PROGRAMME ON INNOVATION:
SMALL GRANTS PROJECTS THROUGH DIRECT ACCESS MODALITY

REQUEST FOR PROJECT FUNDING FROM THE ADAPTATION FUND

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

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

Please note that a project must be fully prepared when the request is submitted.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
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ADAPTATION FUND

PROGRAMME ON INNOVATION: SMALL GRANT PROJECT PROPOSAL

Country:	Antigua and Barbuda
Title of Project:	Innovative technologies for improved water availability to increase food security in Antigua and Barbuda
National Implementing Entity:	Department of Environment, Ministry of Health, Wellness and the Environment
Executing Entity/ies:	Department of Environment
Amount of Financing Requested:	250,000 USD

Project Background and Context:

Climate Rationale

Antigua and Barbuda (A&B) is a twin island state located in the Tropical Atlantic, with a Tropical Maritime climate of alternating dry and wet seasons. Such changes in the precipitation system have direct effects on livelihoods, the economy, and overall development of many small island nations. Experts have long predicted that the frequency and intensity of droughts would increase as a result of climate change, especially in tropical areas.[1]

Due to the island's low elevations, they are heavily prone to experiencing severe droughts. The only elevation of some importance is Boggy Peak, 402 meters (1,319 feet) high, in the southwest of Antigua Island. In Codrington, on the island of Barbuda, rainfall amounts to 1,165 mm (46 in) per year, while in Antigua, it amounts to 1,000 mm (40 in) in the north of the island, to 1.100 mm (43 in) in the southeastern part, and to 1,300 mm (51 in) in the southwest, near Boggy Peak giving a total average annual rainfall of 1,141.25 mm (45.08 in).

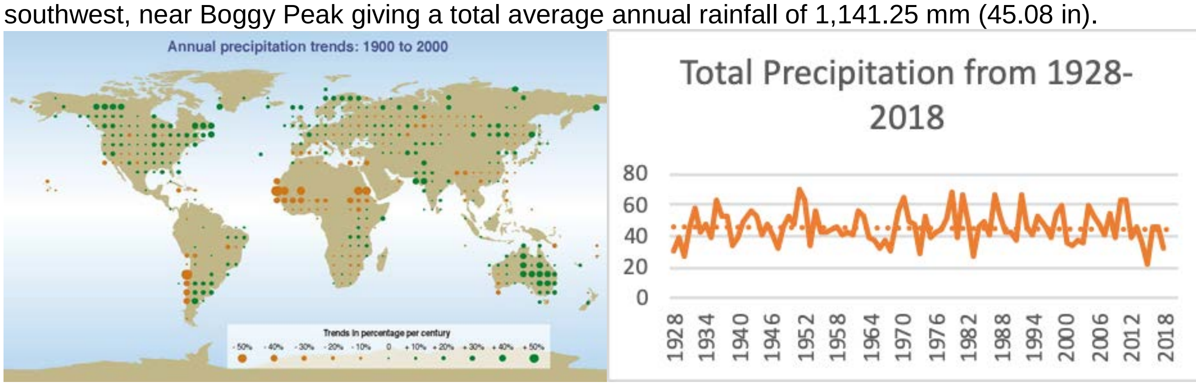

Fig. 1: (a) Global Annual Precipitation trends – 1900 to 2000 and (b) Precipitation totals for Antigua and Barbuda – 1928 to 2018

The dry months runs from January-June with the wet periods from September-November. What is clear is that there has been a decline in precipitation amounts within the last three decades. Moreover, data from the Antigua and Barbuda Meteorological Services indicates that during the September– November rainy seasons, droughts are becoming much more frequent. A total of thirty-two (32) serious- severe droughts occurred in Antigua and Barbuda between 1928 and 2019.[2] The probability of a serious to severe drought in Antigua and Barbuda at least once a year is 28.9%, with at least one in 5 years of 81.8%, and at least one in 10 years of 96.7% chance.

The IPCC technical report on climate change and water[3] concludes that, despite global increases in rainfall, many dry regions including the Caribbean will suffer badly from reduced rainfall and increased evaporation. As a result,

[1] T. Zhao et al. (2015) 'The Magnitude and Causes of Global Drought Changes in the Twenty-First Century under a Low–Moderate Emissions Scenario', Journal of Climate, 28

[2] ABMS, 2019. Droughts. http://www.antiguamet.com/Climate/STATS/anu_drought.html

[3] https://www.ipcc.ch/publication/climate-change-and-water-2/

the IPCC special report on climate change adaptation estimates that around one billion people in dry regions may face increasing water scarcity.

There is mounting evidence that climate change is likely to be contributing to higher temperatures in the region, and that increased temperatures are exacerbating the impacts of drought. Higher temperatures result in greater evaporation, meaning soil moisture is reduced, reinforcing drier conditions and intensifying the impacts of failed rains. This will either result in economic, environmental and social impacts or all, since crops and pasture will have less water, and the chance of failed harvests or lack of feed for livestock increases.

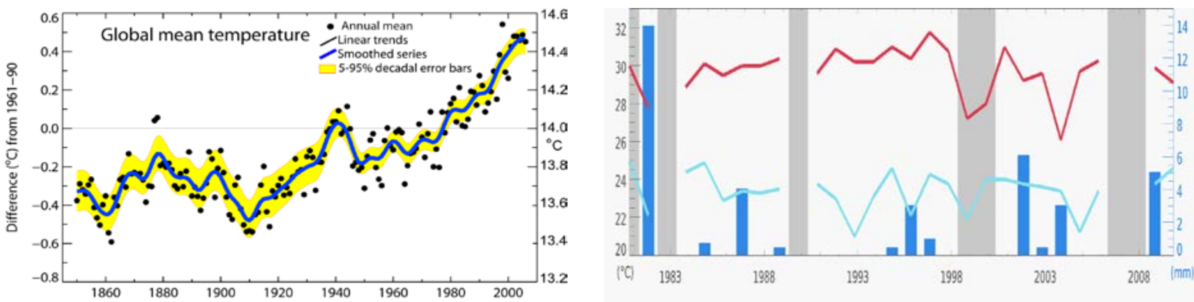

Fig. 2: (a) Global mean temperature rise from 1850 to 2000 and (b) Mean Temperature for Antigua and Barbuda – 1990 to 2010

There has also been a significant increasing trend in the overall number of tropical cyclones[4], or in the intensity of tropical cyclones, in the North Atlantic Ocean over the period 1989–2019. The islands have a return period for tropical cyclones of 1.45 years or a 71.4% probability chance of being affected by at least one (1) storm in an active season. These statistics are important because these systems have the potential to contaminate fresh water sources. In 2017, Hurricane Irma brought a storm surge to the island of Barbuda that resulted in 100% saltwater inundation of surface and groundwater.

Sea levels globally have been rising and is accelerating according to the Intergovernmental Panel on Climate Change (IPCC) in their special report on the Oceans and Cryosphere in a changing Climate (SROCC). Without proper adaptation, SLR will affect land and water resources in Antigua and Barbuda, mainly through land submergence, soil and fresh groundwater resources salinisation (contamination), and land loss due to permanent coastal erosion, with consequences on production, livelihood diversification and food security[5]. There is strong evidence that, under most climate change scenarios, water resources in small islands are likely to be seriously compromised[6].

