IMPLEMENTATION OF A STUDY ON THE ECONOMICS OF CLIMATE ADAPTATION IN TRINIDAD AND TOBAGO

(ATN/OC-13324-TT: TT-T1033)

TECHNICAL COOPERATION: UNDERSTANDING THE ECONOMICS OF CLIMATE ADAPTATION (ECA)

TERMS OF REFERENCE

I. BACKGROUND

1.1 Trinidad and Tobago as a small island developing State within the Caribbean region is highly vulnerable to the impacts of global climate change due to its limited land space, fragility of its ecosystems, limited human and technological capacity, and susceptibility to the vagaries of international trade and exogenous economic shocks. The impacts from climate change on the country are expected to stem specifically from rising temperatures, decreased precipitation and sea level rise. It is anticipated that these changes will likely have adverse effects on biophysical and socio-economic conditions in Trinidad and Tobago, with the following specific sectors likely to be impacted: (i) agriculture; (ii) human health; (iii) human settlements; (iv) coastal zones, where climate change impacts are expected to be multi-sectoral based on the fact that Trinidad and Tobago's settlements are concentrated within those areas; and (v) water resources.

1.2 There have been some estimates of the cost of the impacts of climate change in Trinidad and Tobago but these have been limited to agriculture, health and the energy sectors but these studies do not provide estimates in terms of the cost of adaptation or include other key sectors or themes such as the coastal zone; a critical element for any small island state given expected increase in sea level rise (SLR). These costs have to be quantified in order to provide decision makers with a quantitative fact base to decide on sound and effective natural disaster risk management and adaptation strategies to build resilience within the country.

1.3 The study proposed in the referenced operation will provide a decision making tool which is required to develop both qualitative and quantitative adaptation and disaster risk management strategies than can be incorporated into the national development plans of Trinidad and Tobago to increase resilience against climate change related hazards. This tool will be built around a risk baseline (identification of current and future expected losses from climate related risks based on climate scenarios) and an assessment of the adaptation and disaster risk management measures that could be implemented, including a cost-benefit analysis of risk mitigation and transfer measures.

1.4 It is expected that the study developed through this consultancy will be built on similar ECA studies carried out by the Caribbean Catastrophe Risk Insurance Facility (CCRIF)

and that the framework methodology and the knowledge generated will be transferred to risk, climate change and economic practitioners in Trinidad and Tobago and the Caribbean region in order to ensure sustainability and homogeneity of the approach to assessing the cost of climate adaptation.

1.5 In this regard, the Inter-American Development Bank (IDB) and the Caribbean Catastrophe Risk Insurance Facility (CCRIF) have signed and Memorandum of Understanding (MoU) to formalize a non-exclusive framework of cooperation and to expand CCRIF's work on the Economics of Climate Change for the Caribbean and Latin-American region with the objective of enhancing decision making processes taking into account climate change considerations.

II. CONSULTANCY OBJECTIVES

2.1 The objective of this consultancy is to develop and implement an Economics of Climate Adaptation (ECA) study in Trinidad and Tobago that can be applied to the broader Caribbean region, together with the dissemination of the information generated and the process involved in the implementation of the study.

2.2 Type of consultancy: Consulting Firm. The amount of the contract includes all expenses that might incur during the development of this assignment (i.e. gathering of data, travel, printing and publishing of the report, etc.)

2.3 Duration: 6 months from the date of the signing of the contract.

2.4 Place of work: The consulting team will be based in the firm's country of origin but will be expected to travel and spend sufficient time in Trinidad and Tobago to complete the work.

2.5 Means of payment: Remuneration will be processed as defined in section VI "Schedule of Payments".

III. ACTIVITIES AND DELIVERABLES

3.1 The selected consulting firm will coordinate with IDB staff in the Climate Change and Sustainability (INE/CCS) and the Environment, Rural Development and Disaster Risk Management (INE/RND) divisions for the implementation of the consultancy. The consulting firm will also coordinate with CCRIF staff and other relevant stakeholders, including officials from the Ministry of Environment and Water Resources, Ministry of Planning and the Economy, Environmental Management Authority, Office of Disaster Preparedness and Management, University of the West Indies, University of Trinidad and Tobago, private sector organizations, etc., when necessary.

