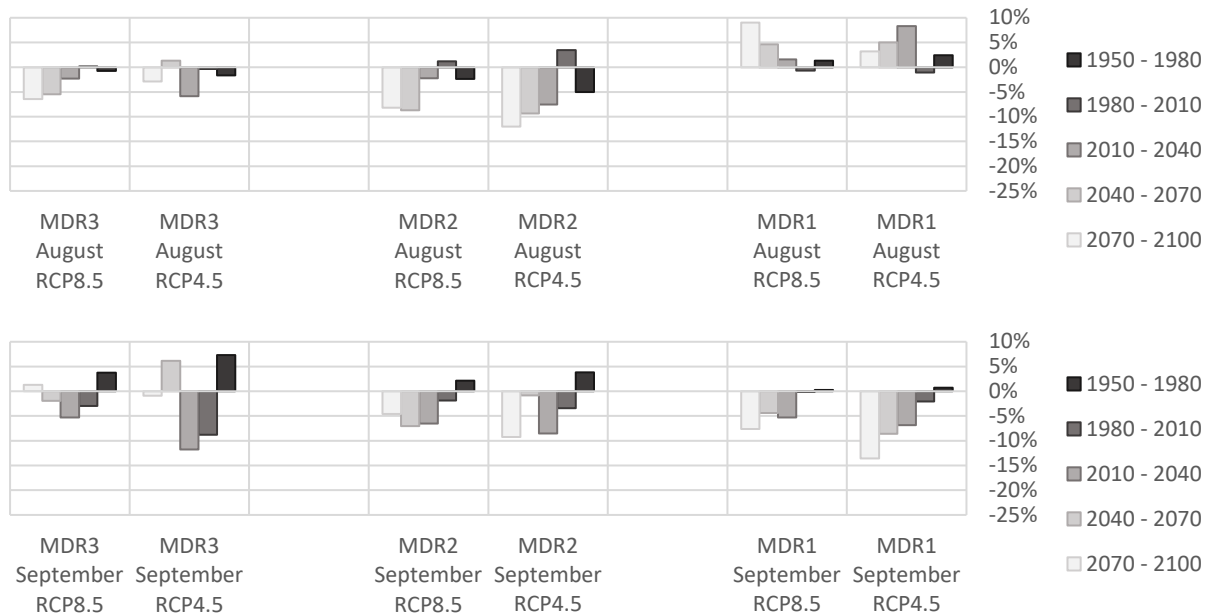
<sup>11</sup> These representative concentration pathways (RCPs) are based on the main forcing agents of climate change, including GHG emissions, GHG concentrations and land-use change. RCP4.5 represents the likely best-case scenario with a peak radiative forcing of 4.5 W/m<sup>2</sup> (~650 ppm CO<sub>2</sub> eq) at stabilisation after 2100. RCP8.5 represents a very high GHG emission scenario with a peak radiative forcing of 8.5 W/m<sup>2</sup> (~1,370 ppm CO<sub>2</sub> eq) and no expected stabilisation in emissions. RCP8.5 indicates a business as usual scenario where the rate of GHG emissions continues to increase with no mitigation measures.

<sup>12</sup> Kossin J. 2018. A global slowdown of tropical-cyclone translation speed. *Nature*. 558: 104–107.

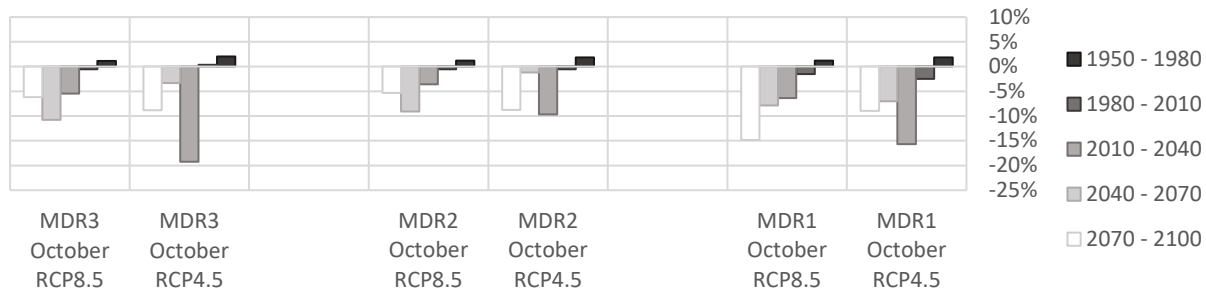


**Figure 3.** Sea surface temperature (SST) anomaly yearly for RCP4.5 (left) and RCP8.5 (right).

In addition to the increasing SST, a general decreasing trend in VWS is expected under both RCP4.5 and RCP8.5 climate scenarios (Figure 4) and across all MDRs. Such decreases, combined with increasing SST, will create more favourable conditions for the development of high-intensity storms in the MDRs assessed. These key findings are supported by the most recent IPCC AR5 report, which emphasises an expected 50% increase in the frequency of high-intensity storms, along with increases in the magnitude of these events and their associated maximum wind speeds<sup>13</sup>.



<sup>13</sup> The Intergovernmental Panel on Climate Change. Fifth assessment report. Available at: <https://www.ipcc.ch/assessment-report/ar5/>. Accessed on: 19 September 2019.



**Figure 4.** Change in VWS from August (top) to October (bottom) for MDR1-3 and under RCP4.5 and RCP8.5 scenarios. *Climate change impacts and vulnerability*

Given that Category 4 and 5 hurricanes are expected to occur more frequently under future climate conditions, the combined impacts of intense rainfall and strong winds will become increasingly severe in the absence of urgent adaptation interventions. This will have severe impacts on the lives and livelihoods of local communities as well as the economy as a whole<sup>14</sup>. Following a Category 5 hurricane, power and water supply can be disrupted for up to 24 months, while damage to communication and transport infrastructure disrupts associated services for up to 6 months. Furthermore, rough seas and inflated insurance premiums after a storm disrupts the import of vital food, medical and building supplies for several weeks after an extreme climate event. The ability of the country to respond to such events is constrained by the vulnerability of critical public services, including healthcare, police, fire and rescue services as well as government coordination and response agencies. Disruption to these services caused by damages to critical infrastructure reduces the efficiency and effectiveness of emergency response and delays recovery. This vulnerability is further exacerbated by limited capacity within Antigua and Barbuda’s Meteorological Services (ABMS) for early warning and preparatory action in response to an extreme climate event. To determine the most appropriate sites to receive project interventions and ensure that maximum benefits are realised as a result of these interventions, a climate vulnerability analysis was conducted. This analysis included a hydraulic flood analysis as well as a walk-time analysis to determine the total coverage of project interventions and support justification for the project to primarily address the impacts of Category 4 and 5 hurricanes. The findings from this analysis are presented in Section B.3 of this Funding Proposal, as well as in Section 10 of Annex 2: Feasibility Study.

**Rationale for the use of the Saffir-Simpson Hurricane Wind Scale (SSHWS) as the operational meteorology measure for the proposed project**

The current assessment for the project utilises the Saffir-Simpson Hurricane Wind Scale (SSHWS) as the currently accepted, applied and projected academic and operational meteorology measure. There are, however, potential limitations with the SSHWS as a robust and granular measure of a tropical cyclone’s potential impact both in observed records and for projecting future tropical cyclone activity. This deficiency is based on the wide variety of noted, on-the-ground impacts within a given hurricane category as a result of being classified primarily by maximum sustained windspeed. However, given the data input requirements (ocean–atmosphere–energy interaction, wind intensity duration, wind speed threshold radii) of alternative hurricane impact indices, the weakness of climate models to accurately simulate these extreme dynamics, and the limited uptake of these scales in academics as well as by the IPCC, the use of the SSHWS remains more feasible.<sup>15</sup>

**Baseline projects, programmes and initiatives**

Considerable baseline investments are being made through public expenditure and donor-funded initiatives to increase the resilience of Antigua and Barbuda’s building sector to extreme climate events. Lessons learned and best practices from these investments have been incorporated into the design of the proposed project to replicate successful adaptation techniques and ensure that there is complementarity between the project and existing actions. During project development, the most relevant baseline investments that will be complemented by the proposed project interventions were identified. Following this identification, an analysis of each of these projects was conducted to ensure that the

<sup>14</sup> A detailed cost-benefit analysis is presented in Annex 3 and summarised in Section D.6 of the Funding Proposal. This analysis describes what the projected costs of extreme climate events will be in Antigua and Barbuda with and without project interventions under baseline and projected climate change scenarios.

<sup>15</sup> Alternative methodologies that seek to address deficiencies in the SSHWS as a granular measure of a hurricane’s potential impact are investigated and presented in Section 3.3.3 of Annex 2: Feasibility Study.

proposed project will not duplicate or adversely affect these ongoing initiatives. Instead, GCF resources will be used to enable project interventions to build on and complement existing initiatives to achieve maximum adaptation impact in the target sector. The most relevant baseline investments, including a description of how the proposed project will complement these investments, are presented below<sup>16</sup>.

The Government of Antigua and Barbuda (GoAB) is currently implementing a project entitled *Building climate resilience through innovative financing mechanisms for climate change adaptation (2016–2020; SCCF; US\$11,390,000)*, funded by a grant of US\$5 million from the Special Climate Change Fund (SCCF) and co-financing from the GoAB. Among its four primary focus areas are: i) developing innovative financing mechanisms to fund adaptation interventions through the Sustainable Island Resource Framework Fund (SIRF Fund), including for the building sector; and ii) strengthening national policies and plans to promote adaptation to climate change through *inter alia* updating the national building code, which includes considerations for Category 4 and 5 hurricanes. In its current form, the SIRF Fund is optimised for small grants and a revolving loan program. Small grants are provided to vulnerable Community Buildings in vulnerable areas of the country such as churches, schools and community centres. The revolving fund program is highly concessional non-collateralize loans to individual homeowners. The loan portfolio for individual applications is capped at 5% of the total funds available at a given time. The loans are to be used for the incremental cost of the climate interventions only and cannot be used for normal construction cost. The Incremental cost is calculated by identifying the agreed adaptation interventions and what is normal construction cost. The SIRF Fund is the only finding mechanism of this type in Antigua and Barbuda. It is designed to not compete with the local private financial sector. At this time and based on the capital in the fund, no individual loan can exceed \$400,000 USD. This acts as a barrier to small- to medium-sized businesses, which often require larger investments to implement the incremental costs related to adaptation interventions. The proposed GCF project will complement the SCCF-funded project as well as to set the stage for the scaling up to the private sector by the following (a) the demonstration of the DCA building codes on government buildings (b) provide a new source of trained construction workers in the public and private sectors who can deliver work to meet the new code (c) the project for the first time will mainstream and increase demand for renewable energy installers and will generate interest in this field for young students and finally (d) provide additional evidence based incremental cost calculation to the SIRF Fund for buildings used for a business. With information and lessons learnt from this GCF project, the SIRF Fund can now establish a window for small businesses. During the implementation of Activity 2.2, options for increasing financial inflows into the SIRF Fund will be investigated (through consultations with relevant public and private sector actors) to increase the available financial resources to address the anticipated cost and other barriers to the implementation of the new code and the scaling up of the number of resilient buildings in the country. This will increase the amount of financing available for access by the public and private sector, which will in turn enable these entities to implement more / larger-scale adaptation interventions on their buildings more rapidly. GCF resources from this project will not be used to capitalise this fund, fill funding gaps or retroactively finance activities already under development or implementation other programmes / initiatives.

*The Global Climate Change Alliance (GCCA) climate change adaptation and sustainable land management in the Eastern Caribbean (2013–2018; US\$14,575,000)* project is closely aligned with the SCCF-funded project in that it supported mainstreaming climate change adaptation into policymaking. Although there is alignment, the building code — which is being updated to meet the design requirements for future climate scenarios — is not included in the country's as part of the national regulatory framework. The building code however enjoys wide range of compliance since the banks and the physical planning department (i.e. Development Control Authority [DCA]) require that the plans for construction are designed to the code. If the plans are not approved by the DCA the banks will not fund the project. This approach actually demonstrates the value of Article 2(1)(c) of the Paris Agreement 2015 (i.e. making finance flows consistent with a low emission and climate resilient development pathway) and is a valuable mechanism to effect change. The fact that the code is just a standard therefore does not necessarily limit the ability of the government to enforce the climate-proofing technologies proposed under the revised building code. The proposed project however will seek to move the building codes from a standard to a legal requirement which allows for the Government to include clear financial incentives to reduce the barriers hindering full implementation of the code. To this end the project will: i) draft amendments to the Physical Planning Act (PPA) to make provision for the inclusion of the national building code in the country's regulatory framework; and ii) raising awareness of and providing training for relevant technical staff from *inter alia* Ministry of Works (MoW) and Development Control Authority (DCA), as well as building inspectors,

<sup>16</sup> A comprehensive list of baseline projects, programmes and initiatives as well as details of their focus and alignment with the proposed project is presented in Section 6 of Annex 2: Feasibility Study.

engineers, architects and draughtsmen on the application of the updated PPA and national building code and iii) along with the ADFD<sup>17</sup> project (parallel financing of RE in the private and public sectors) will demonstrate the bulk purchasing of RE equipment for the private sector. In so doing, project interventions may be able to create a stronger enabling environment for the upscaling and replication of climate-resilient solutions across Antigua and Barbuda's building sector. This approach, however, has risks since there is a greater than 50% increase in the cost between a Category 3 and a Category 5 code. This will in turn limit the ability of most citizens as well as the Government to meet this code.

A further two projects are currently being implemented in Antigua and Barbuda to increase the climate resilience of the country's built environment, namely: i) *An integrated approach to physical adaptation and community resilience in Antigua and Barbuda's northwest McKinnon's watershed (2017–2020; AF; US\$9,970,000)*; and ii) *Integrated physical adaptation and community resilience through an enhanced direct access pilot in the public, private, and civil society sectors of three Eastern Caribbean small island developing states (2018–2023; GCF; US\$20,000,000)*. Both of these projects address resilience through a multi-stakeholder approach and include private sector and NGO owned buildings and promotes flood reduction using an ecosystems-based approach. The focus of these projects is on drainage infrastructure to prevent flooding and vector management combined with the establishment of community shelters using NGO and community buildings rather than schools. As described above, building the climate resilience of critical public services to the impacts of climate change is essential for reducing economic downtime and faster recover after an extreme climate event. These projects focus on private sector and community buildings, and will involve the implementation of climate-proofing measures on publicly owned and maintained critical public service and community buildings. Resilience interventions will also include decentralised renewable energy and climate-resilient water-harvesting solutions.

### **Complementarity within Antigua and Barbuda's GCF Country Programme**

The proposed project forms an integral part of Antigua and Barbuda's GCF Country Programme. The current portfolio under the Country Programme has been specifically designed to take a holistic approach to climate change adaptation and mitigation in Antigua and Barbuda. Each project addresses a specific element of climate risk in the country, with the concept of complementarity underpinning the entire portfolio. These projects are focused on *inter alia* climate-proofing the country's-built environment, mainstreaming climate resilience into the financial sector in Antigua and Barbuda and initiating a paradigm shift within the transport and electricity sectors towards low-emissions development.

Although hurricanes are considered the most urgent climate hazard in Antigua and Barbuda, the impacts of hurricanes are multi-faceted, and all impacts cannot be addressed in a single project. Interventions under the 'Build' project are directed toward immediate adaptation needs for critical public service and community buildings, particularly with regard to the impacts of strong winds associated with Category 4 and 5 hurricanes on critical services. This project will be complemented by other projects under the Country Programme which will address the additional climate hazards associated with hurricanes, including flooding and storm surges. In particular, two other GCF projects are under development that will: i) increase the climate resilience of road infrastructure, including adaptation measures for reducing flooding and improving drainage; and ii) build the resilience of the fisheries sector to the impacts of hurricanes, with specific focus on storm surges. Of particular relevance within the context of the proposed project is the GCF project currently under development by the GoAB focused on increasing the resilience of key road infrastructure and adjacent utilities in Antigua and Barbuda to withstand the impacts of floods and droughts. Proposed adaptation interventions under this project include a combination of grey and green infrastructure through: i) increasing the thickness of key roads and burying adjacent utilities to withstand the impacts of hurricanes and droughts; ii) constructing detention ponds in key areas upstream of the target road infrastructure to attenuate water flow from heavy rainfall events, therefore, reducing the flood-risk of these roads; and iii) implementing protection measures on specific sections of these roads that are situated along the coastal and consequently vulnerable to sea level rise.

The proposed project, combined with the GCF project focused on climate-proofing key road and utilities infrastructure, will cumulatively reduce the impacts of multiple climate hazards on Antigua and Barbuda's built environment. Furthermore, these projects, combined with the additional projects in Antigua and Barbuda's GCF Country Programme, will contribute significantly towards achieving the adaptation and mitigation goals put forward in the country's NDC (2015).

### **B.2. Theory of change (max. 1000 words, approximately 2 pages plus diagram)**

<sup>17</sup> Abu Dhabi Fund for Development

### Problem statement

Climate change is causing an increase in the frequency of high intensity hurricanes making landfall on the small island developing state (SIDS) of Antigua and Barbuda. Historically, the majority of tropical depressions impacting the islands were of relatively low intensity, remaining as tropical storms or Category 1–3 hurricanes. Only nine Category 4 and two Category 5 hurricanes have been recorded since 1850<sup>18</sup>, with eight of these more intense storms occurring in the last 15 years alone. Given the previous return rate of major hurricanes, the country's current infrastructure is only designed to withstand the impacts of hurricanes up to Category 3. However, warming conditions over the Atlantic Ocean are resulting in an increased intensity of hurricanes in the Caribbean, with Antigua and Barbuda experiencing their first recorded Category 5 hurricanes (Irma and Maria in 2017). Because existing building codes in Antigua and Barbuda have not accounted for Category 4 and 5 hurricanes, the impacts of such events have been severe, causing significant damages to housing and infrastructure, as well as disrupting basic services such as health, education, telecommunication, electricity, water, sewage and waste systems. Moreover, the disruption of critical service infrastructure — including hospitals/clinics, police and fire stations as well as buildings that serve as storm shelters — limits the capacity of the National Office of Disaster Services (NODS) to respond during and after an extreme event. This problem is exacerbated by limited capacity for and coordination of early warning systems in the country which reduced the ability of communities and government agencies to prepare for an extreme climate event.

The challenge of upgrading existing buildings to Category 4 and 5 is estimated to cost over US\$6.4 billion<sup>19</sup>. While Category 4 and 5 standards can be incorporated into new buildings much easier than existing structures. The economy of Antigua and Barbuda is US\$1.6 billion<sup>20</sup> and to transition the building sector alone to the climate change impacts will take time to generate the funds needed. Taking into consideration that climate change is now considered an emergency situation, the Government via its NDA and nationally Accredited Entity (DoE) is requesting a grant to expedite the building of resilience in 54 of the 254 buildings in the Government sector. This will allow for the Government to provide critical services while providing time for the resilience of the rest of the buildings within the country to be enhanced over time.

### Preferred adaptation solution

For Antigua and Barbuda to adapt to the impacts of extreme climatic events, it is necessary to strengthen the climate resilience of the building sector. Existing infrastructure needs to be upgraded to withstand the impacts of Category 4 and 5 hurricanes – which have sustained wind speeds of over 200km/h. This can be achieved by strengthening the structural integrity of buildings to withstand the wind shear forces, as well as by decentralising power and water supplies to reduce communities' reliance on vulnerable centralised systems. Initial climate-proofing interventions should focus on critical services such as police, fire, and health, as well as community buildings that act as shelters during a storm. Increasing the resilience of these priority buildings will lead to: i) critical services remaining operational during and after an extreme event; and ii) more rapid recovery, including restoring water supply, power and communication services, along with healthcare and education. In addition to climate-proofing critical infrastructure, an enabling environment that includes both the public and private sectors needs to be created to facilitate the upscaling of climate-proofing interventions to all buildings. Finally, climate information services should be strengthened to improve the dissemination of early warnings and facilitate early action for disaster preparedness.

### Barriers to the adaptation solution

Several barriers to the preferred adaptation solution have been identified for Antigua and Barbuda. These are summarised below and explained in detail in Section 8 of Annex 2: Feasibility Study.

- *Barrier 1:* The government of Antigua and Barbuda has limited financial capacity to invest in climate proofing critical public service and community buildings to withstand Category 4 and 5 hurricanes. This includes not being able to install decentralised Renewable Energy backup energy and water systems to maintain supply when centralised distribution lines are disrupted by a storm.
- *Barrier 2:* The remote location of Antigua and Barbuda makes it difficult to access replacement solar PV panels to restore power after a storm to critical service buildings that are equipped with decentralised renewable energy

<sup>18</sup> Antigua and Barbuda Meteorological Services. Antigua Tropical Cyclones 1851–2018. Available at: [http://www.antiguamet.com/Climate/HURRICANE\\_SEASONS/AntiquanStorms.txt](http://www.antiguamet.com/Climate/HURRICANE_SEASONS/AntiquanStorms.txt)

<sup>19</sup> This figure is coming from the initial costings on resilience cost from applications to the SIRF Fund.

<sup>20</sup> World Bank Data. 2018. Antigua and Barbuda. Available at: <https://data.worldbank.org/country/antigua-and-barbuda>.

systems. There is currently limited stock of renewable energy equipment available in the country and no secure location to store additional back-up equipment.

- **Barrier 3:** During a major storm, critical information servers/computers at public institutions – including hospitals, police stations and other government institutions – are likely to be damaged resulting in the loss of vital information for public health and security. However, there is currently limited technical capacity to preserve this information, either through the safeguarding of physical infrastructure or the provision of reliable coordinated backup systems.
- **Barrier 4:** The high cost of adaptation in the building sector to Cat 4 and 5 limits the ability to sufficiently mainstreamed into Antigua and Barbuda's regulatory frameworks. Based on initial costings from the initial operation of the SIRF Fund, this amount is approximately US\$130/sq ft. At an average of 1000 sq ft per building, and 50 thousand buildings, a conservative cost estimate is US\$6.5 billion. In particular, the Physical Planning Act (2003) does not yet make provision for the newly revised national building code — which includes appropriate actions for reducing the risk of buildings to the impacts of Category 4 and 5 hurricanes. As a result, the guidelines established in the building code are not formalised into legislation. There is also limited technical and institutional capacity within the Public Works Department (PWD) and Development Control Authority (DCA) to adequately apply the regulations stipulated in the building code.
- **Barrier 5:** While there is a firm understanding of the need to climate proof buildings in Antigua and Barbuda, local communities and private sector property owners, as well as public sector decision makers and design engineers/architects, have limited knowledge of the adaptation options available for the building sector. This increases the risk of over-engineering of interventions and consequently also higher incremental cost and risks to low income persons that they cannot meet the code.
- **Barrier 6:** There are currently limited evidence based entry level into the national financial systems and mechanisms available to support ongoing investment into climate-resilient development in both the public and private sectors, i.e. the implementation of Article 2.1c of the Paris agreement. This includes limited provision for adaptation finance through existing national private financial entities and local development funds. With limited replenishment of development funds as well as limited consideration of climate change adaptation by the banking and insurance sectors This project will allow for the evidence and information needed to attract replenishments from local and international sources as well as the mainstreaming of adaptation into the private banks.
- **Barrier 7:** The long-term sustainability and upscaling potential of climate change adaptation interventions is constrained by limited technical capacity within NODS, DCA and PWD for long-term monitoring, maintenance and planning for adaptation measures in the building sector. These capacity limitations extend to the local workforce who are ultimately responsible for the installation and maintenance of equipment.
- **Barrier 8:** To effectively prepare for a storm – including the temporary removal of solar panels – requires adequate lead time on early warnings. However, there is currently limited technical capacity in the ABMS and NODS to adequately disseminate early warnings to support early action, particularly with regards to preparing shelters and securing renewable energy equipment ahead of a storm.

### **Project approach to overcoming the barriers to adaptation**

The proposed project will overcome the abovementioned barriers to build the climate resilience of Antigua and Barbuda's building sector. This will be achieved through three interconnected outputs, described in detail in Section B.3. below. The Theory of Change is presented in Figure 5.

Barrier 1 will be addressed by investing directly into strengthening the climate resilience of existing critical service infrastructure, including clinics, fire stations, police stations, and community buildings that serve as shelters during hurricanes (Activity 1.1). This investment will improve the structural integrity of the buildings, as well as decentralising water and energy supplies to ensure that services continue to be provided during and directly after a storm – thereby contributing to GCF Impact Area A.3 and Output A.7. Furthermore, by ensuring the operability of first responders during and immediately after an extreme event, the project will build the overall resilience of vulnerable communities to the impact of such events, thereby contributing to GCF Impact Area A.1. To further support the rapid recovery of critical services, a climate-resilient warehouse will be established to store replacement renewable energy equipment – solar panels and batteries in particular – which can be used to restore power in the event of equipment being damaged by a storm (Activity 1.3). This will overcome Barrier 2. The preservation of data which underpins the operation of these critical service buildings will also be ensured by installing physical safeguards to protect servers from damage during a storm, as well as establishing cloud-based backup servers, thereby overcoming Barrier 3 (Activity 1.4).

In addition to on-the-ground interventions for climate proofing critical infrastructure, a policy-based approach will be adapted to create an enabling environment for future investment into climate-resilient buildings (GCF Outcome A.5). This includes revising building codes and standards to further guide future design and construction accounts for climate change and the impacts of high intensity storms (Activity 2.1). Awareness campaigns will also be conducted to inform the public and private sectors of the revised building codes and associated adaptation options available on Antigua and Barbuda (Activity 2.3). These interventions will only partially overcome Barriers 4 and 5. The paradigm shift potential of the project will be enhanced by overcoming Barrier 5 through the evidence based analysis of the financial and other barriers to allow the government along with the banking and insurance sectors, as well as in the existing SIRF fund (Activity 2.2) to collaborate to overcome other barriers. These actions are expected to reduce the incremental cost of meeting the standards of the code. Some of these actions may include bulk purchasing, lowering the cost of training new persons, access to concessional financing and others. There are regulatory barriers to access financing, collateral requirements and limits to individual borrowing that are appropriate for the traditional banking sector but limits the urgent need for financing for public and private sector to adopt climate-adaptive technologies.

Barrier 7 will be overcome by establishing training programmes at existing educational institutions that focus on various aspects of climate change adaptation – including planning, implementation, operation and maintenance. The training will target staff at relevant government institutions (NODS, DCA and PWD) to promote effective adaptation planning and adaptive management of adaptation interventions (Activity 2.3). Furthermore, public and private sector stakeholders – including engineers, architects and tradespeople – will be targeted to increase the national capacity for the installation, operation and maintenance of adaptation technologies (Activity 2.4). Training of private sector engineers, architects and tradespeople will contribute to GCF Impact Area A.1 by enhancing their livelihoods through adapting to future needs of the building sector. This will ensure that the adaptation technologies promoted and implemented through the project are sustainable and can be upscaled in the long term (GCF Outcome A.5).

Finally, the project will address Barrier 8 by strengthening the technical capacity of ABMS for the real-time processing of climate data (GCF Outcome A.6). This will be achieved by establishing a centralised online server, housed within ABMS, to ensure that climate threats are detected in advance and facilitate impact-based forecasting (Activity 3.1). In addition, a formalised communication protocol will be established between ABMS and relevant decision-makers to facilitate rapid information sharing and early action preceding a hurricane (Activity 3.2). This will lead to better preparedness, including affording maintenance teams sufficient time to secure vulnerable infrastructure to reduce damages.

Together, the abovementioned interventions will overcome the barriers to climate change adaptation in Antigua and Barbuda, thereby contributing to a paradigm shift within the building sector towards climate-resilient sustainable development. This shift will ultimately reduce the impact of hurricanes on the country, ensuring that critical services remain operational during an event, and that normalcy is restored quickly after the event.

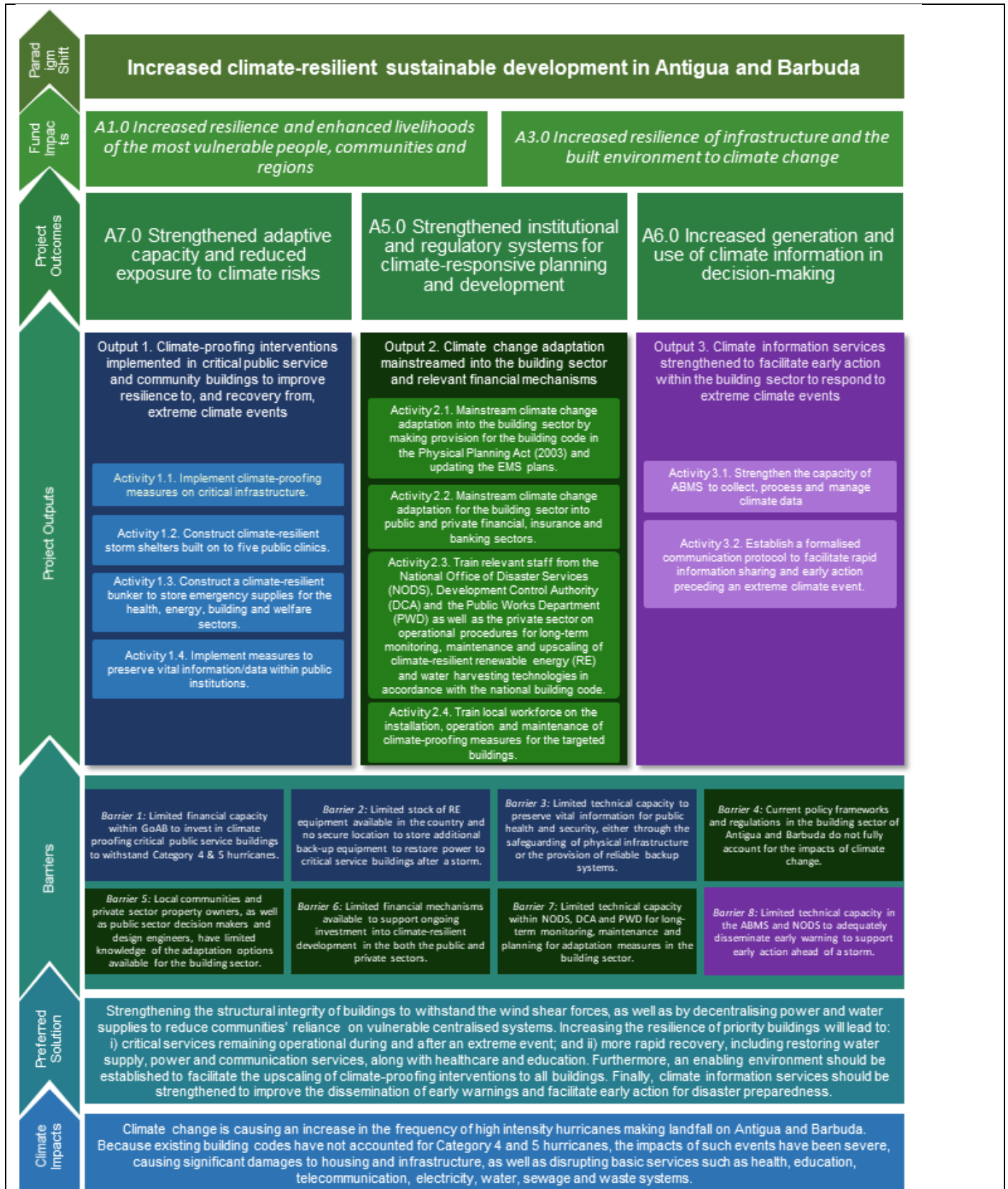


Figure 5. Theory of Change diagram.

