Concept Note

Project/Programme Title:	**Dominica** - **Cl**imate **E**lucidation for **A**daptive **R**esilience in the Water Sector (D-CℓEAR-Water)
Country(ies):	Dominica
National Designated Authority(ies) (NDA):	Ministry of Economic Affairs, Planning, Resilience, Sustainable Development, Telecommunications and Broadcasting
Accredited Entity(ies) (AE):	Caribbean Community Climate Change Centre
Date of first submission/ version number:	*[YYYY-MM-DD] [V.0]*
Date of current submission/ version number	*[YYYY-MM-DD] [V.0]*

GREEN CLIMATE FUND

Please submit the completed form to **fundingproposal@gcfund.org**, using the following name convention in the subject line and file name: ***"CN-[Accredited Entity or Country]-YYYYMMDD"***

Notes

- The maximum number of pages should **not exceed 12 pages**, excluding annexes. Proposals exceeding the prescribed length will not be assessed within the indicative service standard time of 30 days.
- As per the Information Disclosure Policy, the concept note, and additional documents provided to the Secretariat can be disclosed unless marked by the Accredited Entity(ies) (or NDAs) as confidential.
- The relevant National Designated Authority(ies) will be informed by the Secretariat of the concept note upon receipt.
- NDA can also submit the concept note directly with or without an identified accredited entity at this stage. In this case, they can leave blank the section related to the accredited entity. The Secretariat will inform the accredited entity(ies) nominated by the NDA, if any.
- Accredited Entities and/or NDAs are encouraged to submit a Concept Note before making a request for project preparation support from the Project Preparation Facility (PPF).
- Further information on GCF concept note preparation can be found on GCF website Funding Projects Fine Print.

A. Project/Programme Summary (max. 1 page)			
A.1. Project or programme	☐ Project ☒ Programme	**A.2. Public or private sector**	☒ Public sector ☐ Private sector
A.3. Is the CN submitted in response to an RFP?	Yes ☐ No ☒ If yes, specify the RFP: _____	**A.4. Confidentiality[1]**	☐ Confidential ☒ Not confidential
A.5. Indicate the result areas for the project/programme	Mitigation: Reduced emissions from: ☒ Energy access and power generation ☐ Low emission transport ☐ Buildings, cities and industries and appliances ☐ Forestry and land use Adaptation: Increased resilience of: ☒ Most vulnerable people and communities ☒ Health and well-being, and food and water security ☒ Infrastructure and built environment ☐ Ecosystem and ecosystem services		
A.6. Estimated mitigation impact (tCO2eq over lifespan)	17,767 tCO_2eq	**A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)**	71,300 (2011 census) and 100%
A.8. Indicative total project cost (GCF + co-finance)	Amount: USD $71,633,942	**A.9. Indicative GCF funding requested**	Amount: USD $45,510,650
A.10. Mark the type of financial instrument requested for the GCF funding	☒ Grant ☐ Reimbursable grant ☐ Guarantees ☐ Equity ☐ Subordinated loan ☐ Senior Loan ☐ Other: specify_____		
A.11. Estimated duration of project/ programme:	a) disbursement period: b) repayment period, if applicable:	**A.12. Estimated project/ Programme lifespan**	This refers to the total period over which the investment is effective.
A.13. Is funding from the Project Preparation Facility requested?[2]	Yes ☐ No ☒ Other support received ☐ If so, by who:	**A.14. ESS category[3]**	☐ A or I-1 ☒ B or I-2 ☐ C or I-3
A.15. Is the CN aligned with your accreditation standard?	Yes ☒ No ☐	**A.16. Has the CN been shared with the NDA?**	Yes ☒ No ☐
A.17. AMA signed (if submitted by AE)	Yes ☐ No ☐ If no, specify the status of AMA negotiations and expected date of signing:	**A.18. Is the CN included in the Entity Work Programme?**	Yes ☐ No x
A.19. Project/Programme rationale, objectives and approach of programme/project (max 100 words)	*Brief summary of the problem statement and climate rationale, objective and selected implementation approach, including the executing entity(ies) and other implementing partners.* There is evidence that climate change will result in increasing variability and extremes[4] and this will impact the availability of water in Dominica, particularly in the dry season. Less water will be available to support water supply to communities and water quality will be negatively impacted by extreme climatic		

[1] Concept notes (or sections of) not marked as confidential may be published in accordance with the Information Disclosure Policy (Decision B.12/35) and the Review of the Initial Proposal Approval Process (Decision B.17/18).

[2] See here for access to project preparation support request template and guidelines

[3] Refer to the Fund's environmental and social safeguards (Decision B.07/02)

[4] Vichot-Llano, A., Martinez-Castro, D., Bezanilla-Morlot, A., Centella-Artolla, A. and Giorgi, F. (2020). Projected changes in precipitation and temperature regimes and extremes over the Caribbean and Central America using a multiparameter ensemble of RegCM4. Int J Climatol. 2020;1–23 doi: 10.1002/joc.6811

	events. Decreases in water availability and poorer water quality will require the upgrading of water system capacities to meet future climate-challenged operating conditions. The objective is to reduce the impact of climate change on water services provision through adaptation and mitigation measures. This will be achieved through improving hydro-meteorological monitoring and forecasting for warning and planning purposes, reductions in abstraction, provision of contingency storage, use of renewable energy for pumping, evidenced-based planning using climate projections to optimise adaptation investments, improved operation efficiency using climate information, and uptake of efficiency measures by communities. The measures will directly benefit the executing entity the water utility, the hydropower operator, agriculture, tourism and the commercial centres of Roseau and Portsmouth and water stressed communities.

B. Project/Programme Information (max. 8 pages)

B.1. Context and baseline (max. 2 pages)

Describe the climate vulnerabilities and impacts, GHG emissions profile, and mitigation and adaptation needs that the prospective intervention is envisaged to address.

The Challenge

The security of water supply and the ability of Dominica to meet future water demand will be severely challenged by climate change and climate variability. The island is characterised by extensive networks of streams and rivers which are accessed through independent river intakes with small storage capacity. This abundance of water gives Dominica a clear distinction in comparison to other countries of the Caribbean with regards to the availability of water resources. In fact, Dominica has served as an alternative source of water supply for the rest of region during times of emergency. Notwithstanding, the effects of climate change are already being experienced and are having adverse effects on water resources and the ability to provide water services. Reduced and more variable rainfall, increasing frequency of drought conditions, extended periods of drought, and increases in severe rainfall events are all impacts being experienced. During the dry months of January through to May, water supplied from surface water can decrease by up to 50% as compared to the wet season, as dry weather stream flows have declined by approximately 30% of wet weather flows[5]. The primary impact of these dry spells includes intermittent water shortages in some of the water systems, particularly in the months of April and May. The climate change projections are that this situation will continue to reduce water availability through decreases in rainfall and increases in temperature.[6]

Compounding the issue of prolonged dry periods is the reality that extreme events driven by climate change are directly and negatively impacting water infrastructure and water quality at the sources of supply. In 2015, following the impact of Tropical Storm Erika, the Rapid Damage & Impact Assessment (RDIA) estimated damages and losses to the water sector at US $16.8 million[7]. Flash flooding and landslides triggered by heavy torrential rainfall caused damage to water abstraction and distribution infrastructure, ultimately resulting in disruption to the entire water service provided by the Dominica Water and Sewerage Company (DOWASCO). In 2017, 43 of the 44 water systems in operation were rendered non-functional following the impact of Hurricane Maria. Production and distribution lines sustained significant damage or were washed away, river intakes were blocked by debris, and pumps, storage tanks, access roads and other physical infrastructure were damaged. The Roseau wastewater treatment plant as well as the Canefield and Jimmit sewage systems suffered critical damage, directly affecting approximately 5,190 homes[8] amounting to 80% of the households. Damages were calculated as US$24 million, losses as US$39.73 million and recovery needs as US$56.26 million[9] , many of the recovery measures proposed are incorporated into this project. Limited access to safe drinking water coupled with the inadequate treatment and disposal of sewage raised considerable issues of sanitation and public health risks. It is important to note that these extreme events appear to be occurring at a faster rate than Dominica can recover from the socio-economic impacts of the damages sustained and impact on the economy (Hurricanes: Dean (2007) – 58% of GDP, Erica (2015) – 90% of GDP, Maria (2017) – 226% of GDP).

The barriers to being able to respond and implement climate resilient water management and infrastructure are: inadequate access to climate information with which to plan and implement climate resilient water management; inadequate tools to operate the infrastructure under climate change and to manage the effects of climate change on water resources and water services. Added to this is inadequate access to finance to invest in climate resilient infrastructure given the scale of the impacts.

[5] Commonwealth of Dominica Second National Communication, 2012.
[6] McLean, N., Stephenson, T., Taylor, M. and Campbell, J. (2015). Characterization of Future Caribbean Rainfall and Temperature Extremes across Rainfall Zones, Advances in Meteorology, vol. 2015, Article ID 425987, 18 pages. https://doi.org/10.1155/2015/425987
[7] Commonwealth of Dominica (2015). Rapid Damage and Impact Assessment Tropical Storm Erica 27 August 2015.
[8] Post Disaster Needs Assessment Hurricane Maria, September 18, 207. A Report by the Government of the Commonwealth of Dominica
[9] Commonwealth of Dominica (2017). Post-Disaster Needs Assessment Hurricane Maria, September 18, 2017, see Table 51 page 102.

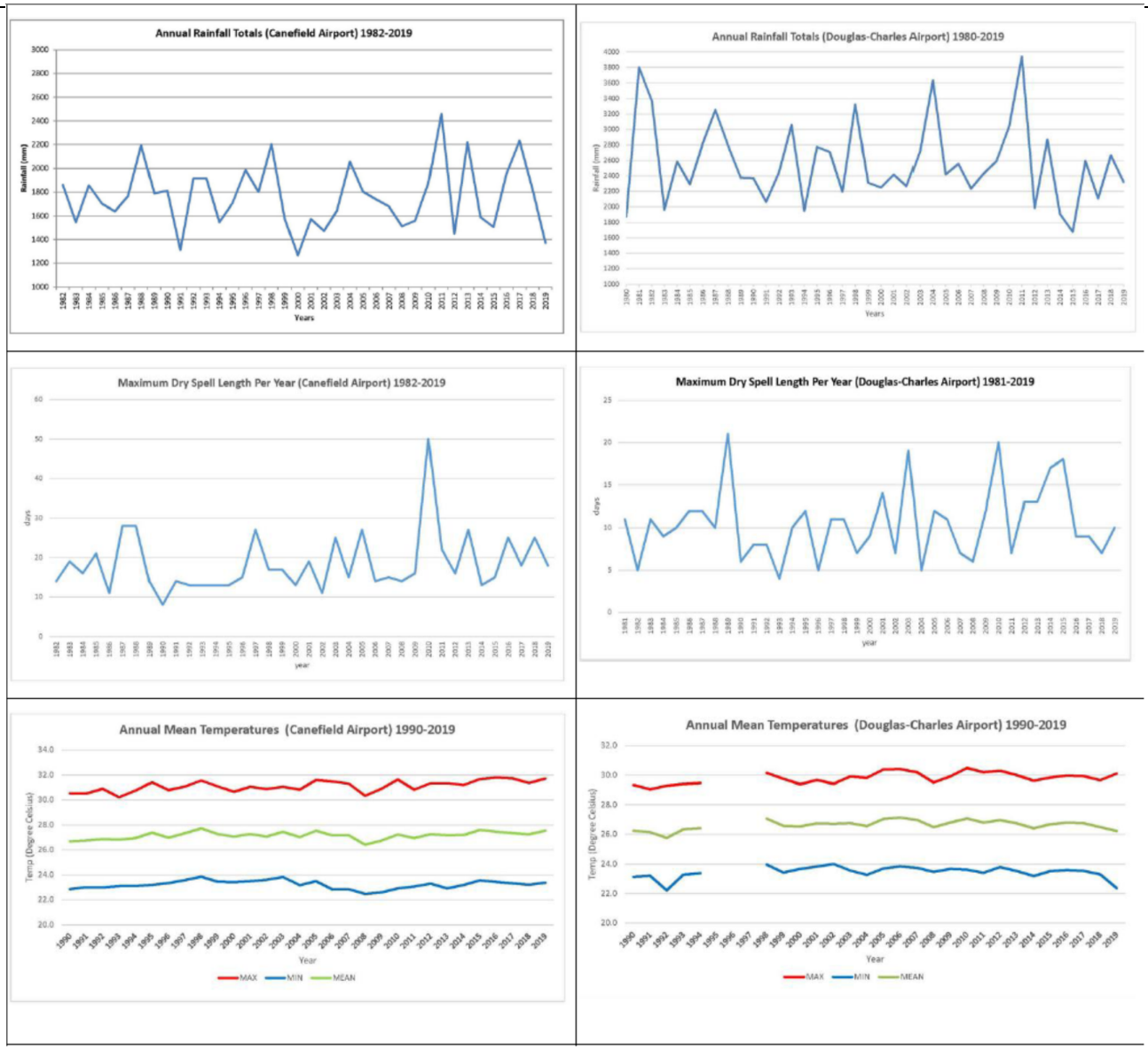


Figure 1: Historic trends in temperatures and rainfall for two weather stations (http://www.weather.gov.dm/climate/climate-data/historical-time-series-charts)