Antigua and Barbuda are likely to experience increased water stress as a result of climate change. Reduced rainfall in summer is projected under all SRES scenarios, so that it is unlikely that demand would be met during low rainfall periods. With more demand for water for irrigation and loss of water through contamination due to salt intrusion, the most common solution is to increase water supply in Antigua and Barbuda is by adaptation. A way of insuring against possible climate change impacts, is the engineered redistribution of freshwater over space and time: reservoirs to store it, pipelines to transfer it, and desalination to recover freshwater from the oceans.

Economic, Social, and Environmental Context

Over the past few decades, Antigua and Barbuda has transitioned from a mainly agrarian economy to a tourism-based economy. According to the CIA World Fact Book, tourism accounts for nearly 60% of GDP, while agriculture accounts for roughly 3% of GDP.[7] The dual-island nation's agricultural production is focused on the

[4] https://www.climatesignals.org/climate-signals/intense-atlantic-hurricane-frequency-increase
[5] https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/
[6] https://www.ipcc.ch/report/ar5/wg2/

[7] Country Gender Assessment Report, 2015, Prepared by Tamara Huggins of Rawwida Baksh & Associates for the Caribbean Development Bank http://www.caribank.org/uploads/2014/12/CGA-AB-Vol-I-_JUNE-2014_FINAL.pdf

domestic market and is constrained by a labour shortages, as well as a limited water supply caused by intense drought periods.

To cope with increased frequency and intensity of droughts, energy intensive RO desalination plants have been utilized to provide in excess of 60% of all potable water to the islands. This has made the potable water supply more expensive for Antigua and Barbuda, which already suffers from a high debt to GDP ratio. This added expense has further limited the government's ability to ensure consistent water supply for the population. The expense of water has consequences for the agricultural communities who depend heavily on rainfall for crop production and are not often prioritized due to the sector's limited contribution to GDP. This has severe implications for food security and nutrition within the country as limited water can result in limited agricultural production and a greater reliance on imported goods.

Furthermore, drought conditions have increased the cost of doing business for farmers and local sellers, many of whom have limited access to financial resources outside of agriculture and are identified as a vulnerable group due to their susceptibility to economic disadvantages. In this gender polarized sector, men account for roughly 78% of registered farmers, a majority of whom are reported to depend on Crown land for agriculture (a policy facilitated by the Ministry of Agriculture) and have limited access to income beyond harvest yields.

Table 1: Farmers registered with Central Market Cooperation by Sec

T3: FARMERS REGISTERED WITH CENTRAL MARKETING COOPERATION BY SEX

SEX	No.	Total %
Number of Males	62	77.5%
Number of Females	16	20%
Unknown	2	

Source: Country Gender Assessment Report (2015), Antigua and Barbuda

This lack of land ownership among farmers indicates limits capital investment into adaption technologies and discourages farmers from investing in sustainable land use practices. Women, predominately elderly women, generally participate in the agricultural sector as produce sellers at the local market or within small shops in local villages. Low harvest yields necessitate small businesses to rely on imported produce, adding further expenses to already constrained operations. Small businesses are then forced to sell produce at a more expensive rate, disadvantaging the most vulnerable populations who depend on affordable prices from the local market or village shops to purchase agricultural produce. This can be seen in St. John's City where the Public Market Complex operates and the St. Phillips parish, a generally rural area with large-scale agriculture: both of which have the highest rates of poverty on Antigua.

Table 2. Head count index by district

District	Headcount (% of population poor)
St. John's City	22.29
St. John's Rural	18.41
St. Paul	15.63
St. Mary	13.57
St. George	12.28
St. Peter	15.03
St. Philip	25.85
Barbuda	10.53
All Antigua & Barbuda	18.36

The passage of hurricane Irma in Barbuda demonstrated the long-lasting effect of hurricanes and tropical storms on agriculture along with drought conditions. In addition to the destruction of crops, severe damage to the main RO facility and saltwater intrusion in the local wells have prevented large scale farming as well as home gardening on the twin-island state. As of 2020, all agricultural produce items are imported. This has resulted in increased costs for healthy food for the population and a greater dependence on canned goods. In Barbuda, the large majority of vendors selling agricultural produce as well as persons tending home gardens (the general state of agriculture on island) are women.

Water in Antigua:

Historically potable water in Antigua and Barbuda has come from dug wells, water catchment, and the few natural small bodies of fresh water on the islands. Currently due to the growing populations, saltwater intrusion, increasing frequency and intensity of droughts, and growing consumption from natural storage, potable water on the islands must now be provided by desalination. There are four (4) reverse osmosis desalination plants on the island of Antigua and one such plant on Barbuda. The main reverse osmosis (RO) plant on Antigua is collocated with the majority of the island's energy infrastructure on the low lying Crabbs peninsula on the North Eastern portion of island. It produces in excess of 4,000,000 gallons of potable water per day. The other 4 plants provide the other 2,500,000 gallons of capacity that is produced each day. Due to cracks in distribution infrastructure and leaks in water storage tanks, over 2,600,000 gallons of water that is produced each day is lost[8]. Cracks in water distribution infrastructure also allow for intrusion of undetermined amounts of contaminants and pollutants into the water before it reaches it point of use. This ensures that residents of Antigua and Barbuda are unable to safely consume the water that reaches their homes, businesses, and shelters. Residents rely on bottled water in the form of 5-gallon water jugs that are filled at locations and businesses around the country, or on small plastic water bottles which inevitably contribute to the countries growing solid waste management issues. Having to purchase drinking water, on top of paying for the water from the national distribution system can place an additional financial strain on residents, especially the most vulnerable populations.

Currently all RO facilities are dependent on the national electrical grid to function. The national grid is also plagued by high frequency of failures, and high inefficiencies. Energy generation and transmission is also very vulnerable to the increasing frequency and intensity of extreme weather events.

Water security on Barbuda is even more tenuous than on Antigua. Currently, the main RO facility operated by the national utility is being repaired/ upgraded following damage sustained during Hurricane Irma in 2017. Water is provided on a rotational basis due to lack of storage capacity for desalinated potable water. Residents have

[8] Joseph, C (November 29,2019) APUA to spend $30 million on water network. Retrieved from: https://www.antiguaobserver.com/apua-to-spend-30-million-on-water-network/

confirmed that there they receive potable water for a one (1) hour window, at the end of which is a 30-minute period where there is no water as the system replenishes. This rotation continues throughout the day.

Water use in agriculture in Antigua and Barbuda:

Small scale agriculture is mainly rainfed with very little use of irrigation practices. Drip irrigations is utilized by both medium and large-scale farming operations. It is the purview of the Antigua Pubic Utilities Authority (APUA) to supply the water resources to farmers. Antigua and Barbuda's Food and Nutrition security Policy has identified 6 major water supply challenges facing farmers in the country[9]:

1. Accelerated depletion of groundwater due to saline intrusion
2. High cost of water production from RO
3. High water transport cost to remote areas
4. Inadequate water catchment
5. Chemical contamination of water resources due to chemical misuse
6. Proximity of farms to water resources

This project will address 4 of these six challenges, by desalinating ground water resources used for agriculture, lowering the cost of water production for farmers, lowering the cost of water transport, and providing water storage to lieu of increasing catchment areas.