### **B.3. Project/programme description (max. 2000 words, approximately 4 pages)**

At present, global development efforts to address the impacts of climate change predominantly focus on the deployment of mitigation measures — primarily clean energy solutions and energy-efficiency measures. Adaptation measures for climate-proofing of structures against climate hazards are still at the preliminary stages of advancement, with limited experience on the ground and practically no calibrated engineering solutions for integrated building codes which embrace both climate change streams. This situation is visible in the broad adoption of ‘green’ building codes, which relate to energy-efficiency measures and the preservation of natural resources but do not incorporate customised climate-proofing solutions.

With existing worldwide examples of climate-proofing against wind and water loads, it can be preliminarily assessed that climate-proofing solutions are much more disruptive for the structure of buildings than mitigation measures. Consequently, in the cases where mitigation measures are not yet introduced, it is advisable to refurbish structures to achieve climate-proof characteristics prior to the incorporation of renewable energy (RE) or energy efficiency (EE) measures. This is because EE solutions are related to the building structure directly and therefore depend strongly on the building’s features and use.

The proposed project is one of first projects in the Caribbean region to introduce building codes that account for the impacts of Category 4 and 5 hurricanes. The successful accomplishment of this task, as well as lessons learned from the refurbishment of a 52 targeted critical public service and community buildings, will allow EE measures to be assessed to determine which solutions are the most efficient and compatible with the improved structural integrity of these targeted buildings. It will also enable the adjustment of existing EE building codes to integrate climate-proofing measures. This exercise can become an important market test to benchmark the scope of integrated building codes for future use. As presented further in this Funding Proposal, RE installations, water harvesting solutions as well as EE measures will be part of the design of the critical buildings, along with the climate-proofing elements. The combined information generated from the implementation of these interventions will create the best combination of both mitigation and adaptation measures to be introduced into building codes. A comprehensive report on this matter will be developed upon the project completion.

#### **Project objective**

The proposed project will contribute to GCF’s paradigm shift objective of increased climate-resilient sustainable development through enhancing the resilience of Antigua and Barbuda’s building sector to extreme climate events such as hurricanes and tropical storms. The proposed transformative approach will shift the country’s building sector away from reactive development — involving costly recovery actions after an extreme climate event — towards a proactive approach in which buildings are adapted to withstand the increased frequency of high-intensity hurricanes. This proactive approach will include direct investments into critical public service and community buildings to climate-proof them against Category 4 and 5 hurricanes, as well as mainstreaming climate resilience into the building sector and relevant financial sector and mechanisms to facilitate the upscaling of such interventions across all buildings in the country. The effectiveness of climate-proofing interventions will be enhanced by formalising communication protocols between the ABMS and relevant government agencies to facilitate early action within the building sector to respond to extreme climate events. This will include strengthening the capacity of ABMS to collect, process and manage climate data, thereby improving the accuracy and reliability of early warnings. The combined effect of project interventions will result in a standard of climate resilience for Antigua and Barbuda’s building sector being established that can be readily scaled up and replicated nationally and regionally. Proposed project outputs are described below with detailed descriptions of all project activities described in Section E.6 of this Funding Proposal.

#### **Output 1. Climate-proofing interventions implemented in critical public service and community buildings to improve resilience to, and recovery from, extreme climate events**

Output 1 will contribute to GCF Outcome A7.0 — Strengthened adaptive capacity and reduced exposure to climate risks — by climate-proofing critical public service and community buildings (hereafter referred to as ‘priority buildings’) to withstand the adverse impacts of Category 4 and 5 hurricanes and safeguarding critical basic supplies. These priority buildings include hospitals/clinics, police and fire stations as well as buildings that serve as storm shelters. Each of the 54 priority buildings that will be targeted under the project is briefly described in Annex 2: Feasibility Study, with preliminary assumptions regarding their design and adaptation needs also presented in this annex. The technical assumptions were derived from the most advanced protocols developed by the State of Florida. This is possibly the only existing system that encompasses resilience against wind speed above 270 km/s. These provisions, combined

with the findings from Annex 22: Building assessment, enabled the costing of materials and workload to be determined and assigned in the detailed project budget (Annex 4). A full design of each priority building targeted under the project will be a pre-requisite for disbursement of GCF resources. These designs will also embrace a thorough assessment of the drainage needs, RE, EE and water harvesting measures for all critical buildings selected for interventions under the project. Such designs will further support the preliminary selection of these 14 buildings to receive additional drainage engineering solutions in the face of climate change.

To reduce the exposure of priority buildings hurricanes, the structural integrity of these buildings will be strengthened through several adaptation interventions, including the installation of hurricane shutters and using hurricane straps to secure roofs. These interventions will physically protect buildings, thereby reducing damages and maintaining operability of critical services during and directly after an extreme event. The climate-resilience of critical services will be further enhanced through the decentralisation of power and water supplies to priority buildings. Decentralising power and water supplies will reduce the dependence of critical services on vulnerable central systems which are often disrupted for prolonged period both during and after an extreme climate event. This will ensure that priority buildings and the critical services they support maintain an uninterrupted power and water supply when centralised systems are disrupted. To decentralise power supply, renewable energy (RE) systems will be installed on priority buildings, comprising solar PV panels and battery packs. These systems will be grid-interactive and the necessary regulatory process will be followed with the utility authority (APUA). The installation of solar panels account for site-specific requirements, including exposure to climate hazards and the energy requirements of the building. Specifically, solar panels will be installed using hurricane-proof clamps, that will secure panels during periods of extreme winds, while allowing for easy removal prior to extreme winds to prevent damage from flying debris. Maintenance staff at priority buildings, along with teams from the PWD will be trained to safely remove and store panels prior to a Category 4 or 5 hurricane making landfall (See Activity 2.4). To ensure continued power supply during the period that the panels are removed, the storage capacity of battery packs will be sufficient to meet basic electricity demands of priority buildings for 24–48 hours. The effectiveness of battery packs will be enhanced through the installation and use of energy-efficient equipment in priority buildings to reduce demand. To ensure uninterrupted supply of water to priority buildings, climate-resilient rainwater harvesting solutions will be installed. These solutions will be site-specific and secured to withstand the maximum sustained windspeeds associated with Category 4 and 5 hurricanes. Coupled with these water harvesting systems will be the installation of stormwater drainage solutions on 14 buildings situated less than 30 m from inundation zones in Antigua and Barbuda. While flooding is not recognised as a primary hazard at these 14 project sites, these solutions will mitigate the risk of potential flooding that may result from heavy rainfall associated with Category 4 and 5 hurricanes. This flood risk mitigation will be achieved through installing drainage gutters at the 14 target sites to ensure that water from these heavy rainfall events is distributed into the existing drainage systems to avoid localised flooding. Further details on the technical design of climate-proofing interventions and a list of the specific priority buildings that will be targeted by the project are provided in Annex 2: Feasibility Study.

In addition to adaptation investments in existing priority buildings, the project will construct two types of climate-proof structure to protect human life, preserve vital information within public institutions and secure basic supplies — including RE equipment, building materials, food and medicine. First, five climate-resilient storm shelters will be built on to public clinics to provide places of safety for vulnerable community members who may be ill and whose own homes are not equipped to withstand Category 4 and 5 hurricanes. Targeted clinics will take ownership of these extension shelters, which will be sufficiently equipped to protect community members and provide the necessary services during an extreme climate event. Attaching shelters to selected clinics will improve health and safety, not only because nurses will be present on site to treat the sick and injured, but also because the greater distribution of small shelters will reduce health risks associated with crowding in public schools which are currently used as shelters. Furthermore, by limiting the need for schools to function as shelter, the project will reduce the downtime for schools resulting from prolonged occupation after an event. All five shelters will be equipped with RE and climate-resilient water harvesting equipment to reduce their reliance on centralised supply systems. Second, a climate-resilient bunker will be constructed at a central location to store supplies required by critical services during and immediately after an extreme event. The bunker will be operated by a sub-committee for disaster preparedness, comprising representatives from the health, environment, public works and welfare sectors, who will be responsible for maintaining supplies of medicine, RE equipment, building materials and food, respectively. This bunker will also serve as a battery recharge site, allowing for battery packs to be recharged and swapped out at priority buildings if RE systems cannot be made operational again before battery systems run out. In addition to these physical interventions, back-up protocols will be developed and operationalised to secure vital information within critical public institutions, including hospitals, clinics, schools, police and fire stations. In so doing, critical service providers will have increased access to emergency supplies, and vital

information will be preserved. Detailed site-specific assessments will be conducted for Activities 1.1–1.3, preceding the implementation of climate-proofing interventions and construction of the climate-resilient bunker and extension hurricane shelters. The AE will oversee these site-specific assessments and the public sector entities who own the targeted critical buildings that will receive climate-proofing interventions will take ownership of these interventions.

*Justification for the selection of target critical infrastructure*

The vulnerability-driven selection process was followed for targeted critical public service and community buildings to ensure that climate-proofed critical services provide maximum coverage to vulnerable areas with high population density, the poorest communities and those individuals living in areas outside of the main drainage channels. The distribution of project interventions therefore covers the majority of built-up areas in Antigua and Barbuda, with increased coverage in the more densely populated and exposed communities (Table 1).

**Table 1.** Population coverage of critical public service and community buildings that will receive climate-proofing interventions under the proposed project.

| Parish       | Populations | Intervention buildings |
|--------------|-------------|------------------------|
| Saint John   | 51,737      | 28                     |
| Saint Mary   | 7,341       | 5                      |
| Saint George | 8,055       | 3                      |
| Saint Peter  | 5,325       | 1                      |
| Saint Paul   | 8,128       | 5                      |
| Saint Philip | 3,347       | 2                      |
| Barbuda      | 1,634       | 2                      |

Project intervention sites were also selected by accounting for the location of lower income communities in Antigua and Barbuda, where infrastructure is generally less resilient to the extreme winds and heavy downpours associated with Category 4 and 5 hurricanes. To ensure maximum coverage of these vulnerable groups by project interventions, a walk-time analysis was conducted at 5-, 15- and 30-minute intervals from these vulnerable communities to critical public service and community buildings targeted under the project (Table 2). This analysis demonstrated that the selection of target intervention sites would ensure that maximum coverage of critical services to the most vulnerable people as a result of project interventions.

**Table 2.** Walk-time analysis conducted to determine the coverage of project interventions.

| Walk time  | Population served | Population served (%) | Low income Population served (%) |
|------------|-------------------|-----------------------|----------------------------------|
| 5 minutes  | 10,512            | 11%                   | 17%                              |
| 15 minutes | 45,923            | 47%                   | 62%                              |
| 30 minutes | 73,216            | 76%                   | 89%                              |

The majority of the selected project intervention sites are located in areas of higher elevation, outside of the potential inundation areas from extreme downpours associated with hurricanes, such as those noted during Hurricane Irma. Specifically, 9 sites are located within 10 m of the flood inundation zones, 5 are within 30 m, 5 within 50 m, 12 within 100 m and 16 sites are located further than 100 m away from these inundation zones. 60% of the project intervention sites are therefore located 50 m or more away from potential flood inundation zones. For this reason, climate change adaptation measures to be implemented on target critical infrastructure will be focus on reducing the impacts of extreme winds and heavy downpours associated with Category 4 and 5 hurricanes, which are considered the main climate threat to these critical buildings.

Based on the vulnerability-driven selection process, site assessment and the findings from the building assessment (Annex 22), 54 critical public service and community buildings were selected to receive adaptation interventions under the proposed project. These buildings are listed below and maps showing their locations are presented in Section D.1 of this Funding Proposal as well as in Section 10.3.2 of Annex 2: Feasibility Study. Where a need is identified during the implementation phase for originally targeted critical building(s) to be replaced with other buildings, these potential replacement buildings will be subject to same selection criteria used in the selection of the 54 targeted buildings. Additionally, the upgrade cost will be considered during the selection of replacement building(s) to ensure that the cost of upgrading these replacement building(s) does not exceed the original budget allocated to implementing adaptation

interventions on critical public service and community buildings. The AE will notify the GCF if such changes are required and these changes will be subject to GCF approval.

The 54 targeted critical public service and community buildings are listed below. Those buildings that are listed more than once are building complexes with multiple buildings within each complex (corresponding to the number of times the building is listed) targeted for receiving adaptation interventions.

- All Saints Clinic
- All Saints Fire Station
- All Saint's Police Station
- Analytical services 1
- Analytical services 2
- Antigua State College 1
- Antigua State College 2
- Bendals health clinic
- Bolans health clinic
- Clareview Psychiatric Hospital 1
- Clareview Psychiatric Hospital 2
- Clareview Psychiatric Hospital 3
- Clareview Psychiatric Hospital 4
- High Court of Justice
- Defence Force Building 1
- Defence Force Building 2
- Department of Environment 1
- Department of Environment 2
- Fiennes Building 1
- Fiennes Building 2
- Good Shepherd Children's Home
- Met office
- Ministry of Finance
- Ministry of Tourism
- National Archives
- National Office of Disaster Services
- Parham health clinic
- Police Headquarters
- Potters health clinic
- Her Majesty's Prison
- St John's Fire Station
- Swetes health clinic
- Liberta Police Station
- Liberta Primary School
- Urlings Primary School
- Jennings Primary School
- Bolans Primary School
- Bendals Primary School
- Pigotts Clinic
- Princess Margaret Secondary School
- Cedar Grove Clinic
- Old Road Clinic
- Freetown Primary School
- Emergency Medical Service
- Gray's Farm Clinic
- Grays Farm Police Station

- Willikies Primary School
- Red Cross
- Cedar Grove Primary
- Clare Hall Secondary School
- Bethesda Clinic
- Cobbs Cross Primary School
- Barbuda Fire Station
- Barbuda Council & Treasury

#### *Operation and maintenance of climate-proofing interventions*

All operations, maintenance and Insurance activities required under the project will be financed by the Government of Antigua and Barbuda. The MoF will create an internal budget line for the maintenance of climate-proofing interventions, highlighting their commitment to ensuring the adequate implementation, operations and maintenance of these interventions. Furthermore, the sustainable operation and management of construction-related project interventions has been secured by identifying key government institutions to oversee specific project activities. MoW will oversee the implementation of climate-proofing measures on critical infrastructure (Activity 1.1), while the Ministry of Health, Wellness and the Environment (MoHWE) will be responsible for managing the shelters that will be built on to five clinics in the country (Activity 1.2). In addition to the operations and maintenance plan for climate-proofing interventions described above, multiple project partners have been engaged to ensure the management and restocking of critical supplies that will be housed within the climate-resilient bunker (Activity 1.3). Responsibilities for the stocking of these supplies will be as follows: i) RE stock and medical supplies will be maintained by the MoHWE; ii) food supplies will be maintained by the Ministry of Social Transformation; and iii) building supplies will be maintained by MoW. To ensure that climate change adaptation measures to be constructed under the project provide maximum benefits, relevant project partners have committed to maintaining all climate proofing measures implemented under the project (including physical upgrades as well as decentralised RE and climate-resilient water harvesting solutions) for at least 20 years after implementation of the project. A framework for effective operations and maintenance of these measures, including the associated costing, is presented in Annex 21. Project activities that will be implemented under Output 1 are summarised below. Further details on these activities, including on the associated sub-activities and deliverables, are presented in Section E.6 of this Funding Proposal and Section 9 of Annex 2: Feasibility Study.

#### Activity 1.1. Implement climate-proofing measures on critical infrastructure.

To ensure that critical public services remain functional during and directly after a hurricane, the proposed project will invest in improving the structural integrity of critical infrastructure to enable buildings to withstand Category 5 hurricanes. Preliminary assessments have identified appropriate climate-proofing interventions, as presented in Annex 22: Building assessment. During project implementation, detailed site-specific building assessments will be conducted to determine the precise extent of the adaptation upgrades to be conducted as well as the cost associated with upgrading each targeted building. Co-finance will also be provided to invest in baseline repair work required to upgrade priority buildings in accordance with the building code. Targeted infrastructure will include hospitals/clinics, police and fire stations, storm shelters, relevant government buildings and schools. Furthermore, to ensure continuous supply of power and water during and after an extreme event, when centralised systems are down, this activity will install decentralised systems at critical public service buildings. For energy supply, RE systems will be installed, comprising solar PV panels and battery packs. The solar panels will be removable, allowing maintenance teams to take down the panels ahead of a large storm to prevent damages. During these periods, the buildings will run on battery reserves, with power being directed to critical equipment. Energy efficient equipment will also be installed where feasible to maximise battery life. This will include energy efficient cooling and ventilation systems, particularly in shelters where the density of people will be relatively high. Given that the water supply in Antigua and Barbuda is heavily dependent on a reliable energy supply, when the national grid goes down water supply is disrupted. To ensure that those buildings that are used as shelters or provide critical services have a safe and reliable water supply during and directly after an extreme climate event, the project will provide climate-resilient water harvesting equipment (including solar pumps). This decentralised water supply is essential to maintain health and sanitation standards in these buildings. Coupled with these water harvesting systems will be the installation of stormwater drainage solutions on 14 buildings situated less than 30 m from inundation zones in Antigua and Barbuda. While flooding is not recognised as a primary hazard at these 14 project sites, these solutions will mitigate the risk of potential flooding that may result from heavy rainfall associated with Category 4 and 5 hurricanes. This flood risk mitigation will be achieved through installing drainage gutters at the 14

target sites to ensure that water from these heavy rainfall events is distributed into the existing drainage systems to avoid localised flooding.

Activity 1.2. Construct climate-resilient storm shelters built on to five public clinics.

To facilitate the transition away from using schools as storm shelters, the project will commission five purpose-built storm shelters attached to public clinics. These shelters will be managed by the targeted clinics and serve as multi-purpose centres for *inter alia* training and conferences outside of the hurricane season. Attaching the shelters to clinics will not only reduce downtime for schools after being used as shelters but will also improve the health conditions as nurses will be present on site to treat the sick and injured. The shelters will also be equipped with renewable energy systems and water harvesting equipment to reduce reliance on centralised supply systems (see Activity 1.4 below). To ensure the effective operation of and adherence to national health and safety requirements for storm shelters, an emergency protocol will be developed for each shelter. These protocols will include details on the: i) responsible parties; ii) carrying capacity of the shelter; iii) preparation actions ahead of a storm; iv) sanitation, food and water requirements; v) approved duration of stays; and vi) communication channels with the National Office of Disaster Services (NODS).

Activity 1.3. Construct a climate-resilient bunker to store emergency supplies for the health, energy, building and welfare sectors.

To address the need for a secure location to store such supplies, the project will construct a climate-resilient bunker that will service the health, energy, building and welfare sectors. The bunker will be managed by a ministerial sub-committee for disaster preparedness who will be responsible for coordinating efforts between relevant stakeholders. Four specific units will be established within the bunker, each focussing on a specific sector. These units are described briefly below.

- The first unit will serve the health sector, providing safe storage for medicine and medical supplies which can be quickly distributed after an event.
- The second unit will be managed by Antigua and Barbuda's Department of Environment (DoE) and will be used to store backup solar panels to replace those damaged during a storm.
- The third unit will service the Public Works Department (PWD), storing timber and other building materials that can be used as shutters during preparation or for repairs after an extreme event.
- Finally, the fourth unit will be used to store critical food supplies to support emergency responders who have limited opportunity to access personal supplies during and after an extreme event. The distribution of this food will be controlled by the Ministry of Social Transformation.

The climate-resilient bunker will be used year-round to stock medical supplies, RE equipment, building materials, and dry food.

Activity 1.4. Implement measures to preserve vital information/data within public institutions.

Under this activity, protocols will be developed for how to effectively and efficiently back up all vital information and data preceding a storm and IT teams within each public institution will be trained on the application of these protocols. Each targeted institution will be responsible for the delivery of this training to relevant staff. Furthermore, physical protection measures will be designed and implemented on the relevant public buildings to reduce the risk of critical IT infrastructure being damaged by an extreme event.

**Output 2. Climate change adaptation mainstreamed into the building sector and relevant financial mechanisms**

Output 2 of the project will contribute to GCF Outcome A5.0 – Strengthened institutional and regulatory systems for climate-responsive planning and development – and support the implementation of adaptation interventions under Output 1. The strengthened regulatory frameworks, combined with capacity buildings and skills development in the building sector, will create an enabling environment for the upscaling and replication of project interventions across the country. This upscaling potential will be achieved by: i) mainstreaming climate change adaptation into the building sector, as well as the public and private financial sectors; ii) strengthening the capacity of the public and private sectors to design, implement, operate and maintain climate-adaptive measures for the building sector; and iii) raising awareness within the public and private sectors on the benefits of adopting these adaptation measures.

*Mainstreaming climate change adaptation into the building sector*

To complement the ongoing SCCF project<sup>21</sup> described in B1 — which updated the national building code to develop standards that account for the impacts of Category 4 and 5 hurricanes — the proposed project will draft regulations for the Physical Planning Act (PPA) of 2003 to make provision for the inclusion of the updated building code in national regulatory frameworks. These regulations will undergo a strategic impact assessment to assess the technical, financial, social and gender impacts. This process and output will contribute to establishing a standard for climate-resilient development across the country. Antigua and Barbuda's building code incorporates elements of the Bahamas Building Code, which in turn was based generally on the South Florida Building Code<sup>22</sup>. Applying the Florida Building Code, which makes provision for Category 4 and 5 hurricanes, has been shown to reduce the damage caused by hurricanes by up to 72%<sup>23</sup>. Similar reductions can therefore be expected, and the adaptation impact of this intervention enhanced, by: firstly, updating the building code to include design criteria that accounts for Category 4 and 5 hurricanes (which is currently being done under the SCCF-funded project); and secondly, strengthening the technical and institutional capacity of technical staff involved in infrastructural design and development (e.g. staff from the MoW, DCA and NODS, as well as building inspectors, engineers, architects and draughtsmen; and the private sector) to apply the updated code. To further contribute to the mainstreaming of climate change adaptation into the building sector, recommendations will be made for the Environmental Management Systems plans (EMS plans) to be updated to include climate-resilient measures. The mechanism for the development of these recommendations will include engaging with relevant project partners to review the EMS plans and identify entry points for the inclusion of climate change adaptation for the building sector. Following this review, recommendations will be drafted proposing the relevant revisions to the EMS plans and milestones for these revisions will be set. The target for these revisions to be complete is the end of Year 2 of project implementation. Annual meetings will be held thereafter with relevant stakeholders to collate and share lessons learned from implementing the EMS plans and ensure that these plans are updated regularly where necessary.

#### *Mainstreaming climate change into public and private financial sectors*

Under the SCCF-funded project<sup>24</sup>, entry points for climate change adaptation financing within the SIRF Fund have been established to increase public and private sector access to financial resources for adaptation, including for the building sector. The SIRF Fund has two main thematic funding windows, namely the climate change window and biological diversity window, with corresponding programmes under each window.

Climate-proofing buildings in Antigua and Barbuda is currently financed by two streams, namely via the SIRF Fund for small enterprises that do not always qualify for access to funds from mainstream banking sector and the private banks for medium and large enterprises. Under the SIRF Fund's climate change window, there is currently a Revolving Fund Programme for Adaptation which focuses on providing microfinancing for the incremental cost of implementation of adaptation measures to small buildings (i.e. vulnerable households, clinics, schools, etc.). In its current form, this climate change window is optimised for small loans/grants to vulnerable households, with individual applications capped at 5% of the total funds under this window available at a given time. However, as presented below, the anticipated adaptation needs exceed the available funds particularly for medium and large enterprises.

The overall financing needs<sup>25</sup> of small enterprises to climate-proof their premises accounts for US\$208.5 million within the next 20 years, while medium and large enterprises require an investment of US\$650 million within the next 20 years to achieve the same goal. The current capitalization of the SIRF Fund accounts for US\$8 million within next 2 years, resulting in a financial gap of US\$5 million/year to bring existing buildings up to standard for the Category 4–5 building code. This financial gap will be addressed by using lessons learned from the proposed project to reduce the cost of adaptation interventions, including: i) determining the incremental cost of building adaptations used in small businesses and applying these to selection criteria to allow for the development costs to be split between baseline and adaptation measures; and ii) developing sustainable bulk procurement processes to reduce the cost of building materials required for climate-proofing infrastructure.

<sup>21</sup> entitled: "Building climate resilience through innovative financing mechanisms for climate change adaptation"

<sup>22</sup> OAS. 2002. Status of Building Codes in the Caribbean. Available at: <https://www.oas.org/cdmp/bulletin/codemtrx.htm>.

<sup>23</sup> Simmons, Kevin M., Jeffrey Czajkowski, and James M. Done. "Economic effectiveness of implementing a statewide building code: the case of Florida." *Land Economics* 94, no. 2 (2018)

<sup>24</sup> entitled: "Building climate resilience through innovative financing mechanisms for climate change adaptation"

<sup>25</sup> The presented costs estimation will also be further amended via lessons learnt derived for this project.

Although the trajectory of financial needs of medium and large companies for climate-proofing upgrades is not known at this time, the trajectory for the larger companies is currently being assessed by the GoAB. This project will provide more information on the policy guidance that the GoAB needs to consider and adopt to meet these financial needs.

In addition to the financial needs for adaptation of Antigua and Barbuda's building sector, several non-financial market barriers have been identified during project development and have been considered in the proposed solution. These include limited: i) experience in implementing climate-proofing interventions to fully understand the cost requirements, coupled with high costs of bringing materials into the island; ii) technical capacity within NODS, DCA and PWD for long-term monitoring, maintenance and planning for adaptation measures in the building sector; iii) technical knowledge of the adaptation options and approaches available for the building sector, increasing the risk of over-engineering and overpricing interventions; and iv) understanding of private sector partnerships in the building sector to promote upscaling of and investment in adaptation interventions.

To specifically overcome the abovementioned barriers, as well as those listed in Section B2, the proposed GCF project will catalyse the creation of additional entry points to increase the access of both the public and private sectors to financial resources for implementing climate-proofing measures. In particular, the project will introduce incremental cost reasoning to SIRF Fund selection criteria, which will allow for the development costs to be split between baseline and adaptation measures. This will reduce the investment requires from the SIRF Fund, with baseline costs being covered through alternative development funding sources, such as the GoAB as well as other development agencies that can provide funding to undertake baseline-related interventions for the building sector. During the implementation of Activity 2.2, options for increasing financial inflows into the SIRF Fund will be investigated to increase the available financial resources to be accessed by the public and private sector. This will be done to further bridge the financing gap, including incentive programmes, levies and insurance/risk management products. To facilitate this process, engagements will be held with relevant public and private sector stakeholders in Year 1 of project implementation to identify entry points for unlocking finance for climate-resilient sustainable development in Antigua and Barbuda. Through the consultation process, the most appropriate options discussed above will be selected and validated by all project partners. These consultations will happen in Year 1 of implementation. The SIRF Fund guidelines will be updated and validated by all project partners following these discussions by the end of Year 2. To promote the use of the SIRF Fund as a mechanism for financing climate-adaptive measures for the building sector, decision-makers from NODS, DCA and PWD, as well as private sector representatives, will be trained on how to access financial resources under the SIRF Fund — within the specified thresholds. This training will be provided regularly commencing in Year 3. Finally, from the beginning of Year 3 to the end of the project implementation period (Year 6), annual engagement workshops will be held to collate and share lessons learned from public and private sector interactions with the SIRF Fund and processes for replenishment will be discussed and revised where necessary.

In addition to enhancing access, where appropriate, of the private sector to the SIRF Fund for larger scale adaptation investments, the project will refine the SIRF Fund selection criteria for adaptation interventions. Using an evidence-based approach that draws lessons learned from the SCCF and Enhanced Direct Access (EDA) projects<sup>26</sup>, as well as the implementation of on-the-ground adaptation interventions under Activity 1.1 of this project, the list of adaptation options supported by the SIRF Fund will be refined. This process will ensure that all options are optimised for the local conditions and markets, and that clear guidelines are set for assessing the eligibility of each application. GCF resources will not be used to capitalise this fund, fill funding gaps or retroactively finance activities already under development or implementation other programmes / initiatives.

#### *Capacity building and awareness raising for the public and private sectors*

To ensure the sustainability and upscaling potential of climate-proofing measures implemented under Output 1, training programmes will be developed with partner organisations such as the Antigua and Barbuda Institute for Continuing Education (ABICE). These training programmes will focus on how to appropriately apply the regulations of the building code during the design, installation and monitoring of climate change adaptation measures specific to the building sector. Appropriate local training institutes such as ABICE will deliver these programmes to public and private sector representatives, including staff from MoW and DCA as well as building inspectors, engineers, architects and

<sup>26</sup> Under the GCF project, entitled *Integrated physical adaptation and community resilience through an enhanced direct access pilot in the public, private, and civil society sectors of three Eastern Caribbean small island developing states* (referred to as the EDA project in this Funding Proposal), the SIRF Fund is being used as a mechanism for financing adaptation at a household level. Lessons learned from this intervention will be used to inform interactions with the SIRF Fund under the proposed GCF project.

draughtsmen. A certified training course will also be developed for and delivered to the local workforce through these training institutions. This training course will focus on how to support the installation, operation and maintenance of climate-resilient physical upgrades to buildings as well as RE and climate-resilient water harvesting solutions. To contribute to the uptake of these capacity-building interventions, gender-sensitive awareness-raising campaigns will be designed and conducted for the public and private sectors. These campaigns will promote the availability of training on climate change adaptation for the building sector as well as on the benefits of implementing these measures. The combination of interventions implemented under Output 2 will enable the public and private sector actors to build sufficient capacity for the independent adoption and maintenance of climate-resilient solutions for the building sector. This will maximise the adaptation benefits delivered by these solutions and ensure their sustainability beyond the project lifetime. Activities that will be implemented under this project output are summarised below. Further details on these activities, including on the associated sub-activities and deliverables, are presented in Section E.6 of this Funding Proposal and Section 9 of Annex 2: Feasibility Study.

Activity 2.1. Mainstream climate change adaptation into the building sector by making provision for the building code in the Physical Planning Act (2003) and updating the EMS plans.

Under this activity, climate change adaptation will be mainstreamed into the country's building sector. This will be achieved in three primary ways. Firstly, regulations for the Physical Planning Act (2003) will be drafted to make provision for including the updated building code in the national regulatory framework. Doing so will facilitate the formalisation of the code, which addresses Category 4 and 5 hurricanes, into policy. This will in turn contribute to establishing a standard for climate-resilient development across the country. Secondly, a Strategic Impact Assessment (SIA) of the building code regulations will be conducted to assess the environmental and social safeguards and gender risks, consequences and mitigation measures related to the enactment of these regulations in the Physical Planning Act (2003). This SIA will ensure that the building code is able to be applied by the most vulnerable groups in the country, particularly persons with low income, limited access to financing, as well as the elderly and those people who have disabilities. Thirdly, recommendations will be made for the EMS Plans to be updated to include climate-resilient measures for the building sector. Engagements will be held with project partners to review the EMS Plans and identify entry points for the inclusion of climate change adaptation for the building sector. Following this review, recommendations will be drafted proposing the relevant revisions to the EMS Plans. The target for these revisions to be completed is the end of Year 2 of project implementation. Annual meetings will be held thereafter with relevant stakeholders to collate and share lessons learned from implementing the EMS plans and ensure that these plans are updated regularly where necessary.

