**Annex C**

*October 23rd 2019*

[Redacted]

This Technical Consultation Document is in connection with the *Administrative Agreement regarding the Establishment of the UK Blue Carbon Fund*, signed on April 2, 2019 as it may be amended from time to time (the “Fund Agreement”).

Below is a description of the “Regional Blue Carbon Monitoring, Reporting and Verification (MRV) Mechanism” Project. Unless we receive a written objection from you by close of business of October 26, 2019, communicated as per the Non-Objection Process set forth in Section 5.1 of the Fund Agreement, we will proceed to allocate $1,550,000 of the Fund to this Project, as per the provisions of Section 5.1 of the Fund Agreement.

1. **BASIC FACTS**

Type of Operation: NON-REIMBURSABLE

Country: Latin America and Caribbean Region

Project name: Regional Blue Carbon Monitoring, Reporting and Verification (MRV) Mechanism

Borrower/Beneficiary The following countries will benefit from this operation: Panama, Jamaica, Belize, Colombia, Haiti, Nicaragua, Dominican Republic, Guatemala, Honduras, Ecuador, Suriname, Guyana, Trinidad and Tobago

Executing Agency: Center for Innovation and Entrepreneurship, The University of the West Indies (UWI), St. Augustine

Total project cost: $1,690,000

Total financing cost: $1,550,000

Financing breakdown:

|  |  |  |  |
| --- | --- | --- | --- |
| **Activity/Component** | **IDB/Fund Funding** | **Counterpart Funding****(In-kind)** | **Total Funding** |
| Component I.: Mangrove forest mapping, monitoring and carbon stock determination  | US$ 1,100,000 | US$ 100,000 | US$ 1,200,000 |
| Component II: Institutional Capacity Building  | US$ 200,000 | US$ 40,000 | US$ 240,000 |
| Component III: Knowledge development and dissemination | US$ 100,000 | - | US$ 100,000 |
| Project Administration including project evaluation | US$ 150,000 (9.7%) | - | US$ 150,000 |
| **Total** | **US$ 1,550,000** **(92%)** | **US$140,000** **(8%)** | **US$ 1,690,000** |

1. **PROJECT DESCRIPTION**

**Justification.**

1. Blue carbon, the carbon stored and sequestered in mangrove forests, seagrass meadows and tidal salt marches, is considered a cost-effective means to achieve positive climate change mitigation and adaptation outcomes. In total, mangroves account for around 1% of carbon sequestration (13.5 Gt/year) but as coastal habitats they account for 14% of carbon sequestration. Most mangrove carbon is stored as large pools in soil and dead roots and they have higher below- to above-ground carbon mass ratios than terrestrial trees so any remarkable disturbance to these ecosystems could result in very high carbon emissions. Despite their small geographical space, mangroves provide a range of valuable ecological and economic resources, in particular many ecosystem services, such as nursery grounds for fish, mammals and other aquatic fauna, sea shore protection against erosion, nutrient retention, recreation and tourism, carbon sequestration, water and air purification, waste assimilation and traditional uses. In the context of carbon sequestration, blue forests are more effective carbon sinks, both in the short and long-term storage of carbon, than terrestrial forests.
2. However, data quantifying the blue carbon ecosystems and their carbon pools is scarce, specifically country and region-specific data. Especially data on the whole-ecosystem carbon storage level/potential/capacity, the carbon released because of land-use conversion, and the rate of storage increase/improvement over time from areas that are being restored, which is critically important information. The need for this country and region specific data has become necessary especially in the context of mangrove systems because of the growing global trend to incorporate the carbon storage services of mangroves into aspects of (i) National Determined Contributions (NDCs) (it is estimated that at least 28 countries mention coastal wetlands including mangroves in terms of mitigation in their the NDCs, in addition to those that reference adaptation);[[1]](#footnote-1) (ii) Reduced Emissions from Deforestation and Forest Degradation (REDD+) schemes (e.g. Suriname includes mangroves in its forest reference emission level)[[2]](#footnote-2); (iii) carbon trading initiatives;[[3]](#footnote-3) (iv) Sustainable Development Goals (SDGs), in particular the attainment of SGD 14 - under the target of conserving by 2020 “at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information”.[[4]](#footnote-4) Additionally Article 5 1. of the Paris Agreement states “Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1 (d), of the Convention, including forests.”
3. In order to obtain the data from mangrove systems, traditional methods for collecting biophysical parameters are used but these typically consist of labor-intensive field collections, requiring the measurement of individual tree attributes repeatedly over time. In mangrove forests this is extremely challenging in comparison to other forest ecosystems, because of the soft unconsolidated sediment and the intricate architecture of the mangrove forest landscape (i.e. the presence of aerial roots, prop roots, multiple water channels, ponds etc.). This project aims to overcome this challenge by utilizing innovative methodologies to measure biophysical parameters (e.g. tree height, crown diameters, diameter at breast height, stem volume and biomass) utilizing both satellite and field measurements for the different mangrove forest types. The measurements will distinguish between long standing mangrove forests versus reforested mangroves at various localities, to monitor and verify carbon storage across the region and site locations. For reforested mangrove, the measurements will aim to document the changes in carbon storage throughout the length of this operation.
4. The objective of this project is to implement a regional Monitoring Reporting and Verification (MRV) system for mangrove ecosystems that provides a science-based data platform on the sequestration and release of blue carbon. The regional MRV is to be used in part, to monitor the progress of the projects that are to be implemented under the UK Blue Carbon Fund being managed by the IDB. With this MRV system, participating countries/projects will be able to:
* Improve the valuation of ecosystem services provided by blue ecosystems, including mangroves.
* Potentially include blue carbon data in the national NDCs[[5]](#footnote-5), REDD+ schemes, SDG programs, UNFCCC National Communications and carbon markets programs.
* Utilize an MRV system for results-based payments under a reforestation program. There is a growing trend to support or encourage results-based actions for reforestation, conservation, or reduced deforestation efforts.[[6]](#footnote-6) In order to effectively participate in or take advantage of these types of efforts, a key element of the results-based payment scheme will be a fully functional MRV.

