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TERMS OF REFERENCE (TOR)

CLIMATE CHANGE VULNERABILITY AND ADAPTATION STUDY FOR THE PORT OF PORT LOUIS IN MAURITIUS

CTCN REFERENCE NUMBER: 2016000013

1 BACKGROUND INFORMATION

The Climate Technology Centre and Network (CTCN) is the operational arm of the United Nations Framework Convention on Climate Change (UNFCCC) Technology Mechanism and hosted by the United Nations Environment Programme (UNEP) in collaboration with the United Nations Industrial Development Organization (UNIDO) and supported by 11 partner institutions with expertise in climate technologies.

The mission of the CTCN is to promote accelerated deployment and transfer of climate technologies at the request of developing countries for energy-efficient, low-carbon and climate-resilient development.

These requests for Technical Assistance (TA) are being submitted to the CTCN by the National Designated Entity (NDE) of the respective country. The scope of services under these Terms of Reference shall be executed based on a restricted solicitation process. By mandate, only accepted Members of the CTC Network are eligible to submit proposals and execute the required services to implement the response. Should the bidder partner with another institution to deliver a minor part of the services described in these Terms of Reference, it is expected that the partner institution also joins the CTC Network.

In case you are not a CTCN network member yet, you may bid for implementation of the technical assistance, subject to the condition that you submit your completed application for CTC Network membership before the award of contract and the same is acknowledged by the CTCN. The contract award – should your bid be selected – is conditional to your network membership application having been successfully approved by the Director of CTCN. Should the bidder partner with another institution to deliver the services described in these Terms of Reference, it is expected that the partner institution also joins the CTC Network.

The budget for this contract is **USD 281,820** and needs to be in line with the detailed budget breakdown provided in the GCF readiness proposal annexed to the TOR. The amount under each budget line is fixed and the bidders are free to add on activities beyond what is mentioned in the ToR to enhance the quality of the deliverables and outputs, as long as the budget line remains the same.

2 PROJECT CONTEXT

Port Louis's harbour is exposed to risks stemming from weather and climate change effects such as sea level rise, storm surges, wave and wind impact, precipitation and flooding, and water temperature rise. In recent years, port operations have been suspended temporarily due to adverse weather resulting in strong winds, including cyclonic winds, and wave action. Also, flooding of land areas has caused interruption of operations. With climate change follows the risk of more frequent stops of operations, alongside the risk of increased wear on structures, resulting in increased maintenance efforts and costs.



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In addition to these, there is a risk of increase in siltation rates and hence potentially an increased requirement for maintenance dredging or other mitigating measures around Port Louis harbour.

The Third National Communication (2016) has proposed several adaptation options for the coastal zone, including 'Adaptation of public infrastructure on the coastal zone and the Ports Area'. The adaptation measures include wave breakers at sea and flood wall on the coastline to protect vulnerable on-land infrastructure, raising existing wharfs to lessen inundation by sea surges and building elevated roads or relocating coastal roads more inland.

Safeguarding infrastructure is one of the key priority adaptation actions presented in the Mauritius NDC (2015). Specifically, the NDC states that the 'protection of infrastructure will be enhanced against climate change calamities'.

The Ministry of Social Security, National Solidarity and Environment and Sustainable Development (MSSNSESD) on this basis has requested CTCN technical assistance with the aim of assessing the vulnerability of the harbour of Port Louis to climate changes and to undertake a vulnerability study that shall identify specific technologies to mitigate negative effects of climate change on the port. Mauritius' National Designated Authority (NDA), the Ministry of Finance and Economic Development, has included this TA into its Readiness and Preparatory Support pipeline.

3 AIM OF THE CONTRACT

The TA aims to provide a technology needs assessment and identification of adaptive measures to improve the resilience and sustainability of Port Louis harbour.