Activity 2.2. Mainstream climate change adaptation for the building sector into public and private financial, insurance and banking sectors.

Activity 2.2 will complement the SCCF project to maximise the effectiveness and accessibility of the SIRF Fund's adaptation window. First, public and private sector stakeholders will be engaged to identify additional entry points for accessing climate finance through the SIRF fund for investments. Specifically, for resilience building for small micro businesses that are important to community resilience. Lessons learned from this project will allow the fund to accurately calculate the incremental cost of building adaptations used in small businesses. For the segment of the private sector, it is not expected that they will exceed the current 5% cap. Key to this process will be the introduction of accurate incremental cost reasoning to selection criteria for these business which will allow for the development costs to be split between baseline and adaptation measures. Private sector access to climate finance through the SIRF Fund will be further enhanced by enabling Fund (or some mechanism of the fund working with the private sector) to sustainably procure bulk building materials required for climate-proofing infrastructure. Private entities — for example, businesses, hotels and homeowners — could then buy the materials they need from the Fund at this reduced price and this is included in the loan. This approach is a key option to bridging the financial gap in incremental cost of adaptation financing. This approach is currently being demonstrated with the provision of concessional loans to purchase grid interactive back-up renewable energy to homeowners. The RE equipment is purchased by the Fund in bulk the solar/battery grid interactive systems and made available to loan applicants. Once demonstrated, the effectiveness of the bulk-import model will be reviewed for a potential viable tool to support the financing of climate change adaptation in Antigua and Barbuda's building sector.

In addition to enhancing access of the private sector to the SIRF fund for larger scale (but still micro levels) adaptation investments, this activity will refine the selection criteria for adaptation interventions. Using an evidence-based approach that draws lessons learned from the SCCF and EDA projects, as well as the implementation of on-the-ground adaptation interventions under Activity 1.1 of this project, the list of adaptation options supported by the SIRF Fund will

be refined. This process will ensure that all options are optimised for the local conditions and markets, and that clear guidelines are set for assessing the eligibility of each application. GCF resources will not be used to replenish this fund, fill funding gaps or retroactively finance activities already under development or implementation other programmes / initiatives.

Activity 2.3. Train relevant staff from the National Office of Disaster Services (NODS), Development Control Authority (DCA) and the Public Works Department (PWD) as well as the private sector on operational procedures for long-term monitoring, maintenance and upscaling of climate-resilient renewable energy (RE) and water harvesting technologies in accordance with the national building code.

Training will be provided to relevant staff from NODS as well as building inspectors from DCA and building maintenance teams from PWD on operational procedures for long-term monitoring, maintenance and upscaling of climate change adaptation interventions that will be implemented under Output 1. Building-specific operations and maintenance (O&M) plans will be used to inform this training to ensure that the knowledge shared during these trainings is technically sound. To complement these capacity-building interventions, training programmes will be developed with partner organisations such as Antigua and Barbuda Institute for Continuing Education (ABICE) for the public and private sector representatives, including staff from the Ministry of Works (MoW) and Development Control Authority (DCA) as well as building inspectors, engineers, architects and draughtsmen. This training will focus on how to apply the regulations of the national building code during the installation of climate change adaptation measures that are specific to the building sector, such as renewable energy and climate-resilient water harvesting solutions. In addition, awareness raising campaigns will be designed and conducted to increase the uptake of climate change adaptation measures for the building sector across the public and private sectors.

Activity 2.4. Train local workforce on the installation, operation and maintenance of climate-proofing measures for the targeted buildings.

To complement the capacity-building interventions under Activity 2.3 that are focused on long-term operations and maintenance of adaptation measures for the building sector, the local workforce will be trained on how to support the installation, operation and maintenance of climate change adaptation solutions that will be installed in targeted buildings under Activity 1.1. To facilitate this training, suitable training institutions in the country, such as ABICE, will be engaged to develop and deliver a certified training programme that focuses on: i) installing, operating and maintaining climate-proofing measures for the building sector; and ii) implementing early action protocols (developed under Output 1) preceding an extreme climate event. The training course that will be developed under this activity will apply regional and international best practices for climate change adaptation measures in the building sector.

### **Output 3. Climate information services strengthened to facilitate early action within the building sector to respond to extreme climate events**

Project interventions under Output 3 will contribute to GCF Outcome A6.0 – Increased generation and use of climate information in decision-making – by strengthening Antigua and Barbuda’s early warning system (EWS) as well as the capacity of Antigua and Barbuda Meteorological Services (ABMS) to facilitate rapid information sharing and early action preceding an extreme climate event. Interventions under this project output will complement the *Caribbean Disaster Emergency Management Agency (CDEMA) Early Warning Systems (EWS) Regional Readiness Project*. This project is currently under development and is focused on improving regional coordination of EWS across the Caribbean. Although the interventions under the CDEMA project are thematically aligned with the proposed project, the scope of the CDEMA project is not at a sufficient level to improve the production and dissemination of early warnings at a national and local level in Antigua and Barbuda to facilitate early action. Output 3 of the proposed project will fill this gap in two ways. Firstly, a centralised online server will be established and housed within ABMS to process climate data in real time, overcoming existing shortfalls in the data processing capabilities. This will enable ABMS to reliably and timeously forecast extreme climate events using data from the country’s existing weather stations. The centralised server will be equipped to process data in several formats which will reduce processing time given that data is inputted from the country’s weather stations using several different operational platforms. To further strengthen the capacity of ABMS to produce early warnings, training workshops will be conducted for ABMS staff on how to: i) collect, process and manage climate data generated by the server; and ii) use the generated data to develop early warning information products, including easily interpretable infographics. A knowledge exchange trip will also be conducted to the nearest Regional Climate Centre (RCC), which is under the auspices of the World Meteorological Organisation (WMO). This trip will enable these staff to learn from this RCC, which is currently implementing an impact-based forecasting approach to early warnings focused on early action.

To complement the abovementioned capacity-building interventions and ensure the effectiveness of early warnings, communication and early action protocols will be formalised between AMBS and relevant government agencies to facilitate rapid information sharing preceding an extreme climate event. The communication protocol will define which agencies need to be notified at each stage of hurricane development, from initial identification of a tropical disturbance through to a full hurricane. The communication protocol will be underpinned by specific early action protocols linked to specific stages of hurricane development. Each stage will require action from different stakeholders, including NODS, DoE, the Ministry of Health, Wellness and Environment (MoHWE), the Ministry of Education Science and Technology (MoEST) and the general public. As the threat level increases, so will the required level of response. The early action protocols will define what needs to be done at each stage, as well as how it should be done and who is responsible. These protocols will include variable responses to allow flexibility depending on the anticipated intensity of incoming storms. This will include specific responses for each priority building to ensure that critical services are adequately prepared for a hurricane.

The combined effect of the early warnings and early action protocols will complement Output 2 of the project. This project output will ensure that relevant public institutions responsible for coordinating emergency response —such as NODS — as well as critical service providers — such as hospitals, clinics, police and fire stations — have the technical capacity to implement early action protocols preceding an extreme climate event. This will minimise the adverse impacts of these events on critical infrastructure and vulnerable local communities. Project activities that will be implemented under Output 3 are summarised below. Further details on these activities, including on the associated sub-activities and deliverables, are presented in Section E.6 of this Funding Proposal and Section 9 of Annex 2: Feasibility Study.

Activity 3.1. Strengthen the capacity of ABMS to collect, process and manage climate data.

Under this project activity, a centralised online server will be established and housed within Antigua and Barbuda Meteorological Services (ABMS) to overcome the current barrier of an insufficient climate data processing system. This online server will enhance the real-time processing of climate data to ensure that climate threats are detected in advance and facilitate impact-based forecasting. To support the establishment of the server, staff within ABMS will receive training on: i) efficient and effective methods for collecting, processing and managing climate data in real time; and ii) how to develop early warning information products, including infographics that are locally appropriate and easily interpreted by vulnerable communities. A knowledge-exchange trip, funded by GCF resources, will be undertaken by relevant technical staff at ABMS to the nearest Regional Climate Centre (RCC), which is under the auspices of the World Meteorological Organisation (WMO). This trip will enable these staff to learn from this RCC, which is currently implementing an impact-based forecasting approach to early warnings focused on early action.

Activity 3.2. Establish a formalised communication protocol to facilitate rapid information sharing and early action preceding an extreme climate event.

A formal communication protocol will be developed and operationalised under Activity 3.2 to support the development of early warning information products and impact-based forecasts (Activity 3.1). This will be done to facilitate effective communication of impact-based forecasts from ABMS to decision-makers within relevant government entities responsible for preparation ahead of an extreme climate event. To support this communication protocol, the capacity of ABMS will be strengthened to ensure that the dissemination of climate information is locally appropriate and effective. Early action protocols will also be developed for critical public service and community buildings, with variable responses built into these protocols to account for variable intensities of incoming storms. Training will then be provided to the relevant public and private sector actors on the application of these protocols to ensure decision-makers, that are integral to disaster response (such as NODS), have sufficient capacity to respond efficiently and effectively to the threat of an extreme climate event.

**B.4. Implementation arrangements (max. 1500 words, approximately 3 pages plus diagrams)**

The proposed project will be implemented over a six-year period, from 2021–2027. Antigua and Barbuda's Department of Environment (DoE) will be the Accredited Entity (AE) for this project, as designated by the Government of Antigua and Barbuda (GoAB). The AE will be responsible for overseeing the implementation, financial management, evaluation, reporting and closure of the project. To support the selection of the DoE as the AE and highlight the DoE's sufficient capacity to oversee the implementation of all project interventions, the DoE's Project Implementation Manual has been submitted as Annex 25 to this Funding Proposal.

*Executing Entity*

Antigua and Barbuda's Ministry of Finance (MoF) will be the Executing Entity (EE) for the project. As the EE, MoF will provide oversight and manage entities in the respective government bodies (e.g. MoW, MoHWE, NODS and ABMS) that will be involved in the implementation of project interventions (Table 3). MoF will be accountable to the AE for the project implementation. All operating policies and procedures will follow the DoE policies and procedures.

**Table 3.** Project Executing Entity and the preferred implementing partners for each project intervention.

| Project output  | Project activity  | Implementing Partners or Affiliates <sup>27</sup> |
|---|---|---|
| 1. Climate-proofing interventions implemented in critical public service and community buildings to improve resilience to, and recovery from, extreme climate events. | 1.1. Implement climate-proofing measures on critical infrastructure.  | MoW   |
|   | 1.2. Construct climate-resilient storm shelters attached to public clinics.   | MoHWE; NODS; and MoW                              |
|   | 1.3. Construct a climate-resilient bunker to store emergency supplies for the health, energy, building and welfare sectors.   | DoE; MoHWE; MoW; and MoST                         |
|   | 1.4. Implement measures to preserve vital information/data within public institutions.  | DoE   |
| 2. Climate change adaptation mainstreamed into the building sector and relevant financial mechanisms.   | 2.1. Mainstream climate change adaptation into the building sector by making provision for the building code in the Physical Planning Act (2003) and updating the EMS plans.  | DoE; DCA; and MoW                                 |
|   | 2.2. Mainstream climate change adaptation for the building sector into public and private financial, insurance and banking sectors.   | DoE   |
|   | 2.3. Train relevant staff from the National Office of Disaster Services (NODS), Development Control Authority (DCA) and the Public Works Department (PWD) as well as the private sector on operational procedures for long-term monitoring, maintenance and upscaling of climate-resilient renewable energy (RE) and water harvesting technologies in accordance with the national building code. | DoE; NODS; DCA; and PWD                           |
|   | 2.4. Train the local workforce on the installation, operation and maintenance of climate-proofing measures for the targeted buildings.  | DoE   |
| 3. Climate information services strengthened to facilitate early action within the building sector to respond to extreme climate events.                              | 3.1. Climate information services strengthened to facilitate early action for extreme climate events.   | DoE; and ABMS                                     |
|   | 3.2. Establish a formalised communication protocol to facilitate rapid information sharing and early action preceding an extreme climate event.   | DoE; ABMS; and NODS                               |

**Accredited Entity**

DoE will be responsible for overseeing the implementation of the proposed project in coordination with the national-level Project Steering Committee (NPSC) and a national-level Project Management Unit (PMU). As the AE, DoE will: i) execute an agreement with MoF to establish clear roles and responsibilities for project execution, including the use of the DoE grievance redress mechanism and the AML/CTF provisions; ii) ensure that the project is executed in

<sup>27</sup> The most suitable name for these partnering government bodies in relation project implementation and in line with the AE's AMA is 'Affiliates' of the AE as defined in Clause 1 of the AMA. This is because all of these entities, including the AE, are under the 'common control' by the Government of Antigua and Barbuda.

accordance with GCF and DoE standards; iii) supervise, oversee and manage the implementation of project interventions; iv) report on project progress; v) participate in the NPSC; and vi) ensure that project activities are well coordinated and aligned with national priorities. A Task Management Team (TMT) will be responsible for project supervision to ensure consistency with GCF and DoE policies and procedures. This TM will participate in: i) biannual NPSC meetings; ii) facilitating Mid-Term and Final Evaluations; iii) preparing Annual Performance Reports and relevant documentation; and iv) technical reviews of project outputs. Project funds will be channelled through AE. The AE will be responsible for the procurement and efficient disbursement of financial resources for the implementation of all project activities.

#### *National Project Steering Committee*

The National Project Steering Committee (NPSC) will comprise representatives from *inter alia*: i) DoE; ii) MoF; iii) the Ministry of Health, Wellness and the Environment (MoHWE); iv) Ministry of Works (MoW); v) Ministry of Education Science and Technology (MoEST); and vi) Antigua and Barbuda Meteorological Services (ABMS). The committee will primarily be responsible for providing technical oversight and advisory support. This includes: i) overseeing project implementation; ii) reviewing annual workplans and project reports; and iii) approving any changes to the project's targets, activities or timelines. Biannual NPSC meetings will be held<sup>28</sup> to take management-related and technical decisions, discuss the project's main performance indicators and provide strategic guidance. Any changes made by the NPSC to the project's Results Framework or timeline will be communicated to the PMU. In addition, the NPSC will be responsible for: i) overseeing the PMU; ii) providing technical and administrative functions; and iv) serving as the focal point for engagements and interactions between project stakeholders and partner organisations.

Full-time staff members will be recruited competitively to fulfil the role of PC and PM. The PC who will be responsible for the daily on-the-ground implementation and management of the project. The PC will be primarily responsible for ensuring that the project achieves the targets set out in the Results Framework (Section E) to the required quality standards and within the specified time and budget allocations. To achieve these targets, the PC will: i) report directly to the PSC on project management-related matters; ii) manage the project in accordance with the specified workplans and allocated budget; iii) ensure that all project interventions are implemented according to GCF and DoE guidelines; iii) manage and disburse financial resources allocated for the project during project implementation; iv) work closely with national and local authorities to ensure that the project is managed effectively and that the needs of all beneficiary groups are considered; and v) oversee the efficient and effective information and knowledge-transfer to relevant project partners.

The PM will be required to manage all project risks at all times. Many of the risks are either medium or high. This is as a result of the fact that the project is being implemented on an Island where most of the items are being shipped, as well as the high risks of hurricane occurring during project implementation. A full time PM will therefore be employed to anticipate risks and address them early, before they can delay the project. The PM will also be responsible to meet with the Cabinet and the PMC to coordinate high-level stakeholders. The PM's role will be maintained until project completion to allow for the fulfilment of all FAA requirement, including submission of the terminal evaluation report — as well as any other required documentation — to the GCF and DoE.

#### *Project management unit (PMU)*

A PMU managed by the MoF will coordinate the implementation of project interventions with the AE, EE and other implementing partners. This unit will be primarily responsible for coordinating project activities between the AE, EE and relevant stakeholders. The PMU will consist of: i) the PM; ii) a Project Coordinator (PC); iii) a Financial Officer (FO); iv) a Procurement Officer (PO); v) an Environmental and Social Safeguards Officer (ESO); vi) a Communications Officer (CO); vii) a Monitoring and Gender Officer; and viii) an Administrative Officer (AO). Both the FO, PO and AO will report directly to the PM. Their responsibilities will include: i) providing administrative, logistical and technical financial support to the PMU; and ii) compiling reports on the disbursement procedures for the project and projected requirements for project funding during the implementation phase. The FO in particular will manage the process of requesting financial disbursements from the AE. . A full-time PC will be contracted competitively to support the PM in the implementation of day-to-day project activities. The PC's responsibilities will also include to serve as a focal point for facilitating all stakeholder engagements that will be undertaken during the project implementation phase.

<sup>28</sup> with ad hoc meetings held wherever necessary

#### *Experience and track record of the Accredited Entity*

The Department of Environment will be the Accredited Entity for the proposed project. The DoE has a proven track record of implementing resilience building projects from the Special Climate Change Fund (SCCF), the Adaptation Fund (AF) and the Global Environment Facility (GEF) and the GCF. Key resilience projects implemented in recent years are listed below.

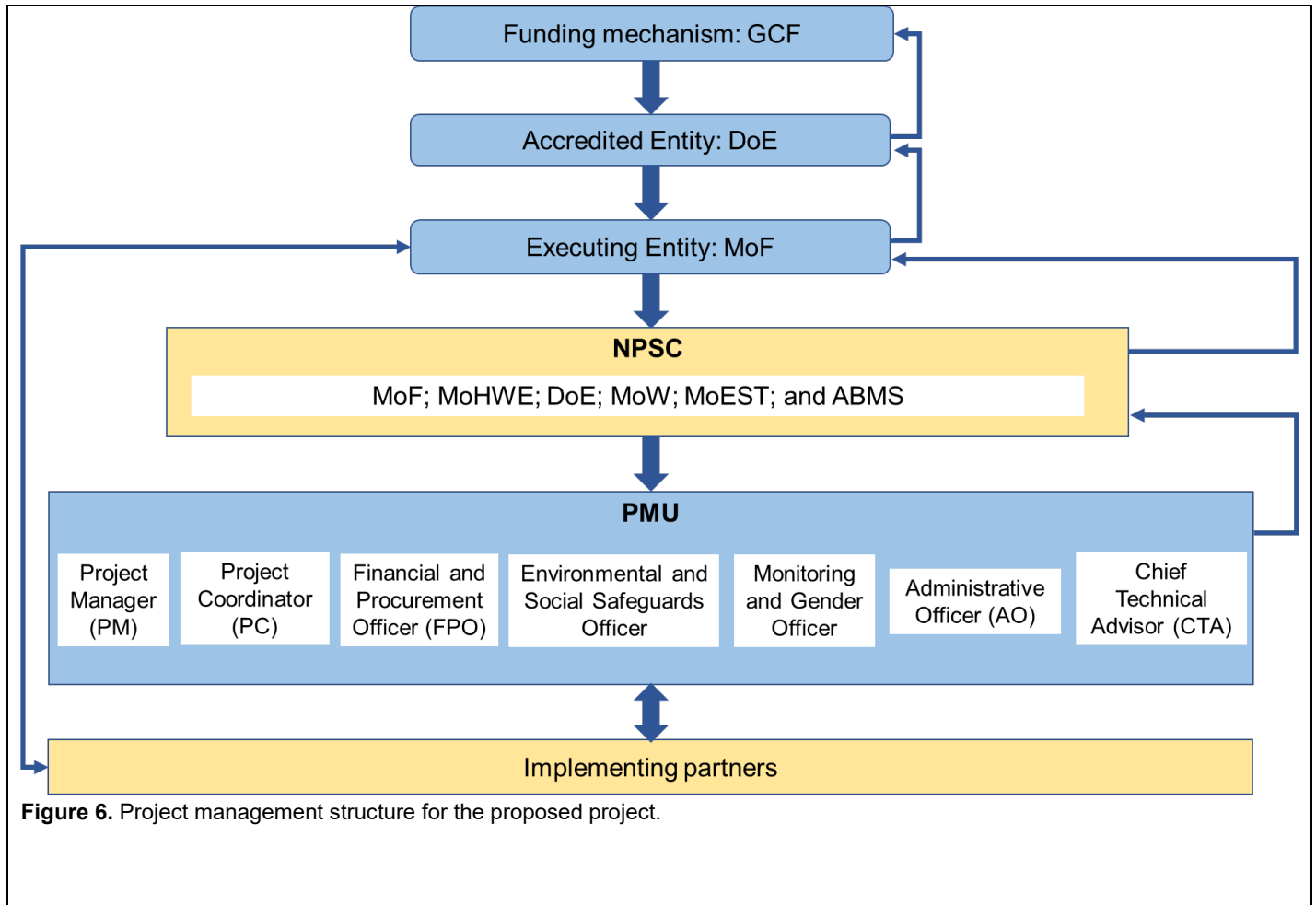
- An integrated approach to physical adaptation and community resilience in Antigua and Barbuda's northwest McKinnon's watershed – Adaptation Fund (\$10 million USD)
- Sustainable Pathways Protected Areas and Renewable Energy UNEP (SPPARE) – GEF (\$2.6 million USD)
- Building climate-resilience through innovative financing mechanisms for Ecosystem-based Adaptation – SCCF (\$5 million USD)
- Energy for Sustainable Development in Caribbean Buildings (ESD) – GEF (\$ 0.9 million USD)
- Sustainable Energy Facility (SEF) – GEF (1.02 million USD)
- Enhanced Direct Access (EDA) project 'Integrated physical adaptation and community resilience through an enhanced direct access pilot in the public, private, and civil society sectors of three Eastern Caribbean small island developing states' – GCF (20 million USD)
- Resilience Back-Up Energy project – ADFD Loan (15 million USD)

#### *Experience and track record of the Executing Entity*

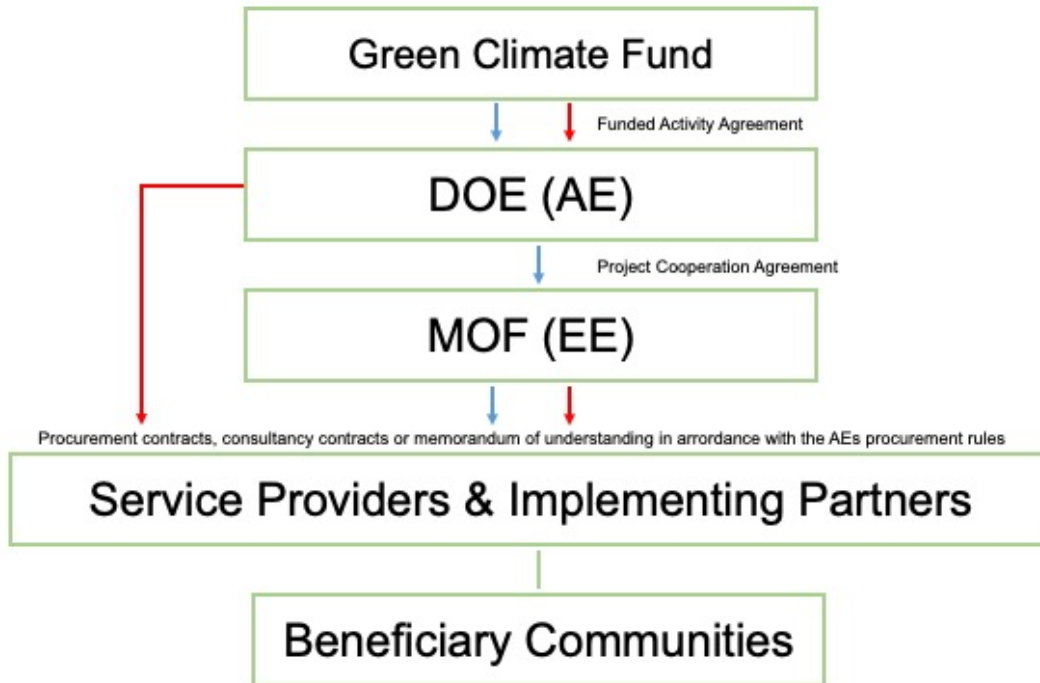
Antigua and Barbuda's Ministry of Finance (MoF) will be the Executing Entity for the proposed project. The MoF has been identified as the appropriate government entity to fulfil this role because of it has the necessary technical expertise for the implementation of project activities as well as its ability to provide financial risk mitigation measures (insurance, in-kind and cash). The MoF has a proven track record of managing and implementing multiple national and regional projects with a focus on climate change adaptation, sustainable development and public sector social and digital transformation. The projects that the MoF has supported over the last five years are listed below.

- World Bank - Public Sector Social Transformation Project (US\$6 million)
- 10<sup>th</sup> European Development Fund Project (€3 million)
- 11<sup>th</sup> European Development Fund Project (€2.4 million)
- World Bank – Caribbean Resilience Facility (US\$15 million)
- World Bank – Caribbean Digital Transformation Program (US\$2 million)
- World Bank – ECPCGC (US\$2 million)
- Government of Canada – Eastern Caribbean Debt Management Advisory Services (CAD US\$7 million)

Figure 6 below shows the implementation arrangements for project implementation while Figure 7 shows the flow of funds and contractual arrangements.



**Figure 6.** Project management structure for the proposed project.



**Figure 7.** Flow of funds and contractual arrangements for project implementation. The red arrows indicate the flow of funds while the blue lines show the contractual arrangements, including the types of contracts, between the relevant parties.

**B.5. Justification for GCF funding request (max. 1000 words, approximately 2 pages)**

As a Caribbean SIDS, Antigua and Barbuda is one of the most vulnerable countries to extreme climate events such as hurricanes and tropical storms<sup>29</sup>. These events have a significant impact on the country’s economy, resulting in significant damaged to infrastructure losses in across key economic sectors, including tourism. Over the quarter century, the intensity and frequency of hurricanes has increased<sup>30</sup>, exacerbating the impacts of extreme climate events on the island nation’s economy. This includes a series of hurricanes and tropical storms hitting Antigua and Barbuda in 1995, 1998, 1999, 2008, 2011 and 2017. The impact of such events on the economy is severe. For example, Hurricanes Luis and Marilyn (1995) resulted in a ~30% decline in the country’s GDP, while Hurricanes Irma and Maria (2017) resulted in US\$136 million in damages and US\$19 million in economic losses across major sectors in the country<sup>31</sup>. To fully recover from the damages and economic losses caused by the 2017 hurricanes, an estimated US\$222 million in support was required, including US\$5 million for environmental recovery and US\$11.5 million for disaster risk management. Table 4 below provides a sector-specific breakdown of these damages and losses as well as the estimated recovery needs.

**Table 4.** Damages and losses caused by Hurricanes Irma and Maria as well as the recovery needs of the country.<sup>32</sup>

| Sector         | Damage (million US\$) | Losses (million US\$) | Total (million US\$) | Recovery needs (million US\$) |
|----------------|-----------------------|-----------------------|----------------------|-------------------------------|
| Infrastructure | 20.5                  | 0.61                  | 21                   | 38.3                          |
| Social         | 54.2                  | 2.7                   | 57                   | 93.3                          |
| Production     | 59.5                  | 8.7                   | 68.2                 | 70.3                          |
| Governance     | 0.87                  | 0.75                  | 1.5                  | 2.2                           |

<sup>29</sup> Further details on Antigua and Barbuda’s vulnerability to climate threats is presented in Section B.1. of this Funding Proposal and Section 3 of Annex 2: Feasibility Study.

<sup>30</sup> Further details on climate trends and projections for Antigua and Barbuda are presented in Sections 2 and 3 of Annex 2: Feasibility Study.

<sup>31</sup> Government of Antigua and Barbuda. Antigua and Barbuda Recovery Needs Assessment. Available at: [https://www.gfdr.org/sites/default/files/publication/Antigua%20and%20Barbuda%20executive%20summary\\_print\\_text%282%29.pdf](https://www.gfdr.org/sites/default/files/publication/Antigua%20and%20Barbuda%20executive%20summary_print_text%282%29.pdf)

<sup>32</sup> Government of Antigua and Barbuda. Antigua and Barbuda Recovery Needs Assessment.

|              |            |             |            |            |
|--------------|------------|-------------|------------|------------|
| Culture      | 1.15       | 0.76        | 1.9        | 1.4        |
| <b>Total</b> | <b>136</b> | <b>18.9</b> | <b>155</b> | <b>222</b> |

To address the impact of extreme climate events on the people and economy of Antigua and Barbuda, it is critical to integrate climate change considerations into development planning and to invest in building the resilience of critical public services and the infrastructure that supports them. To address these impacts, the government of Antigua and Barbuda is seeking US\$32.7 million of GCF grant financing to build the climate resilience of the building sector, focusing on climate-proofing critical public service and community buildings. At present, the country has limited capacity to finance climate change adaptation interventions through domestic sources of financing – including both private and public sector finance.

Although Antigua and Barbuda is considered a middle income country on a per-capita basis, its size and small population means that it lacks the scale required to invest adequately in adaptation. The country also has a high public debt burden which, in 2018, reached ~US\$1.4 billion — more than 88% of the country’s GDP<sup>33</sup>. The estimate cost of consideration the cost of upgrading all buildings in the country to Cat 4 & 5 is conservatively estimated about 6.4 Billion USD. This burden is increased by extreme climate events, with recovery needs reducing economic growth and the ability of the country to repay public debt. Although this debt was expected to decline by 2019, long standing problems in the fiscal and banking sectors remain unresolved, including this unsustainable public debt as well as persistent large financing gaps, high non-performing loans in the private sector and the delay in bank resolution<sup>34,35</sup>. Restoring fiscal and debt sustainability has therefore been recommended by the Executive Directors of the International Monetary Fund (IMF) as an urgent need to be addressed by the GoAB. Because of this recommendation, the GoAB is prioritising overcoming fiscal imbalances over investing in climate change adaptation. The recent 2020 global response to the CoVID 19 virus all but makes it impossible for the country to further invest in resilience building. This situation will impact both the public and the private sector for the next three years. GCF support is therefore required to overcome the financial barrier to urgently addressing the climate crisis and by improving the climate resilience of the country’s building sector.

Several alternative financing options have been considered during project development, including government funding. However, fully financing the project through government funds is not feasible, with the GoAB having already extended its maximum feasible contribution of US\$13 million (~33% of the total project cost) as co-financing. The threat of hurricanes will ensure however that the Government stay committed to this project regardless of the impact of the CoVID 19 response.

GCF financing will be used to overcome the barriers to increasing the resilience of Antigua and Barbuda’s building sector to climate change threats. Grants from the GCF will only be used to address the additional impacts of climate change, with government co-finance being used to cover all baseline costs – including business as usual repairs/maintenance to buildings that are necessary to ensure sustainability of climate-proofing interventions. With the support of GCF grant funding, the proposed project will deliver several adaptation benefits that will contribute to achieving a paradigm shift in the country towards climate-resilient sustainable development<sup>36</sup>.