The strategy adopted and promoted through this project is to establish a standardized and regional monitoring, reporting and verification (MRV) mechanism for the blue carbon captured in mangrove forests for at least those LAC countries that are beneficiaries of the UK Blue Carbon Fund via the IDB, with potential to upscale this initiative to other countries in the region. The project aims to collect data using both satellite imagery and LIDAR as well as on the ground field measurements, to aide in the development of region-specific parameters for the estimation of carbon stocks in mangroves (e.g. allometric equations).

1. The countries selected for the operation are expected to have at least one project under the UK Blue Carbon Fund, which are expected to include projects from the eligible countries under the Fund - Panama, Jamaica, Belize Columbia, Haiti, Nicaragua, Dominican Republic, Guatemala, Honduras, Ecuador, Suriname, Guyana,[[7]](#footnote-7) and Trinidad and Tobago.
2. Defra have already approved projects in Panama and Jamaica. These will run in parallel to this project, as this will provide an opportunity to compare the two methodologies used in this project, with the standard method being used as the baseline for comparison. The M&E techniques that will be used for the Panama and Jamaica projects will mainly follow the traditional method of determining the carbon sequestered by measuring the tree diameter at breast height (DBH) and the tree height to calculate the tree biomass as though it were a cylinder.  This is a standard method used and is a typical forester’s method for measuring tree biomass and measuring carbon sequestered.  The technique being proposed by the MRV project is expected to improve on this methodology in one major way, it will include in the measurement the complicated prop root system of red mangroves (Photo 1) which are usually excluded from the standard method.  Thus the MRV project will introduce an innovative new technology to capture more of the carbon sequestered with a mangrove forest, which can be replicated globally. This project will complement the institutional capacity building elements of the Panama and Jamaica projects, by introducing new technologies and upgraded methods.

Photo 1.



1. Suriname has specifically asked about institutional capacity building in blue carbon – capacity development in Suriname is limited, and there is a substantial area of coastal forests that requires management.  Specifically, interest has come from GONINI - The National Land Monitoring System of Suriname - in collaboration with the Directorate of Planning and Development Finance. Haiti has also requested institutional strengthening but mainly through the Rector of the public university in Haiti – The Universite d’Etat d’Haiti. We may receive interest from other countries not REDD+ members. We expect this to be mainly be driven by two factors, the need to incorporate mangrove forests into their updated NDCs which all countries have to complete by 2020 and increasing awareness of the role that marine-based ecosystems play in climate change mitigation and adaptation.