The following activities to be undertaken are:

- The identification of gaps in the existing national plans and strategies on the port sector and the port of Port Louis with relation to climate change resiliency and mapping of past impacts of climate change on the operation of the port
- The assessment of the climate change risk of the port of Port Louis
- The prioritisation of adaptive measures
- The formulation of an action plan for the implementation of adaptive measures including costing and resource requirements
- The identification of capacity building needs for the stakeholders of the port and port sector
- The drafting of a GCF concept note on Adaptation for the port of Port Louis
- Monitoring and communication

The expected outcomes are:

- Level of risks and hazards on the port of Port Louis assessed
- Capacity in vulnerability assessment (including modelling) and adaptation technologies of Port Authority technical staff and other concerned stakeholders strengthened



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- Adaptive measures to ensure the resilience of the port of Port Louis selected
- Prefeasibility study of the selected adaptive measures completed
- Preliminary GCF concept note drafted
- Improved preparedness of the port of Port Louis to climate change

The outputs are in line with the country's NDC and will contribute to the country's adaptation readiness. Specifically, the TA will enable the Mauritian counterparts in the identification of most relevant adaptive measures for the climate resiliency of the Port of Port Louis. The outputs shall be used by the Mauritius Port Authority and the port of Port Louis for enhancing their development and implementation of short-term and long-term plans and strategies for the climate change adaptation. Moreover, outputs will be considered in future design specifications of all port infrastructure elements, implementation of mitigating measures and the daily port management, monitoring and operations.

The assistance will also provide an essential platform for future projects and funding in the form of a preliminary draft of a GCF concept note and the identification of stakeholders likely to be engaged in policy formulation, the implementation of adaptation measures, and the contribution of financial and other resources.

4 SCOPE AND ACTIVITIES OF THE PROPOSED CONTRACTED SERVICES

Once the Contractor is contracted, the CTCN will organize a kick-off implementation call between all parties involved to introduce the Contractor to the Mauritius NDE and NDA and Mauritius Port Authority (MPA), present the activities and timeline and clarify the roles and responsibilities.

In general, to ensure a successful implementation and proper interaction with national counterparts and stakeholders, it is recommended that enough days be allocated on site for the most relevant activities. It is also recommended to include regional, or preferably, national experts or organisations in the proposed implementation team.

It is mandatory for the Contractor(s) to allocate at least 1% of the budget to integrate a gender-approach to the activities. Please refer to the CTCN Gender Mainstreaming Tool for Response Plan Development for guidance at <https://www.ctc-n.org/technologies/ctcn-gender-mainstreaming-tool-response-plan-development>

Output 1: The identification of gaps in the existing national plans and strategies on the port sector and the port of Port Louis with relation to climate change resiliency and mapping of past impacts of climate change on the operation of the port

1.1 Review of available background documentation

The Contractor will go on a site visit to meet with the stakeholders and collect relevant necessary information with a view to:



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- Review existing national plans and strategies relevant to the Mauritian port sector in general and to the port of Port Louis specifically in the context of projected impact from climate change and extreme weather conditions.
- Review available port infrastructure documentation to assess potential vulnerabilities.
- Review available port operation and performance documentation including financial and operational indicators to identify past climate change related disruptions.
- If available at the time of initiation of the activities, review the Mauritius Port Authority's (MPA) new masterplan (2015 -2040) – currently under preparation.

1.2 Study of the port infrastructure and operations mapping

In consultation with main stakeholders and based on information collected during the field visit and visual inspection of the site as well as information such as GIS-based information available from the MPA¹, the Contractor will map the existing port infrastructure at the port of Port Louis and evaluate the port's physical conditions. The Contractor will specifically:

- Identify areas having already been impacted by adverse weather conditions in the recent years.
- Assess the existing staff capacities to understand and respond to climate-related hazards.
- Identify the areas of the port being the most vulnerable at risk to climate change impact.
- Analyse how adverse weather conditions and potential climate change have impacted and are likely to impact port operations. This analysis will lead to a definition of threshold criteria for closure of the port, better understanding of the conditions that affected the port operations currently and in the past is needed (including what can the ships manage and the resilience of cranes and the services, the identification of container terminal impacted by flooding of port area etc).