Without GCF support, and with the recent CoVID 19 pandemic, the public and private sectors in Antigua and Barbuda will continue to operate under the existing paradigm of reactively recovering from consecutive hurricanes, with national- and local-level decision-makers being limited in their capacity to plan for, and respond to, the increasing impacts of climate change. Moreover, Antigua and Barbuda’s critical public service and community buildings will become increasingly vulnerable to extreme climate events such as hurricanes and tropical storms. This will result in: continued declines in the efficiency and effectiveness of critical services, including emergency response units, during and following these events; and increased damages and loss of life under future climate change conditions.

**B.6. Exit strategy and sustainability (max. 500 words, approximately 1 page)**

<sup>33</sup> Caribbean Development Bank. Country Economic Review 2018; Antigua and Barbuda. Available at: [https://www.caribank.org/sites/default/files/publication-resources/CDB%20Economic%20Brief%202018%20-%20Antigua%20and%20Barbuda\\_0.pdf](https://www.caribank.org/sites/default/files/publication-resources/CDB%20Economic%20Brief%202018%20-%20Antigua%20and%20Barbuda_0.pdf).

<sup>34</sup> Bank resolution refers to the restructuring of a bank by a resolution authority through the use of resolution tools in order to safeguard public interests, including the continuity of the bank’s critical functions, financial stability and minimal costs to taxpayers.

<sup>35</sup> International Monetary Fund. 2015. Antigua and Barbuda. IMF Country Report number 15/189.

<sup>36</sup> A detailed description of project activities is presented in Sections B.3 and E.6 of the Funding Proposal.

### **Participatory approach to climate-resilient sustainable development**

Proposed project interventions have been designed to deliver maximum adaptation benefits to vulnerable communities beyond the project lifetime. These benefits are centred around increasing the climate resilience of critical public services and will be highlighted during numerous workshops that will be conducted during the implementation phase. Uptake of climate resilience technologies within the building sector requires buy-in and commitment from all project partners to ensure that adaptation solutions continue to provide benefits to the population over the long term. The proposed project has been developed through a participatory and consultative process, which has allowed all relevant stakeholders to contribute to the design of the project interventions. Undertaking the development of the project in this way has promoted the country-driven nature of the project, which is a key to ensuring sustainability of project interventions over the long term. An extensive stakeholder engagement plan (Section 10 of Annex 6: Environmental and Social Impact Assessment and Management Plan) has also been developed to ensure that this participatory approach is continued during implementation. The impact and sustainability of project interventions will be further enhanced through the project's focus on ensuring gender-equal benefits are provided to project beneficiaries. Gender sensitive targets for all project activities have therefore been set in the project's Gender Action Plan (Annex 8) to ensure that project interventions are not gender-bias. This will contribute to the ownership of project activities by both women and men which, in turn, will result in gender-sensitive adaptation benefits being conferred beyond the project lifetime.

### **Upskilling public and private sector representatives for climate-resilient development**

Innovative solutions to increasing the climate resilience of Antigua and Barbuda's building sector will be implemented under the project. Such solutions include: i) increasing the structural integrity of critical public service and community buildings to withstand high-intensity storms; ii) installing decentralised renewable energy and climate-resilient water harvesting solutions; and iii) establishing a climate-resilient bunker for the stocking of critical supplies for the energy, medical, welfare and building sectors. Efficient and effective knowledge transfer is critical for achieving sustainability and encouraging scaling up and replication of these innovative solutions. As a result, public and private sector stakeholders will be trained on climate-resilient adaptation solutions for the building sector, incorporating a training-of-trainers approach to ensure that institutional knowledge of these solutions is maintained regardless of staff turnover. Technical staff from DCA (e.g. building inspectors) and MoW (e.g. building maintenance teams) as well as the local workforce will be trained on how to effectively implement, operate, maintain and monitor climate-adaptive measures installed on buildings in line with the requirements of the updated national Building Code. This updated code makes provision for climate change threats, detailing how buildings should be designed and upgraded to withstand Category 4 and 5 storm events. Consumers and producers within the private sector will also be targeted to receive training on the application of this code, including: i) private user groups — for example, business owners and homeowners; and ii) private sector service providers — for example, architects, engineers and private contractors. The provision of such training will ensure that new building designs and upgrades are sufficiently developed to adhere to the updated Building Code. Moreover, it will enable business owners and homeowners to hold private contractors accountable to adhering to the Building Code when upgrades to private buildings are being conducted. Mainstreaming the use of the Building Code into national policy and regulation will further initiate a shift towards climate-resilient development across Antigua and Barbuda's building sector.

### **Unlocking Private and Public Sectors investment into climate-adaptive technologies for the building sector beyond the project lifetime**

Funding for climate resilience infrastructure is available to the private sector by the Private Banks, Credit Union and the Government owned SIRD Fund. The SIRD Fund will serve as the main mechanism to unlock private financing in several segment of the population, including: i) low income home owners and first responders to upgrade existing homes to Category 4 and 5; ii) community buildings important for hurricane shelter and recovery, including churches, schools, clinics and community buildings; and iii) small businesses that are important to the community and that traditionally provide services such as child care, small shops, bakeries etc. These sectors account for just over 50% of the buildings in Antigua and Barbuda. The SIRD Fund does not provide grants to individuals but can provide grants to communities. In addition, the Fund only provides funding for incremental cost therefore leveraging funding from the Government and or the private Banks.

This GCF project resources will be used to support the Government's efforts catalyse the creation of additional entry points to promote investment into climate-adaptive measures in Antigua and Barbuda (Activity 2.2). Specifically, these resources will be used to expand and inform the Government of Antigua and Barbuda interventions via its SIRD Fund, as well as other financial entities for Cat 4 and Cat 5 infrastructure. In particular, this will further strengthen the enabling environment for private sector access to information and finances from the SIRD Fund for adaptation in the building

sector, in accordance with the guidelines and criteria for the adaptation list of options. The GCF project outputs will assist the technology and capacity risks currently faced by the SIRF Fund with current Cat 4 & 5 construction consists of over engineering and not really a thoughtful attempt to meet the standards via technical design and new technologies. Further this project will provide a new cadre of trained personnel which will increase skilled capacity for construction and for Renewable energy installations. Notwithstanding the lessons learned and success of this GCF project there will be a need to increase capital into the SIRF Fund to meet the private sector demand. During the implementation of Activity 2.2, options for increasing financial inflows into the SIRF Fund is currently under consideration with the aim to increase the available financial resources to be accessed to meet the funding gap to be experienced within the private sector.

To unlock Public Sectors investment in resilient infrastructure the Government of Antigua and Barbuda does not intend to use the SIRF Fund. The Government however in 2020 announced the establishment of the Climate Resilience and Development Fund. The purpose of the fund is to provide funding for climate resilience public sector projects. This Fund receives funding from current taxes and levies on the tourism sector. Lessons learnt from this GCF project as with the SIRF Fund will be providing this new Government Facility with technical guidelines on appropriate technologies and project design. With the CoVID 19 outbreak however, it is not expected that these funds will be available for adaptation until the financial impact of the CoVid 19 pandemic has been addressed. Based on very early IMF discussions (no documents at this time) the CoVID 19 response will cost the Government over six months of income and estimates that this will take the economy three years to recover.

This project will promote the benefits of implementing adaptation solutions in the buildings in both the public and private sectors. Stakeholders may be encouraged to further invest in climate change for future development. At present, there is limited financial capacity for such investment, in both the private and public sectors and this project will provide much needed information and trained capacity to use what resources available even more efficiently.

**Operation and maintenance beyond the project lifetime**

The sustainable operation and management of construction-related project interventions has been secured by identifying key government institutions to oversee specific project activities, with a commitment from the Government of Antigua and Barbuda to finance all operations, & maintenance and insurance activities required under the project. Interventions under Activity 1.1, focused on increasing the structural integrity of priority critical public service and community buildings, are expected to deliver adaptation benefits for 50 years<sup>37,38</sup>, while the installation of solar PV panels and climate-resilient water harvesting solutions on targeted buildings are expected to deliver adaptation benefits for 20 years. The expected lifetime of project interventions was determined based on consultations with local engineers as well as experts and representatives from the DoE, MoW and DCA. MoW will oversee the implementation of climate-proofing measures on critical infrastructure (Activities 1.1 and 1.4), while the Ministry of Health, Wellness and the Environment (MoHWE) will be responsible for managing the shelters that will be built on to five clinics in the country (Activity 1.2). Furthermore, site-specific operational procedures will be developed for long-term maintenance of climate-proofing interventions for each priority building, and these procedures will be integrated into the project O&M Framework. The maintenance plans and costs for the climate change adaptation measures to be installed on priority buildings are presented below.

Table 5 below highlights the required maintenance interventions, including the frequencies, for the priority buildings that will receive climate-proofing interventions under the project. The level of maintenance required for each activity is categorised as follows: i) minimum requirement, ii) recommended, iii) according to manufacturer specification, and iv) site-dependant. During project implementation, assessments of the targeted priority buildings as well as the associated maintenance should be carried out in accordance with the plan presented in Table 5 below.

**Table 5.** Operation and maintenance works required for the climate adaptation upgrade of target priority buildings.

| <i>Maintenance activity</i> | <i>Level of importance</i> | <i>Frequency</i> |
|-----------------------------|----------------------------|------------------|
|-----------------------------|----------------------------|------------------|

<sup>37</sup> UNDP. 2011. Paving the Way for Climate-Resilient Infrastructure. Available at: [https://www.uncclearn.org/sites/default/files/inventory/undp\\_paving\\_the\\_way.pdf](https://www.uncclearn.org/sites/default/files/inventory/undp_paving_the_way.pdf)

<sup>38</sup> GIZ. 2011. Climate proofing for development. Available at: [https://www.adaptationcommunity.net/?wpfb\\_dl=34](https://www.adaptationcommunity.net/?wpfb_dl=34)

|   |                     |          |
|---|---------------------|----------|
| <i>General Building Repairs (minor repairs)</i>                 | Minimum requirement | Yearly   |
| <i>General Structural Repairs (major repairs)</i>               | Recommended         | Yearly   |
| <i>Roof Structural Assessment / Repair</i>                      | Recommended         | Yearly   |
| <i>Windows, doors and shutters maintenance</i>                  | Recommended         | Yearly   |
| <i>Electrical infrastructure and energy efficiency measures</i> | Recommended         | Yearly   |
| <i>Maintenance of on-site water supply</i>                      | Recommended         | 6 Months |
| <i>Storm water maintenance and cleaning</i>                     | Recommended         | 6 Months |
| <i>Wastewater treatment</i>                                     | Recommended         | Yearly   |

### Maintenance Cost

The cost estimates of annual O&M are represented as a percentage of the replacement costs, ranging from 4–6%<sup>39</sup>. Table 6 outlines the base costs for the routine maintenance of interventions per building, to be conducted during the project lifespan, according to the frequency presented in Table 8. In addition, Table 7 outlines the cost of maintaining project interventions beyond the scope of biannual and annual maintenance works.

**Table 6.** Annual operations and maintenance costs per building.

| <b>Maintenance activity</b>                                     | <b>Cost per frequency (USD)</b> | <b>Total Cost/50 Year Period (USD)</b> |
|---|---------------------------------|--|
| <i>General Building Repairs (Minor Repairs)</i>                 | 500                             | 25,000                                 |
| <i>General Structural Repairs (Major Repairs)</i>               | 200                             | 10,000                                 |
| <i>Roof Structural Assessment</i>                               | 500                             | 25,000                                 |
| <i>Storm Shutter Maintenance</i>                                | 500                             | 25,000                                 |
| <i>Electrical Infrastructure and Energy Efficiency Measures</i> | 500                             | 25,000                                 |
| <i>Maintenance Of On-Site Water Supply</i>                      | 200                             | 20,000                                 |

<sup>39</sup> CIDB. Infrastructure Maintenance Budgeting Guideline. Retrieved from: <http://www.cidb.org.za/publications/Documents/Infrastructure%20Maintenance%20Budgeting%20Guideline.pdf>

|   |     |        |
|---|-----|--------|
| <i>Storm Water Maintenance and Cleaning</i> | 250 | 25,000 |
| <i>Wastewater Treatment</i>                 | 250 | 12,500 |

**Table 7.** Cost of additional repairs beyond the scope of biannual and annual maintenance works.

| <b>Maintenance activity</b>                                    | <b>Cost of Additional Repairs (USD)</b> |
|--|---|
| <i>General Building Repairs (Minor Repairs)</i>                | 2,500                                   |
| <i>General Structural Repairs (Major Repairs)</i>              | 5,000                                   |
| <i>Roof Structural Assessment/Repair</i>                       | 3,000                                   |
| <i>Windows, Doors and Shutter Maintenance</i>                  | 3,000                                   |
| <i>Electrical Infrastructure and Energy Efficiency Measure</i> | 4,500                                   |
| <i>Maintenance of On-Site Water Supply</i>                     | 2,500                                   |
| <i>Storm Water Maintenance and Cleaning</i>                    | 1,500                                   |
| <i>Wastewater Treatment</i>                                    | 2,500                                   |

### Solar PV panels

Table 8 outlines indicative maintenance tasks and frequencies for each component of the solar PV system. The level of importance of each maintenance task falls into four categories, namely: i) minimum requirement, ii) recommended, iii) according to manufacturer specification, and iv) site dependant. In addition, the maintenance extent falls into two categories, namely: i) total system (T) and ii) random unit (R).

**Table 8.** Maintenance tasks and frequency for Solar PV arrays.

| <b>Equipment</b> | <b>Task</b>                           | <b>Level of importance</b> | <b>Frequency</b>                     | <b>Extent</b> |
|------------------|---------------------------------------|----------------------------|--------------------------------------|---------------|
| <i>Modules</i>   | Integrity inspection and replacement  | Minimum requirement        | Yearly                               | T             |
|                  | Thermography inspection               | Recommended                | Yearly                               | T             |
|                  | Check tightening of clamps and bolts  | Minimum requirement        | Quarterly or before any major storms | R             |
|                  | Module cleaning                       | Site-dependant             | As required                          | T             |
|                  | Internal inspection of junction boxes | Recommended                | Yearly                               | T             |

|   |   |   |        |   |
|---|---|---|--------|---|
| <i>Electrical cabinets and switchboards</i> | Integrity inspection and cleaning         | Minimum requirement                     | Yearly | T |
|   | Check labelling                           | Minimum requirement                     | Yearly | R |
|   | Electrical protection inspection and test | Minimum requirement                     | Yearly | T |
|   | Check fuse status                         | Minimum requirement                     | Yearly | T |
|   | Check surge protection                    | Minimum requirement                     | Yearly | T |
|   | Check cables and terminals                | Minimum requirement                     | Yearly | T |
|   | Sensor verification                       | Recommended                             | Yearly | T |
|   | Thermographic inspection                  | Recommended                             | Yearly | T |
|   | Lubricate locks                           | Minimum requirement                     | Yearly | T |
|   | Check tightening                          | Minimum requirement                     | Yearly | T |
| <i>Cables</i>                               | Integrity inspection and replacement      | Minimum requirement                     | Yearly | R |
|   | Check labelling                           | Minimum requirement                     | Yearly | R |
|   | Check terminals                           | Minimum requirement                     | Yearly | R |
| <i>Inverter</i>                             | Integrity inspection and replacement      | Minimum requirement                     | Yearly | T |
|   | Check labelling                           | Minimum requirement                     | Yearly | T |
|   | Electrical protection inspection and test | Minimum requirement                     | Yearly | R |
|   | Check fuse status                         | Minimum requirement                     | Yearly | T |
|   | Check surge protection                    | Minimum requirement                     | Yearly | T |
|   | Thermographic inspection                  | Recommended                             | Yearly | T |
|   | Sensor verification                       | Minimum requirement                     | Yearly | R |
|   | Check parameters                          | Minimum requirement                     | Yearly | T |
|   | Test Ventilation system                   | Minimum requirement                     | Yearly | T |
|   | Check/replace batteries                   | According to manufacturer specification | Yearly | T |
|   | Replace fans                              | According to manufacture specification  | Yearly | T |
|   | Safety equipment inspection               | Minimum requirement                     | Yearly | T |
| Clean/replace filter                        | Minimum requirement                       | Yearly                                  | T      |   |
| <i>Transformers</i>                         | Integrity inspection and cleaning         | Minimum requirement                     | Yearly | T |
|   | Check labelling                           | Minimum requirement                     | Yearly | R |

|                       |   |   |        |   |
|-----------------------|---|---|--------|---|
|                       | Thermographic inspection                  | Recommended                             | Yearly | T |
|                       | Sensor verification                       | Minimum requirement                     | Yearly | T |
|                       | Check parameters                          | Minimum requirement                     | Yearly | T |
|                       | Check oil level                           | Minimum requirement                     | Yearly | T |
|                       | Check cooling system                      | Minimum requirement                     | Yearly | T |
|                       | Check MV surge discharge                  | Minimum requirement                     | Yearly | T |
| <i>MV switchgear</i>  | Integrity inspection and cleaning         | Site-dependant                          | Yearly | T |
|                       | Safety equipment inspection               | Minimum requirement                     | Yearly | R |
|                       | Check labelling                           | Minimum requirement                     | Yearly | T |
|                       | Electrical protection inspection and test | Minimum requirement                     | Yearly | T |
|                       | Thermographic inspection                  | Recommended                             | Yearly | T |
|                       | Sensor verification                       | Minimum requirement                     | Yearly | T |
|                       | Check correct operation                   | Minimum requirement                     | Yearly | T |
|                       | Check fuse status                         | Minimum requirement                     | Yearly | T |
|                       | Check terminals                           | Minimum requirement                     | Yearly | T |
|                       | Check/replace batteries                   | According to manufacturer specification | Yearly | T |
|                       | Check lubrication                         | Minimum requirement                     | Yearly | T |
|                       | Check protection parameters               | According to local code                 | Yearly | T |
| <i>Power Analyser</i> | Integrity inspection and cleaning         | Minimum requirement                     | Yearly | T |
|                       | Check labelling                           | Minimum requirement                     | Yearly | R |
|                       | Software maintenance                      | Recommended                             | Yearly | T |
|                       | Monitoring operation test                 | Minimum requirement                     | Yearly | T |
|                       | Check parameters                          | Minimum requirement                     | Yearly | T |
| <i>Energy Meter</i>   | Integrity inspection and cleaning         | Minimum requirement                     | Yearly | T |
|                       | Check labelling                           | Minimum requirement                     | Yearly | R |
|                       | Check parameters                          | Recommended                             | Yearly | T |
|                       | Check communication devices               | Recommended                             | Yearly | T |
| <i>UPS</i>            | Integrity inspection and cleaning         | Minimum requirement                     | Yearly | T |

|                             |                                      |   |                               |   |
|-----------------------------|--------------------------------------|---|-------------------------------|---|
|                             | Check/replace batteries              | According to manufacturer specification | Yearly                        | T |
|                             | Test Ventilation system              | Recommended                             | Yearly                        | T |
| <i>Lights</i>               | Integrity inspection and cleaning    | Minimum requirement                     | Yearly                        | T |
|                             | Check operation                      | Minimum requirement                     | 3 years                       | T |
| <i>Lightning protection</i> | Integrity inspection and replacement | Recommended                             | Yearly                        | R |
| <i>Fences and Gates</i>     | Integrity inspection                 | Minimum requirement                     | Yearly                        | T |
|                             | Lubrication of locks                 | Minimum requirement                     | Yearly                        | T |
| <i>Vegetation</i>           | Clearing                             | Minimum requirement                     | Site dependant                | T |
| <i>Safety Equipment</i>     | Integrity check and replacement      | Minimum requirement                     | Yearly                        | T |
| <i>PV Support Structure</i> | Check operation                      | Minimum requirement                     | Yearly                        | T |
|                             | Integrity check                      | Minimum requirement                     | Yearly                        | R |
|                             | Check tightening                     | Minimum requirement                     | Yearly or before major storms | R |
|                             | Check potential equalization         | Minimum requirement                     | 2 years                       | T |
| <i>Weather station</i>      | Integrity check and replacement      | According to manufacturer specification | Yearly                        | T |
|                             | Sensor verification                  | According to manufacturer specification | Yearly                        | T |
|                             | Check operation                      | According to manufacturer specification | Yearly                        | T |
|                             | Check/replace batteries              | According to manufacturer specification | Yearly                        | T |
|                             | Monitoring operation test            | According to manufacturer specification | Yearly                        | T |
| <i>Irradiation sensors</i>  | Integrity check and replacement      | According to manufacturer specification | Quarterly                     | T |
|                             | Calibration                          | According to manufacturer specification | 2 years                       | T |

|                             |                           |   |         |   |
|-----------------------------|---------------------------|---|---------|---|
|                             | Monitoring operation test | According to manufacturer specification | Yearly  | T |
| <i>Communication board</i>  | Communications test       | Minimum requirement                     | Yearly  | T |
| <i>Stock of spare parts</i> | Inventory of stock        | Minimum requirement                     | Yearly  | T |
|                             | Inspection of stock       | Minimum requirement                     | Yearly  | T |
|                             | Test of stock             | Minimum requirement                     | Yearly  | R |
|                             | Stock replenishment       | Minimum requirement                     | Monthly | T |

In addition to the operations and maintenance plan for climate-proofing interventions described above, multiple project partners have been engaged to ensure the management and restocking of critical supplies that will be housed within the climate-resilient bunker (Activity 1.3). Responsibilities for the stocking of these supplies will be as follows: i) RE stock will be maintained by the DOE, ii) medical supplies will be maintained by the MoHWE; ii) food supplies will be maintained by the Ministry of Social Transformation; and iii) building supplies will be maintained by MoW. To ensure that climate change adaptation measures to be constructed under the project provide maximum benefits, relevant project partners have committed to maintaining all climate proofing measures implemented under the project (including physical upgrades as well as decentralised RE and climate-resilient water harvesting solutions) for at least 20 years after implementation of the project. A framework for effective operations and maintenance of these measures is presented in Annex 21.

## C. FINANCING INFORMATION

### C.1. Total financing

| (a) Requested GCF funding<br>(i + ii + iii + iv + v + vi + vii) |                       | Total amount             |             | Currency         |                            |         |           |
|---|-----------------------|--------------------------|-------------|------------------|----------------------------|---------|-----------|
|   |                       | 32,706,595 <sup>40</sup> |             | million USD (\$) |                            |         |           |
| GCF financial instrument  |                       | Amount                   | Tenor       | Grace period     | Pricing                    |         |           |
| (i)   | Senior loans          | Enter amount             | Enter years | Enter years      | Enter %                    |         |           |
| (ii)  | Subordinated loans    | Enter amount             | Enter years | Enter years      | Enter %                    |         |           |
| (iii)   | Equity                | Enter amount             | Enter years |                  | Enter % equity return      |         |           |
| (iv)  | Guarantees            | Enter amount             |             |                  |                            |         |           |
| (v)   | Reimbursable grants   | Enter amount             |             |                  |                            |         |           |
| (vi)  | Grants                | 32,706,595               |             |                  |                            |         |           |
| (vii)   | Result-based payments | Enter amount             |             |                  |                            |         |           |
| (b) Co-financing information                                    |                       | Total amount             |             | Currency         |                            |         |           |
|   |                       | 13,458,035               |             | million USD (\$) |                            |         |           |
| Name of institution   |                       | Financial instrument     | Amount      | Currency         | Tenor & grace              | Pricing | Seniority |
| GoAB  |                       | <u>In kind</u>           | 8,508,370   | million USD (\$) | Enter years<br>Enter years | Enter%  | Options   |
| GoAB  |                       | <u>Grant</u>             | 4,899,665   | million USD (\$) | Enter years<br>Enter years | Enter%  | Options   |

<sup>40</sup> This value includes a contingency fee, which will only be used when required and in accordance with agreements between the AE and GCF. The contingency fee is calculated a

| (c) Total financing<br>(c) = (a)+(b)  | Amount  | Currency         |
|---|---|------------------|
|   | (d) 46,164,630  | million USD (\$) |
| (d) Other financing arrangements and contributions (max. 250 words, approximately 0.5 page) | <p>The following are financial resources flows that will run alongside this project which are earmarked for similar outcomes and are consistent with general mitigation and adaptation measures (i.e. 'Parallel Finance' as outlined in Paragraph 6(h) of the GCF Policy on Co-financing):</p> <ul style="list-style-type: none"> <li>• <b>Global Environment Facility Sustainable Energy Facility Project</b> executed by the Caribbean Development Bank – <i>USD 1.2 million</i> (Grant) – Focus on installing Back-Up RE Solutions for 10 public buildings (mainly clinics and schools)</li> <li>• <b>Abu Dhabi Fund for Development Project</b> – <i>USD 1.5 million</i> (Loan) – Back-up RE Generation – Focus on installing Back-Up RE Solutions for 10-11 public and community buildings</li> <li>• <b>Adaptation Fund Project</b> – <i>USD 1.5 million</i> (Grant) – Focus on installing Back-up RE Solutions and Category 5 Hurricane resilient climate proofing interventions via microfinancing for private households within a vulnerable community</li> <li>• <b>Italian Government Bilateral Grant</b> – <i>USD 0.5 million</i> (Grant) – Back-up RE Solutions and EMS development for 19 schools</li> <li>• <b>Indian Government Bilateral Grant</b> – <i>USD 1 million</i> (Grant) – Back-up RE Solutions and EMS development for 10 schools</li> </ul> <p><b>Total Parallel Finance = USD 4.2 million (Grant) + USD 1.5 million (Loan)</b></p> <p>It should be noted that some of these streams of parallel finance focus on providing RE solutions some of the remaining 20 priority buildings that are not receiving RE which are not receiving RE solutions under Sub-activity 1.1.5 of this project.</p> |                  |

**C.2. Financing by component**

Please provide an estimate of the total cost per component and output as outlined in section B.3. above and disaggregate by source of financing. More than one co-financing institution can fund a single component or output. Provide the summarised cost estimates in the table below and the detailed budget plan as annex 4.

| Output   | Indicative cost (USD) | GCF financing           |                      | Co-financing            |                      |                      |
|--|-----------------------|-------------------------|----------------------|-------------------------|----------------------|----------------------|
|  |                       | Amount million USD (\$) | Financial Instrument | Amount million USD (\$) | Financial Instrument | Name of Institutions |
| Output 1. Climate-proofing interventions implemented in critical public service and community buildings to improve resilience to, and recovery from, extreme climate events. | 37,340,858            | 25,082,823              | Grants               | 12,258,035              | Grants               | GoAB                 |

|   |                   |           |                   |         |                   |      |
|---|-------------------|-----------|-------------------|---------|-------------------|------|
| Output 2. Climate change adaptation mainstreamed into the building sector and relevant financial mechanisms.                                    | 3,050,740         | 2,880,740 | Grants            | 170,000 | Grants            | GoAB |
| Output 3. Climate information services strengthened to facilitate early action within the building sector to respond to extreme climate events. | 846,012           | 746,012   | Grants            | 100,000 | Grants            | GoAB |
| <b>Total contingency fee requested from the GCF<sup>41</sup></b>  | 2,689,620         | 2,689,620 | Grants            |         |                   |      |
| <b>Project management costs, including M&amp;E costs (USD)</b>  | 2,237,400         | 1,307,400 | Grants            | 930,000 | Grants            | GoAB |
| <b>Indicative total cost (USD)</b>  | <b>46,164,630</b> |           | <b>32,706,595</b> |         | <b>13,458,035</b> | GoAB |

**C.3 Capacity building and technology development/transfer (max. 250 words, approximately 0.5 page)**

C.3.1 Does GCF funding finance capacity building activities? Yes  No

C.3.2. Does GCF funding finance technology development/transfer? Yes  No

**Technology transfer**

Output 1 of the proposed project will facilitate technology transfer by implementing innovative climate change adaptation interventions within Antigua and Barbuda's building sector. These interventions include: i) strengthening the structural integrity of priority buildings to withstand the impacts of Category 4 and 5 hurricanes (Activity 1.1); ii) installing renewable energy (RE) and climate-resilient water harvesting solutions to ensure continued power and water supply to critical public services during and immediately after a storm (Activity 1.1); iii) constructing a climate-resilient bunker to store critical supplies such as renewable energy equipment, building materials, food and medicine (Activity 1.3); and iv) constructing climate-resilient storm shelters attached to public clinics (Activity 1.2). The total cost of project activities that support technology transfer is US\$37,340,858.

The technologies to be implemented under the project are not entirely new to Antigua and Barbuda, having all been implemented to some extent through various channels, including through private sector investment. What is novel under this project, is the approach of mainstreaming these technologies into the building sector. So, instead of being implemented on an ad hoc basis, these interventions will become the new standard approach for the country.

<sup>41</sup> The contingency fee will only be used when required and in accordance with agreements between the AE and GCF. The total contingency fee amount is calculated as the sum of the following: i) 10% of the total GCF cost for project interventions under Output 1; ii) 5% of the total GCF cost for project interventions under Output 2; and iii) 5% of the total GCF cost for project interventions under Output 3. Further details on the contingency fee is presented in Annex 4: Detailed budget.

In the public sector, Antigua and Barbuda has begun developing/implementing several initiatives focused on increasing the resilience of infrastructure, including physical engineering work, installing solar panels on selected buildings and installing climate-resilient water harvesting solutions. Although these initiatives are limited in scale, they have capacitated the Government of Antigua and Barbuda's procurement and legal systems to support the implementation of the proposed project interventions. While these legal and procurement systems are adequate for the project, there is limited capacity within the public and private sector, including the local workforce to implement, monitor and maintain the climate-proofing interventions proposed under this project. To address these limitations, capacity-building initiatives in the form of training and awareness will be delivered under Activities 2.3 and 2.4 to ensure that project interventions achieve maximum adaptation impact. Capacity-building initiatives to be implemented under the project are described in further detail below.

### **Capacity-building interventions**

Technical and institutional capacity of decision-makers and the local workforce will be built under Outputs 2 and 3 of the project. Capacity-building activities under Output 2, in particular, include: i) partnering with local training institutions such as Antigua and Barbuda Institute of Continuing Education (ABICE) to develop and deliver certified courses to the public and private sectors focusing on implementing, monitoring and maintaining climate change adaptation measures specific to the building sector (Activity 2.3); ii) developing training programmes for relevant staff from the Ministry of Works (MoW) and Development Control Authority (DCA), as well as building inspectors, engineers, architects and draughtsmen on climate change adaptation technologies, and how to apply the updated national building code (Activity 2.3); iii) training relevant staff from the National Office of Disaster Services (NODS), Development Control Authority (DCA) and the Public Works Department (PWD) on operational procedures for long-term monitoring, maintenance and upscaling of climate-resilient RE and water harvesting technologies in accordance with the national building code (Activity 2.3); and iv) training the local workforce on the installation, operation and maintenance of climate-proofing measures for the targeted buildings (Activity 2.4). The total cost of all capacity-building activities to be implemented under Output 2 is US\$2,508,430.