3.2 The specific activities to be undertaken for this consultancy are as follows:

i. **Review of literature including work on existing methodologies** on the economic analysis of adaptation measures, from a local, regional and international perspective.

ii. **Identification of risks**, which will identify the most relevant hazards related to climate change (i.e. hurricane-induced wind damage, coastal flooding/storm surge, SLR and inland flooding due to tropical meteorological systems) and exposure i.e. the areas at risk in regards to population (especially vulnerable communities) and economic value (infrastructure and GDP);

iii. **Assessment of the magnitude of the expected loss**, which will assess the frequency and severity per climate change scenario (A2, B1 and A1B1 emission scenarios), quantify populations, assets and income value at risk as well as determine their vulnerability. Economic assessments of risks will cover current risk, future risk assuming current climate conditions under projected economic development for selected years (i.e. 2013, 2030, 2050) and future risk assuming various climate change scenarios.

iv. **Identification of responses,** as knowing what the risks are and their magnitude, it will be necessary to identify potential adaptation and disaster risk reduction (DRR) measures, their feasibility and the economic and societal costs and benefits of their implementation. This activity will allow for an accurate understanding of the measures available to address the quantified climate risks, as well as the costs and benefits of those measures. This activity will also include a detailed **cost benefit analysis on a case study for the energy sector to be defined by the project team**. Measures that prevent the occurrence of climate risks can be grouped into three categories:

    a. **Infrastructure - and asset-based responses**. Measures that require physical changes to existing assets or building of new assets, e.g., build sea walls in strategic locations or beach nourishment.
    b. **Technological/procedural optimisation responses**. Measures that require adoption or use of a different technology, process, or input, e.g., retrofit important buildings.
    c. **Systemic/behavioural responses**. Measures that involve behavioural change or a coordinated systematic response, e.g., incentivise movement uphill.
    d. Measures that would transfer risk via insurance and alternative financial solutions are also considered. Typically, such measures are used to protect against catastrophic low-frequency/high-severity weather events, such as storm surges with return periods of 1 in 100 years.

v. **Determination of decision-making framework for action**, which will identify key barriers (e.g. policies, regulations, institutional capacity) to

implementation and actions required to implement relevant measures to inform the decision making process; and

vi. **Dissemination of knowledge and lessons learnt** under the study, which will involve training workshops in Trinidad and Tobago on the methodology and approach in order to build capacity among relevant practitioners (both public and private sector) such as but not exclusive to the Ministry of Environment and Water Resources, Environmental Management Authority, Ministry Of Planning and Sustainable Development, Tobago House of Assembly, University of the West Indies, University of Trinidad and Tobago.

3.3 The expected outputs from this consultancy are the following:

i. Identification of most relevant socio-economic areas in terms of GDP generation, employment and population concentration;

ii. Identification of the main hazards, exposure to these hazards (assets at risk and their valuation*)* and vulnerability assessment (identifying vulnerable areas)

iii. Probabilistic risk assessments of critical socioeconomic areas;

iv. Estimation of expected economic loss under various climate change scenarios;

v. Identification of potential adaptation and DRR measures and their feasibility. This should take into account existing adaptive capacity;

vi. Cost-benefit analysis / cost effectiveness analysis of proposed adaptation and DRR measures and pilot cost-benefit analysis for energy sector case study to be identified;

vii. Prioritization of investment options based on the findings of the analysis;

viii. An ECA methodology that is applied in Trinidad and Tobago and can be replicated throughout the Caribbean region. This methodology should be done using software that is accessible and economically feasible.

ix. Training workshops on the ECA methodology to relevant practitioners (both public and private sector). At these workshops, it is expected that practitioners (e.g. Ministry of Environment and Water Resources, Environmental Management Authority, Ministry Of Planning and Sustainable Development, Tobago House of Assembly, University of the West Indies, University of Trinidad and Tobago, etc.) would be trained in how to use and apply the methodology. The presentation of the methodology should include all formulae, assumptions, calculations, logic, etc. that were used in the development of the methodology to ensure that all steps involved are clear and open to the understanding of the practitioners. The workshop will also

present the initial results of the study for feedback, verification and adjustments by the practitioners. The workshop/s should be at least 2 days in duration, as they will cover (i) presentation of methodology as outlined above; and (ii) feedback/verification/adjustments of results by the practitioners.