Climate Rationale

As a result of Dominica's mountainous terrain its climate can vary over short distances with rainfall varying from 1,245 mm on the drier northwest coast to 7,620 mm over the central peaks. Approximately 65-75% of the annual rainfall comes during the wet season. There is marked variability in rainfall between years, influenced by El Niño Southern Oscillation (ENSO) events. The meteorological data generally does not show statistically significant historical trends in rainfall Figure 1, but there is an observed trend of decreasing average monthly precipitation, which is more marked during the wet season. Significant drought periods have been experienced across the Eastern Caribbean between the mid 1930's-1940's, mid 1960's-1970's and more recently in 2000/01, 2009/10 and 2015/16. Maximum and minimum temperatures have shown an increase while average annual temperatures have shown a 0.16°C rise per decade since 1960. The frequency of hot days and hot nights has also increased since 1960, whilst the difference between day and night time temperatures has narrowed, Figure 2. The frequency and severity of droughts appears to also have increased, see Figure 2. Over the last decade Dominica has been severely affected by storm activity, the most severe being Tropical Storm Erika in 2015 and Hurricane Maria in 2017 devastating

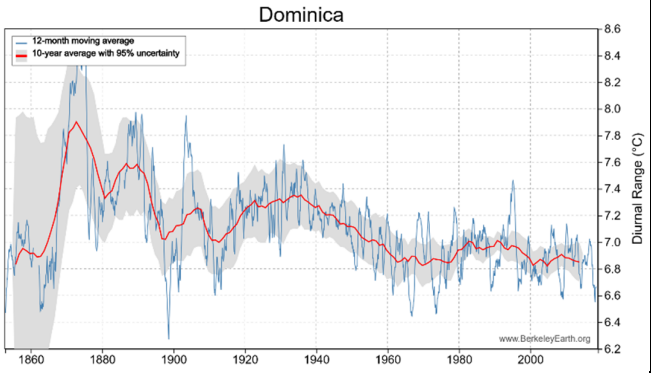


Figure 2: Change in diurnal temperature range (http://berkeleyearth.lbl.gov/regions/dominica#)

the country causing damage and loss of 90% and 200% of GDP respectively. Erika and Maria have had long-term impacts on water resources; due to associated changes in vegetation, land cover and slope stability catchment water yields have decreased and are more variable, and erosion and sedimentation has increased causing water quality problems. The overall changes in indicators are shown in Figures 4 and 5 for RCP4.5 and 8.5 respectively for period 2041-2070. Overall the projected changes will have an impact on stream flows with a decrease in water availability.

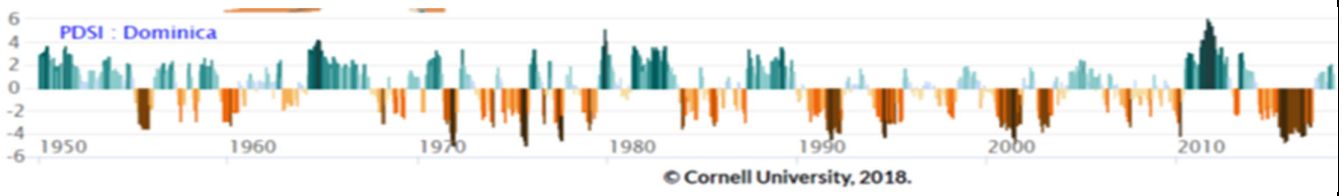


Figure 3: Historical Drought Severity Index

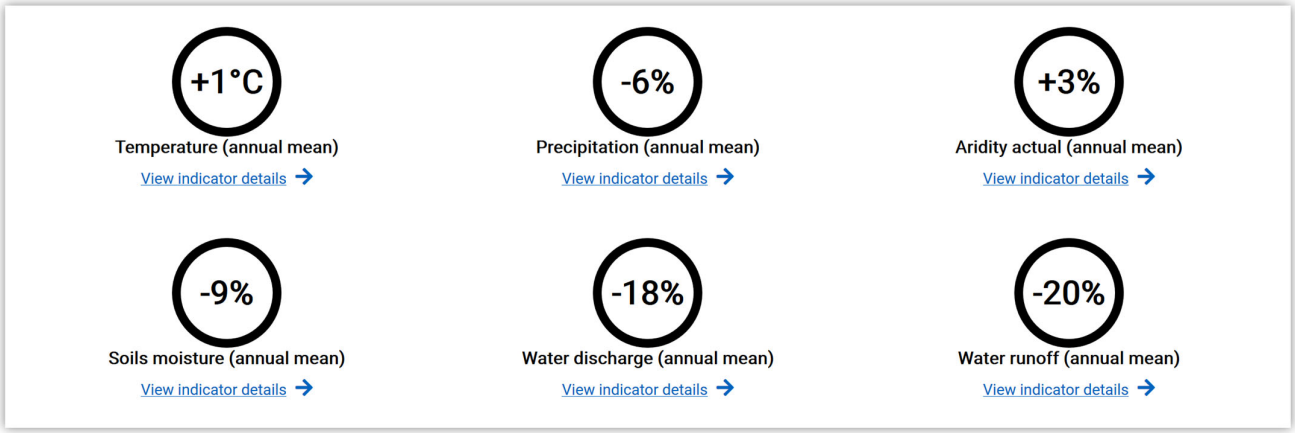


Figure 4: Climate change indicators RCP 4.5 2041-2070 (ClimPACT https://climateinformation.org/create-report/)

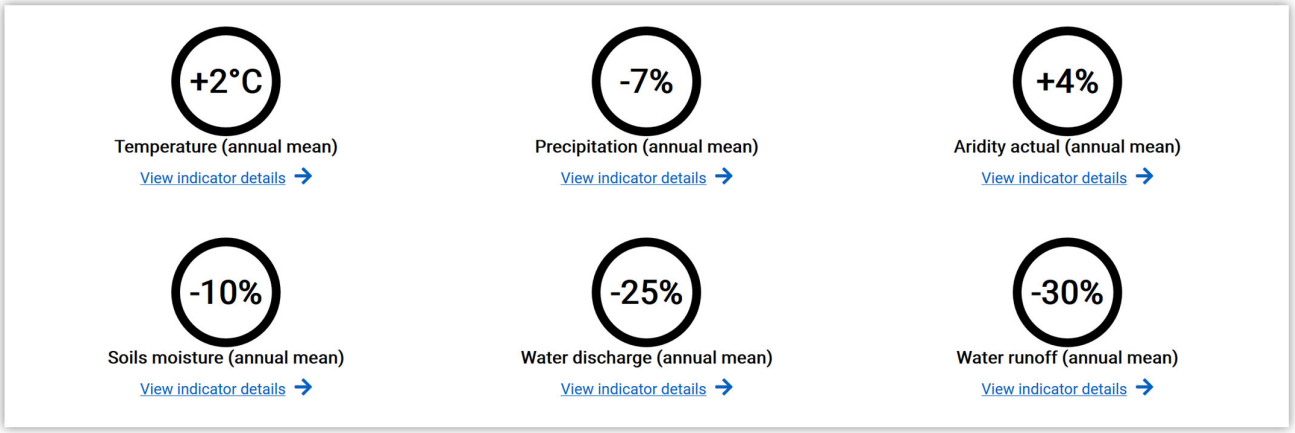


Figure 5: Climate change indicators RCP 8.5 2041 – 2070 (ClimPACT https://climateinformation.org/create-report/)

Climate projections for the Eastern Caribbean[10] indicate that the warming trend will continue with average annual temperatures expected to increase by 2°C by 2050 with the number of days exceeding 30°C increasing with the increase being more marked during September through to November. Annual precipitation could decrease by up to 20% with the most pronounced drying being during the wet season of May to November (high rainfall months are August to November). The worst case scenario for emissions, as described by Representative Concentration Pathway (RCP) 8.5, indicates a decrease of 113.2 mm in mean annual rainfall by 2050 for Dominica. Projections of mean annual rainfall indicate decreases in rainfall in all seasons except March, April, and May when persistent and intense drought conditions are already experienced. This will be accompanied by a 1.4°C increase in mean annual temperature. Under this emission scenario of 2°C rise in average temperatures by 2050, the duration of consecutive hot dry days could increase by up to 10 days whilst the number of days when precipitation exceeds 10mm would drop by

[10] McLean, N., Stephenson, T., Taylor, M. and Campbell, J. (2015). Characterization of Future Caribbean Rainfall and Temperature Extremes across Rainfall Zones, *Advances in Meteorology*, vol. 2015, Article ID 425987, 18 pages. https://doi.org/10.1155/2015/425987

up to 4 days[11][12]. The frequency of occurrence of droughts is likely to increase, though the severity is expected to vary. Overall there is projected to be a decrease in the number of intense rainfall events. The effect of these changes on surface water resources and on groundwater have been little studied in the Caribbean. However, increases in temperature appear to have a greater effect than changes in precipitation on water resources so that a change in one variable has a proportionately greater effect on streamflow for example.

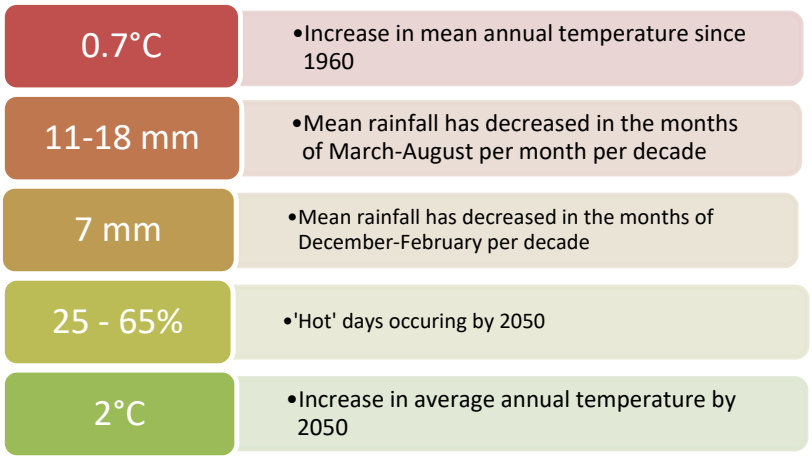


Figure 5: Headline changes in climate

There are no long-term river discharge measurements carried out in Dominica, so it is not possible to do any analysis of the effect of changes in rainfall on river flows in Dominica. Recent work by consultants (Fichtner, 2019) has underlined the great difficulty attached to trying to predict future changes in river flows due to the lack of data "*Due to the lack of measured climatological data and especially long term discharge measurements it was not possible to use a more educated method to perform the hydrological study. It was not possible to give reliable values for different low water discharges without any discharge measurements. Likewise, it was not possible to calculate any monthly based values of water availability*". However, work carried out in other parts of the Caribbean, in similar conditions have found decreases in streamflows of up to 50% by 2050, depending on the climate change projections used (Edwards, 2012). Edwards (2012) also showed temperature changes to have a greater impact on flow than changes in precipitation. Added to this will be the increase in the effects of hurricane activity and more extreme, though less frequent, intense rainfall events which will lead to adverse changes in water quality. Recent work by Balaguru et al. (2018) suggests Rapid Intensification magnitude increases of hurricanes which along with a projected shift from lower to higher category hurricanes under all climate change scenarios has major implications for the amount of potential damage these events could cause.