During the site visit in activity 1.1, the Contractor will meet with relevant stakeholders, notably with representatives from the MPA and the Ministry of Social Security, National Solidarity, and Environment and Sustainable Development (MSSNSESD).

1.3 Review and mapping of registered climate and extreme weather conditions

The Contractor will analyse meteorological trends and conditions over the past decades (i.e. wind and cyclones, rainfall, waves, water levels, etc.). Because climate change affects the weather patterns, past and current meteorological trends and conditions need to be defined (with climate change projections aggregated at a later stage) in order to assess the impact of possible adaptive measures. The Contractor will:

- Conduct a preliminary study of non-cyclonic and cyclonic wind and wave conditions at the port,

¹ For long-term use of the results of this technical assistance, the Contractor will endeavour in using software used by the Mauritius authorities or software that are available free of charge. The list of already available software can be found in section 9.



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based on available data and information and numerical modelling³.

- Identify the major weather conditions issues for the port over recent decades.
- Provide preliminary recommendations for the port operability and infrastructure resilience based on the results of mapping.

This activity also includes on-the-job training/knowledge sharing of the technical staff of the Port Authority and other concerned authorities involving them in the modelling, analysis and explaining the methods and results.

Deliverable output 1:

- *Main findings of the review of background documentation including information on the relevance of existing plans and policies, the adequacy of current capacity to respond to climate change impacts, and the scale and scope of the economic and operational threats faced as a result of climate change*
- *Mapping and analysis of the vulnerability of port infrastructure and operations*
- *Preliminary recommendations on adaptation needs and gaps for the port operability and infrastructure resilience*

Output 2: Assessment of the climate change risk of the port of Port Louis

2.1 Identification and review of climate change scenario and projections

Based on consultations with the MPA, MSSNSESD and other relevant stakeholders, the Contractor will select climate change scenario from IPCC AR5. Consultations with the Mauritius counterparts (NDA, NDE and Port Authority) will be undertaken to select 2-3 scenarios. Wind and sea-levels scenarios will be also taken into account. The Contractor will then:

- Review the climate change scenario selected at national, regional and port area levels.
- Consider i) MSSNSESD 'Disaster Risk Reduction Strategic Framework and Action Plan 2013' and ii) other relevant Mauritian government policies and strategies.

2.2 Evaluation of risk areas

Using the climate scenario selected, the Contractor will evaluate the climate risk areas in the port of Port Louis. The Contractor will specifically:

- Conduct GIS-based modelling or simulation²
- Identify impact of different climate scenario on port operability, structural resistance and resilience
- Evaluate the risk areas within the port of Port Louis that are vulnerable to impact from climate changes.
- Consider gender related issues to be encountered due to effects of climate change under different scenarios

This activity also includes on-the-job training of/knowledge sharing with the technical staff of the Port

² For long-term use of the results of this technical assistance, the Contractor will endeavour in using software used by the Mauritius authorities or software that are available free of charge. The list of already available software can be found in section 9.



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Authority and other concerned stakeholders involving them in the evaluation and explaining the methods and results of activity 2.1 and 2.2.

Deliverables output 2:

- *Report, including maps, on the evaluation of the risk areas in the port of Port Louis*

Output 3: Prioritisation of adaptive measures

3.1 Recommendation of adaptation technologies

Based on the outcomes from activity 1 and 2, the Contractor will provide the possible technical measures to adapt to climate change and associated constructional guidance. The Contractor will:

- Identify a list of adaptive measures (adaptation technologies and/or mitigating measures) to be used to enhance resilience against climate risk.
- Prepare technology fact sheets including information on the following elements:
 - Technology description
 - Climate change adaptation benefits
 - Environmental and social benefits
 - Knowledge/capacity building requirements
 - Cost (including costs of operation/maintenance)
 - Opportunities and barriers
 - Sustainable construction standards and codes of practice.
 - References to case studies where the technology has been applied
- Consider gender-related aspects of planning and design of adaptive measures to climate change. CTCN gender mainstreaming tool will be used as baseline reference to assure that gender issues will be included since the early stage of the technology prioritisation of this proposal. A description of the gender tool can be found at this link: <https://www.ctc-n.org/technologies/ctcn-gender-mainstreaming-tool-response-plan-development>