**Description of Activities and Outputs**

1. **Component I:** **Mangrove forest mapping, monitoring and carbon stock determination.** The first component will consist in characterizing the mangrove forests using novel techniques, and in particular it will allow the production of high-resolution maps of mangrove forests, as well as determining and monitoring the carbon stocks contained in such mangroves, paving the way to a robust region-wide MRV mechanism for blue carbon ecosystems:
	1. **Development of a mangrove cover baseline map for project sites.** The mapping will distinguish between different mangrove forest types and species, including intact mangrove forests and areas under reforestation/rehabilitation, in order to undertake change analysis and detection over time. The baseline mangrove cover maps will digitize the extent of mangrove patches directly in Google Earth (GE Pro software) by tracing the outline of each patch, creating individual polygons by visual photointerpretation of Google Earth Very High Resolution (GE VHR) imagery. This method can be updated at periodic intervals and is more accurate and orders of magnitude cheaper than the existing 19 year old [Global Mangrove Forest Distribution (GMFD)](https://data.unep-wcmc.org/datasets/4) data set produced by the National Aeronautics and Space Administration (NASA) agency , which used Landsat imagery (30 m resolution) for the period 1997-2000 with a hybrid supervised and unsupervised image classification technique. The NASA 30m resolution missed small patches of mangroves so most countries have dated maps developed using aerial photographs from aircraft flyovers, IKONOS or LIDAR imagery when available. It is expected that the maps to be produced will be at a spatial resolution of 10m or higher in order to include relatively smaller mangrove areas, which is much better suited based on the size of the countries involved. The areas to be mapped will correspond to areas primarily where UK Blue Carbon Fund projects will be implemented.
	2. **Determination and monitoring of carbon stocks in mangrove forests both by remote sensing and in-situ field measurements.** Specific attention will be given to mangrove reforestation areas versus intact mangrove forests, to determine the difference of carbon storage and discharge. Also, the efficiency of carbon storage in mangrove reforestation will be monitored in detail over the course of this operation. This project will utilise innovative technologies such as ground-based side-scan Light Detection and Ranging (LIDAR) to determine tree species density along with measurements of tree height and diameter, stem volume and biomass for the different types of mangroves present, to determine the carbon sequestered in living trees that can be offset against carbon dioxide emissions from industry. A Perkin Elmer Carbon Analyzer available at the University of the West Indies will be used to determine the percentage weight of the carbon content of individual tree species. In the field plots, technical staff from local agencies will be trained to (i) measure tree height using a laser emitting Hypsometer device pointed up to the top of the tree, and (ii) measure tree diameter using a calliper at the standard 1.37m above ground breast height (DBH). The location of each tree will be determined using a Global Positioning System (GPS) handheld unit. The Side-scan LIDAR will be used as required to determine the best local algorithm equation to measure above ground carbon sequestration in each country. A drone with a survey-grade LIDAR sensor will be used as required to do aerial LIDAR surveys to generate a digital elevation model (DEM) of mangrove tree heights, that can be used to calibrate the relationship between the aerial LIDAR estimated tree heights and the carbon sequestered as measured in the ground plots. This will be essential where there is a lack of spatial data for the area.
	3. **Timing of implementation of monitoring program:** It is anticipated that the application of the monitoring protocol will begin with implementation of individual projects within the Blue Carbon program. This implies a staggered approach to the implementation schedule that will be based on the commencement of the individual projects. It is anticipated that the monitoring program will begin with Panama and Jamaica during the first semester of 2020. In addition, it is expected that the capacity building efforts on monitoring will take place in all participating countries.
2. **Component II: Institutional Capacity Building.** This component will support: (i) Training of a cadre of wetland ecologists within participating countries in carbon sequestration measuring techniques for mangroves. These wetland ecologists will be recruited from research and academic institutions as well as government institutions/agencies (e.g. ministries of environment, forestry, natural resource management etc.), responsible for the management of mangrove forests. The training program will include the hosting of capacity building workshops on the methodologies of carbon measurement, reporting and verification of the data and the creation of databases and protocols for the management and storage of data; (ii) National entities to prepare and publish technical articles or reports per country on the methodology and recommendations on MRV for mangrove forests and a joint regional paper on the comparison of technical attributes of mangrove forests. All of the countries in the project are [UN-REDD Partner countries](https://www.un-redd.org/partner-countries) (except Haiti, Belize, Trinidad and Tobago and Nicaragua) so this project will help build or strengthen capacity (where appropriate) to include mangrove monitoring in countries’ respective forest monitoring programs so that they can be credited for climate change mitigation and adaptation considerations in their NDC’s under the Paris Agreement.
3. **Component III.** **Knowledge development and dissemination**. This component will support: (i) the development of a regional data sharing platform for all participating countries. The platform will be used to collate, analyze and synthesize information collected from all research sites. It will also be used to build a community of practice in order to share information and lessons across the region and will be open to various entities and sites even where no active restoration is taking place; and ii) the dissemination of appropriate information on the value of carbon stocks present in mangrove forests aimed at the public and in particular at coastal communities (awareness raising campaigns).