Dominica is very weak in respect of water resources data collection, monitoring and analysis. Whilst there is some long-term, consistent climate data from the two airports, the network of rain gauges has degraded over the decades is sparse consisting of just six in operation. There is no consistent hydrological monitoring network or records of streamflow, in part due to damage from extreme events. This situation is being addressed through the Disaster Vulnerability Reduction Programme (DVRP) (part of the Pilot Project for Climate Resilience PPCR) which under Component 1 supports the construction of 8 water storage systems and under Component 2 the country's hydrometeorological monitoring network is being upgraded. The soils mapping and forestry inventory under Component 2 will provide valuable input into this project's proposed activities. However, the DVRP does not meet all the community storage needs outside of Water Area 1 and not all the required automatic water level stations could be installed under this programme, hence this project will complement and extend the work undertaken under the DVRP. Going forward this investment will greatly enhance the country's ability to respond to climate change. Whilst there is metering and monitoring of water production and of consumption analysis of the data for trends and planning purposes has been limited. Increases in metering in Water Area 1, which serves 40% of the total population and is inclusive of the capital Roseau, will improve but not solve the situation. There is though still a lack of metering in the other 42 Water Areas. Water quality monitoring of raw water and treated water quality is undertaken and the laboratory analytical capacity is being upgraded. **As a result, there is little understanding and assessment of the country's surface water resources and none of the groundwater resources. Other than a general understanding that climate change and variability will have an adverse effect on water availability going into the future, there is no facility to take it into account in the planning of future water service provision.** Anecdotal information already indicates that changes in water quality are being experienced. There are already seasonal shortfalls in supply leading to constrained domestic consumption as well as affecting tourism and agriculture. Some water intakes have been relocated as a result of decreases in streamflow. Recent extreme events have compromised the functioning of intakes through sedimentation and mass movement of debris. As a result, attention has been turning to the need to redesign intakes to make them more resilient. The destructive impacts of flooding, particularly associated with tropical storms and hurricanes, has been mentioned by stakeholders in Dominica as an area of growing concern and the need to better understand flood risks. Hydropower generation has decreased in recent years correlated with changes in stream flows (IDB, 2015), and now accounts for between 30-35% down from approximately 45% in 2000. Thus water resources and water availability will be adversely affected by climate change and variability and maintaining minimum flows for ecological purposes whilst meeting demands will require a better understanding of the future behaviour of water resources. Stakeholders have highlighted the need in Water Area 1 to incorporate groundwater sources as a resilience measure to be able to maintain a minimum level of service in the aftermath of extreme weather events, such as hurricanes, which disrupt supplies through damage to intakes, treatment works, pipelines and pump stations, as well as a source of augmentation during droughts which are increasingly affecting dry season stream flows.

Climate Mitigation

[11] Vichot-Llano, A., Martinez-Castro, D., Giorgi, F., Bezanilla-Morlot, A. and Centella-Artolla, A. (2020). Comparison of GCM and RCM simulated precipitation and temperature over Central America and the Caribbean. Theoretical and Applied Climatology. doi: 10.1007/s00704-020-03400-3

[12] Taylor, M. et al. (2018). Future Caribbean Climates in a World of Rising Temperatures: The 1.5 vs 2.0 Dilemma. Journal of Climate 31, p2907-2926 https://doi.org/10.1175/ JCLI-D-17-0074.s1

Dominica's INDC (2015) gave its GHG emissions as 164.5 Gigagram of CO_2 or 1.9 tonnes per person. According to the 2nd National Communication to the UNFCCC (2012), the Transport sector contributed 44% and Energy 33% to overall emissions. Under the 2012 Low Carbon Climate Resilient Development Strategy, Dominica intended to reduce emissions by 44.7% by 2030. This was to be achieved through replacing fossil fuel energy generation by renewable energy sources. Fuel imports are equivalent to 12% of GDP. Currently 74% of electrical energy is generated by fossil fuel and 26% from renewable sources of which hydropower constitutes 24%, down from a high of 45% in the early 2000s. Residential and commercial use account for 4% and 9% respectively of emissions. Conversion to renewable energy sources, through bringing geothermal power generation on line will reduce the energy sectors emissions by an estimated 98.6%. Under the strategy Transport would reduce its emissions by 17%. The estimated cost of the measures was estimated to be US$99 million in 2012. Dominica's forest cover was estimated to sequester 100 Gigagram of CO_2 annually implying that under the Strategy by 2030 the country would be at least carbon neutral. However, this figure was estimated before the impact Hurricane Maria and Tropical Storm Erika on forest cover and composition. The two events led to a decrease in forest density and reduced canopy cover, favouring more heat tolerant species, and reduced seed germination.

The proposed interventions for Dominica will have a limited mitigatory effect as the country is replacing its fossil fuel power generation capacity with geothermal. The mitigatory effect will be due the replacement of the water utility's standby generation capacity with renewable energy sources. This is in line with the National Resilience Development Strategy Dominica 2030 which includes proposals for the investigation of water resources to support hydropower as well as a commitment to support the introduction of other forms of renewable energy such as solar power. The introduction of renewable energy generation at 21 of DOWASCO's pumping installations over a 30 year period would result in avoided emissions amounting to 17,767 tCO2eq. The overwhelming benefits will be the adaptive responses to the impact of climate change and variability on the water sector. The adaptation needs were identified in the 2012 INDC report to the UNFCCC as well as the Low Carbon Climate Resilient Development Strategy 2012-2020 and the Growth and Social Protection Strategy 2012-2014. The climate impacts identified in these documents include threats to water quality from extreme events exacerbating agrochemical run-off, increasing turbidity due to more intense rainfall events, seasonal reductions in stream flows associated with changes in rainfall patterns and increased temperatures. Adaptation interventions to address the climate impacts will benefit supply systems unable to meet demand in the dry season and supply small population centres separated by rugged terrain whilst mitigation interventions will mitigate the high cost associated with pumping, and the need to improve water use efficiency. Adaptations proposed respond to increases in extreme events and climate variability giving rise to damage to critical infrastructure such as water and wastewater systems, increases in landslides damaging water transmission mains, damage and degradation of watersheds affecting water quality and water yields; climate variability changes in rainfall patterns and higher temperatures leading to increased water shortages and droughts, increased losses from water systems, loss of hydropower generation capacity, increased cost of treatment due to changes in water quality, and overall increases in cost of service provision. The knock-on effects of decreases in adequacy, accessibility, assurance and affordability (Cashman, 2014) will be felt in all sectors of the economy, not just those reliant on the water and wastewater services. The proposed measures provide a robust adaptive response to manage these challenges.

The proposed project activities respond to Dominica's NDC through the use of renewable energy for pumping reducing the use of fossil fuels and GHG emissions and through reductions in abstraction leading to less pumping being required. Dominica's 2nd National Communication to the UNFCCC highlighted the following actions for risk reduction and adaptation to climate change: collaborative working between DOWASCO, the Agriculture, Forestry and Environment departments, watershed management, increased public awareness of climate change, integration of climate change projections into water sector plans and operations, development of capacity to respond to climate change, and the application of integrated water resources management. All of which are core activities propose in this project. Dominica's climate response actions are guided by the Low Carbon Climate Resilient Strategy, the National Development Resilience Strategy 2030, the Dominica Climate Resilience and Recovery Plan 2020-2030, and the Climate Resilience Act of 2018 which set up the Climate Resilience Execution Agency of Dominica. These plans and strategies stress the need for the use of renewable energy, mitigation of flood risks, community emergency preparedness, and growing the economy. All these elements are addressed through the proposed actions; in particular, a climate resilient water sector is essential for commercial activities, tourism and industry as well as for human dignity. Other supportive interventions and on-going projects, complementary to this proposal include the UKAID/CDB funded Technical Assistance programme to upgrade DOWASCO's water supply and wastewater management systems, community resilience through the Basic Needs Trust Fund and interventions in Housing, Transport, Community Resilience and Education through CREAD utilising funds from the Dominica Citizenship By Investment scheme.

Root Causes and Barriers

The national reports for the water sector of Dominica indicate the root causes of the challenges to maintaining security and availability of water supply under both current and future climatic conditions. The challenges as described by the Organisation of American States (OAS) as well as internal government agencies can be summarised as:

1. Limited access to hydro-climatic data which makes effective management of a climate resilient water sector difficult,
2. Inadequate monitoring and assessment of water resources which corresponds to a lack of technical and organisational capacity to analyse the impacts of climate change,
3. Lack of tools for water management decision support systems to inform policy, plan adaptive interventions, and operate water systems to minimise the impact of climate change,
4. Insufficient funding to establish hydro-climatic data collection networks and support capacity building,
5. Inadequate access to finance options to invest in climate resilient water infrastructure,
6. Weak inter-departmental and inter-sectoral coordination for the integrated management of water resources
7. Lack of regulatory frameworks and mechanisms to effectively manage water resources including:
    a. A ratified and enforced Integrated Water Resources Management (IWRM) policy
    b. General enforcement of legislation enacted to protect water resources
    c. An independent pricing commission
8. Inadequate understanding among stakeholders of the impact of climate change on future water resources

Please indicate how the project fits in with the country's national priorities and its full ownership of the concept. Is the project/programme directly contributing to the country's INDC/NDC or national climate strategies or other plans such as NAMAs, NAPs or equivalent? If so, please describe which priorities identified in these documents the proposed project is aiming to address and/or improve.

Describe the main root causes and barriers (social, gender, fiscal, regulatory, technological, financial, ecological, institutional, etc.) that need to be addressed. Where relevant, and particularly for private sector project/programme, please describe the key characteristics and dynamics of the sector or market in which the project/programme will operate.

B.2. Project/Programme description (max. 3 pages)

Describe the expected set of components/outputs and subcomponents/activities to address the above barriers identified that will lead to the expected outcomes.

The overall goal of the proposed project is complement existing adaptation interventions (e.g. the DVRP), implement measures proposed in the country's climate adaptation and resilience building strategies (outlined above) by building a climate-resilient water sector by a) integrating climate-related risks into the sustainable use of water resources, b) developing and deploying tools to manage the impact of climate change and climate variability on water resources and ensure that the additional stresses can be moderated, c) building technical and organisational capacity for assessing and operationalising the impact of climate change on water resources d) developing climate resilient infrastructure e) reducing CO_2 emissions, f) promoting actions that encourage the efficient use of water among users, and g) creating a regulatory framework that mainstreams climate change adaptation.

The expected outcomes are a strengthened institutional and regulatory system for climate responsive planning and development, and strengthened adaptive capacity and reduced exposure to climate risks. The actions are consistent with the existing priorities of the Government of the Commonwealth of Dominica and in particular DOWASCO, the agency responsible for the management of water resources and the provision of water services. The proposed interventions have been designed to complement and support the on-going Water Sector Strategic Development Programme (WSSDP) being undertaken by DOWASCO and the Climate Resilience Execution Agency of Dominica (CREAD). Furthermore, the actions are consistent with the *Caribbean's Implementation Plan for Development Resilient to Climate Change Implementation Plan* and the *Regional Strategic Action Plan for the Water Sector in the Caribbean to Develop Resilience to the Impacts of Climate Change* (RSAP). The proposed project actions address the climate change impacts on the water security of the most economically important part of Dominica, benefiting at least half of the island's population, as well as the economic sectors which are heavily dependent on water availability and accessibility. The project comprises 5 components, which respond to the challenges identified above.

Component 1: Hydrological Information Tools for Water Resources Management

As aforementioned in section B1, climate change and increased climate variability is already having an impact on the ability of Dominica to ensure water security through its management of water resources and provision of water services. Changes in rainfall and temperature are decreasing stream flows, modifying baseline conditions, and variability has increased the recurrence of droughts and compromised security of supply. Milley et al. (2008) highlight the fact that assumptions of stationarity are dead. That is, management assumptions based on past hydroclimatic performance are no longer adequate for decision-making regarding the future. A tool is required to inform the management of water resources in the context of climate change. The tool has to be capable of addressing the impact of climate change on the long-term sustainable yields of water resources as well as the shorter term impact of climate variability on resource availability, and to support decisions on resource utilisation, particularly under low flow and drought conditions. Dominica's experience of Tropical Storm Erika and Hurricane Maria have also highlighted the effects of flooding associated with extreme on infrastructure and livelihoods in general events and on water supply in particular e.g. supply intakes, water mains, tanks, pump stations, and sewer systems. The climate resilient water resources management tool would incorporate downscaled climate data, hydroclimatic data, conjunctive use of surface and groundwater resources, and other physical parameters. Integrated water resources management tools are commercially available e.g. MIKE HYDRO Basin and SWAT-MODFLOW, Openflow FLOODS; their use and the necessary associated capacity building would address barrier 2. identified in the section above. Due to the lack of a water resources unit there is little capacity to manage climate change impacts on the water sector, placing it at grave risk, as has already been demonstrated in recent years.