Project Objectives:

This project aims to improve food security in Antigua and Barbuda by facilitating the availability and use of ground or surface water for agricultural purposes via innovative technologies. These technologies run on self-generating renewable power, making them resilient to disruptions from grid instabilities or extreme climate events, and are aligned with the country's Nationally Determined Contribution (NDC) target of transitioning to 100% renewable energy by 2030.

There are two main objectives in this project, which correspond to the two components describes below. The objectives are to:

1) Demonstrate the application of two different innovative technologies for water provision in the agriculture sector. These demonstrations will i) provide water for agriculture to vulnerable populations facing water scarcity, and ii) provide information on the application of these technologies in Antigua and Barbuda to inform policy standards and potential scale-up projects.
2) Assess and develop policy standards to promote further uptake of innovative technologies to increase water availability for agriculture. This will be done through i) an assessment of technology gaps and needs in the agriculture sector with respect to water use, ii) an assessment of policy standards with recommendations, iii) development of a financing strategy to promote scaling up of these technologies in the country, iv) provision of a technical package for early up-takers to support them in accessing finance options, and v) knowledge sharing of key technologies identified with stakeholders.

Project Components and Financing:

[9] Government of Antigua and Barbuda (2012) Food and nutrition security policy. Retrieved from: http://agriculture.gov.ag/wp-content/uploads/2016/09/FINAL_2012_Antigua_and_Barbuda_Food_and_Nutrition_Security_Policy_10_15_12.pdf

Project Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
Component 1: Test the use of innovative technology to increase availability of water for agriculture.	**Output 1.1:** Demonstration of solar powered RO technology at main agriculture sites. **Output: 1.2:** Demonstration of solar-powered water pump at three farms.	**Outcome 1.1.** Test innovative technology to increase the availability of water for agriculture. **Outcome 1.2.** Standards and policy developed to ensure sustained availability of water for agriculture.	208,530
Component 2: Standards and policy developed to ensure sustained availability of water for agriculture.	**Output 2.1:** Development of an Agriculture Technology Assessment in line with National Technology Needs Assessment (TNA) and the National Adaptation Plan (NAP). **Output 2.2:** Assessment of the potential for market mainstreaming of new technologies for the Agriculture Sector.	**Outcome 2.1.** Additional adaptation technologies are identified and selected for scale up. **Outcome 2.2.** New RE technologies for the Agriculture Sector mainstreamed	24,255
6. Project Execution cost			2,715
7. Total Project Cost			232,785
8. Project Cycle Management Fee charged by the Implementing Entity (if applicable)			14,500
Amount of Financing Requested			250,000

Projected Calendar:

Milestones	Expected Dates
Start of Project Implementation	September 2020
Project Closing	August 2023
Terminal Evaluation	May 2024

PART II: PROJECT JUSTIFICATION [10]

A. Project Components

<u>Component 1:</u> Test the use of innovative technology to increase availability of water for agriculture.

An initial scoping study was conducted to identify potential technologies that could be tested in Antigua and Barbuda to meet the overarching objective of the project. Two technologies were selected for demonstration in this component: i) solar powered reverse osmosis units, and ii) solar powered water pumps. Both of the technologies and the justification for their selection are described below in their respective outputs.

<u>Output 1.1:</u> Demonstration of solar powered RO technology at main agriculture sites.

The first technology that has been identified to meet the objective of this project is the SolarRO 1500 solar photo voltaic (PV) powered desalination unit. The SolarRO 1500 is a brackish water (BW) or saltwater (SW), containerized reverse osmosis (RO) desalination unit that is designed to function solely on solar energy. The SolarRO 1500 operates with twenty (20) 250-290Wp solar panels and can also function on a small 3kW generator if needed.

This technology has been selected for testing at Barbuda's main agriculture site in the highlands. The Barbuda SolarRO unit will be installed at one of two man-made wells that are currently inoperable due to saltwater intrusion. Historically, these wells were used for agricultural purposes. Due to the lack of available water resources, many agricultural practices and their associated lands have been abandoned or left fallow. The first location is near 35 acres of former agricultural lands located near the Barbuda highlands. At this location a SolarRO brackish water (BW) unit can be deployed to produce up to 15,000 liters of potable water daily.

By testing this technology on Barbuda, there is the co-benefit of providing potable water infrastructure to significantly increase the island's resilience to extreme climate events. Water production from the BW unit will be able to provide enough drinking water to residents in the event of damage to existing RO facilities, reducing the need to transport water resources to the island. According to FEMA guidelines, a single SolarRO 1500 desalination unit will be able to provide the recommended daily emergency water for roughly 3,000 persons[11].Furthermore, when working in parallel with Barbuda's existing RO plant, the SolarRO unit will be able to help revitalize a portion of the islands now defunct agriculture. This agriculture can aid in increasing the food security on the island and provide valuable diverse streams of income not dependent on tourism.

This technology will also be tested at an agricultural site in Antigua that is near a compromised water source. An expression of interest will be sent out to the site owner and partnership established.

<u>Activities:</u>

1.1.1. Install solar panels and RO unit at two test site.

The solar RO unit and all associated parts (including solar panels) will be procured, installed and commissioned at the highlands agriculture site in Barbuda.

To ensure the maximum benefit from the project and maximum water resource utilization from the SolarRO plant, drip irrigation or similarly efficient irrigation methods are recommended.

1.1.2. Workshop for the launch of the demonstration for key stakeholders.

The workshop will provide key stakeholders with a detailed description and workplan of the project, as well as provide the opportunity to become familiar with the technology and how it works. This will also provide feedback to inform development of the final protocol (Activity 1.1.6.) and the training needs for Activity 1.1.7. A workshop report will be developed as a deliverable and due no later than two weeks after the close of the workshop. There will be a workshop for each of the test sites, but only one report.

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[10] Parts II and III should jointly not exceed 10 pages.

[11] Federal Emergency Management Agency (2004) Food and water in an emergency. Retrieved from: https://www.fema.gov/pdf/library/f&web.pdf

1.1.3. Develop protocol for monitoring of water quality, water usage, and well water levels.
This will involve setting water quality standards safe for agricultural use. Methodologies will be developed for water quality testing and well water level testing, and the testing frequency will also be established. Safety steps on what to be done in the event that any water quality parameter is exceeded will be developed. Steps should also be outlined for how much water will be allowed for use in times of water scarcity. One protocol developed for both sites.

1.1.4. Monitoring of water quality, water usage, and well water levels.
Well water levels are measured weekly. The amount of water used should be recorded on a daily basis, broken down per farmer if applicable. Quarterly water quality testing of water before and after treatment should be done. Monitoring is done at both site.

1.1.5. Develop protocol for sustainable disposal of RO permeate.
This will involve researching ways to either dispose of or repurpose the brine water. One protocol developed for both sites.

1.1.6. Develop protocol for operation, maintenance, and repair.
This will involve setting operating and maintenance guidelines based on the operations/technical manual. Spare filters will be available for replacement after 3 years (have been budgeted for). A draft protocol must be prepared before the demonstration launch workshop, and final protocol complete after the workshop. One protocol developed for both sites.

1.1.7. Training workshop for operation, maintenance and repair.
This training workshop will be based on the operating and maintenance guidelines developed in Activity 1.1.6. A list of persons capable of maintaining and repairing the unit will be prepared. Workshop report completed two weeks following the workshop. There will be a workshop at each site, but only one report.