**Execution period: 72 months**

**Expected Results Framework indicators and, when available, preliminary expected results:**

*Component I: Mangrove forest mapping, monitoring and carbon stock determination*

|  |  |
| --- | --- |
| **Indicator** | **Target** |
| ICF KPI 14: Level of institutional knowledge of Blue Carbon issues in partner countries | TBD |
| Mangrove cover maps and historical analysis completed. | At least 13 organizations using cover maps |
| Private sector participation in mangrove stakeholder engagement | At least one entity collaborating on the project |
| Public sector participation in mangrove stakeholder engagement | At least four government agencies collaborating on the project. |
| NGO/CBO participation in mangrove stakeholder engagement  | At least 4 NGO/CBO’s collaborating on project |
| ICF KPI 12: Amount of private resources mobilized | US$80,000  |

*Component II: Institutional capacity building*

|  |  |
| --- | --- |
| **Indicator** | **Target** |
| Number of persons trained  | At Least 36 persons trained |
| Number of knowledge products produced related to mangrove restoration. | 4 technical / research papers produced |
| ICF KPI 12: Amount of private resources mobilized | US$40,000  |

*Component III: Knowledge development and dissemination*

|  |  |
| --- | --- |
| Number of knowledge platforms developed | 1 Knowledge platform |

1. **PROJECT AGENCIES**
	1. This project will be executed by the St Augustine [Center for Innovation and Entrepreneurship](https://sta.uwi.edu/stacie/about) (STACIE), under the leadership of [Professor John Agard](https://tt.linkedin.com/in/john-agard-b92a0732?trk=people-guest_profile-result-card_result-card_full-click), Director of the Center and [Professor of Tropical Island Ecology](https://scholar.google.com/citations?user=tV9iQMsAAAAJ&hl=en&oi=ao) in the [Department of Life Sciences](https://sta.uwi.edu/fst/lifesciences/staff/john-agard), University of the West Indies (UWI). The UWI is the largest, most longstanding higher education provider in the Commonwealth Caribbean, with five campuses in Antigua and Barbuda, Barbados, Jamaica, Trinidad and Tobago, and an Open Campus that has facilities on 19 Caribbean islands. For the past 70 years the UWI has provided service and leadership to the Caribbean region. The UWI is mandated to leverage the best resources from any campus to deliver on any project. In this regard a number of specialised coordinating offices for projects and innovation across UWI have been created and cross-connected to the Regional Headquarters of UWI in Jamaica. One of these is the new STACIE, which was formerly called the Office of Research Development and Knowledge Transfer. STACIE is already implementing a pilot project on the monitoring of mangroves in Trinidad and Tobago and Jamaica that will be the basis for the regional MRV.
	2. The Director of this STACIE, Professor John Agard, is also a Professor of Tropical Island Ecology in the Department of Life Sciences. Professor Agard is particularly suited to manage this Blue Carbon MRV as he is currently in the field doing a Blue Carbon proof of concept project using innovative side-scan LIDAR to render mangrove prop roots in 3-Dimensions to determine the carbon sequestered. The project is sponsored by the British Commonwealth and Foreign Service Office. He has also completed other carbon sequestration projects in traditional forests in Trinidad and Tobago, including the Nariva Swamp Restoration and Carbon Sequestration Project (BioCarbon Fund Project). Professor Agard is well regarded globally and is a Coordinating Lead Author in the Intergovernmental Panel on Biodiversity and Ecosystem Services (IBBES). He is also the current IPCC editor for the Small Islands Chapter in the ongoing 6th Assessment and has been a Lead Author on Small Islands in the previous IPCC 4th and 5 Assessments.
	3. The program will be implemented in collaboration with the other partners including the Foundation for Forest Management and Production Control (Suriname), UWI Centre for Marine Sciences in Jamaica and the State University of Haiti (Université d'État d'Haïti). UWI has also had MOU’s with several of the universities around the region (e.g. University of Belize, Anton de Kom University of Suriname, Universidad de los Andes Colombia [UNIANDES]) and who are expected to collaborate on the project. It is also proposed that the project collaborates with international partners at NASA and the University of Cambridge in the UK.
	4. The project will engage with private sector entities on the MRV program in order to leverage support and resources under their corporative and social responsibility programs. An initial engagement will take place in Trinidad and Tobago which will focus on the compatibility of restoration activities and the objective of the firm’s CSR program and where alignment and support are possible.
2. **STRATEGIC ALIGNMENT**
	1. Alignment with UK Blue Carbon eligibility criteria and Fund thesis:
	2. The project is aligned with existing IDB program on Sustainable Islands Platform, which seeks to help island territories to pursue sustainability under the pillars of Blue and Circular economy and climate change resilience. This project will add to the local knowledge and information of the rate of carbon sequestration within island territories. In addition, the project is aligned with the IDB’s Natural Capital Lab programming, which seeks to develop projects that value the range and nature of ecosystem services of a country’s natural assets.
	3. **Theory of Change**: The starting point for the project is the identification of opportunities for mainstreaming in the various country institutions by using the discussion of baseline maps and blue carbon sequestration to address the action required by UN-REDD+ and the Paris Agreement. This should lead to agreement on what policy tools and institutional capacity support are required to address the priority mainstreaming opportunities that the project seeks to realise. At the outset it is recommended that a process for the successful mainstreaming of Blue Carbon ecosystem services at the pilot sites be developed so that the country teams are clear on the main stages / steps in the process, timeline (aligned with key policy and regulatory entry points) and key institutions that need to understand the tools being developed. Consideration of the replicability of the tools / mainstreaming process also needs to be considered to ensure sustainability of project outputs & that the project meets its intended outcomes at the international scale.