OUTPUT: Tools that enhance the capacity to generate and use climate Information

In order to use a water resources management tool, good quality, reliable and consistent time series hydroclimatic data, and parameters to characterise the water catchments are necessary. The lack of hydro-meteorological information and a monitoring network to collect it had been identified as a major shortcoming and it is being addressed under the Disaster Vulnerability Reduction Programme (DVRP) through the purchase and installation of 43 new monitoring stations although the original assessment recommended at least 53. The country is also working with the Caribbean Institute for Meteorology and Hydrology (CIMH) to upgrade its monitoring network. Therefore, it is expected that good quality data will become increasingly available. This would address barrier 1. identified above. In order to implement the Integrated Water Resources Management Tool (IWRMTool), the following activities would be undertaken.

Activity 1.1: Hydrometeorological data generation to provide information related to climate induced changes in groundwater and surface water behaviour (quantity and quality) Including the following. Identification of groundwater potential as a conjunctive use source particularly as backup sources during catastrophic events. Very few groundwater resources – springs, are utilised in conjunction with surface water, supplementing supplies during dry season, drought conditions and when extreme rainfall damages surface water intakes and flooding adversely impacts surface water quality. Under climate change such events are predicted to become more frequent. However, there has been little investigation of groundwater potential, even though it assumed to contribute significantly to stream baseflows, particularly during low rainfall and drought periods. Given the more consistent nature of groundwater and its lower susceptibility to damage from extreme events it is an important back up source of supply. Therefore, it is considered by DOWASCO to investigate if there is sufficient potential to justify its development as a back-up supply for Roseau during extreme events.

Gather hydroclimatic data to parameterise the catchments and surface water resources to be incorporated into the IWRMTool. A weather and streamflow monitoring and data collection and management network is being established throughout the island by the Meteorological Service (operational by end 2020) but an addition 10 automatic discharge measurement stations are required as not all of DOWASCOs needs are covered by the system being implemented. Additional information will be required and obtained from the use of drones and remote sensing. The existing LIDAR information will be reinterpreted to provide information on land cover, land use change and vegetation indices. This will be correlated with the forestry mapping work also being undertaken as part of the DVRP programme.

Water quantity and quality deteriorates during the dry season, periods of low rainfall and droughts and, increasingly, requires more treatment. Intense rainfall and extreme events are increasingly a major issue affecting supply. Whilst extreme events are destructive of the infrastructure even

smaller, intense rainfall events cause water quality issues by mobilising huge amounts of sediment, resulting in water treatment works having to close down. In order to better understand the changes associated with climate change more regular and consistent data collection will be needed. More data will be required in order to incorporate this important element into the IWRMTool. Information on associated land use and land use change (LULUC) which affects water quality will be gathered using remote sensing and drones to complement water quality data and incorporate the impact of extreme climate events.

Implement data management systems to interface between the monitoring networks in DOWASCO and other information providers e.g. Meteorological Service, Domlec, Lands and Surveys Department, and the Forestry Department, and the IWRMTool.

Activity 1.2: Using the Integrated Water Resources Modelling Tool with downscaled climate information generated by the UWI Mona Climate Studies Modelling Group and the Caribbean Community Climate Change Centre provide assessments of catchment responses and water yields under existing and future climate conditions for operational and climate resilient infrastructure planning purposes, conjunctive use of surface and groundwater resources, for hydropower scheduling and for agriculture planning. The tool will also address issues associated with flooding events given the impact of catastrophic flooding along river courses and downstream, coastal areas where the majority of the population live, particularly on the western side of Dominica. This will provide support and input into disaster risk assessment and management by analysing areas at risk of pluvial, fluvial and conjunctive flooding. The tool will support the extension of Water and Sanitation Safety Plans, in conjunction with Caribbean Public Health Agency (CARPHA) and Pan-American Health Organisation (PAHO), and Drought Management Plans that respond to climate change and climate variability.

Component 2: Climate Resilient Water Supply Management

OUTPUT: Decision tools for the allocation of water resources, and climate resilient planning and operation

This component implements a climate resilient water supply management tool that uses information from the IWRMTool on the climate resilient management of safe yields and conjunctive use of water resources to be balanced against water use and consumption to a) determine short, medium and long-term system supply requirements taking into account the impact on the water supply systems of climate change b) associated need for system modification and expansion, identification of climate vulnerable infrastructure components such as intakes and transmission pipelines, the need for contingency storage under climate change, c) the development of demand management initiatives, and d) seasonal and climate variable tariff adjustments.

Activity 2.1: Using the information generated by activities 1.2 to 1.5**, i**mplement a climate resilient water supply management tool, incorporating systems hydraulic models to inform the management and operation of the water supply systems, assess the integrity and capability of the water distribution systems to manage supply fluctuations, meet future water demand, inform systems upgrades, and optimise systems operation, energy use, and optimisation of the use of supply sources.

Activity 2.2: Application of hydro-informatics (including data mining and machine learning techniques) to detect trends, relationships and impacts of climate variability and climate change on water use and availability, to inform decision making, and the operation and management of the water systems.

Activity 2.3: Implementation of collaborative decision support system that focuses on climate change challenges and decisions. Bringing together technical and social approaches, modellers and other key stakeholders to develop consensus on the key future climate challenges, uncertainties and impacts. Address complex water management problems to develop climate adaptive solutions and interventions that respond to future conditions including climate change and climate variability. The challenge that this activity addresses is 'what level of adaptation should there be and at what cost?'. This activity will support and contribute to the Resilient Dominica Physical Plan. It will engage a broad cross-section of stakeholders including but not limited to Forestry, Agriculture, Met Services, Environmental Health, Domlec, CBOs and NGOs. Expert input will be provided through UNESCO IHP Centres of Excellence. This activity draws on the information generated by activities 1.2 to 1.5 as well as 2.1 and 2.3 to be able to generate operational and planning information that would support the agriculture, forestry, tourism, economic development, power generation sectors, support activities 3.3, 3.5, 3.7, 3.8, 4.2 – 4.4 and 5.

Component 3: Climate Resilient Water Services

OUTPUT: Climate resilient water services that increase water security and reduce fossil fuel use

Activity 3.1: Resource use optimisation through Non-Revenue Water Loss Reduction. Losses from water distribution systems are high, calculated as 58.5% of input (Fichtner, 2019), which contributes to the overuse of water resources and increased energy use and emissions. The accuracy of the losses is limited since the volume of water sent through the distribution systems are not measured while all customers are not metered. Implementing a NRW Reduction programme will reduce the amount of water being abstracted from surface water resources, offsetting reductions in safe yields of surface water resources due to climate change. It will also improve the financial position of DOWASCO through reduced operation and maintenance costs. This will be achieved through the implementation of a Non-Revenue Water Loss Reduction programme, extending improved metering beyond Water Area 1, and upgrading of the existing SCADA and Management Information systems.

Activity 3.2: Pipeline replacement programme to improve the capacity of the water supply network resilience against the impact of extreme events on vulnerable parts of the system, improve flow capacity to improve supply and reduce energy use, and replace severely deteriorated pipelines and contributing to NRW Loss reduction.

Activity 3.3: Provision of Distributed Strategic Water Storage as an adaptation measure against climate induced water supply interruptions and outages. The provision of storage within the water transmission and distribution systems will offset the impact of climate change on surface water flows, increase supply system resilience to interruptions caused by more frequent droughts and extreme rainfall events disrupting supplies and adversely affecting water quality. Actions include improved standards for household systems, regulatory guidelines, and the provision of storage facilities. Partner with ongoing and planned water storage initiatives across Ministries and government agencies and liaison with CREAD to support the Community Emergency Resilience Initiative (CERI) through the provision of small community reservoirs to provide 14 day's contingency storage.

Activity 3.4: Provision of PV renewable energy systems to power water supply systems[13]. Dominica has some of the costliest energy in the Caribbean. Whilst DOWASCO uses gravity systems where it can, due to the nature of the terrain, re-pumping is required to service areas in and around Roseau. Escalating costs associated the high cost of energy can be reduced significantly by introducing renewable energy systems to

[1313] The local private sector has developed suitable technology.

replace the standby generators that had to be put in place after Hurricane Maria. This will also add resilience to the water supply system. It can also be noted that DOWASCO has installed PV systems at its Roseau sewage treatment works and is in the process of installing a further three PV systems at pump stations. Furthermore, there are private PV systems already installed in Dominica so the country has a developing market.

Activity 3.5: Provision climate resilient water supply systems for communities across the island which are not serviced by DOWASCO. Establishment of community based operation and management arrangements in conjunction with DOWASCO to ensure that communities are better prepared to manage the impact of climate change on their water systems.

Activity 3.6: Provision of a cost of service climate Activity Based Cost Allocation tool to provide information on the cost of service provision, to capture the capital and operational costs associated with climate change (climate change premium), inform seasonal revenue assessments, climate change adjustments and demand management incentive support programmes.

Activity 3.7: Integrated Water Resources Management and upgrading of governance and regulatory oversight, and incorporation of climate change, disaster management, cross-sectoral collaboration and participatory practices within water sector policies and operations.

Activity 3.8: Water and energy efficiency support including audits, monitoring and optimisation of energy and water use efficiency, and efficiency improvements to inform the implementation of appropriate maintenance regimes. The Energy Unit has previously supported and promoted energy audits this was of a limited extent but together with other agencies (e.g. Domlec) there is an opportunity to expand the scope through an independent organisation and to include water management. The activity will partner with organisations to create opportunities for demand-side management. Through supporting and setting up a WESCO (water and energy services cooperative) initiative resource use efficiency and climate resilience will be supported, including a revolving fund mechanisms, audits, renewable energy, and resource efficient fixtures.

Component 4: Capacity Development for the Management of Climate Adaptation

OUTPUT: Increased knowledge and capacity to manage climate adaptation and apply climate-resilient measures

In collaboration with local partners i.e. the Dominica State College and other local institutions address the knowledge, capacity development and service delivery needs by developing programmes to support the implementation of activities under components 1 – 3 above. The emphasis will be on developing and promoting activities 4.2 and 4.3 but recognising that some higher level studies would also be required.

Activity 4.1: Scholarships to support tertiary level studies with the aim of bringing on the next generation of water sector professionals.

Activity 4.2: Capacity building and continuing professional development through the implementation of short courses and certificated programmes. This activity supports activities 1.1-1.6, 2.1-2.5, 3.1-3.8 and would address, inter alia, topics such as: application of water resources assessment technologies, climate change and water resources modelling, modelling of water distribution systems, management of water distribution systems, GIS, hydro-informatics, water energy and resource use efficiency assessments, installation of water savings measures, installation and operation of renewable energy systems, project management, business development and management, and financial management. The activity will engage with regional and national training partner institutions e.g. Dominica State College and the private sector to provide recognised certificated courses and activities. Within the project, partners will be encouraged to nominate individuals and to recognise participation in capacity building in furthering persons' careers.

Activity 4.3: Technical and Vocational Education Training programmes would support all of the activities included under components 1, 2 and 3 including the training and skills upgrading for technicians, artisans, and others.

Activity 4.4: General outreach and awareness programmes for stakeholders and interested members of the public, focusing broadly on water and climate related topics, programmes would be open to participants across the Caribbean.

Component 5: Awareness and Communication

OUTPUT: Increased adaptive capacity, awareness and reduced exposure to climate risks

The primary aim of this component is to raise stakeholder awareness of project objectives and achievements in relation to the wider context of adaptation and resilience to climate impacts in the water sector. Proposed storylines (to be confirmed through pre-launch feedback) will focus on: Climate and water, Gender & social inclusion, Community action, National planning, and Regional learning.

Activity 5.1: Stakeholder profiling - To identify and group stakeholders according to their relationship to the project, information needs, and communication preferences.

Activity 5.2: Story development - To develop content reflecting project priorities and which engages and motivates target audiences.

Activity 5.3: Channel development - To identify, plan and set-up media channels that respond to target audience preferences.

Activity 5.4: Communications - To promote and engage two-way conversation with target audiences to advance component objectives.

Activity 5.5: Fielding feedback - To ensure target audiences feel they have a say in project developments, and that their feedback / inputs are considered appropriately by project proponents.

Project Management

The project will be managed by CCCCC, the AE and co-implemented by DOWASCO. In order to effectively implement and manage the project with its many components Project Coordinating Units will be set up within the CCCCC (Accredited Entity) and the Water Utility (DOWASCO). The Unit with the CCCCC will be responsible for all major transactional obligations such as budgeting, procurement, consultancy services and coordination of training and capacity building. The Unit within DOWASCO will report to the CCCCC but have operational responsibility for activities such as planning and coordination of partners and collaborators. It will also have responsibility for the awareness and communications activities including the promotion and mainstreaming of gender equality and social inclusion (GESI) in the programme and by extension into DOWASCO. A separate section dedicated to monitoring, evaluation and quality assurance will be set up the CCCCC Unit. Furthermore, the CCCCC gender specialist will work with and support the GESI specialist within DOWASCO.