Under Output 3 of the project, capacity-building activities will focus on increasing the capacity of Antigua and Barbuda Meteorological Services (ABMS) to process climate data in real time and disseminate early warning information products. Specifically, Activity 3.1 will strengthen the capacity of staff within ABMS to collect, process and manage climate data in real time, as well as develop early warning information products, including infographics that are locally appropriate and easily interpreted by vulnerable communities in the country. Activity 3.2 will strengthen the capacity of ABMS to disseminate these early warning information products to critical service providers as well as the private sectors to facilitate early action. The total cost of capacity-building activities to be implemented under Output 3 is US\$846,012.

## D. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA

This section refers to the performance of the project/programme against the investment criteria as set out in the GCF's [Initial Investment Framework](#).

### D.1. Impact potential (max. 500 words, approximately 1 page)

The proposed project will contribute to the GCF's fund-level adaptation objective of increased climate-resilient sustainable development by improving the resilience of Antigua and Barbuda's building sector to extreme climate events — particularly Category 4 and 5 hurricanes. To accomplish this objective, project interventions have been designed to achieve two GCF fund-level impacts and three fund-level outcomes, as presented below<sup>42</sup>.

#### Fund-level Impacts

The proposed project will enhance the resilience of Antigua and Barbuda's building sector by achieving the following fund-level impacts:

- A1.0 — Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions; and
- A3.0 — Increased resilience of infrastructure and the built environment to climate change.

#### Project Outcomes

The proposed project will be evaluated against several relevant GCF impact assessment factors, as specified in the GCF Performance Measurement Framework. It is anticipated that the project will achieve three Fund-level Outcomes, described below<sup>43</sup>.

*A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development.* Output 2 of the project will build the institutional capacity of decision-makers in Antigua and Barbuda to mainstream climate change adaptation into the building sector. This will be achieved through several elements of project design. Firstly, building codes that are currently being updated through the SCCF-funded project will be integrated into legal frameworks and regulations at the national level to ensure effective uptake across all future infrastructural developments (Activity 2.1). Secondly, climate change adaptation will be mainstreamed into public and private financial, insurance and banking sectors, which will facilitate investment in climate-resilient measures for the building sector such as RE and water harvesting measures (Activity 2.2). This will include increasing public and private sector access to financial resources through the SIRF Fund to finance the uptake of climate-adaptive measures in the building sector beyond the project lifetime. And finally, the effectiveness of adaptation options will be supported by the development of technical training programmes on the implementation, operation and maintenance of climate-resilient technologies for the building sector under project Activities 2.3 and 2.4.

*A6.0 Increased generation and use of climate information in decision-making.* The effective use of climate information will be a central component of early action in response to an anticipated extreme climate event. Output 3 of the proposed project will build on existing early warning initiatives by establishing a communication framework for Antigua and Barbuda's Meteorological Services (ABMS) that will maximise efficiency in reporting on early warnings to the relevant national disaster response agencies (including NODS). Furthermore, early action protocols will be established under Activity 3.2 of the project that link directly to the impact-based forecasts currently under development by ABMS. These protocols will be sector- and building-specific, detailing actions that need to be taken in preparation for a hurricane. By linking the protocols to impact-based forecasts, the timing and extent of preparation actions can be determined relative to the perceived risk. Establishing such a system for early action in Antigua and Barbuda will create a transformational shift in how the country responds to climate threats in the future.

*A7.0 Strengthened adaptive capacity and reduced exposure to climate risks.* Output 1 of the project will strengthen the adaptive capacity of local communities by installing climate change adaptation technologies on 54 priority buildings in the country. These adaptation measures include: i) increasing the structural integrity of priority critical buildings to withstand high-intensity storms; ii) installing decentralised renewable energy and climate-resilient water harvesting

<sup>42</sup> Detailed information on the assumptions and estimates of the impact potential of the proposed project are provided in the project's results framework and economic analysis (Section E of this document and Annex 3, respectively).

<sup>43</sup> A detailed description of the project activities that will be implemented under each output to achieve the GCF project outcomes is presented in Section E.6 of the Funding Proposal.

solutions on priority buildings; and iii) establishing community storm-shelters. By securing critical buildings, including storm-shelters, the project will ensure that critical services<sup>44</sup> remain operational throughout an extreme climate event, thereby increasing the adaptive capacity of vulnerable communities. In addition, a climate-resilient bunker will be established to store emergency supplies that are urgently required for effective preparation, response and recovery. The availability of these supplies will help secure the critical health, energy, building and welfare sectors during and directly after an extreme event.

### **Mitigation co-benefits of installing solar PV panels on target infrastructure**

While the installation of solar PV panels on 34 target buildings under Activity 1.1 is primarily an adaptation solution proposed under the project, the implementation of this intervention will also deliver mitigation co-benefits.

The methodology used for calculating the avoided emissions that will be realised under the proposed project through installing solar PV panels on 34 target critical buildings is presented below.

#### *Climate additionality of the project*

The project is located in Antigua and Barbuda, which is a SIDS. According to CDM methodological tool for demonstration of additionality of microscale project activities (Version 09.0), paragraph 11(a), project activities that are located in SIDS, employ renewable energy and have total installed capacity equal to or less than 5 MW are considered automatically additional. Therefore, the proposed project is considered to meet the climate additionality requirements.

#### *Applied methodology.*

The proposed project activity involved the installation of PV generation systems in buildings that are connected to the grid. The PV system supplies electricity to the end users and does not supply electricity to the grid. Therefore, the emission reduction for the project can be calculated using CDM methodology AMS – I.F.: Renewable electricity generation for captive use and mini-grid (Version 3.0).

#### *Emissions reduction calculations*

The formula used to calculate the avoided emissions that will result from project interventions is presented below.

$$BE_y = EG_{BL,y} \times EF_{CO_2,y}$$

$$BE_y = 1,923 \text{ t CO}_2/\text{yr}$$

$$EG_{BL,y} = 2,776 \text{ MWh/yr} \quad [\text{Calculated based on Annex 26}]$$

$$EF_{CO_2,y} = 0.693 \text{ tCO}_2\text{eq/MWh} \quad [\text{IFI TWG default grid emission factors}]$$

$$ER_y = BE_y = 1,923 \text{ tCO}_2/\text{yr}$$

Based on the above assumptions and calculations, installing solar PV panels on 34 critical public service and community buildings in Antigua and Barbuda will result in an estimated 1,923 tCO<sub>2</sub>/yr of avoided CO<sub>2</sub> emissions. Further details on the methodology for calculating the emissions reduction potential of installing these solar panels are presented in Annex 26b: Emissions reduction analysis.

### **Adaptation impact**

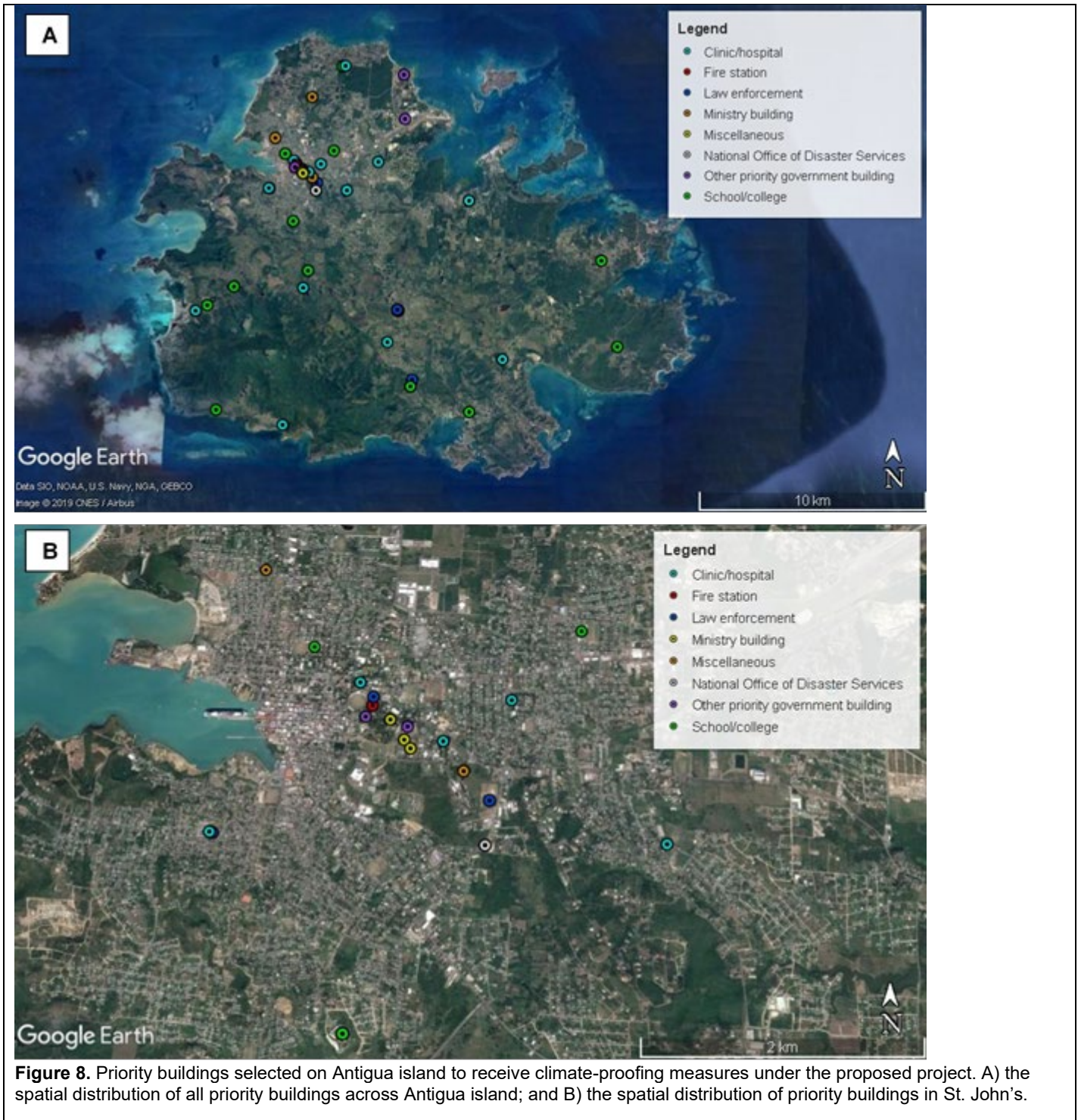
The distribution of project interventions covers the majority of built-up areas in Antigua and Barbuda, with increased coverage in the more densely populated and exposed communities. Because of this distribution, project interventions will directly benefit ~73,216 people in Antigua and Barbuda<sup>45</sup> (52% women and 48% men) by securing the provision of critical services to these people during and directly after an extreme climate event, and indirectly benefit the entire population of the country. Overall, project interventions will increase the climate resilience of 54 priority buildings in Antigua and Barbuda, which represents nearly one-third of the country's public building portfolio of 254 buildings. The GCF investment into climate-proofing high-priority critical public service and community buildings will be enhanced by the GoAB's commitment to increase the climate resilience of the remaining public buildings. This commitment is

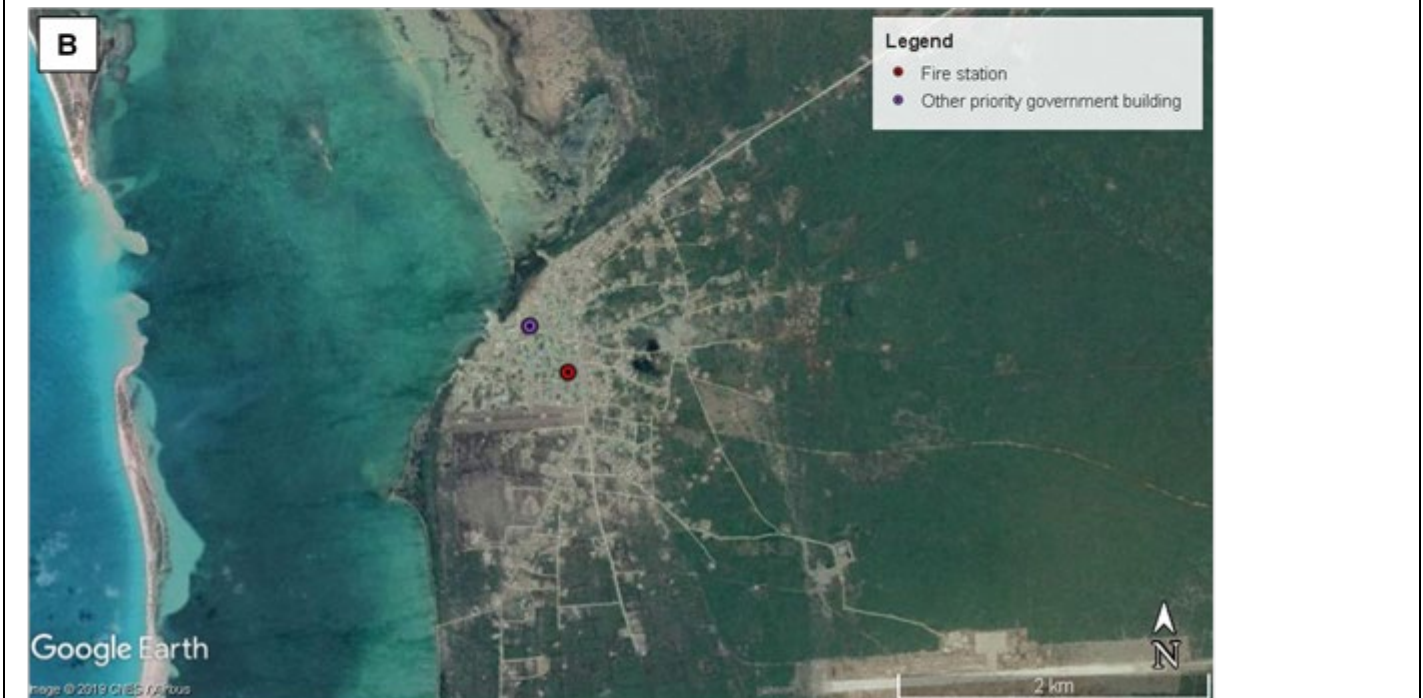
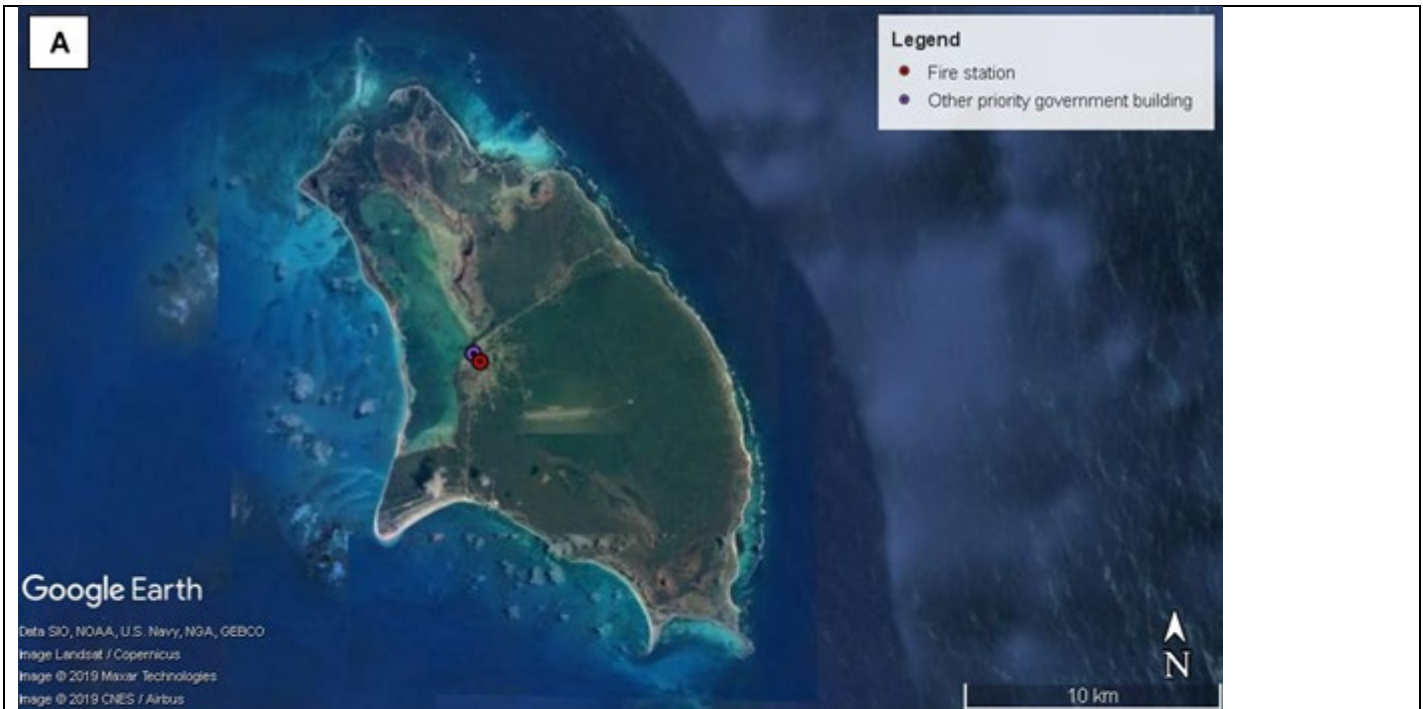
<sup>44</sup> including hospitals/clinics, police and fire stations as well as buildings that serve as storm shelters

<sup>45</sup> Further details on how project beneficiaries were calculated are presented in Section E2.4 of the Funding Proposal.

evidenced by the government's annual budget allocation for undertaking the necessary adaptation upgrades to strengthen the structural integrity of these buildings to withstand Category 4 and 5 hurricanes. Moreover, project interventions will facilitate public and private sector investment into climate change adaptation through demonstration of the adaptation and economic benefits of climate-proofing existing infrastructure, as well as by creating entry points for increased access of the public and private sectors to resources for financing adaptation upgrades, particularly in the building sector. The combined effect of project interventions will contribute to the creation of an enabling environment for future upscaling and replication of climate change adaptation intervention within the public and private sector, locally, nationally and across the Caribbean region.

A map showing the spatial distribution of the priority buildings to receive climate-proofing interventions under the proposed project are presented in Figure 8 and 9 below.





**Figure 9.** Priority buildings selected on Barbuda island to receive climate-proofing measures under the proposed project. A) the spatial distribution of all priority buildings across Barbuda island; and B) the spatial distribution of priority buildings in Codrington.

**D.2. Paradigm shift potential (max. 500 words, approximately 1 page)**

The proposed project will catalyse a paradigm shift within Antigua and Barbuda’s building sector from conventional development to an approach that prioritises the adoption of innovative climate-resilient solutions and early action. Details on how the project will contribute to GCF’s paradigm shift objective are presented below.

**Potential for scaling up, replication and strengthening policy, Financial and regulatory frameworks**

The Caribbean is seeing for the first-time category 5 hurricanes the first being in 2017. There is no well-known studies to show category 5 construction in public buildings, including homes as well as costings and strategy for cost reduction in the Caribbean. The project will catalyse a paradigm shift in the building sector by establishing a new standard for the adoption of climate-resilient interventions that could be readily scaled up and replicated across the country's public building portfolio<sup>46</sup> as well as within the private sector. This process will be supported by: i) implementing climate-proofing measures on critical infrastructure, including RE and climate-resilient water harvesting solutions; ii) making provision for the building code<sup>47</sup> in the Physical Planning Act (2003); iii) increasing the capacity of the public and private sector to apply the building code during all phases of development; iv) increasing the technical and institutional capacity of relevant user groups to install, operate, monitor and maintain climate-proofing measures and v) potential fiscal and other policy interventions, including bulk purchasing. Through the implementation of these transformative adaptation interventions, the project will facilitate the wide-scale replication of climate-resilient development practices nationally and across the Caribbean region. Table 9 below supports the regionally replication potential of the proposed project interventions by showing that similar interventions have been identified as appropriate and viable solutions for these countries to adapt to the impacts of extreme climate events.

**Table 9.** Countries in the Caribbean region where similar adaptation interventions to those proposed under this project are being implemented.

| Country                                | Project name and date   | Intervention   | Reference   | Project cost (US\$) |
|--|---|--|---|---------------------|
| Antigua and Barbuda, Dominica, Grenada | Integrated physical adaptation and community resilience through an enhanced direct access pilot in the public, private, and civil society sectors of three Eastern Caribbean small island developing states | <ul style="list-style-type: none"> <li>Enhanced direct access for CSOs and NGOs to adaptation financing</li> </ul>   | <a href="https://www.greenclimate.fund/project/fp061">https://www.greenclimate.fund/project/fp061</a>   | 22.6 million        |
| Barbados                               | Water sector resilience nexus for sustainability in Barbados  | <ul style="list-style-type: none"> <li>Enhanced access of the public to adaptation financing related to the water sector</li> <li>Installation of rainwater harvesting and water storage systems in critical buildings or vulnerable residences</li> </ul> | <a href="https://www.greenclimate.fund/project/fp060">https://www.greenclimate.fund/project/fp060</a>   | 45.2 million        |
| Barbados                               | Disaster risk and energy access   | <ul style="list-style-type: none"> <li>Installation of solar panels in critical community buildings to be used as shelters</li> </ul>  | <a href="https://unctad.org/meetings/en/Presentation/MSatoh_UNDP_OECS_BBWorkshop_p06_en.pdf">https://unctad.org/meetings/en/Presentation/MSatoh_UNDP_OECS_BBWorkshop_p06_en.pdf</a>                                       | 1.7 million         |
| Dominica                               | Disaster vulnerability reduction project  | <ul style="list-style-type: none"> <li>Investment in climate-resilient infrastructure</li> </ul>   | <a href="https://projects.worldbank.org/en/projects-operations/project-detail/P166540?lang=en&amp;tab=overview">https://projects.worldbank.org/en/projects-operations/project-detail/P166540?lang=en&amp;tab=overview</a> | 31 million          |
| Dominica                               | Dominica Community Resilience Enhancement Project   | <ul style="list-style-type: none"> <li>Off-grid water and renewable energy supplies for emergency shelters</li> </ul>  | <a href="https://www.greenclimate.fund/document/dominica-community-resilience-">https://www.greenclimate.fund/document/dominica-community-resilience-</a>   | 10 million          |

<sup>46</sup> This portfolio identifies 200 public buildings for implementation of climate-resilient measures.

<sup>47</sup> The updated Building Code outlines design and construction standards for buildings to withstand high-intensity storm events (such as Category 4 and 5 hurricanes).

|  |  |   |                                    |  |
|--|--|---|------------------------------------|--|
|  |  | <ul style="list-style-type: none"> <li>• Resilience building of critical agricultural infrastructure</li> </ul> | <u>enhancement-project-domcrep</u> |  |
|--|--|---|------------------------------------|--|

**Knowledge sharing, awareness and the creation of an enabling environment**

To support the shift away from the current paradigm of reactive development and recovery<sup>48</sup>, climate change adaptation for the building sector will be mainstreamed into public and private financial, insurance and banking sectors. This will facilitate a proactive approach to climate-resilient planning and development by the GoAB and the private sector. This, combined with awareness-raising activities promoting the benefits of installing climate change adaptation measures in the building sector, will encourage further investment opportunities into resilience building, thereby enabling a greater percentage of the population to access financial resources for adaptation.

The uptake and sustainability of climate-resilient adaptation solutions will be enhanced through awareness campaigns that highlight the benefits associated with investing in climate-resilient practices. These benefits include: i) reductions in insurance premiums as a result of a reduced risk to climate-proofed buildings; and ii) reductions in the economic losses caused by extreme climate events as a result of improved structural integrity of critical buildings. Efficient and effective knowledge transfer through the aforementioned awareness campaigns will not only improve the uptake of climate-resilient building practices, but will also improve the preparedness of critical public services, local communities, business owners and other private sector stakeholders for the onset of extreme climate events.

In addition to facilitating the uptake of climate-resilient building practices, the project will shift disaster response by the GoAB from a reactive approach towards a proactive climate-responsive planning. This will be focused on increased preparedness for extreme climate events such as hurricanes and tropical storms. The adoption of such an approach will be achieved through: i) establishing formalised communication channels between ABMS, national- and local-level decision-makers to communicate climate change-related information; ii) developing building-specific protocols for early action ahead of an extreme climate event and iii) establishing a centralised online platform to allow for user-friendly climate change knowledge products to be disseminated to all relevant decision-makers to facilitate early action in the building sector. Improved communication channels between ABMS and decision makers will become increasingly important as the severity of storms increases with climate change. By facilitating rapid information sharing between ABMS, decision-makers and emergency response units, the project will create an enabling environment for early action. This will increase disaster-readiness as clear guidelines will be established for how to efficiently and effectively prepare for a high-intensity storm hitting the country, as well as highlighting the appropriate actions to take at different stages of storm development.

**D.3. Sustainable development (max. 500 words, approximately 1 page)**

The proposed project will contribute towards achieving nine of the 17 UN Sustainable Development Goals (SDGs), including: SDG 3 — Good health and well-being; SDG 4 — Quality education; SDG 5 — Gender equality; SDG 6 — Clean water and sanitation; SDG 7 — Affordable and clean energy; SDG 9 — Industry, innovation and infrastructure; SDG 11 — Sustainable cities and communities; and SDG 13 — Climate action. The contribution of the proposed project to these SDGs aligns with the country's Medium-Term Development Strategy<sup>49</sup> by providing the Necessary Conditions (NCs) to achieve the country's Sustainable Development Dimensions (SDD). Firstly, by contributing to SDGs 7, 9 and 11, the project will assist in the achievement of SDD 1 — Optimal generation of national wealth, by providing several NCs including i) technological adaptation and innovation (including green technology); ii) inclusive growth (growth with equity); iii) adequate infrastructure (including energy, water and telecommunications); and iv) adequate skills and capacity to support sustainable development. Secondly, by supporting SDGs 4 and 5, the project will contribute to the country's SDD 2 — Enhanced social cohesion, by providing the NCs: i) adequate access to health care; ii) adequate access to education and lifelong learning for all; and iii) social inclusion. Lastly, by contributing to SDGs 3, 6 and 13, the proposed project will assist the country in achieving its SDD 3 — Improved health of the natural environment and sustained historical and cultural assets, by providing the NCs: i) water resource management; ii) disaster risk management and climate change resilience; iii) rural and urban planning; and iv) waste management and pollution

<sup>48</sup> Several barriers to adaptation (described further in Section B.2 of the Funding Proposal ) prevent Antigua and Barbuda from recovering effectively from extreme events. Rebuilding activities do not consider the increasing impacts of climate change, resulting in the country's building sector becoming increasingly vulnerable to these impacts.

<sup>49</sup> GoAB Ministry of Finance and Corporate Governance. 2015. Medium-Term Development Strategy 2016 to 2020.

control. In addition, numerous environmental, social and economic co-benefits will be achieved through project interventions as described below.

#### **Environmental co-benefits**

Increasing the climate resilience of priority buildings through implementing climate-resilient water harvesting and renewable energy (RE) measures will yield several environmental co-benefits. These are listed below.

- Increasing the water harvesting capacity of priority buildings will provide an additional source of freshwater for local communities. This will alleviate pressure on natural water resources by reducing the need for extraction from groundwater and surface reserves.
- Improving the water harvesting capacity of priority buildings will reduce stormwater runoff from priority buildings. This will result in reduced peak flow volume and velocity of stormwater runoff, therefore, contributing to reduced flood impacts and erosion.
- Currently, electricity is supplied by fuel oil-powered plants on Antigua and by diesel generators on Barbuda. The installation of energy-efficient appliances, solar water heaters and rooftop solar PV systems as an alternative renewable energy source in priority buildings will consequently reduce households' dependency on fossil fuel energy sources and minimise the overall emission of GHGs.
- Installing solar PV panels on 34 critical public service and community buildings in Antigua and Barbuda will result in an estimated 1,923 tCO<sub>2</sub>/yr of avoided CO<sub>2</sub> emissions.<sup>50</sup>

#### **Social co-benefits**

Climate-proofing priority buildings will increase the resilience of vulnerable communities to extreme climate events and provide several social co-benefits, which are described below.

- Climate-proofing priority critical public service and community buildings will reduce the exposure of these buildings to more frequently occurring high-intensity storms. This will contribute significantly to reducing the risk of injuries and loss of life during such events.
- Installing decentralised renewable energy technologies on priority buildings will ensure the continued provision of energy during and immediately following extreme climate events. As a result, communication networks will continue to be operational, and businesses will be able to resume operations after an extreme event sooner than would be possible in the absence of decentralised power.
- Installing climate-resilient water storage measures on priority buildings will lead to continued sanitation services as well as improved provision of and access to clean drinking water during and immediately following extreme climate events. This will have considerable health benefits for all users of these buildings and reduce the risk of waterborne diseases such as hepatitis A, cholera and typhoid fever that may result from storm or flood events.
- Increasing the water storage capacity of priority buildings will increase national water supply during drought events and therefore reduce the adverse impacts of such events on vulnerable communities in Antigua and Barbuda.
- Strengthening the technical and institutional capacity of the local workforce on how to support the installation, operation and maintenance of climate change adaptation solutions that will be installed on targeted buildings will contribute to increased job security. This will in turn contribute to improved livelihood security as well as enable these individuals to apply similar interventions at scale in their private capacity, which will further increase their resilience to the impacts of Category 4 and 5 hurricanes.
- Climate change knowledge products disseminated to all user groups through a centralised platform will lead to improved preparedness of critical services before the onset of extreme climate events.
- Improving the dissemination of climate change knowledge products will increase the technical and institutional capacity of emergency services to deliver efficient and effective climate-responsive planning and early action.

#### **Economic co-benefits**

Project interventions will increase the resilience of priority buildings and critical services, resulting in improved climate-responsive planning and early action. These factors will lead to reduced economic losses from extreme climate events and provide several significant economic co-benefits, as listed below.

<sup>50</sup> The methodology for calculating the estimated total CO<sub>2</sub> emissions that will result from the installation of 34 solar PV panels is presented in Annex 26b: Emissions reduction analysis.

- Employment opportunities will be created through the implementation of innovative climate-proofing technologies on priority buildings in Antigua and Barbuda. These opportunities include construction work for installing, operating, monitoring and maintaining climate change adaptation technologies, including decentralised RE and climate-resilient water harvesting solutions. The creation of such employment opportunities will enhance the sustainability of project interventions beyond the project lifetime.
- The cost to repair priority infrastructure following extreme climate events such as hurricanes will be reduced through increasing the capacity of priority buildings to withstand the impacts of these events.
- Increasing the climate resilience of priority buildings will decrease the time required for economic sectors to become operational and for communities to recover immediately following extreme climate events. This will reduce economic inactivity after a storm.
- Improving preparedness of local communities for extreme climate events through strengthening climate information services in the country will reduce personal financial losses of community members. This is because communities will be better prepared to secure their personal assets in anticipation of an extreme event.
- Using decentralised renewable energy and energy-efficient appliances will reduce the associated costs, allowing for additional funds to be made available for maintenance of the systems.

#### **Gender-sensitive development impact**

Climate-proofing critical public institutions in Antigua and Barbuda will help to limit the disruptions to core health, education and care services following extreme climate events. Given the gendered demographics of the employees and users of these institutions, as well as gendered vulnerability to climate impacts, this will induce a gender-sensitive development impact, as described below.