3.2 Selection of adaptive measures

The Contractor will adopt a multi-criteria decision making process such as multi-criteria analysis (MCA) to prioritise the most relevant adaptive measures. Based on this, the Contractor will:

- Propose the environmental, technical, social and/or economic criteria and associated indicators for the MCA
- Host a stakeholder workshop to conduct the MCA
- Compare the possible adaptive measures through the MCA
- Select the most prioritised adaptive measures to adapt to climate change based on the result of MCA and the stakeholders' consultations

During the activity workshop with key stakeholders which are MSSNSESD, MPA, Mauritius Meteorological



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Services (MMS) and Mauritius Oceanography Institute (MOI) will be held, discussing the methodology and results of the prioritisation of adaptive measures. Additional stakeholders identified in previous activities may also be involved.

3.3 Pre-feasibility study of selected adaptive measures

The Contractor will visualise the effect of the selected adaptive measures against the port's climate change vulnerability. The Contractor will:

- Apply a numerical wave modelling and other relevant tools to evaluate the effects of prioritised adaptive measures on climate change resilience of the port of Port Louis³.
- Evaluate design criteria for adaptive measures with regards to impact from extreme wind and wave impact
- Pre-evaluate the social and environmental impact assessment

This activity also includes on-the-job training/knowledge sharing of the technical staff of the Port Authority and other concerned stakeholders involving them in the assessment and explaining the methods and results.

Deliverables output 3:

- *Technology fact sheets of adaptation technology options for the port of Port Louis*
- *Results of MCA exercise (Prioritisation of adaptive measures)*
- *Pre-feasibility study report for prioritized adaptive measures*

Output 4: Formulation of an action plan for the implementation of adaptive measures

4.1 Estimating costs for the implementation and monitoring of selected adaptive measures

The Contractor will assess budget and cost structure for implementation of the recommended/selected adaptive measures for making the port of Port Louis climate resilient and long term sustainable.

The cost estimates will integrate both the cost related to implementation of adaptive measures as well as to the longer-term monitoring of the effectiveness of implemented adaptive measures, in light of continued change and availability of new climate change data.

4.2 Identification of capacity building needs for the stakeholders of the port and port sector

The Contractor will:

- Identify capacity building needs for the port sector staffs and its related cadres to enhance, implement and monitor the adaptive measures for the long-term resilience of the port of Port Louis against climate change.
- Provide a clear assessment on how and where the necessary skills should be obtained and developed.

³ For long-term use of the results of this technical assistance, the Contractor will endeavour in using software used by the Mauritius authorities or software that are available free of charge. The list of already available software can be found in section 9.



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4.3 Guidelines, action plan and priority time frames

In addition to cost estimation, the Contractor will:

- Develop guidelines for the adaptive measures selected/recommended for the implementation of initiatives for making the port of Port Louis climate resilient and long term sustainable.
- Provide an action plan, which will cover adequate and timely prioritised planning, design, implementation and monitoring of adaptive measures deemed necessary to enhance the climate resilience of the port of Port Louis.
- Recommend an investment plan for the implementation of the adaptive measures with mixed resources (for example: revenues from port activities, public subsidies and international donor loans or grants).

Deliverables output 4:

- *Assessment of adaptive measures implementation, operating, maintenance and monitoring costs*
- *Report on capacity building needs*
- *Guidelines and action plan*

Output 5: preliminary draft of a GCF concept note

Based on the results of activity 4 and 5, and with the support of the NDA, the NDE and the port authority, the Contractor will develop a preliminary draft of a GCF concept note. The development of the GCF Concept Note will build on the background research and identification of adaptation measures through the strategic engagement of stakeholders, especially private sector stakeholders. The Concept Note will also explore both the policy and financial enabling environments required for the successful implementation of the adaptation measures and will explore innovative financial mechanisms in partnership with relevant private sector actors, national and international co-financing. For this, the Contractor will together with the NDA, NDE and the port Authority:

- *Prepare a preliminary draft of a Concept Note for the GCF.*
- *Hold consultations with local stakeholders*

There is no Accredited Entity (AE) associated with this proposal at this stage. The Contractor, in collaboration with CTCN, will provide support to the NDA to identify potential AEs taking into account their recorded expertise, local experience and the type of GCF financial instrument envisaged. The NDA, NDE and the Port Authority will then use the preliminary draft to approach their preferred AE for preparing the final draft.