1.1.8. Quarterly reporting on operation and performance.
This should include total water treated, total permeate generated, total brine water generated, total electrical use, and quality of water pre and post treatment. Any unexpected problems and the actions taken thereafter should also be reported here to provide lessons learned. Water levels and water usage should be included in this report, which can be used to develop future projections on water use and water levels and to inform better water management practices and look for areas where water consumption can be reduced. One report for both sites.

1.1.9. *Final report on solar-powered RO demonstration.*
This should include total water treated, total permeate generated, total brine water generated, total electrical use, etc. Should also include a survey to collect farmer's feedback on the new technology. A summary of the water usage during the demonstration should be included in the final report, along with recommendations for improved water management practices based on the data presented. The lessons learned in the quarterly reports should also be compiled and summarized in the final report, with recommendations provided. One report for both sites.

Output: 1.2: ***Demonstration of solar-powered water pump at three farms.***

The second technology being tested for this project are solar powered water pumps (SWPs). These systems will function on 100% self-generated renewable energy to transport water from the point of production or storage to point of use. These units will be paired with conventional preexisting wells or storage systems.

Water pumping for agriculture mainly functions on electrically driven pumps connected to the utility grid or with stand-alone diesel-powered pumps. The vulnerability of small island grids such as Antigua and Barbuda's was illustrated following hurricane Irma in 2017 where energy infrastructure on Barbuda was destroyed and has as of 2020, still has not been reconstructed. Furthermore, as small islands, farmers on Antigua and Barbuda are subject to external price shocks for diesel fuel if operating diesel pumps.

SWPs are typically simpler, more reliable, and more cost-effective systems[12]. SWPs would negate the risks posed by relying on the island's energy grid or on external sources of diesel fuel. Their use would also reduce the emissions profile of agriculture in Antigua and Barbuda.

Activities:

1.2.1 Install one solar-powered water pump at three farms.

Three agriculture sites in Antigua with nearby wells or surface water catchments will be identified for participation in this demonstration. A letter with an expression of interest will be issued to the farmers, to which they will then have the opportunity to discuss the project with the PC and decide if they would like to participate. Preference in the selection of farms will be given to more vulnerable communities that would otherwise not afford a solar pump or other such adaptation measures.

Solar pumps and all associated parts (including solar panels) will be procured to channel water from wells or surface water catchments to nearby farms that will be utilized to irrigate their crops. The procurement process should give preference to local installers.

1.2.2 Workshop for the launch of the demonstration for key stakeholders.

Workshop will provide key stakeholders with a detailed description and workplan of the project. Stakeholders will be given the opportunity to address any issues or suggest better ways to ensure the success of the project. This will be one workshop and a workshop report will be due within two weeks of workshop close.

1.2.3 Develop protocol for operation, maintenance and repair of unit.

This will involve obtaining a list of persons capable of maintaining and repairing the unit. Setting operational guidelines based on the operating manual. Training based on the maintenance/ service manual. Ensuring that spare parts are always available. One protocol for all three sites.

1.2.4 Develop protocol for monitoring water usage.

Establish Rules and guidelines for the frequency at which to monitor well water levels and individual farmer water consumption. One protocol for all three sites.

1.2.5 Monitoring of water usage.

Well water levels are measured weekly. The amount of water used should be recorded on a daily basis.

1.2.6 Quarterly reporting on operation and performance.

This should include total water used/pumped daily, daily water catchment levels, daily electrical use, water consumption per farmer, etc. Any unexpected problems and the actions taken thereafter should also be reported here to provide lessons learned. Water usage data can be used to develop future projections on water use and water levels and to inform better water management practices and look for areas where water consumption can be reduced. One report for all three sites.

1.2.7 Final report on solar-powered water pump technology demonstration.

This should include total water used daily, daily water catchment levels, daily electrical use, water consumption per farmer, etc. Should also include a survey to collect farmer's feedback on the new technology. A summary of the water usage during the demonstration should be included in the final report, along with recommendations for improved water management practices based on the data presented. The lessons learned in the quarterly reports should also be compiled and summarized in the final report, with recommendations provided. One report for all three sites.

[12] Zhou, D., Shalmani, A. (2017) The acceptance of solar water pump technology among rural farmers in northern Pakistan: A strcutral equation model. *Cogent Food and Agriculture.* Vol.3.

<u>Component 2:</u> Standards and policy developed to ensure sustained availability of water for agriculture.

<u>Output 2.1:</u> Development of an Agriculture Technology Assessment in line with National Technology Needs Assessment (TNA) and the National Adaptation Plan (NAP).

<u>Activities:</u>

2.1.1 Conduct a scoping study of technologies currently used in the Agriculture Sector and assess the applicability of new adaptive technologies.

Identify the existing technologies being used within the Agriculture Sector and assess their viability taking into consideration the impacts of climate change on food security, particularly droughts and hurricanes. Research innovative technologies that may help the sector to be more resilient to climate change, in addition to those being tested in this project.

2.1.2 Stakeholder consultation

A stakeholder consultation workshop will be held with the support of the Ministry of Agriculture to identify the perceived risks that farmers may have regarding the new technology options and to provide the opportunity for their feedback. Workshop report will be conducted and due within two weeks of the close of the workshop.

2.1.3 Selection and prioritization of adaptive technologies for the agriculture sector.

A shortlist of adaptive technologies for the Agriculture Sector is developed based on climate change projections, stakeholder feedback in Activity 2.1.2., and the assessment conducted in Activity 2.1.1. This list can include but is not limited to the technologies demonstrated in Component 1 of this project; additional technology options should be considered. The final selection of adaptive technologies should be shared with relevant partners, such as the Ministry of Agriculture.

2.1.4 Development of a financing strategy for scale up in Antigua and Barbuda.

Based on the recommendations of Activity 2.1.3., a GCF concept note is developed. The concept note should involve a financing strategy to allow for scaling up the use of adaptive technologies in the Agriculture Sector of Antigua and Barbuda.

<u>Output 2.2:</u> Assessment of the potential for market mainstreaming of new technologies for the Agriculture Sector.

<u>Activities:</u>

2.2.1 Assessment of business models for the uptake of demonstrated technologies.

This will involve outlining various business models to support the update of the demonstrated technologies in Component 1 and selecting the most viable options. A technical package with all the relevant information on the technologies and selected business strategies will be prepared, including lessons learned from the demonstrations.

2.2.2*. Workshop with key stakeholders.*

A workshop will be conducted in collaboration with the Ministry of Agriculture to disseminate the technical package produced in Activity 2.2.1 to key stakeholders.

2.2.3. *Assessment of tax and other policies to support the uptake of the demonstrated technologies.*

This will involve assessing taxation and other policies applicable to promote and support the uptake of solar RO units or solar pumps. A policy recommendation will be developed based on this assessment.

2.2.4. Development of a training materials for local training groups to administer to potential technology up-takers.

This will involve developing training materials that outline the operations and maintenance requirements of the adaptive technologies demonstrated in country. These materials can then be used by local training groups to ensure that local technical capacity and knowledge of these technologies are developed.

2.2.5. Stakeholder workshop to exhibit the technology in use.

This workshop will exhibit the operations and maintenance of the technology to stakeholders interested in purchasing their own equipment. Stakeholders will be given the opportunity to see the technology in use, have their questions or concerns addressed, and will receive a briefing on the lessons learned during the demonstration projects.