- Although certain institutions are predominantly operated and inhabited by men, women often dominate the users and employees of — or more critically dependent upon — the public buildings targeted for climate-proofing interventions. By reducing the disruptions to the functioning of these buildings and delivery of primary services, the project will ensure both women and men's economic and household activities are able to resume without unnecessary delay, following an extreme climate event.
- The project gender action plan (GAP) has outlined actions to promote gender equality in project implementation: i) implement an apprenticeship program for supporting the participation of persons 16 – 24 in construction activities of the project ; ii) implement training and certification opportunities provided to men to learn new techniques to transition to more resilient construction; iii) Development of gender responsive knowledge and communication products to include the promotion of women in construction;
- Through these measures, the project disrupts underlying factors contributing to gender inequality in the country, thereby contributing to gender-sensitive sustainability beyond the projects' timeline.
- Disseminating climate change knowledge products to all user groups through a centralised platform will help overcome gendered accessibility to information and resources, thereby ensuring gender-sensitive preparedness of critical services and increased response capacity of emergency as a result.

#### **D.4. Needs of recipient (max. 500 words, approximately 1 page)**

##### **Vulnerability of the country**

As a SIDS, Antigua and Barbuda is particularly vulnerable to extreme climate events such as hurricanes and tropical storms. In 2017, the country was ranked 13th on the global Climate Risk Index (CRI) and third in terms of losses per unit of GDP<sup>51</sup>. The country's NDC identifies five primary reasons for the country's vulnerability, including: i) inefficient planning and management of the built environment; ii) high costs of repairing damage caused by recurrent extreme climate events; iii) the composition of the country's economy<sup>52</sup>; iv) high population density in the coastal zone; and v) limited availability of freshwater resources.

The frequency of Category 4 and 5 hurricanes is already increasing and this is expected to continue under future climate change conditions. Such hurricanes have severe impacts on the country, including loss of life, economic losses and damage to infrastructure. For example, in 2017 Hurricane Irma caused an estimated US\$222 million in damages and economic losses in Antigua and Barbuda<sup>53</sup> and resulted in ~129 fatalities across the Caribbean and south-eastern

<sup>51</sup> Germanwatch. 2019. Global Climate Risk Index.

<sup>52</sup> The economic composition clarifies the miscellaneous economic, demographic and cultural attributes of Antigua and Barbuda, which form the basis for region's social and economic development.

<sup>53</sup> UNDP. 2018. Hurricane Irma and Maria: One year on.

region of the United States. The impacts of these extreme climate events on the country are further exacerbated by the country's economic composition. For example, tourism makes up the largest proportion of the country's GDP (~60%) and accounts for the highest overall investment, at ~40%. The onset and aftermath of extreme events, including those events that had regional impacts, but did not directly hit Antigua and Barbuda, significantly reduces tourist activity in the country. This not only affects revenue generation, but also leads to increased unemployment in the tourism sector. Such unemployment results from the closure of tourism-driven businesses and a subsequent reduction employment demand in the sector. Antigua and Barbuda is also heavily reliant on imports of basic supplies, including food, medicine and building materials. Extreme climate events have major impacts on these imports as shipping routes becoming unsafe and insurance premiums for shipping companies becoming unaffordable.

### Vulnerability of beneficiary groups

Extreme climate events cause severe damage to critical public service infrastructure in Antigua and Barbuda, increasing the vulnerability of local communities in two primary ways. Firstly, these events disrupt emergency services, disaster response, electricity and water supply, as well as telecommunications<sup>54</sup>. This results in critical services becoming non-operational, which leads to reductions in economic productivity and mobility as well as increases in personal injury and loss of life. Secondly, extreme climate events cause damage to community buildings that are used as shelters, such as schools, churches, clinics and police stations. As a result, these buildings are rendered structurally insecure to provide places of safety to local communities during a storm, especially vulnerable groups such as women, children, the disabled and the elderly.

### Socioeconomic status

Antigua and Barbuda's GDP per capita and Human Development Index (HDI) are both relatively high (~US\$16,864<sup>55</sup> and 0.78<sup>56</sup>, respectively). This high GDP per capita is primarily the result of persons with high income relocating to the country. In reality the per capita of the local people is much lower. The country's small tax and market base as well as its high public debt — more than 88% its GDP in 2018<sup>57</sup> — constrain the government's ability to allocate funding from the national budget for adaptation. Moreover, limited opportunities exist for the public and private sector to access financial resources for addressing climate change impacts, which was estimated to cost the country ~US\$20 million per annum<sup>58</sup>. This is nearly fifteen times greater than the DoE's national budget was in 2017<sup>59</sup>. With climate predictions this cost is likely to increase substantially under future climate conditions. External investment is therefore critical to increase the pace needed to achieve climate resilience of Antigua and Barbuda's population to climate change.

### Institutional capacity needs

Antigua and Barbuda's National Capacity Needs Self-Assessment identified limited technical and institutional capacity as a major constraint inhibiting the implementation of adaptation interventions in the country. In particular, the GoAB has limited capacity to mainstream climate change adaptation into policy- and decision-making as well as into relevant financial mechanisms for access by the public and private sector. This is largely a result of: i) insufficient knowledge of climate change adaptation benefits, including on how to effectively implement, monitor and maintain climate change adaptation measures; and ii) the absence of formalised processes to enforce such mainstreaming.

## D.5. Country ownership (max. 500 words, approximately 1 page)

The proposed project is strongly aligned with Antigua and Barbuda's national priorities, having been designed in collaboration with project stakeholders at all levels. These priorities are summarised below.

- **Antigua and Barbuda's GCF Country Programme** will achieve its target impact potential by integrating adaptation into development processes, thereby avoiding lock-in of long-lived, climate-vulnerable infrastructure.

<sup>54</sup> Hurricane Irma caused moderate damage to several hospitals and it resulted in the complete disruption of the electricity grid, which took six months to reconstruct. Damage to power stations also resulted in a shortage in water supply because of reduced pumping and desalination capacity. Additionally, the hurricane resulted in widespread damage to roads and housing stock; 70–95% of houses on Barbuda were damaged by the hurricane, leaving thousands homeless.

<sup>55</sup> World Bank. 2018. Available at: <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=AG>

<sup>56</sup> UNDP. 2017. Inequality-adjusted Human Development Index. Available at: <http://hdr.undp.org/en/composite/IHDI>

<sup>57</sup> Caribbean Development Bank. Country Economic Review 2018; Antigua and Barbuda. Available at: [https://www.caribank.org/sites/default/files/publication-resources/CDB%20Economic%20Brief%202018%20-%20Antigua%20and%20Barbuda\\_0.pdf](https://www.caribank.org/sites/default/files/publication-resources/CDB%20Economic%20Brief%202018%20-%20Antigua%20and%20Barbuda_0.pdf).

<sup>58</sup> NDC 2015.

<sup>59</sup> The 2017 budget for the DoE was EC\$3,638,601, which is equivalent to US\$1,347,629. This amount included provisions for: i) staff salaries, training and travel allowances; ii) advertising and promotional costs; and iii) office supplies and repairs. It consequently leaves almost no resources for implementing climate change adaptation interventions.

Specifically, the country programme identifies the building, water and energy sectors as priority sectors to receive GCF support to increase their climate resilience. The proposed project is strongly aligned with these priorities in that it focuses on increasing the resilience of priority buildings to extreme climate events, and decentralising power and water supply to ensure continued provision of power and water during and immediately after an extreme event. Moreover, these interventions have been designed to be scalable and replicable both nationally and regionally, therefore, enhancing the adaptation impact of the interventions.

- The **Nationally Determined Contribution (NDC)** of 2015 outlines the country's commitments to addressing climate change threats through reducing GHG emissions (Article 2) and increasing the adaptive capacity of the population of Antigua and Barbuda (Article 4). The proposed project aligns specifically with the country's adaptation priorities in that project interventions will increase the climate resilience of priority buildings.
- **Antigua and Barbuda's Readiness Proposal** contributes to the climate change adaptation objectives outlined in the Paris agreement by: i) engaging in adaptation planning processes; ii) supporting the adaptation planning in the country by developing national climate assessments that include climate-resilient sector plans for six sectors; iii) synthesising priority actions into a National Adaptation Plan (NAP); and iv) conducting technical studies in preparation for the implementation of new climate change regulations. The proposed project will build on the outcomes of the Readiness Proposal in several ways. Firstly, Output 1 of the project will contribute to reducing the risk of critical public service and community buildings in Antigua and Barbuda. This output links directly to Readiness Proposal Sub-outcome 2.1: Country Programme for climate finance developed across the climate finance landscape, specifically with regards to identifying major interdependencies and vulnerabilities within the water, power and telecommunications sectors and for critical infrastructure in general. Secondly, Output 2 will enhance the technical and institutional capacity of the GoAB and relevant project stakeholders for climate-responsive planning. This intervention links directly with Readiness Proposal Sub-outcome 2.3: stakeholder engagement. Lastly, under Activity 2.2 of the project climate change adaptation will be mainstreamed into public and private financial, insurance and banking sectors. This intervention is linked directly to the Readiness Proposal Sub-outcomes 2.1: Country Programme for climate finance developed across the climate finance landscape; and 4.5: private sector engagement.
- **Antigua and Barbuda's Medium-Term Development Strategy (MTDS)** outlines the strategies and actions to be undertaken from 2016–2020 to meet the national goal of becoming a developed country in 15–20 years<sup>60</sup>. Within the MTDS, seven Flagship Priorities are emphasised, with two of these directly relating to improved buildings and infrastructure. The technical and institutional capacity of the local workforce, as well as private sector consumers and producers<sup>61</sup> will be built through developing and delivering training programmes under Output 2 of the project. These programmes will focus on the application of the updated Building Code as well as on effective techniques for implementing, monitoring and maintaining climate change adaptation measures on infrastructure<sup>62</sup>. This output aligns closely with Flagship Priority One of the MTDS, which focuses on *inter alia* the renewal and maintenance of critical infrastructure.

### Stakeholder engagement

The proposed project was designed following an extensive consultative process with the DoE, which is National Designated Authority (NDA) for Antigua and Barbuda and is responsible for the overall management of Antigua and Barbuda's GCF portfolio, as well as all other relevant project stakeholders. These stakeholders included representatives from DoE, Met Office, NGOs and local communities. Three in-country missions have been conducted during the project development phase.

In March 2017, an initial scoping mission was undertaken during which consultation workshops were held with multiple project partners<sup>63</sup> to: collect baseline information, discuss project implementation arrangements; identify potential risks to the project; and establish methods for ensuring the sustainability of project interventions. Following the initial scoping mission, a second in-country mission was conducted in August 2017 which included technical discussions with relevant government representatives on site selection processes. Shortly after the second mission, Hurricane Irma made landfall

<sup>60</sup> Medium-Term Development Strategy 2016 to 2020 (MTDS). 2015. Government of Antigua and Barbuda.

<sup>61</sup> private sector consumers include business owners and homeowners, while private sector consumers refer to architects, engineers and private contractors.

<sup>62</sup> such measures include climate-resilient water harvesting and decentralised renewable energy

<sup>63</sup> including: i) the Chief Fire Officer; ii) Archives Housing; iii) Antigua State College and Five Island Campus; iv) Ministry of Finance; v) National Parks; vi) MSJMC; vii) Analytics Lab; viii) Assistant Commissioner of Police; ix) All Saints Service Complex; x) PWD; xi) NODS; and xii) the Deputy Director of the DoE.

on the island of Barbuda, necessitating further discussion on national priorities. This led to the identification of target priority buildings to receive climate-proofing interventions<sup>64</sup>. Following these discussions, site visits to the identified target buildings were undertaken to validate the selection of these buildings to receive adaptation measures under the project.

A final mission was undertaken in August 2019 to: i) collect additional baseline information; ii) visit the identified target buildings that will receive climate-proofing measures under the project; iii) collect necessary climate data to strengthen the climate rationale of the project; iv) identify and validate potential project interventions — including appropriate climate-proofing measures — in collaboration with relevant stakeholders; v) engage with the DCA — as the link to the private sector— and MoF to discuss how the private sector could contribute to and benefit from integrating climate change adaptation into their relevant plans and processes; vi) discuss project financing — including co-financing; and vii) determine roles and responsibilities of the relevant implementing entities for the project.

Further details on the stakeholder engagement process are presented in Section 10 of Annex 6: Environmental and Social Impact Assessment and Management Plan.

#### **D.6. Efficiency and effectiveness (max. 500 words, approximately 1 page)**

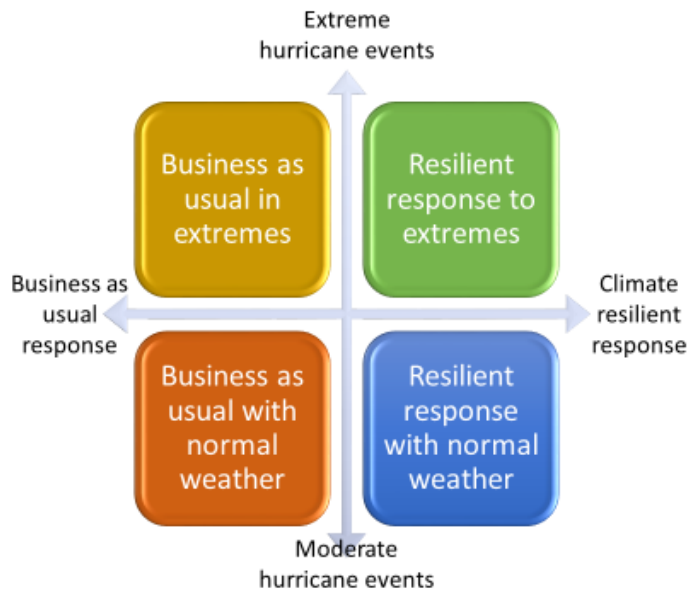
The proposed project is requesting US\$32.7 million in grant finance from the GCF to enhance the climate-resilience of Antigua and Barbuda's building sector to extreme climate events. This GCF investment will be supported by the Government of Antigua and Barbuda (GoAB), which has committed approximately US\$13 million in co-financing. GCF financing will be used to overcome the barriers to increasing the resilience of Antigua and Barbuda's building sector to climate change threats. Grants from the GCF will only be used to address the additional impacts of climate change, with government co-finance being used to cover all baseline costs – including business as usual repairs/maintenance to buildings that are necessary to ensure sustainability of climate-proofing interventions. With the support of GCF grant funding, the proposed project will deliver several adaptation benefits that will contribute to achieving a paradigm shift in the country towards climate-resilient sustainable development<sup>65</sup>. The combined amount of US\$46.1 million will be used efficiently and effectively to: i) increase the climate resilience of critical public service and community buildings; ii) mainstream climate change adaptation into the building sector and therefore unlocking opportunities for investment into innovative climate-adaptive solutions for public and private sector buildings; and iii) strengthen the technical and institutional capacity of decision-makers in Antigua and Barbuda's public and private sector for early action and rapid response to climate threats. The cost-effectiveness of proposed project interventions as well as a summary of the international best practices and lessons learned used to inform project development are presented below.

#### **Cost-effectiveness of project interventions**

<sup>64</sup> including: i) Police Headquarters, Antigua; ii) MSJMC, Antigua; iii) DoE Office, Antigua; iv) Police Station, Barbuda; v) Fire Station, Barbuda; vi) Community Centre, Barbuda; vii) Barbuda Clinic; viii) Barbuda Secondary School; ix) Fisheries Complex, Barbuda; x) Reverse Osmosis Plant, Barbuda; and xi) NODS, Barbuda

<sup>65</sup> A detailed description of project activities is presented in Sections B.3 and E.6 of the Funding Proposal.

In recent years, Antigua and Barbuda has experienced several Category 4 and 5 hurricanes, resulting in serious damage levels. In order to take decisions regarding the type of climate change adaptation options that the government should respond with, it is necessary to understand the adaptation expenditure options and the associated likely avoided hurricane impact costs. As the two options will have very different cost and impact implications, it is necessary to analyse the intervention expenditure and impact avoidance of the different adaptation options. A cost-effectiveness analysis has been employed to inform the decision-making. This analysis will identify which adaptation options will offer the greatest levels of cost-avoidance, or in other words, which option will be the most effective spend for the Government of Antigua and Barbuda. Four plausible scenarios facing Antigua and Barbuda society were developed and are outlined in Figure 10 below.



**Figure 10.** The four plausible scenarios analysed to determine the cost-effectiveness of proposed project interventions.

**Business as usual with ‘normal’ weather scenario.** Under this scenario government chooses to respond in a manner like the past, where infrastructure is repaired anticipating the past ‘normal’ weather. Buildings are repaired using conventional repairs, and the centralised water and energy supply system is maintained. To all intents, it is a business as usual response. In terms of the climatic conditions, hurricane phenomena are assumed to be similar to the past, with occasional Category 3 hurricanes.

**Business as usual with extreme weather scenario.** In this scenario, government also responds in the past manner, where infrastructure is repaired in a conventional manner anticipating ‘normal’ weather. Buildings are repaired using standard responses, and the centralised water and energy supply system is maintained. However, in terms of climatic conditions, the Antigua meteorological data from 1970 to 2013, and 2017 is adopted, which includes hurricanes of greater frequency and greater intensity (at Category 4 and 5 levels).

**Resilient response with ‘normal’ weather scenario.** In this scenario, government responds in a climate resilient manner, by anticipating future extreme weather. In terms of the response to infrastructure, 54 key government buildings are strengthened to resist Category 5 hurricanes (that is, 25% of 200 key government buildings), and water and energy supply is decentralised to allow for multiple supply options (to reduce the risks associated with a single supply system). In terms of human and institutional capital, technical capacity is built in the public and private sector, building codes are regulated, innovative finance facilities to promote building adaptation is provided and an early warning system is established. In terms of the climatic conditions, hurricane phenomena and trends are assumed to be like the past (1900 to 1950).

**Resilient response with extreme weather scenario.** Here government responds in a climate resilient manner by strengthening 54 key government buildings to resist Category 5 hurricanes, and water and energy supply is

decentralised to allow for multiple supply options. Technical capacity is built in the public and private sector, building codes are regulated, innovative finance facilities to promote building adaptation is provided and an early warning system established. Climate change projections under both the RCP4.5 and 8.5 scenarios<sup>66</sup> indicate that, although the total number of storms is not expected to change significantly, there will be an increase in the frequency of high-intensity storms (Category 4 and 5 hurricanes) experienced by Antigua and Barbuda.

The expenditure on alternative intervention options were clustered into two broad packages, namely:

- A baseline package representing the conventional response to Category 3 hurricane impacts and includes a total capital cost of US\$10.4 million and an annual operating expenditure of US\$64,800.
- A climate resilient package representing a retrofit of 54 buildings for Category 5 hurricanes, capacity building interventions to lever climate resilient private sector responses and includes a total capital cost of US\$23.2 million and an annual operating expenditure of US\$717,910.

The Net Present Value (NPV) of the baseline or business as usual intervention package is US\$13.8 million, and the climate resilient retrofit is US\$36.9 million — the climate resilient option being 2.6 times greater than the baseline. The proposed project's climate resilient NPV is comparable to the cost of similar interventions within the Caribbean. For example, a project in Barbados addressing enhanced access of the public to adaptation financing in the water sector and the installation of rainwater harvesting systems cost US\$45.2 million, whereas a project in Dominica addressing the investment in climate-resilient infrastructure cost US\$31 million (Table 9). To judge the whether the expenditure is justifiable, it is necessary to quantify the interventions' impacts in the four scenarios. The impacts of the scenarios were estimated by:

- Firstly, analysing the impacts of single hurricane events (both Category 3 and 5 hurricanes) when combined with government intervention packages – either a business as usual response or a climate resilient response.
- Secondly, summing the costs of repeat hurricane events (Category 3 or 5 or both) in either the 'normal' or extreme weather scenarios over the next 50 years.

The quantum of the impacts were estimated as **avoided losses** using i) direct market values with respect to manufactured capital as a proxy for the loss in infrastructure, ii) loss in income as a proxy for the impact on the economy and welfare of people, and iii) the human capital approach as a proxy for the impact on the productive capability of the population as well as pain and suffering.

The analysis then used 'normal' hurricane trends (i.e. more Category 1,2 and 3 hurricanes) reflected in the period 1900–1950 and extreme hurricane trends (i.e. more Category 4 and 5 hurricanes) reflected in the period 1970–2013 and in 20017 to count and sum the different hurricanes and to combine these with the impact costs over 50 years for each scenario. A comparison of the four scenarios' intervention costs and hurricane impacts is outlined in **Figure10** .. Note the following:

- In a *business as usual with 'normal' weather*, the cost of the interventions is USD 13.8 million, with a USD 551.9 million impact cost. However, in a *business as usual with extreme weather*, while the intervention costs are the same, the impact cost is USD 17.2 billion, orders of magnitude greater.
- On the other hand, in a *climate resilient with 'normal' weather*, the intervention cost is USD 36.9 million, some USD 23 million more than the *business as usual* costs. However, in this scenario, the impact costs are USD 214, some USD 338 less than in a *business as usual with 'normal' weather*. The additional USD 23 million spend buys a cost avoidance of USD 337.9 million. Therefore, even in a 'normal' weather scenario, a climate resilient intervention is a no-regret investment. In terms of a *climate resilient with extreme weather* scenario, the impacts costs are USD 8 billion, some USD 9.1 billion less than *business as usual with extreme weather*. In this case, the additional USD 23 million resilient intervention buys a USD 9.1 billion cost avoidance. This is a highly cost effective spend. **Error! Reference source not found.** below presents a comparison of intervention costs and associated hurricane losses under the four scenarios.

<sup>66</sup> These representative concentration pathways (RCPs) are based on the main forcing agents of climate change, including GHG emissions, GHG concentrations and land-use change. RCP4.5 represents the likely best-case scenario with a peak radiative forcing of 4.5 W/m<sup>2</sup> (~650 ppm CO<sub>2</sub> eq) at stabilisation after 2100. RCP8.5 represents a very high GHG emission scenario with a peak radiative forcing of 8.5 W/m<sup>2</sup> (~1,370 ppm CO<sub>2</sub> eq) and no expected stabilisation in emissions. RCP8.5 indicates a business as usual scenario where the rate of GHG emissions continues to increase with no mitigation measures.

**Table 10.** Comparison of intervention costs and associated hurricane impact costs in the four scenarios.

|   | Net present value (NPV) of the expenditure on interventions (USD millions) | NPV of "Normal" hurricane impact costs (USD millions) | NPV of extreme hurricane impact costs (USD millions) |
|---|--|---|--|
| <b>Baseline: BaU interventions</b>  | \$ 13.8  | \$ 551.9  | \$ 17,253.0  |
| <b>Resilient interventions</b>  | \$ 36.9  | \$ 214.0  | \$ 8,091.4   |
| <b>Differences between Business as usual and Resilient spend and cost avoidance</b> | \$ 23.1  | \$ 337.9  | \$ 9,161.7   |

The cost-effectiveness analysis identifies which options provide the greatest magnitude of avoided losses to society per dollar spent on interventions. Note the following:

- The *'normal' hurricane exposure with a business as usual intervention*, constitutes the *baseline* or the standard by which the other interventions are evaluated. In the comparative ratio, the baseline becomes '1'. Furthermore, in this scenario, a US\$1 spend on interventions is associated with a hurricane impact cost of US\$39.6. On the other hand, a *climate resilient response with 'normal' weather*, is associated with a US\$5.8 hurricane impact cost to society per dollar spend, or some 15% of the baseline – a much lower impact.
- In the *business as usual response with extreme weather* scenario, the loss could be as high as US\$1,246 per dollar spend or 31.3 times greater than the baseline scenario. In terms of a *climate resilient response with extreme weather* scenario, the loss could be US\$219 per dollar spent, orders of magnitude lower than the baseline.
- **In both weather scenarios, the resilient interventions offer more cost-effective responses than a business as usual response, with the expected avoided losses under the project at US\$1.15 billion reduction in loss of assets at mid-term and US\$3.34 billion reduction in loss of assets at final term**

#### Application of best practices in the building sector

Best practices from the Organisation of Eastern Caribbean States (OECS) Building Code and the Caribbean Disaster Mitigation project were used to inform the design of climate proofing interventions to be implemented under the proposed project. Lessons learned from numerous baseline investments into climate change adaptation in Antigua and Barbuda were also used to guide the design of all project interventions. Such lessons include appropriate mechanisms for ensuring that project activities are implemented in a participatory, gender-inclusive and sustainable way. The specific international best practices and lessons learned that were applied to the design of the proposed project and that will contribute to the efficiency and effectiveness of project interventions are summarised below. Specific details on all best practices and lessons learned relevant to the project are presented in Section 7 of Annex 2: Feasibility Study.

International best practices and lessons learned identified for the project include:

- using climate-resilient materials for increasing the structural integrity of critical public service and community buildings, such as pitch pine and / or mahogany wood for hurricane shutters and window frames, as well as straps, bolts or clamps for securing roofs;
- ensuring that designs of buildings under future climate change conditions do not include long overhangs, which are at risk to high-intensity storms;
- incorporating traditional knowledge into training for engineers, architects, draughtsmen on how to design and implement climate-resilient solutions in the building sector;
- increasing compliance with the standards and guidelines stipulated in the national building code;
- updating the national and local policy framework for the building sector to ensure that future development adopts changes in international standards regarding the technical specifications required by all buildings under changing climate conditions;

- drawing on regional experiences and resources to increase capacity to respond to the impacts of extreme events;
- applying an integrated, systemic and coordinated approach to disaster response through the establishment of formalised communication channels;
- developing appropriate strategies for securing financial resources for project development and implementation;
- effectively managing the available financial and human resources to ensure the efficient and cost-effective implementation of project interventions;
- undertaking regular monitoring and evaluation of climate-adaptive interventions to ensure that the most effective and appropriate solutions are being implemented under future conditions of climate change;
- engaging and collaborating extensively with all relevant project stakeholders will encourage buy-in from national- and local-level decision-makers therefore contributing to the sustainability of proposed adaptation interventions over the long term; and
- implementing effective financial and project management strategies to ensure the efficient use of financial resources and avoid delays during the implementation phase.

## E. LOGICAL FRAMEWORK

This section refers to the project/programme's logical framework in accordance with the GCF's [Performance Measurement Frameworks](#) under the [Results Management Framework](#) to which the project/programme contributes as a whole, including in respect of any co-financing.

### E.1. Paradigm shift objectives

Please select the appropriated expected result. For cross-cutting proposals, tick both.

- Shift to low-emission sustainable development pathways
- Increased climate resilient sustainable development

### E.2. Core indicator targets

Provide specific numerical values for the GCF core indicators to be achieved by the project/programme. Methodologies for the calculations should be provided. This should be consistent with the information provided in section A.

|  |  |  |
|--|--|--|
| E.2.1. Expected tonnes of carbon dioxide equivalent (t CO <sub>2</sub> eq) to be reduced or avoided (mitigation and cross-cutting only)  | Annual   | 1,923 t CO <sub>2</sub> eq                             |
|  | Lifetime   | 38,460 t CO <sub>2</sub> eq                            |
| E.2.2. Estimated cost per t CO <sub>2</sub> eq, defined as total investment cost / expected lifetime emission reductions (mitigation and cross-cutting only)   | (a) Total project financing  | 47,403,933 million USD                                 |
|  | (b) Requested GCF amount   | 33,945,898 million USD                                 |
|  | (c) Expected lifetime emission reductions                                | ___ t CO <sub>2</sub> eq                               |
|  | <b>(d) Estimated cost per t CO<sub>2</sub>eq (d = a / c)</b>             | ___ Choose an item. / t CO <sub>2</sub> eq             |
|  | <b>(e) Estimated GCF cost per t CO<sub>2</sub>eq removed (e = b / c)</b> | ___ Choose an item. / t CO <sub>2</sub> eq             |
| E.2.3. Expected volume of finance to be leveraged by the proposed project/programme as a result of the Fund's financing, disaggregated by public and private sources (mitigation and cross-cutting only) | (f) Total finance leveraged  | 13,458,035 million USD                                 |
|  | (g) Public source co-financed  | 13,458,035 million USD                                 |
|  | (h) Private source finance leveraged                                     | ___ Choose an item.                                    |
|  | <b>(i) Total Leverage ratio (i = f / b)</b>                              | <b>0.4</b>   |
|  | (j) Public source co-financing ratio (j = g / b)                         | 0.4  |
|  | (k) Private source leverage ratio (k = h / b)                            | ___  |
| E.2.4. Expected total number of direct and indirect beneficiaries, (disaggregated by sex)  | Direct   | 73,216 people <sup>67</sup>                            |
|  |  | 38,072 women and 35,144 men                            |
|  | Indirect   | 94,400 people;<br>49,088 are women and ~45,312 are men |
| <i>For a multi-country proposal, indicate the aggregate amount here and provide the data per country in annex 17.</i>  |  |  |

<sup>67</sup> Details on the vulnerability analysis conducted that generated beneficiaries' figures, including the methodology, are presented in Section 10 of Annex 2: Feasibility Study.

|  |  |  |
|--|--|--|
| E.2.5. Number of beneficiaries relative to total population (disaggregated by sex) | Direct   | 73,216 people (~78% of the total population)   |
|  | Indirect   | Project interventions will indirectly benefit 100% of the total population of Antigua and Barbuda (i.e. ~94,400 people). |
|  | <i>For a multi-country proposal, leave blank and provide the data per country in annex 17.</i> |  |

| E.3. Fund-level impacts   |   |   |  |   |  |  |
|---|---|---|--|---|--|--|
| Expected Results  | Indicator   | Means of Verification (MoV)   | Baseline   | Target                                    |  | Assumptions  |
|   |   |   |  | Mid-term                                  | Final                                      |  |
| A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions | A1.1 Change in expected losses of lives and economic assets (US\$) due to the impact of extreme climate-related disasters | Initial Situation Overview <sup>68</sup><br><br>Initial Damage Human Needs Assessment <sup>69</sup><br><br>Detail Sector Damage Assessment <sup>70</sup><br><br>Recovery needs assessments/Post Disaster Needs Assessment <sup>71,72</sup><br><br>Mapping of affected area using GIS<br><br>Report/assessment of losses avoided<br><br>Building Maintenance Reports | US\$6.6 billion in economic losses per Category 4 or 5 event | \$1.5 billion reduction in loss of assets | \$3.34 billion reduction in loss of assets | Climate change adaptation measures implemented on target buildings will be adequate to meet current climate projections. |

<sup>68</sup> Conducted by a Rapid Needs Assessment Team of national and local authorities. The team is mobilized within 24 hours and the assessment report is available within 3 days and is shared by the National Emergency Operation Center (NEOC)

<sup>69</sup> This assessment is mobilized within 7 days and is conducted by CARICOM as well as national and local authorities. A report is produced within 14 days shared by NEOC

<sup>70</sup> Mobilized after 14 days and is conducted by national and sector experts

<sup>71</sup> If a Category 4 or 5 hurricane hits the country within the project implementation period

<sup>72</sup> Following an extreme climate event, the GoAB conducts a recovery needs assessment, supported by organisations such as the Global Facility for Disaster Reduction and Recovery, United Nations, European Union, Caribbean Development Bank and the Eastern Caribbean Central Bank. Focuses on (i) the valuation of physical damages and economic losses; and, (ii) the identification of human recovery needs of the affected population.