Deliverables output 5:

- *Preliminary draft of the concept note*

Output 6: Monitoring and communication

To ensure an appropriate and timely implementation of this technical assistance, the Contractor will:

- Produce a one page description of intended outcomes and impacts from this technical assistance, drafted at initiation of implementation and revised at closure, using the CTCN template "Technical



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Assistance – Closure Report Template” (only filling section 5 of the template) located at: <https://www.ctc-n.org/technical-assistance/introduction>. This document will be used for communication purpose by the country and the CTCN in promoting the technical assistance and potentially foster South-South cooperation;

- Prepare a monitoring and evaluation plan, identifying all relevant indicators as specified in the “Technical Assistance – Closure Report Template” as well as other specific, measurable, achievable, relevant, and time-bound indicators suitable to monitor Outputs and Activities. This template is available at: <https://www.ctc-n.org/technical-assistance/introduction>
- Produce the GCF readiness interim and completion reports, as per templates attached.
- Produce a technical assistance ‘Closure and Internal Information Report’ using the CTCN template “Technical Assistance – Closure Report Template” available at: <https://www.ctc-n.org/technical-assistance/introduction>

Deliverables output 6:

- *Technical assistance impact description document*
- *Monitoring and evaluation plan*
- *GCF readiness interim progress report*
- *GCF readiness project completion report*
- *Closure and Data Collection report*

5 GENERAL TIME SCHEDULE

The activities under this Contract should be completed within a period of 15 months from the date of signature of the Contract for the implementation of outputs 1-6.

6 PERSONNEL IN THE FIELD (PROFESSIONAL EXPERIENCE AND QUALIFICATIONS)

The Contractor is expected to provide the services of a team that should ideally comprise the following competencies:

- Proven expertise in the design and implementation of adaptation plans and strategies for port infrastructure
- Proven expertise in analysing meteorological trends and conditions and mapping in consideration with climate change scenario and projections at national and regional levels
- Demonstrated experience in adaptation projects in Africa, preferably in Mauritius
- Demonstrated experience in assessing vulnerability and risk of coastal infrastructure to climate change impact, particularly with regards to ports
- Demonstrated experience in the project proposal drafting and mobilization of resources for the implementation of port adaptation activities, including relevant private sector actors, national and international financing.



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- Demonstrated experience in designing and delivering training for stakeholders to enhance climate change adaptation
- Excellent written and communication skills in English

The CVs of the respective experts assigned to this project by the Contractor must be provided.

7 LANGUAGE REQUIREMENTS

The working language for the purposes of this project is English, thus an excellent command of English is required of the proposed personnel.

All delivered documents must be of such a quality that no further editing shall be required.

8 DELIVERABLES AND SCHEDULE

Activities (Brief description)	Anticipated Duration: 15 months														
	Monthly Implementation Plan of Activities														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Activity 1 – Identification of gaps in the existing national plans and strategies on the port sector and the port of Port Louis with relation to climate change resiliency and mapping of the port’s vulnerability to climate change															
1.1 Review of available background documentation															
1.2 Study of the port infrastructure and operations mapping															
1.3 Review and mapping of registered climate and extreme weather conditions															
Deliverables:															
Main findings of the review of background documentation															
Mapping and analysis of the port infrastructure and operations															
Preliminary recommendations for the port operability and infrastructure resilience															
Activity 2 – The assessment of the climate change risk of the port of Port Louis															
2.1 Identification and review of climate change scenario and projections															
2.2 Evaluation of risk areas															
Deliverables:															
Report on the evaluation of the risk areas in the port of Port Louis															