In terms of rationale, please describe the theory of change and provide information on how it serves to shift the development pathway toward a more low-emissions and/or climate resilient direction, in line with the Fund's goals and objectives.

Theory of Change

The project's TOC is set out in the accompanying schematic below in Figure 6. As has been demonstrated above, the water resources and the water infrastructure of the Commonwealth of Dominica will be severely impact by climate change, and increasing significantly the challenges that water managers and the water service provider will have to face as a result. This will add to their operational and managerial burden, a burden that will put an unconscionable strain on their limited resources, especially financial resources. The Assumptions and Barriers facing the water sector

in the country are highlighted in Figure 6, the way in which he proposed Project Activities addresses them is also indicated. The Outputs from the Project Activities can be characterised broadly as; putting tools, knowledge and capacity in place to enable the water sector to adapt to the additional burden of climate change and climate variability, increase water security by implementing climate-resilient measures, and increasing the adaptive capacity and awareness of the public to be able to reduce their exposure to climate related risks. The Outcomes will therefore be strengthened water institutions and management instruments leading to reduced vulnerability and exposure to climate risks and therefore better utilisation of scarce resources and ability to motivate the mobilisation of financial and economic resources and climate investment to reduce damage and losses whilst maintaining and enhancing service provision. If the proposed programme measures and activities are put in place then the country will be able to sustainably use its water resources, provide a resilient water service that will support social well-being, ecosystem services and underpin economic development.

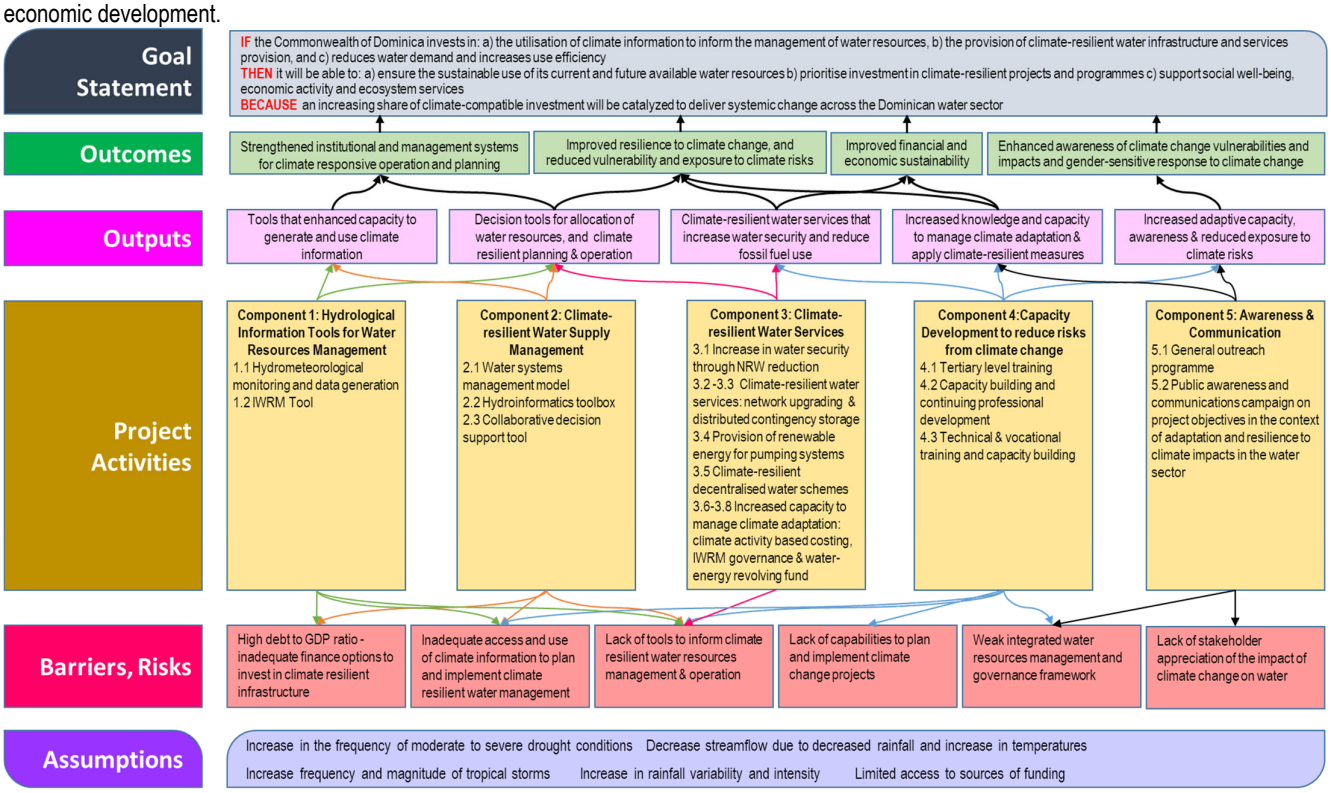


Figure 6: Theory of Change

There is a relatively high level of understanding of the potential effects of different emissions scenarios on Caribbean climate change and there have been significant advances in downscaling these impacts. However, the extent to which climate change will impact the water resources of Dominica is not as well understood other than the expectation that it will negatively impact on water availability. This is partly due to the size of the country and the complex interrelationship between climate and terrestrial systems. Furthermore, the lack of understanding is partly due to the complex interrelationship between climate and terrestrial systems, but also due to the inability to access good quality data due to the paucity and completeness of water resources data, as well as the lack of resources and capacity to undertake the necessary studies. This is compromising the ability to manage the impacts of climate change on future water availability, which is critical to the development of climate resilient water infrastructure, particularly as infrastructure works implemented today are long-lived investments. What is implemented today has to function under conditions up to 50 years and hence be able to cope with the impacts of sea level rise, flooding and drought conditions. The focus on quantifying climate induced changes in water availability and the responses needed to adapt to a new normal will have significant implications for how water resources are used and the types of investment required, avoiding short-term maladaptation and 'locked'-in expense. Focusing on addressing the key challenges of data and capacity it will bring about a paradigm shift to evidence-based investment decisions incorporating the additional stresses on water availability into the planning of climate adapted and resilient infrastructure and development. It would mobilise finances to support climate-compatible investments. The need to address and minimise the impacts of climate change on resources and water supply systems places a greater emphasis on the need for demand-side management with opportunities for the private sector to offer services aimed at increasing water use and operational efficiencies. This is necessary to support societies, economies, power generation and agriculture all of which rely to a greater or lesser extent on knowledge of the availability of water.

Maintaining water security and adapting to climate change means increasing supply and decreasing demand. Tariffs and economic incentives that specifically include climate change effects in their design have the potential to influence consumption behaviour and act as a dynamic adaptation incentive supporting demand side management of a scarce resource. In the context of Dominica, securing the future of water availability directly translates to the securing the future of energy via hydropower generation. It is estimated that Dominica Electricity Services (DOMLEC) consumes more than 22,700 m^3 of water per day at its four hydro-electricity plants which have in the recent past contributed up to 35% of electricity generation. Three of the plants are located on the Roseau River, which supplies the capital Roseau, meaning that a conjunctive use approach becomes critical to reconciling competition within the catchment.

Training and capacity building are key to being able to realise and build on the proposed initiatives. At the same time the investments will create opportunities but to realise them fully the intention is to provide skills training and development through engagement with tertiary and

vocational institutions. These will be able to draw on the training and capacity building programmes with knowledge partners, experience gained in the execution of the project, with lessons incorporated into programmes. Awareness raising and communication with stakeholders and the public will be vital to maintaining support for the initiatives the project will develop 'appropriate and best practices' demonstrating how to motivate climate resilient and compatible investment. Engagement activities will enhance awareness of climate risks and impacts as well as opportunities from this project that support better responses and mitigation of climate change impacts. Outcome will be disseminated through regional organisations such as CARICOM, the OECS and others to bring about a change in approach from short-term, reactive approaches to proactive, future-focused planning and investment.

Describe how activities in the proposal are consistent with national regulatory and legal framework, if applicable.

Consistency with National, Regulatory and Legal Frameworks

The project contributes to several frameworks including the Low Carbon Climate Resilient Development Strategy, Dominica's National Energy Policy, the Water Sector Strategic Development Programme, the National Resilience Development Strategy, and the enactment of the Climate Change, Environment and Natural Resources Management Act. The work will be implemented through DOWASCO, which is the legally responsible body for the provision of water and wastewater services throughout Dominica. Furthermore, DOWASCO has the responsibility for the management of the water resources of the country. The Dominica Meteorological Service has the primary responsibility for the collection of climate information, while the Ministry of Agriculture specifically operates rainfall stations at various agricultural stations across the island. The responsibility of collecting streamflow data is shared by DOWASCO and the Forestry Division of the Ministry of Agriculture from respective areas managed by these agencies. The Environmental Health Department is responsible for testing and regulating potable water quality. The energy utility DOMLEC is responsible for power generation and distribution and also licenses independent power provision. Licenses for power generation by DOWASCO would be issued by the Independent Regulatory Commission.

Describe in what way the Accredited Entity(ies) is well placed to undertake the planned activities and what will be the implementation arrangements with the executing entity(ies) and implementing partners.

The Caribbean Community Climate Change Centre (CCCCC) coordinates the Caribbean Region's response to Climate Change, working on effective solutions and projects on Climate Change adaptation and mitigation. This project builds upon the Centre's more than 10 years of experience as a regional leader implementing catalytic pilot/ demonstration type projects in the Caribbean region, and scaling these up with national governments. It also builds on water sector projects carried out by the Centre including the Water Sector Resilience Nexus for Sustainability in Barbados funded by the Green Climate Fund. The Centre has established key partnerships with contributing organisations such as the Caribbean Institute for Meteorology and Hydrology, The University of the West Indies, International Atomic Energy Agency. The Centre has a track record in all three countries of implementing projects related to CC adaptation and mitigation, providing local experience and knowledge that contributes to successful project implementation.

Please provide a brief overview of the key financial and operational risks and any mitigation measures identified at this stage.

Significance/Impact	**High**	**3,5,7 13,17**	**4,19**	**1,6,10 15,16**
	Medium	**18**	**2,11,12 14**	**9**
	Low		**8**	
Summary of Financial and Operational Risks		**Low**	**Medium**	**High**
		Probability of Occurrence		

The COVID-19 pandemic has served to expose some of the fragilities of aspects such as supply chains, and working arrangements. Although the water sector in the Caribbean has been coping the pandemic through the implementation of measures to prevent community level infection these have restricted the degree to which utilities, suppliers and service providers can work to support the sector effectively. It has also challenged the financial position of governments and utilities with impacts on their ability to be able to continue to provide the services the public requires. The affect is all encompassing , is f high significance and highly likely to be with us for some time to come. It will have far reaching consequences for the successful implementation of the project if it is not planned for in detail at the outset for every activity.