B. Economic, social and environmental benefits

The proposed project aims to provide measures for food security in Antigua and Barbuda by investing in innovative technology which will ensure continuous water supply for the agricultural community in the face of climate change events. In addition to addressing the general matter of food security in the country, this project provides benefits and opportunities for identified vulnerable communities namely farmers, women, the elderly and impoverished urban and rural communities. These benefits include:

Economic – Members of the agricultural communities, particularly farmers are generally without financial capital and have limited opportunities for income outside of harvest yields. A loss in harvest yields due to limited water supply compromises access to livelihood for these farmers who do not have the capital to invest in alternative water sources; it also has implications for vendors (majority of whom are women and elderly) who depend on the local produce to sell at the market or at small shops to provide for themselves or supplement their pension. Increasing water security within the agricultural sector will decrease the financial burden of finding alternative water sources while enabling larger harvest yields. In turn, this allows vendors to sell produce at a cheaper rate, benefiting vulnerable communities. In Barbuda, this project will revitalize the agricultural sector, which has been dormant since 2017 and provide new opportunities for farmers. The Sustainable Island Resource Framework (SIRF) fund, will provide the opportunity for farmers outside of the demonstration to apply for concessional loans to purchase tested technologies.

Social – Increased water security within agriculture is expected to ensure greater harvest yields, reducing dependence on imported agricultural produce and ensuring access to livelihood for men and women in agriculture. This will reduce Barbuda's dependence on imported produce and canned goods. Health officials in Barbuda have noted the health implications for Barbudans, particularly those with non-communicable diseases due to the scarcity of agricultural produce.

Environment – Water scarcity has increased pesticides use on crops, which can negatively impact health, as well as contaminate soil, water and non-target vegetation and organisms. Increased water security can result in decreased usage of pesticides by farmers.

C. Encouraging and accelerating development of innovative adaptation technologies

As a SIDS, farmers in Antigua rely on traditional practices for agriculture. Even with the abundance of new agricultural technologies, these technologies are often too costly for farmers to afford, thus leaving traditional farmers susceptible to issues arising from climate change. With this project, we can influence the technological learning curve of our farmers, introducing ways to increase their productivity and yield while reducing time and effort.

As a nation afflicted by drought, farmers are faced with the issue of water scarcity. It is a challenge to find potable water next to arable land, often leaving farmers with the issue of water transportation once a water source is found. With this project, we will be able to treat water sources next to arable land that have been deemed unsuitable for agriculture ensuring easy access to farmers.

This project gives us the opportunity to implement water measurement practices not currently used by traditional farmers. The use of this technology provides farmers with an insight as to how much water is depleted from the selected water sources daily. Coupled with water quality, catchment size and natural recharge rate data, usage models can then be generated, allowing farmers to better manage their water resources, especially in times of drought.

D. Consistency with national strategies and technical standards

The project is expected to contribute to at least four SDGs including *SDG 2: Zero Hunger, SDG 5: Gender Equality, SDG 6: Clean Water and Sanitation* and *SDG 7: Affordable and Clean Energy*. It is also aligned with Antigua and Barbuda's National Determined Contributions to:

- By 2025, increase seawater desalination capacity by 50% above 2015 levels.
- By 2030, 100% of electricity demand in the water sector and other essential services (including health, food storage and emergency services) will be met through off-grid renewable sources.

Subject to section 23 (1), (2) and Schedule 3 of Physical Planning Act (PPA) 2003, the project does not require an Environmental Impact Assessment; in line with the Department of Environment's Environmental Social Safeguard and Gender policies, the project strives to ensure that environmental, socio-economic and gender benefits are equitably distributed among community members with special targets for vulnerable communities including women, men, farmers and Barbudans.

E. Learning and knowledge management

While there is no dedicated component for learning and knowledge management, activities related to learning and knowledge management are a part of each component of this project.

The first component will collect several forms of data for reporting and knowledge sharing. The monthly reports on water usage will inform better water management practices and be used to determine if the water needs of the site or community are being adequately met, in addition to identifying how it can be improved. Quarterly reports conducted on the operation and performance of the demonstrated technology, as well as final demonstration reports, will inform further technology recommendations to help determine which options should be selected for scale-up projects.

Any issues and solutions will be reported as lessons learned, which will also help to inform the design and implementation of future scale up projects, as well as the technical package prepared in Activity 2.2.1. Further, this report will be shared with stakeholders interested in technology uptake and relevant partners. The training manual developed in activity 2.2.4 can then be used by local training groups to ensure that local technical capacity and knowledge of these technologies are developed.

Workshop reports will collect feedback from stakeholders on their understanding of the technologies and they will inform future technology workshops and determine if additional knowledge resources should be provided to the stakeholders.

F. Environmental and social impacts and risks

The project will operate in a gender polarised sector with men predominately within the farming community and energy sector. In Barbuda, the project further aims to revitalise large scale agricultural farming by stationing the solar RO technology near a main agricultural site. Similarly, in Barbuda large-scale agriculture is male-dominated while women participate as vendors or conduct home-gardening.

The project therefore risks contributing to negative gender roles for men and women with women occupying limiting roles in the implementation and demonstration of the project. To mitigate against advancing gender stereotypes, the project should seek to ensure that at least one farm operated by a female is included as part of the demonstration. The project also operates within the context of the energy portfolio of the Department which seeks to promote procurement practices which include women in technical fields, training geared at including women in STEM fields and gender sensitive campaigning aimed at breaking cultural stereotypes of male and female roles.

In addition, limited lighting within certain farming areas in Antigua may raise issues of theft as well as other security breaches for the solar panels. The project will also mitigate against security concerns at the demonstration sites by implementing appropriate security measures.

G. Justification for funding requested

As Antigua and Barbuda continues to combat the impacts of increased drought and hurricane events, the risk to water and food security is expected to increase. As a SIDS with commitments to the domestic and commercial market to supply water, and an ever-increasing debt due to the aftermath of continuous hurricanes, Antigua and Barbuda is at risk of losing its ability to consistently provide potable water for its population. The Adaptation Fund will assist in mitigating against this increased risk by reducing water scarcity vulnerability among the agricultural community.

Funding utilized to test solar RO equipment will aid in the redevelopment of Barbuda following the widespread devastation of the island experienced in 2017 during Hurricane Irma. The solar RO unit is projected to increase resilience by improving food and water security in Barbuda by assisting in the revival of the agriculture sector on the island. The Solar RO for Antigua will be used to support the agriculture sector as the farming communities in Antigua are socioeconomically vulnerable and heavily reliant on scarce rainfall and water supply from the utility company. Further, the ability to produce potable water for the island's entire population in emergency situations without the presence of centralized grid infrastructure will assist the Barbudan community in adapting to the increased threat posed by extreme weather events.