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Activity 3 – Prioritisation of adaptive measures																				
3.1 Recommendation of adaptation technologies																				
3.2 Selection of adaptive measures																				
3.3 Pre-feasibility study of selected adaptive measures																				
Deliverables:																				
Technology fact sheets of adaptation technology options for the port of Port Louis																				
Results of MCA exercise (Prioritisation of adaptive measures)																				
Pre-feasibility study report																				
Activity 4- Formulation of an action plan for the implementation of adaptive measures																				
4.1 Estimating costs for the implementation and monitoring of selected adaptive measures																				
4.2 Identification of capacity building needs for the stakeholders of the port and port sector																				
4.3 Guidelines, action plan and priority time frames																				
Deliverables:																				
Assessment of adaptive measures implementation and monitoring costs																				
Report on capacity building needs																				
Guidelines and action plan																				
Activity 5 – Development of a preliminary draft of a GCF concept note																				
Deliverables:																				
Preliminary draft of the concept note																				
Activity 6 – Monitoring and communication																				
Deliverables:																				
Technical assistance impact description document																				
Monitoring and evaluation plan																				
Closure and Data Collection report																				

9 OTHER INFORMATION

The latest World Risk Report 2016⁴ has ranked the Republic of Mauritius as the 13th country with the highest disaster risk and 7th on the list of countries most exposed to natural hazards.

There are on-going projects to enhance resilience against climate risk in the Republic of Mauritius, which are:

- a) The Adaptation Fund Project ‘Climate Change Adaptation Programme in the Coastal Zone of Mauritius Coastal’⁵, which aims to increase climate resilience of communities and livelihoods in coastal areas of the

⁴ World Risk Report, 2016, p. 11:

https://collections.unu.edu/eserv/UNU:5763/WorldRiskReport2016_small_meta.pdf

⁵ Climate Change Adaptation Programme in the Coastal Zone of Mauritius: <https://www.adaptation-fund.org/project/climate-change-adaptation-programme-in-the-coastal-zone-of-mauritius/>



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Republic of Mauritius including coastal adaptation works at 3 pilot sites; Mon Choisy, Riviere des Galets and Quatre Soeurs. The project started in August 2012 and expected to end in August 2018.

b) A project under the National Disaster Risk Reduction and Management Centre (NDRRMC) started in October 2013 with the mandate to establish a strategic and coordinated approach to disaster management for the Republic of Mauritius, including for flood events. The Government has enacted a National Disaster Risk Reduction and Management Act in April 2016. The Act provides a legal framework for the prevention and reduction of the risk of disasters; the mitigation of the adverse impacts of disasters; disaster preparedness; effective response to disasters; and, management of post-disaster activities, including recovery and rehabilitation. Under this Act, the NDRRMC is presently working on the establishment of an early warning system for flooding.

In addition to on-going projects, the following projects are currently under a design phase:

a) A project under the Agence Française de Développement (AFD), currently formulating a project proposal to the tune of Euro 32.8M, as grant request, on adaptation to climate change, on behalf of the Republic of Mauritius, for submission to the Green Climate Fund for consideration. The objectives of the project are to reinforce climate monitoring and climate policy, improve disaster risk reduction with a focus on flood management and foster sustainable water resource management. The project proposal is presently being drafted.

b) A project under the Indian Ocean Commission (IOC) is presently engaged in the preparation of a Regional Climate and Risk Reduction Action Plan. The Action Plan will be based on the Sendai Framework for Disaster Risk Reduction, as well as on decisions under the United Nations Framework Convention for Climate Change (UNFCCC) and the Paris Agreement. The draft of the Action Plan comprises two distinct aspects namely; the fight against the adverse impacts of climate change and disaster risk reduction. So far only a preliminary concept note has been drafted for this project.

The GIS software available in Climate Change Division of the Ministry of Social Security, National Solidarity, and Environment and Sustainable Development are: (i) ArcGIS 10.1 & 10.2; (ii) Quantum GIS; and (iii) SimCLIM Desktop 4.0 (modelling).