#	Potential Risk	Impact	Significance level (H, M, L)	Probability of Occurrence (H, M, L)	Proposed Mitigation Measures
1	Loss of equipment due to extreme weather events and vandalism	Loss of data and additional cost of reinstatement	H	H	Design and use of robust equipment, installation in secure locations. Build in redundancy. Conduct outreach and awareness raising programme, involve local communities
2	High cost of operating and maintaining networks	Neglect and deterioration of the networks over time	M	M	Use of technology to minimize life cycle and operation and maintenance costs which can be more than capital costs over the lifetime of the assets. Explore revenue generation opportunities and the potential role of the private sector. Motivate value of the data
3	Lack of capacity and knowledge to carry out assessments	Inability to process data and produce information necessary for climate assessments	H	L	Training and capacity development programmes coupled with requirements for continuing vocational and professional development

4	Lack of ability to collect and store and share data	Loss of data, data inaccessible	H	M	Upgrade ICT infrastructure, work with partners to develop sharing protocols
5	Lack of capacity to undertake analyses and modelling	Inability to provide information for future planning and climate adaptation can lead to sub-optimal and locked-in investments	H	L	Training and capacity development programmes coupled with requirements for continuing vocational and professional development
6	Lack of data to develop IWRMTool	Unable to calibrate and validate models for operational purposes	H	H	Frequent updating of models as more data becomes available. More rigorous validation checks
7	Stakeholders unwilling to participate in Collaborative Modelling	Would not be able to identify the range of issues to be addressed in modelling. Stakeholders and collaborators could dismiss recommendations as inappropriate	H	L	Awareness raising and engagement with collaborators to highlight co-benefits and foster ownership and buy-in
8	Lack of baseline information to initiate an NRW loss reduction programme	Creates additional work needed before NRW programme can be designed.	L	M	Include an assessment of the state of baseline information as part of the design and development of the component
9	Lack of organisational capacity to implement NRW loss reduction	Limits the ability to undertake NRW loss reduction programme, increased levels of frustration at lack of progress and loss of support. Increases the programme time.	M	H	Consider using contractors to implement and co-manage the water loss reduction programme
10	Insufficient finance to undertake pipe replacement programme	Limits the effectiveness and degree to which losses can be reduced. Maintains excessive demand on water resources	H	H	Develop financial case for investment, liaise with ministries of finance and IFI's to secure co-funding
11	High cost of undertaking a NRW loss reduction programme	Limits the effectiveness and degree to which losses can be reduced. Extends the time required to bring losses levels down, may result in 'fatigue' and frustration and a loss of urgency of the need to address the problem. Maintains excessive demand on water resources	M	M	Develop financial case for investment, liaise with ministries of finance and IFI's to secure co-funding. Foster political and community interest. Consider utilising performance based contract to improve efficiency and reduce costs.
12	Unable to foster water savings service partners and protocols	Reduces the ability to realise water efficiency savings	M	M	Engage with the business community and entrepreneurs to promote the initiative.
13	Insufficient number of sites for viable introduction of RE systems	Roll out will be limited and potential financial benefits to water utilities reduced.	H	L	Develop financial case and consider both on and off-site options for implementation.
14	Unable to develop reinvestment financial vehicle	Unable to reinvest savings and income in infrastructure upgrading.	M	M	Engage with the financial sector and the business community.
15	No review of cost of service and tariffs	Inability to secure investment in the improvement of the water sector, deterioration of service under climate change	H	H	High level engagement with politicians and decision-makers & public engagement
16	Unwillingness to implement IWRM recommendations	Poor governance and oversight, continued inefficient service delivery and utilization of water resources	H	H	High level engagement with politicians and decision-makers
17	Lack of partners willing to collaborate in delivering training and capacity building	Limits and delays the development and implementation of many of the component activities. Lengthens the learning cycle.	H	L	Early engagement in the identification and dialogue with potential partners. Develop a cadre of knowledge providers and develop capacity among regional knowledge providers to backstop.
18	Awareness and communications ineffective	Indifference and lack of cooperation with potential partners, communities and stakeholders. Increases the work load of the project and diverts time and effort to addressing concerns.	M	L	Proactive approach that includes outreach to check on effectiveness, incorporate feedback mechanisms and checking protocols.
19	Project complexity challenges ability to manage and implement it	Failure to implement the elements of the project and negative impact on the sustainability of the project initiatives after exit.	H	M	Recruitment of highly qualified and experienced staff, with regional knowledge and technical expertise. Create and empower national teams.

B.3. Expected project results aligned with the GCF investment criteria (max. 3 pages)

The GCF is directed to make a significant and ambitious contribution to the global efforts towards attaining the goals set by the international community to combat climate change, and promoting the paradigm shift towards low-emission and climate-resilient development pathways by limiting or reducing greenhouse gas emissions and adapting to the impacts of climate change.

Provide an estimate of the expected impacts aligned with the GCF investment criteria: impact potential, paradigm shift, sustainable development, needs of recipients, country ownership, and efficiency and effectiveness.

Impact Potential

Approximately 62% of the population lives in the low lying coastal areas which are vulnerable to flooding, storm surge and sea level rise. The implementation of more climate resilient water infrastructure and the development of a resilient water sector would benefit the population. Indirectly, a greater number would potentially benefit from the intervention through adoption of the methodologies rolled out by the project. Apart from maintaining citizens' Human Right to Water, the impact potential on water services is significant. It would improve water security in the face of climate change, secure domestic water supplies and underpin economic development providing employment opportunities. The benefits of more secure, reliable and affordable water supplies would proportionately benefit lower socio-economic income households including female-headed households. This is all the more important given that Dominica has suffered from two recent extreme storm events which have adversely impacted the economy and households. Whilst improving the ability to manage supplies from existing surface water sources will contribute to water security this would not be enough to offset the projected increases in variability and decreases in streamflow. The conjunctive use of surface water, ground water and rainwater resources within the limits of safe and sustainable yields and incorporating them into the supply system for Roseau and low lying regions would further secure future water supplies. This would secure supplies to up to 80% of the population, including the capital city where the majority of economic activity takes place.

During the drier months of the year, the share of the electricity generation by hydropower in Dominica can be reduced by about 50%, declining from the installed capacity of 6.5 MW to 3.2 MW. With climate change there will be both a decrease and greater variability in streamflow. At the same time there would be increased competition for water to supply Roseau. Better information on the impact of climate change on river flows would contribute to the management of existing hydropower plants and inform the planning and development potential of hydropower in Dominica.

Access to better and more targeted climate and water availability forecast information would improve water security and ensure more consistent water availability. Increased certainty contributes to a supportive environment for economic development, particularly in a country where uncertainty creates an investment barrier. Improved forecasting would inform the use of surface water in the agricultural sector which constitutes the main economic activity contributing about 12% to Gross Domestic Product (GDP). The effects of the 2009-2010 drought underscore the need for better forecasting as banana production was reduced by 43% as of March 2010, resulting in significant loss of foreign exchange through export. Improvements in forecasting would also better inform decision-making by DOMLEC, users of water for hydropower generation. Furthermore, better climate and water availability forecasting can improve the efficiency of water use in sectors which are growing in their importance to the GDP in the face of climate-related economic losses. For instance, the withdrawal of Ross University School of Medicine from Dominica in 2018 was a direct result of Hurricane Maria and Tropical Storm Erika, a loss equivalent to 7% of GDP. Despite vulnerability to extreme events, tourism has grown in importance to economic development and the government has explored relatively new economic opportunities such as the export of bulk and bottled water.

The level of Non-Revenue Water (NRW) in Dominica is estimated as 58.5% of production, as of 2019. As stated in Component 3.1, it may be that the true percentage of losses could be more since the volume of water entering the system is not measured. Moreover, considering the devastating impacts of tropical cyclonic events to the water sector since 2007, it is also probable that the percentage loss has increased even with rehabilitation efforts. Regional best practice in Belize and Grenada has NRW levels at 24% and 28% respectively. The project therefore has potential to provide the relevant stakeholders with a more accurate understanding of losses to the water distribution system through improved monitoring at intake stations. Beyond the understanding, reducing real water losses can bolster water supplies and offset climate induced declines in streamflow, whilst reducing commercial losses will improve revenue generation. Furthermore, the expansion of rainwater harvesting as a best practice can reduce the demand on centralised water systems, particularly during supply interruptions and periods of drought, in effect extending available supply by a target of 10%.

The introduction of renewable energy at 21 pumping stations will reinforce DOWASCO's moves to reduce its GHG emissions, improve resilience and improve its financial position allowing for greater investment in upgrading its facilities and by improving its financial position it would be able to attract funding for upgrade and expansion projects. This will benefit customers connected to the DOWASCO water supply systems, approximately 18,500 households and 1,700 businesses.

The introduction of water and energy efficiency will create employment opportunities through the creation of saving service providers, similar to developments already taking place in Jamaica. By providing financial support through a revolving fund and through capacity building communities and households will be empowered to install renewable energy systems and energy efficiency measures that support low-emission sustainable development. Capacity building and training opportunities will promote and empower the 'next generation' of persons coming into the water and associated sectors.

Paradigm Shift

Innovation: This project is innovative because it embraces a shift in approach by creating the framework to a) use relevant data and incorporate it into management tools(Component 1) b) use management tools which explicitly include the effects of climate change (Component 2) c) provide the ability to manage and minimise the effects of climate change and climate variability on the operation and management of resources and supply (Components 2 and 3), d) implement climate resilient infrastructure (Component 3). Second, it supports the use of novel (e.g. IAEA's isotope hydrology) and traditional technologies to gather, analyse and utilise information and expands the use of management tools and support systems (Component 1). Third, it adopts a formal collaborative approach that embeds stakeholders in decisions over the choice of future climate resilient solutions (Component 2). Fourth, it creates opportunities for the involvement of the private and third sectors in demand-side water savings services provision (Component 3). Fifth, it proposes opportunities for improved governance, regulation and accountability of the water sector (Component 3). Sixth, it introduces the concept of using energy savings to fund infrastructure improvements (Component 3). Seventh, it proposes opportunities to adapt tariff to include scarcity premiums reflective of water availability (Component 3). Eighth, it supports the tailoring of water information to the needs of other sectors, reinforcing existing initiatives by the Caribbean Institute for Meteorology and Hydrology (Component 3). Lastly, it seeks to encourage and promote the bringing on of the next generation of employees in the water sector (Component 4).

Enabling Environment: The project will strengthen the enabling environment through a focus on reducing water losses and improving service provision. The establishment of a section dedicated to the reduction of non-revenue water provides a platform for infrastructure improvement and service provision, as does the implementation of renewable energy initiatives. It will do this by adopting approaches that are integral to Integrated Water Resources Management (i.e. strengthening the institutional framework, the enabling environment and mainstreaming management instruments). This will build on work that is being funded by the British Department for International Development (DfID) on reforming the institutional and regulatory framework of the water sector in Dominica. This will result in an enabling environment which will be better able to guide the work of DOWASCO not only in a more sustainable manner but also in a more financially sustainable way. Better information on the impact of climate change on water availability will benefit communities, the tourism industry, commerce and the agricultural sector.

Knowledge and Learning: The project includes specific provision for training and capacity building through the development of partnering arrangements which will go beyond the end of this project. A spinoff from this will be that these arrangements would also be extended to other Caribbean counterparts. Partnering with organisations such as the Caribbean Water and Wastewater Association, Global Water Partnership-Caribbean, CARICOM and the OECS Commission also provide opportunities to develop knowledge sharing and dissemination initiatives. Partnering with university and research institutions and researchers adds an academic dimension to the project. Outreach and dissemination of lessons learnt and skills developed is integrated into the awareness and communication component of the project. This represents the ability to catalyse impacts and through knowledge sharing to replicate and expand the impact beyond Dominica.

Scaling up and replication:

Through knowledge sharing and dissemination, through advocacy and demonstration of the efficacy of adopting the approaches developed by the project, and partly through engagement with regional organisations e.g. Caribbean Development Bank, Inter-American Development Bank and others, the potential for scaling up and replication in other jurisdictions could be realised. The engagement with regional institutions, regional projects and institutions providing capacity building will contribute to regional scaling up and replication opportunities through knowledge sharing

and mobilisation of finances. Improving the financial position of DOWASCO will allow it to invest further in climate resilient measures and infrastructure.

Contribution to country adaptation strategies and plans: Dominica's climate resilience and adaptation actions are coordinated by the Climate Resilience Execution Agency for Dominica (CREAD), a statutory government agency created in the wake of Erika and Maria, to rebuild Dominica as the first climate resilient nation in the world. Discussions have been held with CREAD to ensure that the proposed activities are aligned with their strategy and are complementary with existing and proposed interventions. Thus the project is alignment with Dominica's Low Carbon Climate Resilient Development Strategy Dominica's NDC and framework document for engagement with the GCF This project is also aligned with a result area "Well Planned Durable Infrastructure' identified in the Climate Resilience and Recovery Plan of CREAD. The GoCD has approved, a Climate Resilience and Recovery Plan (CRRP) one result area of which is 'Well-Planned and Durable Infrastructure', which includes water and sanitation. Furthermore, the project is in alignment with Dominica's Low Carbon Climate Resilient Development Strategy and would support the work of the Council on Environment, Climate Change and Development proposed in the Climate Change, Environment and Natural Resource Management Bill. The project would build on work initiated under the DVRP project and the Water Sector Strategic Development Plan (WSSDP) contract, funded by DfID. The work follows from the work commissioned by the Caribbean Development Bank 'Planning for the Integration of Climate Resilience in the Water Sector in the Caribbean: Dominica Investment Plan' (2019). Other flagship projects such as Housing Recovery, and the Climate Resilience and Restoration Project would all be supported, particularly the RWH component in housing and clinics.

Sustainable Development

The project contributes to the realisation of the following SDGs: SDG3: Good Health and Well-being as access to clean water is fundamental to achieving this goal; SDG5: Principles of Gender Equality & Social Inclusion will be embedded in the opportunities provided by the project; SDG6: Clean Water and Sanitation is the main focus of this project; SDG 7: Affordable and Clean Energy through the use of renewable energy for water and wastewater systems; SDG9: Industry, Innovation and Infrastructure is underpinned by water provision and resilient infrastructure is an objective of the project; SDG11: Sustainable Cities and Communities require adequate, affordable reliable water supplies to ensure that they are safe, resilient and sustainable; SDG12: Responsible Consumption and Production monitoring water use and consumption patterns contributes to this goal; SDG13: Climate Action combating climate change and its impact on water resources and those activities and functions that rely on water; SDG 15: Life on Land is protected by the sustainable use of terrestrial resources based on the development of Water Sharing protocols; and SDG17: Partnerships for the Goals through the inclusion of partners to provide specific inputs to the achievement of the goals of the project.