At the core of the theory of change of this project is the idea that the interventions planned throughout the various components will allow the beneficiary countries to be able to better monitor, report and verify the carbon stocks contained in mangrove forests, and in turn to design and implement data-informed policies to better protect and invest in their carbon stocks, as well as to facilitate their access to climate finance. This will be possible by the data expected to be produced under this project (including baseline mangrove cover maps), tools and systems enabling countries to readily quantify and monitor carbon stocks.

Throughout the project there is the need for a strong capacity building, outreach and knowledge dissemination processes, at the pilot sites, national level and international scale. At the pilot / national scale this will ensure that the key decision makers (end users of the policy tools) fully appreciate the products and take ownership of them and the evidence generated by the pilot studies. On-going outreach at the international scale is required to ensure that the tools developed reflect best practice, and to facilitate confidence in their uptake beyond the pilot sites – an anticipated outcome of the project.

1. **IDENTIFICATION OF POTENTIAL RISKS**
	1. The main risk for the project is the political instability of countries [Redacted]. To mitigate this risk the project will work with collaborating entities belonging to the academic sector, which are less prone to suffer from political risks and will also reach out to local NGOs involved in blue ecosystem management and representative of the local coastal communities. It will also involve representative of local coastal communities, who will particularly benefit from the trainings that will be provided as part of this project and will thus help ensuring the sustainability of the project in the medium-long term.
	2. Another potential risk to be considered is the limited capacity within countries to implement the monitoring programs. To negate this risk, the program will identify potential resources from each country for basic training in mangrove ecology and monitoring, ensuring that more than 5 persons are trained within each country.
2. **ENVIRONMENTAL AND SOCIAL CLASSIFICATION**

6.1 There are no negative environmental or social issues associated with the activities.

For an operation with reimbursable and non-reimbursable components, one TCD will be submitted including the applicable elements above.

Sincerely,

[Redacted]

1. Herr, D. and Landis, E. (2016). Coastal blue carbon ecosystems. Opportunities for Nationally Determined Contributions. Policy Brief. Gland, Switzerland: IUCN and Washington, DC, USA: TNC. [↑](#footnote-ref-1)
2. Government of Suriname (2018). Forest Reference Emission Level for Suriname’s REDD+ Programme. Paramaribo, Suriname [↑](#footnote-ref-2)
3. https://www.unenvironment.org/news-and-stories/story/mangrove-conservation-more-valuable-ever-thanks-carbon-trading/ [↑](#footnote-ref-3)
4. https://www.un.org/sustainabledevelopment/oceans/ [↑](#footnote-ref-4)
5. All countries will have to update their NDCs by 2020 and demonstrate increased ambition. [↑](#footnote-ref-5)
6. Roadmap for achieving REDD+ results-based payment from the GCCF. https://www.greenclimate.fund/documents/redd-roadmap [↑](#footnote-ref-6)
7. IDB, 2019. Proposal for the Establishment of the UK Blue Carbon Fund (Single-donor Trust Fund). March 2019 [↑](#footnote-ref-7)