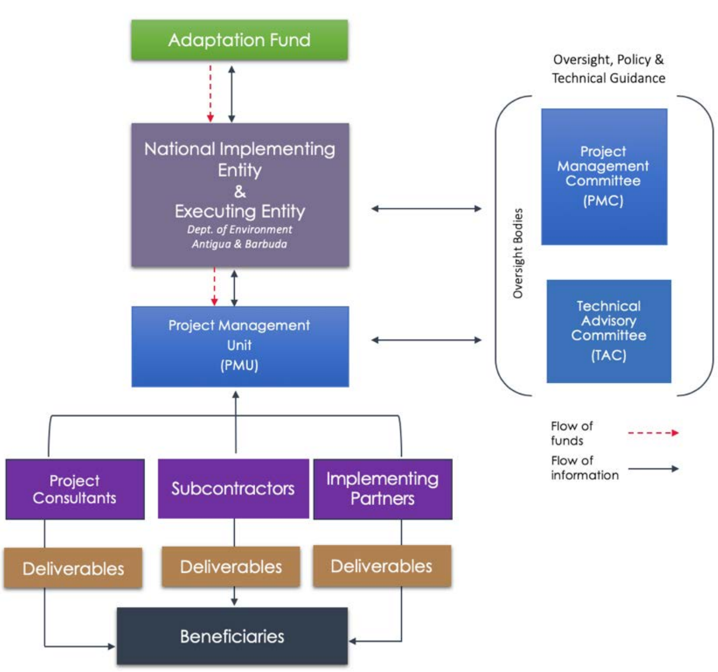
Funding utilized to deploy Solar Water Pumps to Antigua and Barbuda will enable farmers to efficiently transport water from wells and storage sites to farm sites. Paired with modern and efficient irrigation techniques, these technologies can increase the yield of local agricultural production. As both technologies will be deployed with project funding and functioning on self-generated renewable energy, these technologies will help increase the resilience of Antigua and Barbuda's agriculture sector to external fossil fuel-based price shocks.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Implementation arrangements

The Department of Environment (DOE) is the National Implementing Entity (NIE) and will be the Executing Entity for this project. The Department was accredited as a NIE to the Adaptation Fund in 2015 and as a Direct Access Entity to the Green Climate Fund in 2017. The DOE has extensive project development and implementation experience, and expertise located within the other government agencies is available via the office of the Permanent Secretary, the Technical Advisory Committee, and through formal or informal consultations during project concept and development.

Figure 3. Diagram of the NIE's project management structure



The DOE is a regulatory entity that has established and maintained a strong inter-agency and cross-sectoral management framework. This framework consists of three main structures: 1) the Project Management Unit (PMU), 2) the Technical Advisory Committee (TAC), and 3) the Project Management Committee (PMC), summarized below.

The PMU is the management framework within the DOE, whose core structure consists of a Project Manager (PM), full-time Project Coordinators (PC) , and component coordinators with specialized expertise hired to work on specific components. In addition to this core structure, there may be: i) technical coordinators, project consultants, and interns. The PMU works together on a daily basis and meets monthly.

The PMU is designed to achieve efficiency and coordination in the management of funding from a variety of donors, the governments and even NGOs. The PMU also ensures that there is effective coordination and efficiency when there are project activities that are similar and inter-dependent on each other for execution. Antigua and Barbuda is a small island developing state where access to well-trained technical capacity is a key risk. The PMU is a mitigation measure to minimize this risk.

The TAC, mandated by a Cabinet Decision, is a mechanism that enhances coordination between key ministries and stakeholders. The TAC meets monthly and includes representatives from 17 key government agencies, 3 non-governmental organizations and one private sector coalition. The committee provides sustained technical guidance, policy recommendations and support for areas within their expertise to achieve policy coherence among country objectives and not just project-by-project. The TAC meets monthly.

The PMC is a high-level cross-sectorial committee comprising of lead policy makers and heads of departments. The function of the PMC is to focus mainly on procurement, institutional arrangements and financial management of the project. The selection of consultancies and companies is the responsibility of the PMC. The PMC meets quarterly and accounts signatories meet monthly.

B. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

The project's Monitoring Plan outlines the type of M&E activities that will be implemented to ensure that it is progressing as desired. Monitoring will be the responsibility of the Project Coordinator (PC) within the Project Management Unit (PMU) along with technical officers specializing in the areas of renewable energy and water quality testing. The project's results framework, which outlines the baseline condition, targets and indicators, will be used by the coordinator and the technical officers to monitor implementation. In the execution of these functions, these officers will also collaborate with the Ministry of Agriculture and the Barbuda Council.

The Project Coordinator will prepare quarterly progress reports for submission to the Monitoring, Evaluation and Data Management Unit (DMU) and the Project Manager at the end of each quarter. The report should indicate outputs and milestones achieved, activities executed, the use of indicators to measure change, highlight challenges experienced during implementation, captured lessons learned as well as any knowledge disseminated to stakeholders on the interventions. Periodic reports on the performance of the technologies will be delivered to the Project Manager (PM), PMU, the Technical Advisory Committee (TAC), and the Project Management Committee (PMC).

A Terminal Evaluation (TE) will take place at the close of the project. The DOE as the Accredited Entity will be responsible for managing the TE and will oversee the process of hiring an external consultant to carry out the evaluation. The evaluation will adhere to the standard evaluation criteria used to assess development interventions (strategic relevance, effectiveness, efficiency, likelihood of impact and sustainability) and will use a mixed method approach to evaluate results.

Additional M&E Activities and associated costs are indicated below in the Monitoring Plan:

M&E Activity	***Frequency***	***Responsibility***	***Cost (USD)***
Demonstration Workshops	Three two-day workshops one for each technology	PC	6,600
Workshop reports on the launch of the demonstration (3)	Two weeks after the close of each workshop	Project Manager/Project Coordinator and the PMU	1,500
Final report for each demonstration technology (2)	End of each demonstration	PC	1,000

Baseline data collection and measurement of project indicators (outcome, progress and performance indicators)	Before the start of the project and at start of project, mid-point and close of project	PMU (technical officers responsible for RE and water quality testing)	4,620
Training workshops and reports	Two weeks after the delivery of the training workshop	PC	500
Project Progress Report on operation, performance and water usage	Quarterly f	PMU, with review and approval of the TAC and the PMU	6,800
Annual Project Report	Annually	PMU, TAC, M&E Coordinator	None
Project Management Committee (PMC) meetings	Quarterly	PMC	None
Technical Advisory Committee (TAC) meetings	Quarterly	TAC (PMU serves as the Secretariat)	None
External Audits (3)	Annually	External Auditor	10,500
Terminal Independent Project Evaluation and Report	Two months after project completion or no later than nine months after project completion	M&E Coordinator, TAC, PMU	4,000
Total			35,520

C. Include a simple results framework for the project proposal, including milestones, targets and indicators.

Result	Indicator(s)	Baseline	Milestone	Means of Verification
Component 1: Test innovative technology to increase the availability of water for agriculture.				
Outcome 1.1. Test innovative technology to increase the availability of water for agriculture.	Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	0 Climate adaptive technology for water use in agriculture demonstrated.	Procurement, installation and commission of 2 RO units 20 stakeholders participate in demonstration launch workshop	-Procurement records -Workshop report on the launch of the demonstration technology- -Quarterly performance report -Water quality monitoring reports -Final report on solar-powered RO demonstration
Outcome 1.2. Standards and policy developed to ensure sustained availability of water for agriculture.	Number of standards and policies introduced	0	Procurement, installation and commission of 3 solar pumps at 3 agriculture sites	-Procurement records -Workshop report on the launch of the demonstration technology -Quarterly performance report -Final report on solar-powered water pump technology demonstration -Rules and guidelines for monitoring water usage
Component 2: Standards and policy developed to ensure sustained availability of water for agriculture.				