Social co-benefits: The population of Dominica is increasingly facing water scarcity particularly around the dry season where demand exceeds supply. Low-income householders are the most vulnerable to interruptions in supplies and long droughts. Implementing the project will improve access to more reliable water and reduce vulnerability associated with water scarcity, especially among low-income groups. Expanding the sources of supply and improving the supply network will reduce interruptions from extreme events, minimize health-related issues as contamination of supplies will be prevented due to source protection and improved leak repairs and reduced leaks and bursts in the distribution network. Leaks and pipe bursts can give rise to adverse health impacts due to cross-contamination and hence pose a health threat. Reducing water lossess addresses this. A secure water supply supports economic activity and reduces social stressors on the population. It is also in line with the target of restoring 60% of water services within 7 days in the event of a disaster (CREAD, 2019). The provision of distributed storage is a key part of this and will also support health benefits by reducing the use of unsafe and contaminated water in the aftermath of disasters and extreme events. The promotion of safe and efficient use of water also plays a role.

Economic co-benefits: Agriculture remains an important sector, contributing 12% to GDP and employment while tourism is growing in economic importance. Climate smart agriculture is being promoted as one of the pillars of Dominica's recovery. Having better information on water availability will be of benefit to farmers enabling them to offset the negative effects of declining rainfall and increasing drought occurrence which would lead to reduced income for farmers and declining food security. Shortages in water supply would also have a significant negative impact on tourism facilities. Records show that major droughts induce significant losses in these two sectors. Providing water supply and water resources management will foster further economic growth in both of these sectors, create jobs, raise the average income and thus increase purchase power. For agriculture this will be particularly the case if climate smart agriculture is more widely adopted as proposed. Additionally, a reliable water supply helps to mitigate the effects of long lasting droughts, and thus protects the basis for investment in economic growth. Climate-informed management of sources, increased reliability through reduced losses will benefit the domestic, commercial and tourism sectors and the wider economy. Water demand will be reduced by reducing physical water losses and improving the consumer behaviour. The outcome is that more water will be available for further economic ventures. In this way, both economic and social development will profit from more robust and climate-resilient water supplies. The estimated damages and losses to the water sector alone of US $16.8 million following the impact of Tropical Storm Erika provide an indication of the economic losses that will be felt by dependent sectors. Increasing recurrence of flooding, landslides, wind damage and its concomitant economic impacts implies that there would be an on-going and probably escalating economic impact associated with the cost of inaction. An appraisal of Dominica's water sector in 2019 looked at water related risks categorised by consequence and likelihood. It concluded that out of the 42 components, 23 were considered to be in the extreme risk category by 2050. The proposed set of interventions to address these risks was costed at US$54 million. Furthermore, the report stated that the cost of action was estimated to be a sixtieth of the expected damages by 2050. Another study concluded that by 2050 the cost of inaction would amount to 34% of GDP. The introduction of the proposed activities will contribute significantly to the reduction of climate related damages to the water sector and though the improvements in climate resilience benefit other economic sectors such as tourism and commerce that rely on a secure water supply. It is estimated that the net present value of the economic benefits associated with the interventions are at least US$80 million over a 30-year period[14].

Environmental co-benefits: Better utilisation of water sources, the introduction of demand side management, increased water capture and storage, reduction of water losses, and water efficiency measures will water demands. Less ground and surface water will need to be extracted, thereby decreasing stress on the overall water regime. The result is that, local flora and fauna will benefit from a more natural water balance, environmental flows can be maintained, and ecosystems will be less subject to water stress during water scarce events. Adopting collaborative modelling approaches will minimise potential conflict between water abstraction and environmental protection and provide encouragement for water

[14] Calculations provided in the Consolidated Assessment Report.

users to focus more on water efficiency. Better monitoring and data collection will improve understanding of environmental stresses and the need for ecosystem conservation. Improved water sharing and allocation will reduce environmental stressors whilst improved understanding of the relationship between water yields and watershed health will contribute to forest management. The collaborative decision-making provides a platform for this. In addition, better understanding of catchment functions and the impacts of flooding will feed into ecosystems management and the development of nature based solutions.

Climate mitigation co-benefits: Reduced emissions from water systems, reduced emissions from power generation through increased use of hydropower generation. The estimated net present value of the benefits, given in the Consolidated Assessment Report is US$0.7 million and a reduction of GHG emissions of 17,730 tonnes of CO_2.

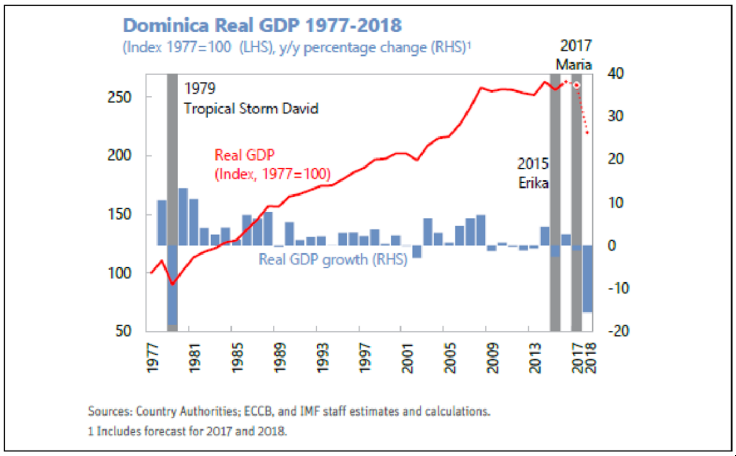
Gender-sensitive development and vulnerable groups: Women, youth and people with disabilities will benefit from increased employment opportunities in the water sector – the water resources units will have a significant female representation. Equality of opportunity will apply (taking into account gender, age and disability, for example) in design and construction of renewable energy systems. The securing of water supplies in the Dominica will proportionally benefit women in the domestic domain and in the informal business sector.

Furthermore, the programme explicitly recognises that there is a need to support and promote gender equality and social inclusion processes across all the proposed activities. To this end the development of a gender equality and social inclusion policy together with monitoring and evaluation will be carried out as part of the work of a gender and social inclusion specialist working within the programme. The specialist will work with the Gender Equality and Social Inclusion Advisory Committee also to be established as part of the programme.

Needs of Recipients

Vulnerability of country and beneficiary groups: Over the last 100 years, Dominica has been directly impacted by 5 major hurricanes but affected by many more passing nearby. In the last 50 years, Hurricane David (1970) killed 40 people and cause US$160 million in damages, Tropical Storm Erika in 2015 killed 30 people and cause US$500 million in damages – 90% of GDP and in 2017 Hurricane Maria caused 64 deaths and US$1.37 billion – 200% of GDP in loss and damage, from which the country has not fully recovered. Both Erika and Maria affected the whole of the population of the country. It should be noted that Tropical Storm Erika hit Dominica whilst it was still experiencing the effects of a severe drought, which exacerbated the impact of the storm. The steep nature of the island, its narrow coastal plain area where most of the population lives means that catchments respond very quickly to excess rainfall resulting in severe flooding of the coastal areas; during TS Erika the Roseau River rose 3 metres in just three hours reaching a stage level of 3.6 metres. The 2010 drought led to losses amounting to 18% of the country's GDP. Given the expected trend in hurricane activity in the Caribbean towards stronger more rapidly intensifying hurricanes and concomitantly the expected increase in drying and drought conditions in the future, the whole of the population is going to be at increased risk. Past extreme events have resulted in outward migration, the effect of which on the economy and society has not been researched. The increase exposure is among the reasons for the Government's emphasis on trying to build a climate resilient nation.

Economic and social development level: In spite of the ongoing impact of TS Erika and Hurricane Maria, Dominica is classed by the World Bank as an upper middle income country. This classification however does not reflect the economic reality of the country. According to the last Country Poverty Assessment by the CDB (2010) 29% of households were below the poverty line, among the Kalinago indigenous group which makes up about 4% of the total population the poverty rate is in excess of 50%. Just over 40% of households are female headed, women make up a smaller percentage of the working population, have higher rates of unemployment and tend to be in lower paying employment. Unemployment is highest among those in the lower income groups while self-employment is highest amongst this group pointing to the importance of the informal economic sector, as well as its vulnerability to shocks. Just over 40% of the work force are employed in the agricultural sector although its contribution to GDP has varied between 12 to 20%. Levels of poverty and unemployment are lowest in the capital Roseau and the surrounding areas. The Country Poverty Assessment noted a GINI income inequality coefficient of 0.44 indicating medium to high income inequality. This deteriorated after the recent extreme events, a situation that could become embedded with an increase in climate variability and occurrence of extreme events.



Growth in GDP has varied over the last 10 years, the swings from negative to positive growth rates reflect the impact of extreme events on the economy. For example, GDP grew in 2014 but declined following TS Erika in 2015. Economic growth during the recovery phases has been driven by primarily construction and restoration activities rather than other activities. Furthermore, the Government's Citizenship by Investment Programme (CBIP) has also made a major contribution to the fiscal balance though perhaps not so much to the economy. Public debt as a percentage of GDP has been increasing over the last decade and now stands at around 80%. Furthermore, the Government runs a budget deficit of around 6% of GDP whilst its spending amounts to just over 50% of the GDP. The introduction of the CIBP was supposed to try to diversify income streams and balance the books. Declines in economic activity across sectors is accompanied by declines in tax revenues, for example after Maria tax revenue declined by 30%. Remittances by the Dominican diaspora amount to around 10% of GDP and constitutes an important source of income for the lower income groups. Tourism and a small commercial/manufacturing sector have seen greater economic growth than agriculture, especially as Dominica continues to promote its ecotourism credentials. Overall, Dominica's economic development has been constrained not only by the impact of extreme events but by having a heavy reliance on a limited number of economic sectors, initially agriculture and more recently by ecotourism. Social development is hampered by a lack of economic opportunities and high income disparities.

Absence of alternative sources of financing: Dominica has long relied on external support to fund development projects; the fact that it runs a fiscal deficit hampers the ability to invest in capital works and development projects. Support to Dominica has been provided by a number financial institutions and agencies including UKAID, CDB and World Bank. This support has been supplemented by pledges of aid in the aftermath of extreme events, more than US$1.3 billion after Maria, though the extent to which the pledges have been realised is difficult to ascertain but evidence on the ground suggests only a small proportion. The post-Maria phase of Dominica's economic transition has been fuelled by a combination of public spending funded by the CBIP and support from the international donor community. In 2017/18, the influx of aid in response to Maria more than doubled spending compared to the previous year. However, CBIP public spending was almost three and a half times higher than international aid. That spending targeted housing, health, education and tourism.

Figure 7: Growth in GDP

The post-Maria spending needs were calculated to amount to US$1.368 billion of which the water and sanitation sector needs were US$56 million. The CDB 's "Planning for the Integration of Climate Resilience in the Water Sector in the Caribbean: Dominica Investment Plan" (2019) identified the amount required for the highlighted interventions to be US$54 million. The UKAID has made US$2.12 million available which is being spent on Technical Assistance to DOWASCO, though this does not include any capital expenditures. All investment in the water sector is provided through the Government rather than directly to DOWASCO, backed by Government guarantees.

Given the country's highly indebted nature and weak economy and weak banking institutions the ability to raise capital for investment in the water sector is challenging and limited.

Need to strengthen institutions and implementation capacity: The Water Sector Strategic Development Programme, funded by UKAID under the Technical Assistance Programme is looking at the institutional arrangements of the water sector and identifying specific strengthening needs. It builds on earlier studies which have already identified the need for a separate water resources management organisation and for independent economic and social regulation of DOWASCO. Other studies have also identified the need for reform of DOWASCOs finances. These initiatives will need supporting and reinforcing to ensure that they are implemented and mainstreamed into the work of the water sector.

DOWASCO has proved capable of implementing improvements to the water infrastructure and also of implementing renewable energy projects to supply its Roseau wastewater treatment facility. However, the ability to undertake the Non-Revenue Water Loss Reduction activity will require assistance as this is not something that the organisation has been able to address adequately in recent years. The formation and now work of CREAD in overseeing the climate resilience initiatives in Dominica, and its capacity to deliver means that there does exist implementation capacity which can be harnessed and built upon.