**E.3. Fund-level impacts**

| Expected Results | Indicator | Means of Verification (MoV) | Baseline | Target   |       | Assumptions |
|------------------|-----------|-----------------------------|----------|----------|-------|-------------|
|                  |           |                             |          | Mid-term | Final |             |
|                  |           |                             |          |          |       |             |

**E.3. Fund-level impacts**

| Expected Results  | Indicator  | Means of Verification (MoV)   | Baseline   | Target  |  | Assumptions  |
|---|--|---|--|---|--|--|
|   |  |   |  | Mid-term  | Final  |  |
| A3.0 Increased resilience of infrastructure and the built environment to climate change | A3.1 Number of physical assets made more resilient to climate variability and change, considering human benefits | <p>Building resilience scorecard<sup>73</sup>.</p> <p>Government building upgrade reports/construction logs</p> <p>Government asset registers</p> <p>Site surveys</p> | <p>52 priority buildings at Level 0</p> <p>2 priority buildings with value USD 8,617,188 at Level 1<sup>74</sup></p> | <p>27 priority buildings at Level 2 with value USD 53,354,316.53<sup>75</sup></p> | <p>54 priority buildings at Level 3 with value USD 106,708,633.07<sup>76</sup></p> | <p>Climate change adaptation measures implemented on target buildings are adequate for predicted extreme climate events.</p> <p>Persons working in the climate-proof priority buildings are able to return to work and provide critical services during and after a storm.</p> |

**E.4. Fund-level outcomes**

| Expected Outcomes  | Indicator   | Means of Verification (MoV)  | Baseline  | Target  |  | Assumptions  |
|--|---|--|---|---|--|--|
|  |   |  |   | Mid-term  | Final  |  |
| A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development | A5.1 Institutional and regulatory systems that improve incentives for climate resilience and their effective implementation | <p>DCA applications for each year</p> <p>Antigua and Barbuda Investment Authority (ABIA) Construct Antigua and Barbuda Initiative report</p> | <p>Total value of category 4/5 resilient buildings annually approved by DCA is USD 6,388,875 (i.e. 25 buildings)<sup>77</sup></p> | <p>Total value of category 4/5 resilient buildings annually approved by DCA is USD 12,777,750 (i.e. 50 buildings)</p> | <p>Total value of category 4/5 resilient buildings annually approved by DCA is USD 63,888,750 (i.e. 250 buildings)</p> | <p>Increase in construction costs and greater longevity of buildings with climate resilient investments.</p> <p>Increase in the minimum strength requirement of buildings to a</p> |

<sup>73</sup> Level of scale measures the potential to withstand a Category 4 or 5 hurricane - Level 0: Building infrastructure cannot withstand a Cat 4 or 5 hurricane and is fully reliant on centralised water and energy systems; Level 1: Building infrastructure will withstand a Cat 4 or 5 hurricane but still fully reliant on centralised water and energy systems; Level 2: Building infrastructure will withstand a Cat 4 or 5 hurricane and still partially reliant on centralised water and energy systems; Level 3: Building infrastructure will withstand a Cat 4 or 5 hurricane and fully equipped with self-sustaining water and renewable energy systems.

<sup>77</sup> The baseline to be confirmed in year one to maintain midterm and final targets relative to the baseline.

|   |   |   |   |  |   |  |
|---|---|---|---|--|---|--|
|   |   | Customs Report  |   |  |   | high-end Cat 4 and a low-end Cat 5 development.  |
| A6.0 Increased generation and use of climate information in decision-making | <i>A6.1 Use of climate information products/services in decision-making in climate sensitive sectors</i>  | Climate information services (CIS) uptake scorecard for the application of the updated building codes <sup>78</sup><br><br>Standard Operating procedures and protocols for early warning<br><br>National Emergency Centre reports | CIS uptake at Level 1<br><br>Decision-makers in critical public services rely on traditional, informal communication channels to prepare for and respond to an extreme climate event. | CIS uptake at Level 2  | CIS uptake at Level 3   | Effective dissemination of early warnings leads to early action and increased resilience.<br><br>Sectors are better prepared to respond to threats of extreme climatic events. |
| A7.0 Strengthened adaptive capacity and reduced exposure to climate risks   | <i>A7.2 Number of males and females reached by [or total geographic coverage of] climate-related early warning systems and other risk reduction measures established/strengthened</i> | MoW Assessments of critical public service and community<br><br>Visitor Logs maintained by security and administrative personnel indicating   | 0   | 19,000 women and 17,000 men (36,000 people in total) reached by climate-related early warning systems and are supported by climate-resilient critical services | 38,072 women and 35,144 men (73, 216 people in total) reached by climate-related early warning systems and are supported by climate-resilient critical services | Climate proofing measures are sufficient to secure the provision of critical services to communities during a Category 5   |

<sup>75</sup> **Aggregate Value of 1 square foot of climate interventions = USD 130**

**Post-Climate Interventions Value of 1 square foot of a priority building = Current Market Value of 1 square foot of a priority building + Aggregate Value of 1 square foot of climate interventions (i.e. USD 298 = USD 168 + USD 130)**

**Post-Climate Interventions Value of a priority building = Total square footage of a priority building X Post-Climate Interventions Value of 1 square foot of a priority building**

<sup>76</sup> **Aggregate Value of 1 square foot of climate interventions = USD 130**

**Post-Climate Interventions Value of 1 square foot of a priority building = Current Market Value of 1 square foot of a priority building + Aggregate Value of 1 square foot of climate interventions (i.e. USD 298 = USD 168 + USD 130)**

**Post-Climate Interventions Value of a priority building = Total square footage of a priority building X Post-Climate Interventions Value of 1 square foot of a priority building**

<sup>77</sup> The baseline to be confirmed in year one to maintain midterm and final targets relative to the baseline.

<sup>78</sup> The (CIS) uptake scorecard seeks to measure the extent of use of climate change information in relevant early action protocols and procedures. Level 0: Early warnings are not used for disaster preparedness and response; Level 1: First responders receive unclear communications from early warning systems, without formal categorisation of the level of threat. As a result, uncertainty over the level of threat delays action while decisions makers debate on what both the level of threat and the response that needs to be taken. Level 2: First responders receive clear communications from early warning systems that categorisation of the level of threat but do not have standardised response protocols. As a result, response is delayed while decisions makers debate on what actions need to be taken for each escalation of the threat level. Level 3: First responders receive clear communications which indicate the level of threat and have clear protocols in place detailing the appropriate level of response. As a result, response is immediate and can be escalated rapidly as the threat level increases, without having to wait for decision makers to reassess the situation.

|  |  |  |  |   |  |                         |
|--|--|--|--|---|--|-------------------------|
|  |  | <p>people serviced by these buildings</p> <p>Public works records</p> <p>Census records of people in the vicinity of the buildings that are at risk to the impacts of extreme climate events<sup>79</sup></p> <p>Annual project reports measure the progress achieved for installing climate proofing measures on target buildings</p> |  | <p>secured through climate proofing measures on critical public service and community buildings (corresponding to the reach of 50% of the target buildings)</p> | <p>secured through climate proofing measures on critical public service and community buildings (corresponding to the reach of 100% of the target buildings)</p> | <p>hurricane event.</p> |
|--|--|--|--|---|--|-------------------------|

### E.5. Project/programme performance indicators

| Expected Results   | Indicator  | Means of Verification (MoV)  | Baseline   | Target  |   | Assumptions  |
|--|--|--|--|---|---|--|
|  |  |  |  | Mid-term  | Final   |  |
| <p>1. Climate-proofing interventions implemented in critical public service and community buildings to improve resilience to, and recovery from, extreme climate events.</p> | <p><i>Number of priority buildings that can reopen within 2 days after a category 4 or 5 hurricane and be fully functional to serve vulnerable persons</i></p> | <ul style="list-style-type: none"> <li>Catalogue of surveys/ assessments from the climate-proofed buildings</li> <li>Commissioning reports</li> <li>Results of drills conducted by NODs as part of the National Hurricanes readiness exercises.</li> </ul> | <p>2 priority buildings are able to withstand the impacts of Category 5 hurricanes</p> | <p>Total of 27 priority buildings can reopen within 2 days<sup>80</sup> after a category 4 or 5 and be fully functional to serve vulnerable persons</p> <p>Of which:</p> <p>Schools = 8</p> <p>Police stations = 5</p> <p>Healthcare buildings = 7</p> <p>Government Office buildings = 6</p> | <p>Total of 54 priority buildings are at level 3 and can reopen within 2 days<sup>81</sup> after a category 4 or 5 and be fully functional to serve vulnerable persons</p> <p>Of which:</p> <p>Schools = 13</p> <p>Police stations = 11</p> <p>Healthcare buildings = 15</p> <p>Government buildings = 14</p> | <p>Climate-proofing interventions related to buildings only and include the installation of RE solutions.</p> <p>Climate-proofing priority critical service buildings is the major but not the only factor in critical services remaining operational during and immediately after extreme climate events.</p> |

<sup>79</sup> The GoAB is responsible for these assessments, which will be conducted to measure project progress and performance.

<sup>80</sup> Workers need time to clean up their homes and then the buildings after any storm and more so after Cat 4 and Cat 5. Also, the Government needs at least 48 hrs to clear roads;

<sup>81</sup> Workers need time to clean up their homes and then the buildings after any storm and more so after Cat 4 and Cat 5. Also, the Government needs at least 48 hrs to clear roads;

|   |   |   |  |   |  |   |
|---|---|---|--|---|--|---|
|   |   |   |  | Community Building=1  | Community Building=1   |   |
|   | <i>Change in gallons of water stored at 54 priority buildings to enable continuous water supply when centralised utilities are disrupted by a storm</i> | <ul style="list-style-type: none"> <li>• Design and QS reports;</li> <li>• Contracts with contractors;</li> <li>• Commissioning reports;</li> <li>• Catalogue of surveys/ assessments from the climate-proofed buildings</li> </ul> | 3 priority buildings fitted with climate-resilient water harvesting solutions with an average of 1,989.35 gallons stored <sup>82</sup> | 27 priority buildings fitted with climate-resilient water harvesting solutions with an average of 17,904.14 gallons stored          | 54 priority buildings fitted with climate-resilient water harvesting solutions with an average of 35,808.27 gallons stored   | <p>The water harvesting and other retrofits on the buildings will be done together.</p> <p>Water harvesting solutions improve water availability during and after a storm.</p> <p>The water storage capacity at each building is sufficient to meet the critical needs of the facility for at least 2 days after a storm.</p> |
|   | <i>Change in recovery time for critical data linked to priority services such as healthcare, safety and security</i>                                    | <ul style="list-style-type: none"> <li>• Commissioning reports for climate-proofing of on-site data servers;</li> <li>• System logs for servers secured within the climate-resilient bunker</li> </ul>                              | Data recovery takes several months as data is not backed up on secure servers and is lost if a storm damages on-site servers.          | Data recovery can be done within 2 days of a storm using backup data stored on secure servers housed in a climate-resilient bunker. | Data recovery can be done in a few hours using data backup on on-site climate-proofed servers, with additional backups accessible within 2 days using backup data stored on secure servers housed in a climate-resilient bunker. | <p>Data backed up on secure servers can be manually downloaded if internet services are disrupted.</p> <p>On-site climate-proofed data servers are connected to a resilient, decentralised backup power source.</p>   |
| 2. Climate change adaptation lessons mainstreamed into the building sector and relevant financial | <i>Change in the % of applications to the DCA for buildings that can meet category 4 &amp; 5 standards;</i>   | <ul style="list-style-type: none"> <li>• DCA reports</li> </ul>   | Approximately 5% of 500 applications approved annually by  | 10% of 500 applications approved annually by the DCA are  | 50% of 500 applications to the DCA are for buildings that can meet   | Technical training is sufficient to increase the capacity of the  |

<sup>82</sup> **Total Expected Number of People to occupy a priority building** = Total square footage of a priority building ÷ 100 square feet  
**Total Minimum Water Storage Capacity of a priority building** = Total Expected Number of People to occupy a priority building X 10 gallons

|                                     |  |   |  |  |                                      |   |
|-------------------------------------|--|---|--|--|--------------------------------------|---|
| <p>institutions and mechanisms.</p> |  | <ul style="list-style-type: none"> <li>• Reports generated by consultants;</li> <li>• Consultation and workshop reports;</li> <li>• Regulations drafted and submitted to the office of the Attorney General;</li> </ul> | <p>the DCA are CAT 4 or 5</p>  | <p>for buildings that can meet category 4 &amp; 5 standards.</p> | <p>category 4 &amp; 5 standards;</p> | <p>local workforce to implement, maintain and monitor climate change adaptation measures installed on buildings in accordance with the national building code and Physical Planning Act (2003).</p> <p>Public and private sector representatives participate in the capacity building programmes.</p> |
|                                     | <p><i>Change in the level of awareness and understanding of updated building codes for government officials in MoW and DCA as well as building inspectors, engineers, architects and draughtsmen</i></p> | <p>Training certificates;<br/>Awareness surveys</p>   | <p>TBD<sup>83</sup></p> <p>MoW and DCA as well as building inspectors, engineers, architects, and draughtsmen are required to build to meet Cat 3 standard.</p> <p>DCA is implementing a project with Compete Caribbean to digitalize processes for construction permits in Antigua and Barbuda and these stakeholders will be registered on an online platform.</p> | <p>Baseline + 20%</p>  | <p>Baseline + 40%</p>                | <p>Training and awareness programs lead to lasting retention of knowledge.</p>  |

<sup>83</sup> Baseline Survey to be conducted in project Year 1, and reported in first APR

|  |  |   |  |   |  |  |
|--|--|---|--|---|--|--|
|  | <i>% reduction of incremental cost for climate interventions as a result of lessons learnt and interventions implemented</i> | SIRF Fund evaluation reports                        | <p>Average baseline incremental costs of climate interventions is USD\$130</p> <p>SIRF Fund has a mechanism for private access to financial resources for the incremental cost of adaptation to climate change.<sup>84</sup></p> <p>The incremental cost is very high and can exceed ability to pay.</p>   | 10% reduction   | 20% reduction  | Lessons learned will allow the Fund to calculate the incremental cost of building adaptations used in small businesses.  |
| <p>3. Climate information services strengthened to facilitate early action within the building sector to respond to extreme climate events.</p> <p>[This output links to GCF Outcome A.6.]</p> | <i>Change in response times of critical service providers and NODS to alerts and warnings received</i>                       | <p>Rate of response drills</p> <p>Drill reports</p> | <p>TBD<sup>85</sup></p> <p>The Antigua and Barbuda Meteorological Service (ABMS) issues four main bulletins at least every 6 hours between 5 am-11pm.</p> <p>Intermediate Bulletins are produced at times every hour between main bulletins based on the severity of the situation.</p> <p>Bulletins increase based on if the hazard draws closer.</p> | 30 minute reduction of NODS response time to bulletins, alerts and warnings | 1 hour reduction of NODS response time to bulletins, alerts and warnings | <p>First responders and decision-makers will be the main users of the data; The private sector will be allowed access to the data as well.</p> <p>There is sufficient demand for community level uptake and use of early warning information products among national-level decision-makers, the private sector and the entities responsible for the coordination of disaster response,</p> |

<sup>84</sup> There is a limit associated with this mechanism controlling the total amount of financial resources that may be accessed by public and private enterprises.

<sup>85</sup> Baseline drills to be conducted in project year 1 and baseline reported with confirmed frequency of drills in the first APR.

|  |  |   |  |                |      |  |
|--|--|---|--|----------------|------|--|
|  |  |   | NODS takes at least 2 hours to start taking action after they receive bulletins from met services. |                |      | including ABMS and NODS  |
|  | <i>% of early response protocols actioned through the formal communication protocols</i> | Rate of response drills<br><br>Drill reports;<br><br>NODS annual Disaster Management Plan | TBD <sup>86</sup>  | Baseline + 30% | 100% | First responders have access to early response protocols and understand the threat levels. |

<sup>86</sup> Baseline drills to be conducted in project year 1 and baseline reported with confirmed frequency of drills in the first APR.

| <b>E.6. Activities</b>  |  |  |  |
|---|--|--|--|
| <b>Activity</b>   | <b>Description</b>   | <b>Sub-activities</b>  | <b>Deliverables</b>  |
| 1.1. Implement climate-proofing measures on critical infrastructure.        | <p>Activity 1.1 will ensure that critical public services remain functional during and directly after a Cat 5 hurricane. Targeted infrastructure will include hospitals/clinics, police and fire stations, storm shelters, relevant government buildings and schools. A comprehensive list of target buildings is provided in Section 10 of Annex 2: Feasibility Study.</p> <p>Adaptation measures will include actions to protect the buildings during a storm (structural alterations), as well as operations after a storm by ensuring a continuous supply of power and water. Specifically, the actions will include water harvesting and structural upgrades to windows, doors and roofs.</p> | <p>1.1.1. Develop site-specific engineering designs for climate proofing 52 priority buildings.</p> <p>1.1.2. Install climate proofing measures on 52 priority buildings based on engineering designs developed in Sub-activity 1.1.1.</p> <p>1.1.3. Develop site-specific operational procedures for long-term maintenance of climate-proofing interventions for each priority building and integrate these procedures into the project O&amp;M Framework.</p> <p>1.1.4. Design climate-resilient renewable energy solutions for priority buildings taking into consideration energy efficiency (EE) and indoor air quality for those buildings that have heating, ventilation and air conditioning (HVAC) systems.</p> <p>1.1.5. Install EE and RE solutions at priority buildings.</p> <p>1.1.6. Design water harvesting solutions for priority buildings as well as stormwater drainage solutions for buildings in flood risk areas.</p> <p>1.1.7. Install water harvesting solutions for priority buildings as well as stormwater drainage solutions for buildings in flood risk areas.</p> | <ul style="list-style-type: none"> <li>• Site-specific engineering designs for climate-proofing 52 priority buildings to withstand the impacts of Category 5 hurricanes</li> <li>• 52 priority buildings retrofitted with climate-adaptive measures</li> <li>• Operation and maintenance guidelines developed and integrated into existing O&amp;M plans for 54 priority buildings</li> <li>• Site-specific engineering designs for climate-resilient RE solutions for 34 priority buildings that provide power for 24 – 48 hrs before needing to be recharged</li> <li>• 53 priority buildings have EE solutions installed.</li> <li>• Climate-resilient water harvesting solutions installed in 51 priority buildings</li> <li>• Restocking protocol</li> <li>• Stormwater drainage solutions installed at 14 project sites</li> </ul> |
| 1.2. Construct climate-resilient storm shelters attached to public clinics. | To facilitate the transition away from using schools as storm shelters ( a recommendation of the ESS and gender assessment), the project will commission five purpose-built storm shelters attached to public clinics. This will not only reduce downtime for schools after  | 1.2.1. Develop detailed, site-specific construction plans for hurricane shelters at five public clinics.   | <ul style="list-style-type: none"> <li>• Five custom-built hurricane shelters with decentralised water and renewable energy supplies.</li> </ul>   |

|  |   |  |  |
|--|---|--|--|
|  | <p>being used as shelters but will also improve the healthcare response as medical facilities will be readily accessible to users of the shelters during a storm event.</p>   | <p>1.2.2. Construct hurricane shelters based on the designs developed under Sub-activity 1.2.1.</p> <p>1.2.3. Equip hurricane shelters with renewable energy and climate-resilient water harvesting systems.</p> <p>1.2.4. Develop emergency protocols for each shelter according to national guidelines.</p>  | <ul style="list-style-type: none"> <li>• Emergency protocols for each shelter</li> </ul>   |
| <p>1.3. Construct a climate-resilient bunker to store emergency supplies for the health, energy, building and welfare sectors.</p> | <p>After an extreme event, emergency supplies are rapidly required to return the country to normalcy. These supplies include equipment required for the generation of renewable energy, building materials, food and medicine. The project will therefore construct a purpose built bunker of ~749 m<sup>2</sup> (8,050 sq. ft.) to store supplies needed immediately after a storm.</p>  | <p>1.3.1. Complete a detailed design and construction plan for the bunker.</p> <p>1.3.2. Construct the bunker based on the design in Sub-activity 1.3.1.</p> <p>1.3.3. Develop an operational protocol for the stock and distribution management of emergency supplies that will be stored within the bunker.</p> <p>1.3.4. Develop a battery recharge and replacement protocol for critical services.</p> | <ul style="list-style-type: none"> <li>• One climate-resilient bunker</li> <li>• One operational protocol</li> </ul>   |
| <p>1.4. Implement measures to preserve vital information/data within public institutions.</p>                                      | <p>Extreme climate events cause long-lasting disruptions to power supplies in Antigua and Barbuda, as well as physical damage to computer servers that store vital medical and security information from hospitals, police stations and other critical sectors. As a result, it is essential for vital information and data housed within public institutions to be protected and backed up to ensure that no losses are experienced during a storm. Under this activity, protocols will be developed for effective and efficient data back-up procedures before a storm and IT teams within each public institution will be trained on the application of these protocols. Each targeted institution will be responsible for the delivery of this training to relevant staff. Additionally, physical protection measures will be designed and implemented on the relevant public buildings to reduce the risk of critical IT infrastructure being damaged by an extreme event.</p> | <p>1.4.1. Develop backup protocols for critical information.</p> <p>1.4.2. Train IT teams on the implementation of backup protocols.</p> <p>1.4.3. Design physical protection measures for critical IT infrastructure.</p> <p>1.4.4. Implement physical protection measures for critical IT infrastructure.</p>  | <ul style="list-style-type: none"> <li>• Backup protocols.</li> <li>• Training modules developed.</li> <li>• Training workshops</li> <li>• Site-specific engineering designs for the physical protection of critical IT systems</li> </ul> |
| <p>2.1. Mainstream climate change adaptation into the</p>  | <p>To promote the uptake of climate-resilient development across Antigua and Barbuda,</p>   | <p>2.1.1. Draft regulations for the Physical Planning Act (2003) that</p>  | <ul style="list-style-type: none"> <li>• Regulations for the Physical Planning Act (2003)</li> </ul>   |

|  |   |   |   |
|--|---|---|---|
| <p>building sector by making provision for the building code in the Physical Planning Act (2003) and updating the EMS plans.</p>           | <p>climate change adaptation standards will be mainstreamed into the country's building sector. This will be achieved through three primary measures. Firstly, regulations for the Physical Planning Act (2003) will be drafted to make provisions for the inclusion of the updated building code in the national regulatory framework. Secondly, a Strategic Impact Assessment (SIA) of the building code regulations will be conducted to assess the environmental and social safeguards and gender risks, consequences and mitigation measures related to the enactment of these regulations in the Physical Planning Act (2003). This SIA will ensure that the building code is accompanied by other policies and measures to safeguard the most vulnerable groups in the country — particularly those with low incomes that have reached their borrowing capacity, the elderly (retired) and those people who have disabilities — so that they are able to meet the requirements of the new code. Finally, recommendations will be made for the EMS Plans to be updated to include climate-resilient measures for the building sector.</p> | <p>makes provision for the Building Code for submission to and enactment by parliament.</p> <p>2.1.2. Conduct Strategic Impact Assessment (SIA) of the building code regulations to assess the environmental and social safeguards and gender risks, consequences and mitigation measures related to the enactment of these regulations.</p> <p>2.1.3. Make recommendations for the EMS Plans to be updated to include climate change adaptation measures for the building sector.</p> <p>2.1.4. Conduct annual meetings with participation from relevant stakeholders to collate and share lessons learned from implementing the EMS plans and ensure that these plans are updated regularly where necessary.</p>  | <ul style="list-style-type: none"> <li>• Strategic Impact Assessment (SIA)</li> <li>• Recommendations report for updating the EMS Plans</li> <li>• Annual stakeholder meetings</li> </ul>   |
| <p>2.2. Mainstream climate change adaptation for the building sector into public and private financial, insurance and banking sectors.</p> | <p>Activity 2.2. will complement the SCCF and GCF EDA projects to maximise the effectiveness of scaling up of financing for adaptation in the building sector. This will be achieved by mainstreaming lessons learned from these projects into the financial sector and related mechanisms. The first of these will be the SIRF Fund's adaptation window. Stakeholders will be engaged to identify additional entry points for accessing climate finance through the SIRF fund for investments. Specifically, this will be for building the resilience of small businesses that are important to the functioning of local communities. This sector is currently not being funded under the SIRF Fund.</p>   | <p>2.2.1. Consult with representatives from the public and private sectors to identify entry points for accessing government financial support to reduce the barrier of high cost of Cat 4 and 5 construction as well as to partner with the SIRF fund to track current activities being undertaken by the fund to pilot incentive programmes, insurance/risk Mitigation products, and opportunities for fund raising.</p> <p>2.2.2. Refine the SIRF Fund's list of adaptation options using an evidence-based approach that draws lessons learned from the SCCF, EDA projects, as well as lessons learnt the implementation of adaptation interventions under Activity 1.1 of this project.</p> <p>2.2.3. Train decision-makers from NODS, DCA and PWD on how to (a) assess, calculate and report on the incremental cost of adaptation in public sector projects for the purposes of tracking the implementation of Article 2.1c of</p> | <ul style="list-style-type: none"> <li>• Evaluation report on funding processes and procedures for climate proofing infrastructure</li> <li>• Updated SIRF Fund guidelines</li> <li>• Training workshops</li> <li>• Lessons learned report</li> <li>• Private sector climate finance options analysis report</li> </ul> |

|  |   |   |   |
|--|---|---|---|
|  |   | <p>the Paris agreement (b) implement the new building codes and regulations to assess planning applications (c) to provided trained technical assistance to the SIRF Fund in the evaluation of private sector applications for loans and grants.</p> <p>2.2.4. Collate and share lessons learned from SIRF Fund application &amp; funding process, with the rest of the Private Financial sector and the Government's newly formed Resilience and Development Fund (2020) .</p>   |   |
| <p>2.3. Train relevant staff from the National Office of Disaster Services (NODS), Development Control Authority (DCA) and the Public Works Department (PWD) as well as the private sector on operational procedures for long-term monitoring, maintenance and upscaling of climate-resilient renewable energy (RE) and water harvesting technologies in accordance with the national building code.</p> | <p>Training will be provided for relevant staff from NODS, building inspectors from DCA and building maintenance teams from MoW on operational procedures for long-term monitoring, maintenance and upscaling of climate change adaptation interventions in the public and private sectors that will be implemented under Output 1.</p> <p>Training programmes will be developed for public and private sector representatives — including staff from the Ministry of Works (MoW) and Development Control Authority (DCA), as well as building inspectors, engineers, architects and draughtsmen — with the assistance of partner organisations such as the Antigua and Barbuda Institute for Continuing Education (ABICE). This training will focus on how to apply the new building code.</p> | <p>2.3.1. Train building inspectors from DCA, building maintenance teams from PWD as well as technical staff from NODS and other relevant institutions on the implementation of the operational procedures for the long-term maintenance of climate-proofing interventions in the target buildings, based on building-specific O&amp;M plans and updated national building code.</p> <p>2.3.2. Design and implement a long-term monitoring framework for building-specific climate-proofing measures – including cost-benefit analyses – to demonstrate the long-term adaptation benefits.</p> <p>2.3.3. Partner with local training institutions such as ABICE to develop training programmes for relevant technical staff from MoW and DCA; building inspectors, engineers, architects and draughtsmen; and the private sector on best practices for implementing, monitoring and maintaining climate change adaptation technologies, including climate-resilient RE and water harvesting solutions, and how to apply the updated national building code during the installation of these technologies.</p> <p>2.3.4. Design and conduct a gender-sensitive awareness campaign targeting the public and</p> | <ul style="list-style-type: none"> <li>• Stakeholder consultations</li> <li>• Training workshops</li> <li>• Awareness campaigns</li> <li>• Installation of relevant software and equipment to monitor buildings</li> <li>• Stakeholder workshops with Ministers, Heads of Departments etc.</li> <li>• Monitoring and Evaluation operational guidelines for buildings</li> <li>• Sign MoUs between DoE and training institutions such as ABICE to formalise partnerships for developing and delivering training on climate change adaptation</li> <li>• Training workshops</li> <li>• Awareness raising campaigns</li> </ul> |

|   |   |   |   |
|---|---|---|---|
|   |   | <p>private sectors on the updated building code, the benefits of taking up climate-adaptive solutions within the building sector as well as the availability of certified climate change courses.</p> <p>2.3.5. Develop and implement a gender-sensitive awareness-raising campaign within the government system on the availability of the courses developed under Sub-activity 2.3.3.</p>   |   |
| <p>2.4. Train the local workforce on the installation, operation and maintenance of climate-proofing measures for the targeted buildings.</p> | <p>The local workforce in both the private and public sectors will be trained on how to support the installation, operation and maintenance of the climate change adaptation solutions that will be installed in targeted buildings under Activity 1.1. To facilitate this training, suitable training institutions in the country, such as ABICE, will be engaged to develop and deliver a certified training programme that focusses on: i) installing, operating and maintaining climate-proofing measures for the building sector; and ii) implementing early action protocols (developed under Output 1) preceding an extreme climate event. The training course that will be developed under this activity will apply regional and international best practices for climate change adaptation measures in the building sector. Furthermore, the course will align with the national building code to ensure that there is uptake of building standards and procedures that account for Category 4 and 5 hurricanes.</p> | <p>2.4.1. Engage with suitable training institutions such as ABICE to develop and deliver a training programme that targets the local workforce on how to install, operate and maintain climate change adaptation technologies in the building sector as well as implement early action protocols.</p> <p>2.4.2. Develop training modules in line with regional and international occupational standards for climate change adaptation in the building sector.</p> <p>2.4.3. Deliver training modules developed under Sub-activity 2.4.2.</p> <p>2.4.4. Design and conduct an awareness building campaign on the opportunity for training on the installation, operation and maintenance of climate change adaptation technologies in the building sector, with the support of training institutions.</p> | <ul style="list-style-type: none"> <li>• Engagement workshops</li> <li>• MoUs signed between DoE and relevant training institutions such as ABICE</li> <li>• Training modules</li> <li>• Training programme</li> <li>• Training workshops</li> <li>• Awareness raising campaigns</li> </ul> |
| <p>3.1. Climate information services strengthened to facilitate early action for extreme climate events.</p>                                  | <p>Under this project activity, a centralised online server will be established and housed within Antigua and Barbuda Meteorological Services (ABMS) to overcome the current barrier of an insufficient climate data processing system. This online server will enhance the real-time processing of climate data to ensure that climate threats are detected in advance and facilitate impact-based forecasting.</p>  | <p>3.1.1. Establish a centralised online server to enhance real-time processing of climate data.</p> <p>3.1.2. Increase the technical capacity of staff within ABMS to collect, process and manage climate data in real time.</p> <p>3.1.3. Conduct a knowledge exchange trip to the nearest</p>  | <ul style="list-style-type: none"> <li>• Centralised online server established</li> <li>• Communication protocol developed and operationalised</li> <li>• Knowledge exchange trip</li> <li>• Training workshops</li> </ul>  |

|  |  |  |  |
|--|--|--|--|
|  |  | <p>Regional Climate Centre, which is under the auspices of the World Meteorological Organisation (WMO), to strengthen the technical and institutional capacity within ABMS for impact-based forecasting.</p> <p>3.1.4. Increase the technical and institutional capacity of ABMS to develop early warning information products, including infographics that are locally appropriate and easily interpreted by vulnerable communities.</p>  |  |
| <p>3.2. Establish a formalised communication protocol to facilitate rapid information sharing and early action preceding an extreme climate event.</p> | <p>A formal communication protocol will be developed and operationalised under Activity 3.2 to support the generation of early warning information products and impact-based forecasts (Activity 3.1). This will be done to facilitate effective communication of impact-based forecasts from ABMS to decision-makers within the relevant government entities responsible for preparation ahead of an extreme climate event.</p> | <p>3.2.1. Design and operationalise a formal communication protocol to facilitate effective communication of impact-based forecasts from ABMS to decision-makers within relevant government entities responsible for preparation ahead of an extreme climate event.</p> <p>3.2.2 Design and implement early action protocols for critical public service and community buildings with variable responses dependent on the anticipated intensity of the incoming storm.</p> <p>3.2.3. Train public and private sector actors on the application of the early action protocols designed and developed under Sub-activity 3.2.2.</p> <p>3.2.4. Improve the capacity of ABMS to disseminate early warning information products to critical service providers as well as the private sector to facilitate early action.</p> | <ul style="list-style-type: none"> <li>• Standardised protocol</li> <li>• Training modules</li> <li>• Stakeholder workshops</li> <li>• MoUs or other partnership agreement signed</li> <li>• Coordination mechanism developed</li> </ul> |

### E.7. Monitoring, reporting and evaluation arrangements (max. 500 words, approximately 1 page)

The Project Manager, under the oversight of Antigua and Barbuda Department of Environment (DoE), will be responsible for monitoring the progress of all project activities against the outcome-based indicators during project implementation. This monitoring of all project interventions will be undertaken on an annual basis. A Monitoring and Evaluation (M&E) Plan detailing the type of specific monitoring activities to be conducted during implementation, as well as the responsible parties for undertaking activities, is presented in Annex 11. Such activities include field observations, key informant interviews and focus group sessions. Reporting on the M&E of project interventions will be conducted by Project Manager and CTA.