Outcome 2.1. Additional adaptation technologies are identified and selected for scale up.	Number of key findings on effective, efficient adaptation practices, products and technologies generated. Percentage of targeted population informed	0	Five (5) adaptative technologies identified for the agricultural sector	Sign-up sheets at Stakeholder Engagements -Stakeholder workshop reports -List of adaptative technologies -Concept note
Outcome 2.2. New RE technologies for the Agriculture Sector mainstreamed	Participation by stakeholders in sector and policy planning and uptake of adaptative technologies	Vulnerable farming populations are unable to access funding for adaptive and innovative technologies for agriculture.	Vulnerable farmers have improved access to concessional loans for adaptive and innovative technologies for agriculture.	-Sign-up sheets at Stakeholder Engagements -Stakeholder workshop reports -Records of farmers receiving business model packages

D. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund

Project Objective(s)[13]	Project Objective Indicator	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
To test renewable energy powered and distributed, water production and distribution technologies to increase the water security for citizens of Antigua and Barbuda.	Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	**Outcome 5.** Increased ecosystem resilience in response to climate change, droughts, and hurricane induced stress on water sources. **Outcome 6.** Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas. **Outcome 7.** Improved policies and regulations that promote and	**5.** Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress. **6.1** Percentage of households and communities having more secure (increased) access to livelihood assets **7.** Climate change priorities are integrated into national development	250,000

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

		enforce resilience measures **Outcome 8.** Support the development and diffusion of innovative adaptation practices, tools and technologies.	strategy **8.1.** Innovative adaptation practices are rolled out, scaled up, encouraged and/or accelerated at national and/or subnational level.	
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Outcome 1.1. Test innovative technology to increase the availability of water for agriculture.	Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress. Percentage of households and communities having more secure access to livelihood assets.	**Output 5.1.** No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets) **Output 6.2.** Type of income sources for households generated under climate change scenario.	**5.1.** No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale) **6.1**. Percentage of households and communities having more secure access to livelihood assets	175,120
Outcome 1.2. Standards and policy developed to ensure sustained availability of water for agriculture.	Number of standards and policies in place to address the availability of water for agriculture.	**Output 7.** Improved integration of climate-resilience strategies into country development plans	**7.1.** No. of policies introduced or adjusted to address climate change risks (by sector)	33,410
Outcome 2.1. Additional adaptation technologies are identified and selected for scale up.	Number of adaptation technologies /models that have been adopted in other areas or 'scaled-up'.	**Output 8.** Viable innovations are rolled out, scaled up, encouraged and/or accelerated.	**8.2.** No. of key findings on effective, efficient adaptation practices, products and technologies generated.	6,675
Outcome 2.2. New RE technologies for the agriculture sector mainstreamed	Participation by stakeholders in sector and policy planning and implementation in energy development		**8.1.** No. of innovative adaptation practices, tools and technologies accelerated, scaled up and/or replicated.	17,580

E. Budget

Please see Annex 1. AF Innovation Grant Detailed Budget for a complete budget description.

	Output	Activities	Total
Component 1	Output 1.1	1.1.1. Install solar panels and RO unit at test site (s).	145,000
		1.1.2. Workshop for the launch of the demonstration for key stakeholders.	2,700
		1.1.3. Develop protocol for monitoring of water quality, water usage, and well water levels.	2,100
		1.1.4. Monitoring of water quality, water usage, and well water levels.	4,620
		1.1.5. Develop protocol for sustainable disposal of RO permeate.	2,100
		1.1.6. Develop protocol for operation, maintenance, and repair.	2,100
		1.1.7. Training workshop for operation, maintenance and repair.	9,200
		1.1.8. Quarterly reporting on operation and performance.	6,800
		1.1.9. Final report on solar-powered RO demonstration.	500
		Output Total	175,120
	Output 1.2	1.2.1 Install one solar-powered water pump at three farms.	14,300
		1.2.2 Workshop for the launch of the demonstration for key stakeholders.	2,700
		1.2.3 Develop protocol for operation, maintenance and repair of unit.	2,625
		1.2.4 Develop protocol for monitoring water usage.	2,625
		1.2.5 Monitoring of water usage.	2,160
		1.2.6 Quarterly reporting on operation and performance.	3,000
		1.2.7 Final report on solar-powered water pump technology demonstration.	500
		Output Total	33,410
Component 2	Output 2.1	2.1.1. Conduct a scoping study of technologies currently used in the Agriculture Sector and assess the applicability of new adaptive technologies.	900
		2.1.2 Stakeholder consultation	4,200
		2.1.3 Final selection and prioritization of adaptive technologies for the agriculture sector.	525
		2.1.4 Development of a financing strategy for scale up in Antigua and Barbuda.	1,050
		Output Total	6,675
	Output 2.2	2.2.1 Assessment of business models for the use of the selected technologies in 2.1.2.	1,440
		2.2.2 Workshop with key stakeholders	2,600
		2.2.3 Assessment of tax and other policies to support the update of the selected technologies in 2.1.2.	1,440
		2.2.4 Develop a training materials for local training groups to administer potential technology up takers.	4,000
		2.2.5 Stakeholder workshop to exhibit the technology in use	8,100
		Output Total	17,580
		Total Components	**232,785**
		Travel to Barbuda quarterly	560

Project Coordinator	2,155
Audit (3)	10,500
Terminal Evaluation	4,000
TOTAL	**250,000**

F. Disbursement Schedule

Milestones	Date	Disbursement Percentage
Upon Signing Agreement	September 2020	130,000 USD
Submission of First Annual Report	August 2021	80,000 USD
Submission of Second Annual Report	August 2022	40,000 USD

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

A. Record of endorsement on behalf of the government[1]

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

Ambassador Diann Black-Layne	Date*: January 20th 2020*

B. Implementing Entity certification

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

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (National Communications to the UNFCCC, INDC, Physical Planning Act) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

…………………………………

Ambassador Diann Black-Layne
Implementing Entity Coordinator

Date: *January 20th 2020*	Tel. and email: +1(268) 464-6410 dcblack11@gmail.com
Project Contact Person: Rashauna Adams-Matthew	
Tel. And Email: +1 (268) 462-4625 rashauna.adams-matthew@ab.gov.ag	

6. Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

GOVERNMENT OF ANTIGUA AND BARBUDA

Department of Environment
Ministry of Health and the Environment
#1 Victoria Park, Botanical Garden
P.O, Box W693
St. John's
Antigua, W.I.
Tel: (268) 462-6265
Fax: (268) 462-4625
Email: antiguaenvironmentdivision@gmail.com

REF#: D.o.E 38/P17 **21th January, 2020**

The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
1818 H Street NW
Washington DC 20433
USA
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for "Innovative Technologies for improved water availability to increase food security in Antigua and Barbuda"

In my capacity as designated authority for the Adaptation Fund in Antigua and Barbuda, I confirm that the above national project/programme proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the country and wider region

Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented and executed by the Department of Environment within the Ministry of Health, Wellness and the Environment.

Sincerely,

....