Country Ownership

Coherence and alignment with national priorities: This project is aligned with the country's national priorities outlined in the NDCs, NAMA, NAP, national development strategies and climate resilience strategies. It is also coherent with the sectoral priorities from the water sector as well as the energy sector.

Capacity of the Accredited Entity: The Centre's capacity as an Accredited Entity relies on the fact that it is the main regional agency in the Caribbean on issues of climate change. The project builds upon the track record and experience, having carried out catalytic pilot/ demonstration type projects in the Caribbean, and scaling them up with national governments. As a regional clearing house for climate change data and information in the Caribbean, it will allow the sharing of the lessons learned from this project and to scale them up in other Caribbean nations.

Capacity of co- implementing Entity

DOWASCO has decades of experience in the establishment and managements of approximately forty (40) water supply networks and sewage systems in Dominica.

Stakeholder engagement process: The Concept Note has been developed in close collaboration with the water sector stakeholders, physical planning agencies, national power utilities, sustainable development units, ministries of finance and economic affairs, and the agencies responsible for responding to climate change. The stakeholders have been consulted and participated in the development of this Concept Note, along with other government institutions and civil society, including NGOs and private sector and regional institutions, and international partners.

Efficiency and Effectiveness

Preliminary calculations indicate that with respect to mitigation the programme would result in 6,622 metric tons of CO_2eq avoided from the introduction of solar power within the water service system and an energy savings of approximately US $11.46 million over a 15-year period. DOWASCO through the WSSDP has mobilised US$27.4 million for capital works which this programme would build on and complement as well as US$1 million in-kind co-financing contribution to the programme cost demonstrating its commitment to the success of this project. The improvements that would result from this project would result in avoided costs associated with damage to infrastructure, additional costs of alternative water provision, and loss of economic productivity. Based on the study (Bueno et al. 2008) by 2050 the annual infrastructure related costs of inaction would be US$50million. Not all of this would be avoided and not all would be specific to the water sector. The current level of non-revenue water has been estimated as contributing US$2 million per annum in lost revenue or a net present value of at least US$15 million over 15 years. In

addition, through the establishment of the revolving fund financial facility (WESCO) economic opportunities and individual savings would be generated, benefiting the wider economy.

Application of best practices and degree of innovation: The degree of innovation included in the project has been described in the above section describing the paradigm shift potential of the project. The supporting proposed application through the IAEA of isotope hydrology to the assessment of groundwater quantity and quality and to surface water quality are considered to be best practice applications in their field. The collection and use of ground and surface water data will continue to use guidelines and regional expertise provided by the CIMH, and the WMO. The choice of modelling approaches will be informed and guided by the advice and input from experts from the UNESCO International Hydrology Programme (IHP) Centres of Excellence. There is a growing body of experience in the region in the field of NRW loss reduction programmes e.g. Barbados, Belize, Grenada, Jamaica, and The Bahamas contributing to best practice. Renewable energy systems in the water sector have been designed, developed and implemented in Dominica, Barbados, Grenada, Guyana and the Grenadines. Hence, this component of the project will draw on that body of best practice.

B.4. Engagement among the NDA, AE, and/or other relevant stakeholders in the country (max ½ page)

Please describe how engagement among the NDA, AE and/or other relevant stakeholders in the country has taken place and what further engagement will be undertaken as the concept is developed into a funding proposal.

The following stakeholder engagements have been conducted in preparation of this concept note. It should be noted that due to the outbreak of COVID-19 and the locking down of the countries across the Caribbean, all physical contact between parties had to cease. As a result, all consultations have been conducted remotely, principally using the Zoom application.

Meeting	Objective	Stakeholders
13/02/2020	To introduce and discuss the Concept Note with the NDA.	Discussions with GCF National Programme Coordinator
07/04/2020	To discuss the draft Concept Note with the AE. Decision taken to develop a Country Concept Note as part of a Regional Programme	Caribbean Community Climate Change Centre (CCCCC) , Consultants
07/05/2020	Draft Dominica Concept Note circulated for comment.	Dominica Water and Sewerage Corporation (DOWASCO) & CCCCC
15/05/2020	Discuss with DOWASCO the content of the draft Concept Note to obtain their feedback and comments. Feedback provided on 27 and 28/05/2020. Subsequent informal meetings through DOWASCO focal point.	DOWASCO, CCCC, Consultants
26/05/2020	Discussion with stakeholders of the draft Concept Note to obtain their feedback, comments and suggestions on the document.	Forestry Dept., Agriculture Dept., National Parks and Protected Areas, Dominica Electricity Corporation, and Independent Regulatory Commission and Consulting Team
28/05/2020	Discussion with DVRP of the draft Concept Note to obtain their feedback, comments and suggestions on the document.	Project Coordinator DVRP Dominica
02/06/2020	Discussion of the draft Concept Note to obtain feedback, comments and suggestions on the document.	Ministry of Health, National Focal Point: Climate and Health and Consulting Team
01/07/2020	To discuss the content of the Concept Note and report back on stakeholder consultations.	National Designated Authority, CCCCC
03/06/2020	Written feedback on the draft document and proposed activities provided by CREAD and follow up discussion	CREAD
03/06/2020	Discussion of the draft Concept Note with the Government Energy Unit to obtain feedback, comments and suggestions on the document.	Coordinator of Renewable Energy Programme and Consulting Team
	Between June and September, 2020 discussions have been held with the following: Departments of the Ministry of Youth Development, Empowerment, Youth at Risk, Gender Affairs, Senior Security & Dominicans with Disabilities, The Kalinago Council, The Basic Needs Trust Fund, The Global Environment Facility (GEF) Small Grants Programme, Dominica Association of Persons with Disabilities, Dominica National Council of Women, National Youth Council.	
	Further engagement with Departments responsible for Physical Planning, Meteorological Services, Forestry, Agriculture, CREAD, Economic Affairs, Health, DVRP Office, Small Grants Programme, Kalinago Affairs, Tourism Association, DOMLEC and Environmental Health are planned.	

C. Indicative Financing/Cost Information (max. 3 pages)

C.1. Financing by components (max ½ page)

Please provide an estimate of the total cost per component/output and disaggregate by source of financing.

Component/Output	Indicative cost (USD)	GCF financing		Co-financing		
		Amount (USD)	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions
Component 1	1,148,125	807,000	Grant	341,125[1]	Internal	DOWASCO
Component 2	630,583	446,000	Grant	184,583[1]	Internal	DOWASCO
Component 3	61,985,250	36,585,750	Grant	699,500[1] 24,700,000[2]	Internal Grant	DOWASCO DfID-UKAID
Component 4	3,757,000	3,701,500	Grant	55,500[1]	Internal	DOWASCO
Component 5	618,817	590,400	Grant	28,417[1]	Internal	DOWASCO
Component 6	3,494,167	3,380,000	Grant	46,667[1] 67,500[3]	Internal Internal	DOWASCO CCCCC
Indicative total cost (USD)	71,633,942		45,510,650			26,123,292

Note:

1. Counterpart funding provided through COWASCO's operational budget
2. Capital work investment in water supply schemes, funds from the DfID-UKAID Grant to the WSSDP through CREAD
3. Counterpart funding provided by the AE

For private sector proposal, provide an overview (diagram) of the proposed financing structure.

C.2. Justification of GCF funding request (max. 1 page)

Explain why the Project/ Programme requires GCF funding, i.e. explaining why this is not financed by the public and/ or private sector(s) of the country.
Describe alternative funding options for the same activities being proposed in the Concept Note, including an analysis of the barriers for the potential beneficiaries to access to finance and the constraints of public and private sources of funding.
Justify the rationale and level of concessionality of the GCF financial instrument(s) as well as how this will be passed on to the end-users and beneficiaries. Justify why this is the minimum required to make the investment viable and most efficient considering the incremental cost or risk premium of the Project/ Programme (refer to Decisions B.12/17; B.10/03; and B.09/04 for more details). The justification for grants and reimbursable grants is mandatory.
In the case of private sector proposal, concessional terms should be minimized and justified as per the Guiding principles applicable to the private sector operations (Decision B.05/07).

The economy is still in the stages of recovery from the impacts of Erika and Maria (see above for the estimated loss and damage. It can take at least a decade for small economies to recover from the economic effects of extreme events. Given the projected changes in the frequency and intensity of extreme events, the island will be increasingly at risk – adding a sense of urgency for Dominica to strive to become climate resilient. Addressing the impact of such events not only diverts funds but leads the country further into debt as previous loans still have to be repaid. In the wake of Maria and Erika much was pledged to aid the island's recovery but what has materialised has fallen short of the pledges. The Government is running a fiscal deficit -6% of GDP which is contributing to the continuing high levels of public debt ~80% of GDP. Although there has been growth in GDP this has been linked to the effects of recovery expenditures rather than underlying growth of the economy. The Government's ability to invest in infrastructure is circumscribed by its ability to raise revenue from a population 40% of whom are classed as poor. Income generated from the CBIP is already hypothecated for investment in housing, health, education and tourism. Given Dominica's status, according to the World Bank, as being an 'upper middle income' country limits its access to concessionary and affordable finance, and there are a limited number of International Financial Institutions (IFIs) to which it could apply. The impact of COVID-19 has already led to a contraction of the economy, according to the IMF (April 28th, 2020) ''*The COVID-19 pandemic poses a major challenge to Dominica, Grenada, and St. Lucia. Their key tourism sectors have been hit hard by the shock. The contraction in tourism is expected to have a major impact on their economies, by causing ripple effects across all economic sectors, eroding fiscal revenues, and creating urgent balance of payments pressures. In addition, these three small states are also highly vulnerable to natural disasters*". Whilst the financial and economic impacts of the pandemic are still emerging, it is clear that they will further limit the ability to respond to climate change. As demonstrated in the climate rationale section above there are significant threats arising from climate change and the need to offset the potential cost of damage in the future from natural disasters and to moderate risks associated with climate change. Yet, the country has only a limited ability to finance the measures required from traditional sources, even at concessionary loan rates. Nationally the local banking sector is too small to be able to provide the level of private sector funding that would be required even if it did have the expertise required, which it does not.

C.3. Sustainability and replicability of the project (exit strategy) (max. 1 page)

Please explain how the project/programme sustainability will be ensured in the long run and how this will be monitored, after the project/programme is implemented with support from the GCF and other sources.

For non-grant instruments, explain how the capital invested will be repaid and over what duration of time.

The project particularly through Components 1, 2 and 4 will equip the DOWASCO with the tools and knowledge to be able to operate and maintain climate resilient water services. Activities are aimed to improve the operational performance; conservation of water supplies, ensuring resilience and minimising the impact of climate change and climate variability. The introduction of collaborative modelling will contribute to better planning and minimise the potential disruption associated with extreme events. It will also contribute to the resilience of the agriculture sector through the provision of climate related information for farmers. Climate resilient water infrastructure will reduce the need to divert funding towards

repairs and additional costs arising from the impact of extreme events. Reducing water losses not only conserves water resources, reduces the need to engage in additional and unnecessary capital works and improves revenue streams for reinvestment in climate resilient capital works. The proposed climate accounting will enable DOWASCO to identify where investments need to be made that respond to operational challenges and climate impacts. Better targeted investments are cost effective investments that conserve funds. The proposed WESCO is intended to be self-financing whilst at the same time delivering resource savings and supporting employment opportunities. The small rural community water schemes will extend services to under resourced and vulnerable communities. The element of co-management not only will ensure community buy-in but will also help to alleviate the additional responsibilities taken on by DOWASCO. The community schemes complement the introduction of distributed contingency storage and will increase the resilience of vulnerable rural communities. The introduction of renewable energy into the water systems will reduce the need for diesel powered back-up generators and reduce pumping costs.

D. Supporting documents submitted (OPTIONAL)

- ☐ Map indicating the location of the project/programme
- ☐ Diagram of the theory of change
- ☐ Economic and financial model with key assumptions and potential stressed scenarios
- ☐ Pre-feasibility study
- ☐ Evaluation report of previous project
- ☐ Results of environmental and social risk screening

Self-awareness check boxes

Are you aware that the full Funding Proposal and Annexes will require these documents? Yes ☒ No ☐

- Feasibility Study
- Environmental and social impact assessment or environmental and social management framework
- Stakeholder consultations at national and project level implementation including with indigenous people if relevant
- Gender and social inclusion assessment and action plan
- Operations and maintenance plan if relevant
- Loan or grant operation manual as appropriate
- Co-financing commitment letters

Are you aware that a funding proposal from an accredited entity without a signed AMA will be reviewed but not sent to the Board for consideration? Yes ☒ No ☐