During the implementation phase, specific means of verification will be used to assess the: i) progress of project interventions towards achieving GCF Fund-level impacts, Fund-level outcomes; and ii) performance of interventions against the project performance indicators presented in Section E.5 of the Funding Proposal. The salaries of the relevant project management staff that will perform M&E activities will cover the work required for the necessary assessments, interviews and field assessments required to inform project evaluations. The M&E costs, as well as the salaries of the project management staff are presented in Annex 4: Detailed budget.

For on-the-ground monitoring of project interventions, a part-time Monitoring and Gender Officer will be employed to conduct and coordinate the monitoring and evaluation (M&E) of the project and ensure that gender targets are met. The Monitoring and Gender Officer will design and operationalise a performance monitoring framework to track the project's progress towards achieving its targets. This will be achieved by: i) measuring the performance against the project indicators (Sections E.3–5) to evaluate the progress of the project; ii) reporting the project's performance to the Project Steering Committee (PSC) and Project Management Unit (PMU); and iii) providing technical support to the Project Manager (PM). Additionally, the Monitoring and Gender Officer will be responsible for overseeing and monitoring the application of gender-disaggregated indicators<sup>87</sup>. At particular milestones (i.e. baseline, annual performance reports, mid-term and end of project), the project team will carry out evidence-gathering exercises to verify this progress. These internal reports will be validated by two independent evaluations at the mid-term and end of the project implementation, as described below.

DoE will be responsible for managing the Independent Interim Evaluation and the Final Evaluation Report of the project and will oversee the process of contracting these positions. For the Interim Evaluation Report, an independent consultant will be contracted to provide an assessment of project performance against its targets at the project's mid-point (end of Year 3). This will be an outcomes-based assessment and will include analysing whether the project is on track, what problems and challenges the project is encountering, and what corrective actions are required, so that the project can achieve its intended outcomes by project completion in the most efficient and sustainable way. The PSC will participate in the Independent Interim Evaluation and develop a management response to the evaluation recommendations along with an implementation plan. It is the responsibility of DoE to monitor whether the agreed recommendations are being implemented during the remainder of the project's operational life.

An independent consultant will be contracted by DoE to conduct the Final Evaluation Report at the end of project implementation. DoE will be responsible for overseeing the Final Evaluation Report, which is a summative evaluation. This evaluation will include an independent assessment of the project's overall performance against standard evaluation criteria (e.g. strategic relevance, effectiveness, efficiency, likelihood of impact and sustainability) as well as against the project indicators presented in the Logical Framework. This evaluation will be based on *inter alia* documentaries of evidence, field observation visits and key informant interviews.

The draft Final Evaluation Report will be sent to project stakeholders during a commenting process managed by DoE. Formal comments on the report will be shared by DoE in an open and transparent manner. This evaluation report will be publicly disclosed and will be followed by a recommendation on compliance processes.

The costs for results monitoring and performance evaluation are included in the project budget (Annex 4).

<sup>87</sup> The project's gender targets as well as the associated gender-disaggregated indicators are presented in Annex 8: Gender Assessment and Action Plan.

*Risk Management*

The AE, supported by the project management unit (PMU) and specifically the Project Manager, will be responsible for managing all environmental and social risks, as well as those risks related to project implementation and management. Processes and procedures for this risk management are presented in Annex 25: Project Implementation Manual. The audit plan for the project will also include a detailed assessment of identified risks to track assumptions during the implementation period. Potential project risks that may arise during implementation will be monitored by the AE and EE and escalated to the PMU in accordance with the project risk register where necessary. The PMU will then be responsible for implementing the appropriate risk mitigation measures during project implementation. Further details on risk screening, management and mitigation during project implementation are presented in Annex 6: ESIAMP, with specific details on the AE's protocols for managing risk presented in Annex 25: Project Implementation Manual.

| RISK ASSESSMENT AND MANAGEMENT  |             |        |
|---|-------------|--------|
| <b>F.1. Risk factors and mitigations measures (max. 3 pages)</b>  |             |        |
| <p><i>For probability: High has significant probability, Medium has moderate probability, Low has negligible probability</i></p> <p><i>For impact: High has significant impact, Medium has moderate impact, Low has negligible impact</i></p> <p><i>Prohibited practices include abuse, conflict of interest, corruption, retaliation against whistle-blowers or witnesses, as well as fraudulent, coercive, collusive, and obstructive practices</i></p>   |             |        |
| <b>Selected Risk Factor 1</b>   |             |        |
| Category  | Probability | Impact |
| Governance  | Low         | Medium |
| Description   |             |        |
| Limited collaboration and coordination between project stakeholders, including relevant government departments, ministries and the private sector will reduce the timely delivery and effectiveness of the project.   |             |        |
| Mitigation Measure(s)   |             |        |
| <ul style="list-style-type: none"> <li>Extensive stakeholder consultations were undertaken throughout the project development to secure buy-in from the relevant project partners and ensure coordination of project interventions. Moreover, a stakeholder engagement plan has been developed and included in Section 10 of Annex 6: Environmental and Social Impact Assessment and Management Plan (ESIAMP), as well as in Annex 7, and the Gender Assessment and Gender Action Plan to ensure that all project stakeholders are involved in the implementation of project interventions.</li> <li>The PMU will be responsible for ensuring coordination between all relevant project stakeholders during the implementation phase. In particular, a full-time Project Coordinator will be contracted competitively under the project to support the PM in the implementation of project activities. The PC's primary responsibilities will be to serve as a focal point for facilitating all stakeholder engagements that will be undertaken during the project implementation phase.</li> </ul> |             |        |
| <b>Selected Risk Factor 2</b>   |             |        |
| Category  | Probability | Impact |
| Technical and operational   | Low         | Medium |
| Description   |             |        |
| Bulk importing of timber may compete unfairly and impact negatively impacts the private sector that rely on sale of these materials for their livelihoods.  |             |        |
| Mitigation Measure(s)   |             |        |
| <ul style="list-style-type: none"> <li>To reduce the impact of timber imports on local suppliers in Antigua and Barbuda, a protocol will be developed for managing the timber stock that is not used at the end of each hurricane season (Activity 1.3). This protocol will include provisions for the resale of timber to local suppliers at bulk discount rates. The government will make the initial purchase of these supplies ahead of the storm season, which will reduce costs of individual suppliers importing timber in small batches. As a result, local timber suppliers in the country will be able to maintain their businesses and will not be negatively impacted by a change in market conditions that could disrupt their livelihoods.</li> </ul>   |             |        |
| <b>Selected Risk Factor 3</b>   |             |        |

| Category  | Probability | Impact |
|---|-------------|--------|
| Technical and operational   | High        | Medium |
| Description   |             |        |
| Renewable energy systems may not have the storage capacity to provide power to critical buildings for the duration of a storm when solar panels have been removed.  |             |        |
| Mitigation Measure(s)   |             |        |
| <ul style="list-style-type: none"> <li>Additional batteries will be stored in the climate-proof bunker that can be used to rotate supply during and after an extreme climate event. A protocol will be developed for keeping spare batteries fully charged throughout the hurricane season and for recharging batteries as they are cycled out during and after a storm. Priority will also be given to restoring power to the bunker after a storm to facilitate the recharging process.</li> </ul>  |             |        |
| <b>Selected Risk Factor 4</b>   |             |        |
| Category  | Probability | Impact |
| Technical and operational   | High        | High   |
| Description   |             |        |
| Extreme climate events, such as hurricanes and tropical storms may disrupt project implementation.  |             |        |
| Mitigation Measure(s)   |             |        |
| <p>Based on current Climate change projects it is almost certain that a hurricane will occur during project implementation. Adaptation solutions will include:</p> <ul style="list-style-type: none"> <li>(a) construct the Hurricane Warehouse (Activity 1.3) very early in the project implement so that materials needed for the project are stored in the warehouse and protected in the event of a hurricane.</li> <li>(b) Purchase Construction insurance throughout the life of the project;</li> <li>(c) Limit critical construction outside of the hurricane season;</li> <li>(d) After a Hurricane the country will be concentrating on clean up and recovery, the project will have to be slowed down after these events to allow for these vital activities.</li> <li>(e) All project contracts including the FAA as should note this and have a flexible time for project extension due to force majeure clause</li> </ul> |             |        |
| <b>Selected Risk Factor 5</b>   |             |        |
| Category  | Probability | Impact |
| Technical and operational   | Medium      | High   |
| Description   |             |        |
| Delays in the installation of climate proofing measures and construction of the bunker and shelter extensions (entire outcome 1). could result in increased costs. Such delays could occur because of delays in materials being shipped to the island, and the shipment, limited construction workers, workers strikes and Contract disputes. Further delays can occur in the construction of the buildings since some buildings cannot close; work will therefore have to continue while the upgrades are taking place. This is particularly important for the upgrades of the clinics and critical government buildings.  |             |        |
| Mitigation Measure(s)   |             |        |

- The implementation plan (Annex 5) has been designed to include a buffer for potential delays in construction activities.
- A full-time Project Manager, in addition to the project coordinator, will be contracted to be dedicate to the management of project risks and to work with the relevant government agencies to ensure that risks are carefully anticipated and addressed early. Further details on the implementation arrangements for the project are presented in Section B.4 of the Funding Proposal.
- Workers will have to upgrade some buildings on the weekends. Labour laws require that they get additional compensation;
- The Project will use the Ministry of Works (MOW) as a service provider to ensure access to stable work force. This allows the government to guarantee its co-financing and there is provision to pay overtime on the weekends;
- The Clinics will be construction no more than one per year since they have to be closed the entire time of construction;
- Schools will have to be address during the summer or Christmas holidays. The summer holidays is also the Hurricane season;
- detailed construction contingency plans will have to be devised for each building in advance of contracting and construction;

**Selected Risk Factor 6**

| Category                  | Probability | Impact |
|---------------------------|-------------|--------|
| Technical and operational | Medium      | Medium |

Description

Limited technical capacity of relevant government authorities, contractors and the private sector will lead to the insufficient implementation, monitoring and maintenance of climate proofing measures.

Mitigation Measure(s)

- Relevant technical staff from the DCA, NODS and Public Works Department (PWD), as well as contractors and engineers, will be trained on how to design and implement climate proofing measures effectively (Activity 2.3).
- The local workforce will be trained under Activity 2.4 on the installation, operation and maintenance of climate proofing measures for the targeted buildings. Furthermore, training modules will be developed in line with regional and international occupational standards for climate change adaptation in the building sector. These modules will be presented to relevant public and private sector representatives.
- The project provides budget for external expertise to design programs for local staff;
- The MOW will be a service provider to the project as a way to reduce several risks. The project will also have contracts with private sector who will be working with their MOW counterparts which will allow for an exchange of expertise. This approach is being used on the current roads project being executed by the MOW along with a loan from the Caribbean Development Bank (CDB) and a private contractor. The team at the MOW has been learning how to build resilient roads. This approach with respect to this project will increase impact of outcomes particular those related to training as well as reduce risks.

**Selected Risk Factor 7**

| Category                  | Probability | Impact |
|---------------------------|-------------|--------|
| Technical and operational | Low         | Medium |

Description

Turnover in key government staff could result in protocols developed during the project (e.g. those that will be developed under Activities 1.3 and 1.4) not being followed correctly in the case of future extreme climate events such as a hurricanes or tropical storms.

| Mitigation Measure(s)   |             |        |
|---|-------------|--------|
| <ul style="list-style-type: none"> <li>Although the probability of staff turnover adversely affecting the implementation of project interventions is low, regular stakeholder consultations will be held with all project partners involved in the implementation of project activities to ensure that institutional capacity built under the project is retained beyond project closure. Clearly defined arrangements for stakeholder engagements are presented in Annex 7: Stakeholder engagement plan, as well as in Annex 6: ESIAMP.</li> <li>The bunker will be managed by a ministerial sub-committee for disaster preparedness who will be responsible for coordinating efforts between relevant stakeholders to ensure that the institutional knowledge around the application of the protocols developed under Activity 1.3 is retained amongst project partners.</li> </ul>   |             |        |
| Selected Risk Factor 8  |             |        |
| Category  | Probability | Impact |
| Other   | High        | Medium |
| Description   |             |        |
| Project activities, specifically those related to construction, could exceed budgeted costs.  |             |        |
| Mitigation Measure(s)   |             |        |
| <ul style="list-style-type: none"> <li>A contingency fee has been built into Annex 4: Detailed budget to ensure that higher-than-expected construction costs do not have any lasting adverse effects on construction activities to be implemented under the project.</li> <li>The Government is committed to maintain its labour force and therefore the project will utilize the Government's MOW as a service provider to provide in kind labour to the project.</li> </ul>   |             |        |
| Selected Risk Factor 9  |             |        |
| Category  | Probability | Impact |
| Technical and operational   | Medium      | Medium |
| Description   |             |        |
| There may be limited uptake of climate change adaptation measures in future development planning and construction.  |             |        |
| Mitigation Measure(s)   |             |        |
| <ul style="list-style-type: none"> <li>Training will be provided to the relevant project stakeholders (Activity 2.3) on the application of the updated building codes that include climate change considerations in future development.</li> <li>Under Activity 2.2, climate change adaptation for the building sector will be mainstreamed into public and private financial, insurance and banking sectors.</li> <li>Building Codes that were updated as part of the SCCF project will be mainstreamed into national regulations under the proposed project.</li> <li>With hurricane intensity increasing, Banks and Insurance are requiring their clients to build to Code as a condition of funding. The Banks normally sends their own engineers to check the progress of construction to ensure that the building is built to code.</li> <li>With hurricane intensity Homeowners are anxious to ensure their homes are safe and they do not have to go to a shelter. There is a high motivation therefore for homeowners to build to code.</li> <li>Project outcomes can provide advice on how to reduce the high cost construction to Code so it is expected that cost reduction measures will increase uptake;</li> </ul> |             |        |
| Selected Risk Factor 10   |             |        |

| Category  | Probability | Impact |
|---|-------------|--------|
| Other   | Low         | Medium |
| Description   |             |        |
| The private sector may not take up the proposed adaptation solutions in future private sector development.  |             |        |
| Mitigation Measure(s)   |             |        |
| <ul style="list-style-type: none"> <li>Gender-sensitive awareness raising campaigns targeting the private sector will be conducted under Sub-activity 2.3.5. These campaigns will promote the benefits of installing climate proofing measures on infrastructure in Antigua and Barbuda. Such benefits include reduced damages to infrastructure and reduced economic losses as critical services will become operational more rapidly following extreme climate events.</li> <li>Segments of the private sector will also have increased access to financial resources through the SIRF Fund to finance the incremental costs of the implementation of adaptation interventions (Activity 2.2).</li> </ul> |             |        |
| Mitigation Measure(s)   |             |        |
| <ul style="list-style-type: none"> <li>A Gender Action Plan (Annex 8) has been developed that details how gender considerations will be included in the implementation of each project activity. A portion of the project budget has been allocated to ensure that activities are conducted in a gender-sensitive manner.</li> <li></li> </ul>  |             |        |

## F. GCF POLICIES AND STANDARDS

### G.1. Environmental and social risk assessment (max. 750 words, approximately 1.5 pages)

The environmental and social risk associated with the project was evaluated in accordance with GCF's Environmental and Social Safeguards (ESS) as well as the environmental, social and economic policies of Antigua and Barbuda's Department of Environment (DoE), which is the Direct Access Entity (DAE). The DoE has assessed the risk category of the proposed project to be a Category B Risk. This categorisation is supported by the comprehensive Environmental and Social Impact Assessment and Management Plan (ESIAMP)<sup>88</sup> developed by the DoE specifically for the purpose of the project. The assessment and management plan comply with both GCF and DoE standards by: i) defining the context and baseline in which the interventions will be implemented; ii) identifying all negative and positive impacts associated with the proposed project interventions; and iii) providing a management plan to describe how any adverse impacts identified during risk screening will be accounted for and / or mitigated throughout the project implementation period. The primary environmental and social risks that may arise as a result of project interventions — as identified by the ESIAMP— are presented below.

Overall, the environmental, social and gender risks assessed to be present under this project are minor and associated with activities under Output 1, whereby climate-proofing interventions will be implemented in critical public sector service and community buildings. While the project is expected to result in significant net-positive benefits in the long term — specifically with regards to the provision of healthcare, emergency response and other critical public sector services during the aftermath of increasingly severe hurricanes — retrofitting of public sector buildings may cause temporary closures, which will restrict access to services for the population of Antigua and Barbuda.

#### Environmental impacts

All potential environmental impacts associated with the project are linked with the construction or renovation of public infrastructure and include the generation and subsequent disposal of waste from demolition processes and construction activities as well as concerns regarding the sourcing of materials. Because the majority of construction will focus on in-situ upgrading of facilities — as opposed to the breaking of new ground — many of the potential environmental impacts that are normally associated with construction activities are not applicable. Additionally, because the required construction activities are relatively small in scale, require limited landscaping and will be implemented within urban or

<sup>88</sup> The ESIAMP is included as Annex 6 in the Funding Proposal submission package.

peri-urban vicinities, impacts on biodiversity, critical ecosystems and soils are assessed to be minor and limited in scale. Further information on proposed actions to reduce, manage or mitigate potential negative environmental impacts — where required — are detailed in Annex 6: ESIAMP.

### **Social impacts**

As previously stated, the main social impacts associated with the project are temporary restrictions on access to public sector buildings and services. Where services provided by these buildings are critical — such as hospitals and police stations — construction activities will be implemented in a phased approach to ensure that limited services can still be provided during construction. Additionally, advance notice of closure will be provided to communities and other similar facilities to prepare for an increase in the average number of patrons. There are also several minor social risks that have been identified by the ESIAMP and are associated with construction activities. These include labour practices, construction site safety and social disruptions adjacent to construction sites. These additional minor impacts are all temporary in nature and can be mitigated through regular monitoring and management. Because the project prioritises the provision of services to the most vulnerable people, including women, children, the elderly and people living with HIV or mental disabilities no long-term social impacts are associated with the project. Further information on potential social impacts and associated management strategies are detailed in Annex 6: ESIAMP.

### **Grievance Redress Mechanism**

The established DoE Complaints Mechanism (CM) will be used as the project level Grievance Redress Mechanism (GRM). This mechanism has been previously approved by the GCF. It provides three approaches to lodging complaints<sup>89</sup> with the DoE Complaints Officer. Complaints are presented to the Ethics committee as an independent body, whereby a series of actions are taken until the complaint is resolved. The CM will be used at all stages of the project and will provide an accessible, rapid, fair and effective response to concerned stakeholders, especially any vulnerable groups who may lack access to formal legal systems or support. Further information on the redressal process is provided in Annex 6: ESIAMP.

## **G.2. Gender assessment and action plan (max. 500 words, approximately 1 page)**

In general, there are no known institutional and legal bias against men or women in Antigua and Barbuda. Even though this is the case and due to the lack of gender disaggregated data however many of the internationally known biases against women are many times included in project design. To ensure the project is truly gender responsive to the local context, during project preparation, a gender assessment was conducted to understand the differential vulnerability to, and impact of, climate change on women and men in Antigua and Barbuda. From the findings of this assessment, and an analysis of the proposed project solution, a gender action plan (GAP) was developed. The process to produce these components included a desktop review of available literature and an analysis of relevant legislation, policy and programmes in the country, as well as interviews and consultations with project and beneficiary stakeholders. These direct stakeholders' assessments span the years 2016 – 2020 and interestingly the gender perspective noticeably change after the Country experienced its first Cat 5 in 2017. After the hurricane there is more acceptance of the impacts of climate change and the need to become more resilient.

The project seeks to build resilience in buildings that project a range of social services. These are education, Health, Security, Social services and operations. Some buildings provide services that can be easily differentiate the impacts by gender. For example, general observations of project activities are:

- project outcomes, for Her Majesty's Prison, the Fiennes Institute and the Clarevue Psychiatric Hospitals<sup>90</sup> hold predominantly male inhabitants, so interventions to increase the resilience of these sites will benefit mainly men.
- Women mainly benefit from the resilience strategies in health, educational and security services. Since mainly women work in these service sectors (except security) construction will mainly disrupt women working in these buildings;
- Training components of the project will mainly target the men in the construction sectors which represent over the 95% of the workers

<sup>89</sup> These approaches include electronic reporting by email, reporting in person or submission of a hard-copy written complaint to the Complaints Officer at the DoE.

<sup>90</sup> 2013 data shows that men consisted 77% of in-patients at Clarevue facilities whilst women represented 55% of out-patients (55%), although the former category would be more highly affected by disruption of services following a hurricane, given the extent of their treatment/accommodation.

- Overall women will be most disrupted by construction conducted under the project in the short-term, they also stand to gain from interventions to build the resilience of buildings in certain sectors.

The GAP seeks to promote gender equality by including activities which will increase women’s representation and awareness, as well as ensuring that training programmes are gender-sensitive and -inclusive of the predominately male population. It includes clear targets, gender-sensitive design features and quantifiable performance indicators to promote ensure gender equal benefits from the project.

The actions of the GAP include the following:

- Courses in construction were made available a few years ago to women. The first graduates are expected over the next few years; the project will establish an apprentice program for these women newly coming into the field;
- The transition of the current workforce means the training of predominantly men. The project notes the difference in learning between men and women and girls and boys and seeks to provide gender sensitive training;
- Most of government building do not have access for persons with special needs, while the project acknowledges this, the budget is not adequate to make significant changes.
- The impacts of climate change in the infrastructure sector, mainly impact on persons based on income levels rather than gender. In general persons with disabilities, and older persons are most vulnerable;

Implementation arrangements of the project also include procuring a full time Monitoring and Gender Officer at annually hosted within the project management unit that will provide technical advice and oversight for project delivery as well as an Apprenticeship program for supporting the participation of person 16 – 24 in construction activities of the project;

The full Gender Assessment and project-level Gender Action Plan are included as Annex 8.

**G.3. Financial management and procurement (max. 500 words, approximately 1 page)**

The Department of Environment (DoE) has expertise in working with donor funds and has a track record in implementing 27 projects in 4 program areas. The DOE is accredited to the adaptation Fund as well as the GCF and for this project, the DoE will be responsible for fiduciary aspects and will be accountable for all financial activities. The financial management and procurement within the project will be guided by procedures and policies of the DOE, which meets the requirements of multilateral and bilateral agreements. The Ministry of Finance (MoF), who will serve as Executing Entity, is a GoAB authority and as such follows the government’s financial and procurement rules and standards. The DOE will therefore manage the funds while the EE implements the activities of the project.

International accounting and financial reporting standards will be applied to all aspects of the project. The DoE follows standard accounting procedures for auditing project expenditure and assumes overall responsibility for financial management of the project, ensuring that funds are used efficiently to support the funded activities. A qualified, internationally recognized auditing firm, competitively selected by the AE, will audit the project in compliance with International Standards on Auditing, and will submit all project-related accounts to the GCF on an annual basis. The audits are documented by a signed audit report.

**Procurement**

The DoE’s Procurement Policy is in accordance with the GCF standards and national laws. The policy facilitates procurement within a standardized framework. These are procedures for which the DoE was accredited to the GCF in 2017. The tables below describe the thresholds in the DOE Procurement Policy for purchasing of goods, works and non-consulting services (Table 11), and for consulting services (Table 12).

**Table 11.** Thresholds in the DOE Procurement Policy – Purchases (Goods, Works and non-Consulting Services).

| Cost Threshold (EC\$)             | Method of Procurement                           | Approval Authority   |
|-----------------------------------|---|--|
| Less than \$10,000                | Price verification – non-competitive – Shopping | Director   |
| \$54,338 (or US\$20,000) or below | Competitive – RFQ - 3 Quotations                | Director (Final Approval)<br>Project Coordinator (initial approval of the requisition) |

|   |                   |  |
|---|-------------------|--|
| Over \$54,338 (or US\$20,000) to \$1,358,450 (or US\$500,000) | Competitive – ITB | Director (final approval with endorsement from the PMC)<br>Project Coordinator (initial approval of requisition) |
| Over \$1,358,450 (or US\$500,000)                             | Competitive – ITB | Minister of Finance (final approval)<br>Director (initial approval of requisition with endorsement from PMC)     |

**Table 12.** Thresholds in the DOE Procurement Policy – Purchases (Consulting Services).

| Cost Threshold (EC\$)                                   | Method of Procurement                     | Approval Authority   |
|---|---|--|
| \$54,338 (US\$20,000) or below                          | Competitive – RFP<br><br>3 Bids/Proposals | Director (final approval)<br>Project Coordinator (initial approval of requisition)                                       |
| Over \$54,338 (US\$20,000) to \$1,358,450 (US\$500,000) | Competitive – RFP                         | Director (final approval with endorsement from the PMC)<br>Project Coordinator (initial approval of requisition)         |
| Over \$1,358,450 (US\$500,000)                          | Competitive - RFP                         | Minister of Finance (final approval)<br>Director (initial approval of requisition with endorsement from PMC requisition) |

The project's procurement plan is included in the Annex 10.

### **Oversight**

The Department of Environment will ensure: i) the substantive quality of the project implementation and compliance with procurement guidelines; ii) the effective use of resources including value for money; iii) the availability of national contributions to support project implementation; and iv) the proper coordination among all project stakeholders.

### **G.4. Disclosure of funding proposal**

*Note: The Information Disclosure Policy (IDP) provides that the GCF will apply a presumption in favour of disclosure for all information and documents relating to the GCF and its funding activities. Under the IDP, project and programme funding proposals will be disclosed on the GCF website, simultaneous with the submission to the Board, subject to the redaction of any information that may not be disclosed pursuant to the IDP. Information provided in confidence is one of the exceptions, but this exception should not be applied broadly to an entire document if the document contains specific, segregable portions that can be disclosed without prejudice or harm.*

*Indicate below whether or not the funding proposal includes confidential information.*

**No confidential information:** The accredited entity confirms that the funding proposal, including its annexes, may be disclosed in full by the GCF, as no information is being provided in confidence.

**With confidential information:** The accredited entity declares that the funding proposal, including its annexes, may not be disclosed in full by the GCF, as certain information is being provided in confidence. Accordingly, the accredited entity is providing to the Secretariat the following two copies of the funding proposal, including all annexes:

- full copy for internal use of the GCF in which the confidential portions are marked accordingly, together with an explanatory note regarding the said portions and the corresponding reason for confidentiality under the accredited entity's disclosure policy, and
- redacted copy for disclosure on the GCF website.

The funding proposal can only be processed upon receipt of the two copies above, if containing confidential information.

## G. ANNEXES

### H.1. Mandatory annexes

- Annex 1 NDA no-objection letter(s) [\(template provided\)](#)
- Annex 2 Feasibility study - and a market study, if applicable
- Annex 3a Economic and/or financial analyses in spreadsheet format
- Annex 3b Cost-effectiveness analysis report
- Annex 3c Sensitivity analysis
- Annex 4 Detailed budget plan [\(template provided\)](#)
- Annex 5 Implementation timetable including key project/programme milestones [\(template provided\)](#)
- Annex 6 E&S document corresponding to the E&S category (A, B or C; or I1, I2 or I3):  
[\(ESS disclosure form provided\)](#)
  - Environmental and Social Impact Assessment (ESIA) or
  - Environmental and Social Management Plan (ESMP) or
  - Environmental and Social Management System (ESMS)
  - Others (please specify – e.g. Resettlement Action Plan, Resettlement Policy Framework, Indigenous People’s Plan, Land Acquisition Plan, etc.)
- Annex 7 Summary of consultations and stakeholder engagement plan
- Annex 8 Gender assessment and project/programme-level action plan [\(template provided\)](#)
- Annex 9 Legal due diligence (regulation, taxation and insurance)
- Annex 10 Procurement plan [\(template provided\)](#)
- Annex 11 Monitoring and evaluation plan [\(template provided\)](#)
- Annex 12 AE fee request [\(template provided\)](#)
- Annex 13 Co-financing commitment letter, if applicable [\(template provided\)](#)
- Annex 14 Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule

### H.2. Other annexes as applicable

- Annex 15 Evidence of internal approval [\(template provided\)](#)
- Annex 16 Map(s) indicating the location of proposed interventions
- Annex 17 N/A (Multi-country project/programme information)
- Annex 18 N/A (Appraisal, due diligence or evaluation report for proposals based on up-scaling or replicating a pilot project)
- Annex 19 Procedures for controlling procurement by third parties or executing entities undertaking projects financed by the entity
- Annex 20 First level AML/CFT (KYC) assessment
- Annex 21 Operations manual (Operations and maintenance)

- Annex 22 Building Assessment
- Annex 23 Design of the climate resilient bunker
- Annex 24 Design of the hurricane shelters
- Annex 25 Project Implementation Manual
- Annex 26a Methodology for calculating avoided emissions
- Annex 26b Emissions reduction analysis
- Annex 27 Operations and Maintenance Commitment Letter
- Annex 28 Temporary annex for co-financing policy requirements

*\* Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*