Chief Environment Officer
Department of Environment

CAEP Implementation by Budget and Activities
BUDGET BY COMPONENT

	Output
Componenet 1	**Output 1.1**
	Output 1.2

CAEP Implementation by Budget and Activities
BUDGET BY COMPONENT

Componenet 2	**Output 2.1**
	Output 2.2

Activities
1.1.1. Install solar panels and RO unit at test site (s).
1.1.2. Workshop for the launch of the demonstration for key stakeholders.
1.1.3. Develop protocol for monitoring of water quality, water usage, and well water levels.
1.1.4. Monitoring of water quality, water usage, and well water levels.
1.1.5. Develop protocol for sustainable disposal of RO permeate.
1.1.6. Develop protocol for operation, maintenance, and repair.
1.1.7. Training workshop for operation, maintenance and repair.
1.1.8. Quarterly reporting on operation and performance.
1.1.9. Final report on solar-powered RO demonstration.
Output Total
1.2.1 Install one solar-powered water pump at three farms.
1.2.2 Workshop for the launch of the demonstration for key stakeholders.
1.2.3 Develop protocol for operation, maintenance and repair of unit.
1.2.4 Develop protocol for monitoring water usage.
1.2.5 Monitoring of water usage.
1.2.6 Quarterly reporting on operation and performance.

1.2.7 Final report on solar-powered water pump technology demonstration.
Output Total
2.1.1. Conduct a scoping study of technologies currently used in the Agriculture Sector and assess the applicability of new adaptive technologies.
2.1.2 Stakeholder consultation
2.1.3 Final selection and prioritization of adaptive technologies for the agriculture sector.
2.1.4 Development of a financing strategy for scale up in Antigua and Barbuda.
Output Total
2.2.1 Assessment of business models for the use of the selected technologies in 2.1.2.
2.2.2 Workshop with key stakeholders
2.2.3 Assessment of tax and other policies to support the update of the selected technologies in 2.1.2.
2.2.4 Develop a training materials for local training groups to administer potential technology up takers.
2.2.5 Stakeholder workshop to exhibit the technology in use
Output Total
Total Components
Travel to Barbuda quarterly
Project Coordinator
Audit (3)
Terminal Evaluation
TOTAL

Project Execution Cost
Project Funds
Project IE Fee
Total

CAEP Implementation by Budget and Activities
BUDGET BY COMPONENT

Total
145,000
2,700
2,100
4,620
2,100
2,100
9,200
6,800
500
175,120
14,300
2,700
2,625
2,625
2,160
3,000

CAEP Implementation by Budget and Activities
BUDGET BY COMPONENT

500
33,410
900
4,200
525
1,050
6,675
1,440
2,600
1,440
4,000
8,100
17,580
232,785
560
2,155
10,500
4,000
250,000

1.2%

2,715	1.1%
232,785	93.1%
14,500	5.8%
250,000	100.0%

		Budget Note	Year 1	Year 2	Year 3	Total
Output 1.1	1.1.1. Install solar panels and RO unit at test site (s).	1	115,200	29,800		145,000
	1.1.2. Workshop for the launch of the demonstration for key stakeholders.	2		2,700		2,700
	1.1.3. Develop protocol for monitoring of water quality, water usage, and well water levels.	3		2,100		2,100
	1.1.4. Monitoring of water quality, water usage, and well water levels.	4	2,140	1,240	1,240	4,620
	1.1.5. Develop protocol for sustainable disposal of RO permeate.	5		2,100		2,100
	1.1.6. Develop protocol for operation, maintenance, and repair.	6		2,100		2,100
	1.1.7. Training workshop for operation, maintenance and repair.	7		9,200		9,200
	1.1.8. Quarterly reporting on operation and performance.	8		3,400	3,400	6,800
	1.1.9. Final report on solar-powered RO demonstration.	9			500	500
	Output Total		**117,340**	**52,640**	**5,140**	**175,120**
Output 1.2	1.2.1 Install one solar-powered water pump at three farms.	10	9,900	4,400		14,300
	1.2.2 Workshop for the launch of the demonstration for key stakeholders.	11		2,700		2,700
	1.2.3 Develop protocol for operation, maintenance and repair of unit.	12		2,625		2,625
	1.2.4 Develop protocol for monitoring water usage.	13		2,625		2,625
	1.2.5 Monitoring of water usage.	14	432	864	864	2,160
	1.2.6 Quarterly reporting on operation and performance.	15	600	1,200	1,200	3,000
	1.2.7 Monthly reporting on water usage and well water levels.	16	1,100	2,200	2,200	5,500
	1.2.8 Final report on solar-powered water pump technology demonstration.	17			500	500
	Output Total		**12,032**	**16,614**	**4,764**	**33,410**
Output 2.1	2.1.1 Conduct a scoping study of technologies currently used in the Agriculture Sector and assess the applicability of new adaptive technologies.	18		900		900
	2.1.2 Stakeholder consultation	19			4,200	4,200
	2.1.3 Final selection and prioritization of adaptive technologies for the agriculture sector.	20			525	525
	2.1.4 Development of a financing strategy for scale up in Antigua and Barbuda.	21			1,050	1,050
	Output Total		**0**	**900**	**5,775**	**6,675**
Output 2.2	2.2.1 Assessment of business models for the use of the selected technologies in 2.1.2.	22			1,440	1,440
	2.2.2 Workshop with key stakeholders	23			2,600	2,600
	2.2.3 Assessment of tax and other policies to support the uptake of the demonstrated technologies	24			1,440	1,440
	2.2.4 Develop a training materials for local training groups to administer potential technology up takers.	25			4,000	4,000
	2.2.5 Stakeholder workshop to exhibit the technology in use	26		2,700	5,400	8,100

	Output Total		0	2,700	14,880	17,580
	Total		**129,372**	**72,854**	**30,559**	**232,785**

Budget note	Comments
1	65,000 USD equiptment plus instalation cost X 2
2	2 days for 20 persons
3	PMU consultant for 60 days @ 105 USD for actvities 1.1.3, 1.1.5, and 1.1.6 (see budget note
4	equipment + part time consultant @ 72 USD 20 days per annum for collection of baseline da
5	PMU consultant for 60 days @ 105 USD for actvities 1.1.3, 1.1.5, and 1.1.6
6	PMU consultant for 60 days @ 105 USD for actvities 1.1.3, 1.1.5, and 1.1.6
7	2 workshops for 10 persons plus international facilitator for 20 days @ 300 USD
8	Executed by PMU
9	Executed by PMU
10	3300 USD x 3 equipment plus installation
11	2 days for 20 persons
12	PMU consultant for 50 days @ 105 USD for actvities 1.2.3 and 1.2.4. (see budget note 13)
13	PMU consultant for 50 days @ 105 USD for actvities 1.2.3 and 1.2.4.
14	PMU consultant @ 72 USD for 30 days
15	Executed by PMU
16	Executed by PMU
17	Executed by PMU
18	1 intern at $600 USD per month (50% co-financed from other project financing)
19	2 workshops for 20 persons
20	PMU consultant for 10 days @ 105 USD (50% co-financed from other project financing)
21	PMU consultant for 20 days @ 105 USD (50% co-financed from other project financing)
22	PMU consultant @ 72 USD for 20 days
23	1 workshop for 30 persons
24	PMU consultant @ 72 USD for 20 days
25	Development plus publication
26	3 two day workshops, 20 persons

ta and ongoing monitoring