IV. DELIVERABLES

4.1 The consultancy firm will be responsible for submitting the following interim and final deliverables:

i. Work plan to be submitted within 2 weeks after signature of the contract
ii. First interim report to be submitted within 6 weeks after contract signature and containing as a minimum: the identification, for Trinidad and Tobago, of the key economic sectors in terms of GDP generation and employment as well as the identification of the main hazards, exposure to these hazards (assets at risk and their valuation*)*
iii. Second interim report to be submitted 11 weeks after signature of the contract and which should contain probabilistic vulnerability assessments of critical socioeconomic areas in Trinidad and Tobago.
iv. Third interim report to be submitted 15 weeks after signature of the contract which will contain the estimation of expected economic loss under various climate change scenarios and the identification of potential adaptation and DRR measures and their feasibility.
v. Fourth interim report to be submitted 18 weeks after signature of the contract which will contain cost-benefit/cost effectiveness analysis of proposed adaptation and DRR measures, including a pilot cost-benefit analysis for case study of a vulnerable area and infrastructure to be identified by project team, and prioritization of investment options based on the findings of the analysis.
vi. ECA methodology to be presented 21 weeks after signature of the contract to be applied in Trinidad and Tobago and implementation report after piloting the methodology in the country.
vii. Final ECA methodology that incorporates lessons learnt and best practices from the implementation of the pilot in Trinidad and Tobago and which can be applied to the broader Caribbean region. In addition at least 2 workshops to be given for relevant practitioners (e.g. Ministry of Environment and Water Resources, Environmental Management Authority, Ministry Of Planning and Sustainable Development, Tobago House of Assembly, University of the West Indies, University of Trinidad and Tobago, etc.), in order to disseminate the information on the methodology. To be completed 24 weeks after signature of the contract.

4.2 Every report submitted to the Bank for review must be sent in one electronic file that should include cover, main document, and all annexes in MSWord format and MS Excel where appropriate. All final reports must be submitted to the Bank in one electronic file that should include cover, main document, and all annexes using PDF format. Zip files will not be accepted as final reports, due to regulations from the Records Management Section.

V. QUALIFICATIONS

5.1 Expertise: The proposed team leader shall hold a Post graduate degree in Environmental Sciences, Engineering, and Environmental Economics or in a related discipline. The team leader shall also possess project management experience. Other key personnel shall demonstrate knowledge in the area of climate change through documented post graduate work with a minimum of 7 years of experience in the field. The list of key personnel must include:

- Climate Change Adaptation Specialist with experience in DRM;
- Expert in Probabilistic Risk Assessments;
- Expert in environmental economics with experience in developing cost estimates and cost-benefit calculations;
- Expert in environmental management;
- Expert in coastal engineering and management;
- Expert in qualitative and quantitative methods of data collection;

5.2 Experience: The firm must have no less than 5 years of legal constitution; have experience managing consulting contracts amounting to $300,000 or more, a year and document experience in vulnerability assessments, climate change adaptation projects and cost benefit analyses directly or through the experience of at least two collaborators proposed for this assignment. In a similar way the firm should demonstrate experience with activities related to climate change and knowledge on probabilistic hazard assessment; local field experience in the Caribbean will be considered an asset.

5.3 Languages: English.

5.4 Skills: Strong analytical skills on probabilistic hazard assessment, vulnerability assessment, cost-benefit analysis, ability to conduct calculation and assessment on natural hazard impacts associated with climate change; produce high quality written and visual communication products.

VI. SUPERVISION

6.1 The overall supervision of this contract, including approval for payments, will be the responsibility of the Climate Change and Sustainability Division (INE/CCS) through Gerard Alleng, Climate Change Sr. Specialist (INE/CCS) with the support of Dale

James, Operations Sr. Associate (CCB/CTT). Staff of INE/CCS will have responsibility for technical supervision in collaboration with INE/RND, through Cassandra Rogers, Disaster Risk Management Lead Specialist (RND/CBA).

VII. SCHEDULE OF PAYMENTS

7.1 The modality for payment of services is a lump sum disbursed according to the following schedule:

- 20% upon signature of the contract and submission and approval of the work plan.
- 15% upon submission and approval of each of deliverables 2 to 5 (four reports).
- 10% upon implementation of ECA methodology (including training workshops) in Trinidad and Tobago and submission and approval of summary report on the pilot.
- 10% upon final acceptance by the Bank of the ECA methodology.