CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

CTCN Technical Assistance
Response Plan

Country:	Uganda (Lake Victoria basin)
Request Identification Number:	2016000034

Title:	**Adaptation to climate change through improved information and planning tools for Lake Victoria**

Summary of the CTCN Technical Assistance

The CTCN technical assistance will strengthen ***adaptation to climate change through improved information and planning tools*** in the part of the Lake Victoria basin located in Uganda. The objective of this technical assistance is to facilitate technology transfer for climate change adaptation, with a focus on seasonal and long-term planning within the water resource and energy sectors. The proposed support will build on existing technologies and new developments will be demonstrated using applications in the region. The support will improve local capacity to access climate change information, estimate impacts, and use climate change impact estimates to support decision making.

The hydrology of Lake Victoria is, to a large extent, a function of the balance between rainfall and evaporation on the lake surface, and historical climate variability has resulted in fluctuations in the volume of water in Lake Victoria (UNEP 2013). Climate models predict changes to the balance between precipitation and evaporation on medium (10 to 30 years) and longer (> 50 years) time scales, with potentially serious impacts on the lake's water balance. These impacts have implications for the approximately 30 million people living in its basin, as well as further downstream in the Nile River basin (UNEP 2013). Hydropower, fisheries and transport are some of the sectors that are impacted by changes to the water balance, particularly when these changes result in decreased lake levels and associated declines in hydropower generating capacity (for example, Hepworth, 2008). Improved technologies for making climate resilient decisions and embedding state-of-the-art climate information into the decision workflow are critical for the sustainability of water resources and energy production in the Lake Victoria basin.

This proposed technical assistance will be implemented through delivery of technology and training to the Lake Victoria Basin Commission (LVBC), including activities in the following areas:

Climate model projections and seasonal forecast data: The CTCN assistance will enable local stakeholders to use state-of-the-art regional climate model projections for estimating climate change impacts at medium and longer time scales. In addition, the assistance will enable access to results from seasonal forecasts useful for estimating short term climate variability. Climate projections will be added to data managed by the existing Water Resource Information System (WRIS) used by LVBC. The assistance will also add seasonal forecast data to the WRIS, as well as procedures for maintaining up-to-date forecasts. Historical data for bias correction and statistical processing will be will be added to WRIS where appropriate.

Impact assessment: Decision makers can use impact models to estimate the impacts of climate change and other drivers (such as population growth) on the performance of

water resources management and infrastructure plans. The technical assistance will make refinements to the existing water resource model hosted by LVBC in order to enhance its utility for impact assessments in the water resource and energy sectors.

Planning: Decision-making under uncertainty about climate change and other drivers benefits from an approach that characterizes system performance across a range of conditions that may be expected in the future. In such an approach, a key challenge is to characterize uncertainty and integrate it into the planning process. The CTCN assistance will develop guidelines on planning methods that incorporate the climate and other drivers into impact modelling, so that the performance of planning alternatives can be evaluated across a range of uncertain future conditions. The guidelines will also include recommendations for using this information in a decision-making process.

Dissemination and outreach: Dissemination and outreach activities will be carried out to ensure that local partners are able to make use of the technical assistance. These activities will be targeted at national organisations through workshops and technical sessions as well as regional organisations through the existing network of LVBC (the applicant).

Technical outputs will be tested using applications in Uganda. The expected outputs are aligned with existing strategic goals, including the **Technology Needs Assessment report (TNA)**, **Nationally Appropriate Mitigation Actions** and the **Strategic Action Plan for the Lake Victoria Basin (SAP)**.

1. Overview of the CTCN technical assistance

1.1 Technology aspects

The CTCN technical assistance will strengthen adaptation to climate change through improved information and planning tools in the part of the Lake Victoria basin located in Uganda. The information and planning tools will strengthen seasonal and long-term planning within the water resource and energy sectors through access to climate forecast and projections, improved use of existing water resource models for impact assessments and guidelines for inclusion of the uncertainty associated with climate change in the decision making process. The support will improve local capacity to access climate change information, estimate impacts, and use climate change impact estimates to support decision making.
It is anticipated that the technical assistance will consist of the following activities:

- **Access to climate model projections and seasonal forecast data.** Access to state-of-the-art climate change projections is critical for water resources planning. In addition, seasonal forecast data are useful for operational planning at shorter time scales. This activity will make information from the latest climate projections and seasonal forecasts available for stakeholders through the existing Lake Victoria Water Resource Information System (WRIS). The WRIS was developed by the Lake Victoria Basin Commission (LVBC) partners for storage and dissemination of water resource data and information. The CTCN assistance will

add state-of-the-art regional climate model projections to the WRIS. These projections will be taken from regional climate models that account for the unique meteorological and hydrological features of the Lake Victoria basin, as well as links between the local and large-scale climate. The projections will consist of ensemble simulation results that characterize a range of climatic conditions that may be expected in the future, depending on assumptions about greenhouse gas concentrations, physical processes, and model parameterizations. Seasonal forecast ensembles will also be included in the WRIS. While the transfer of climate projections will be a one-off event, seasonal forecasts must be updated periodically, and the technical assistance will include procedures for making these updates. Both long-term projections and seasonal forecasting require statistical processing based on comparison to historical data. Therefore, the technical assistance will also make satellite based historical data available through the WRIS. These data could include rainfall (TRMM or CHRIPS), temperature (MODIS) and potential evapotranspiration (MODIS).

- **Impact assessment.** Impact assessment models are useful for the assessment of water resource management and infrastructure plans, and have gained acceptance for evaluating impacts within the complex hydrological setting of Lake Victoria. The CTCN assistance will evaluate the existing water resource model located at LVBC and recommend refinements to make the tool more useful for climate change impact assessment. Refinements will be carried out after consultation with LVBC and other stakeholders. The refined model has the potential to be the central water resource model for assessment of climate change impacts within the water resource and energy sectors in Uganda, and potentially the region.
- **Decision making under uncertainty.** The assistance will provide guidelines for decision making under uncertainty about climate change and other drivers. The guidelines will explain how to use uncertainty about climate change, as represented by ensemble projections, in a decision-making process. The guidelines will be based on the "robust decision making" methodology (Bryant and Lempert, 2010), which uses ensemble simulation to characterize the performance of water resources plans under a range of conditions that may be expected in the future; the methodology then offers tools for identifying plans that are likely to perform well regardless of future conditions (i.e., that are "robust" to uncertainty). The approach can be extended to include uncertainty about other drivers, such as population or economic growth. Technology required to implement the guidelines includes ensemble climate projections, an impact model, and tools for processing ensemble impact model results. The first two items are part of this technical assistance, while stakeholders will have access to existing free software to implement the third.
- **Dissemination and outreach.** Dissemination and outreach will take place through workshops and training courses. The technical assistance will develop a program of appropriate dissemination and outreach activities through collaboration with the stakeholders.

All relevant outputs produced by this technical assistance will be made freely available for the stakeholders and will not be associated with any license or maintenance cost.

1.2 Objectives

The objective of this technical assistance is to strengthen planning in the water resources and energy sectors in Uganda, at both long-term and seasonal timescales. At the conclusion of the technical assistance, local planners and operators should be able to access ensemble climate projections and seasonal forecasts, process these data, use the data to drive impact models, and use ensemble simulation results to support decision-making for long-term planning and seasonal operations. These

objectives are aligned with recent strategic planning, including the technology needs assessment report (TNA), the Nationally Appropriate Mitigation Actions (NAMA) and the Strategic Action Plan for the Lake Victoria Basin (SAP), and will contribute to these national strategies.

The specific objectives of this technical assistance are to:

a. Provide access to state-of-the-art ensemble climate projections, seasonal forecasts, and satellite-based historical data through the existing Lake Victoria WRIS.
b. Refine the existing impact model used for simulating hydrology and water use in the Lake Victoria basin in order to maximize the utility of the model for estimating climate impacts on the water and energy sectors.
c. Provide guidelines for using ensemble projections of climate variables and other drivers in decision-making,
d. Demonstrate the utility of the technologies and guidelines through applications to local use cases.
e. Enable decision makers and stakeholders to use the transferred knowledge, practices and technologies through dissemination and outreach activities.

1.3 Results (outputs expected from CTCN assistance)

The outputs from the CTCN assistance will be as follows:

a. State-of-the-art ensemble climate change projections will be available to stakeholders in Uganda and the region through the Lake Victoria WRIS.
b. State-of-the-art ensemble seasonal forecasts will be available to stakeholders through the WRIS. Procedures will be put in place for maintaining up-to-date forecasts.
c. Satellite-based historical data will be available through the WRIS.
d. The existing impact model used to simulate hydrology and water use in the Lake Victoria basin will be refined so that the utility of the model for estimating climate impacts in the water and energy sectors is maximized.
e. Guidelines will be developed for using ensemble projections of climate variables and other drivers in decision-making. The guidelines will be oriented to existing technologies that are already available to stakeholders, or will be as part of this technical assistance.
f. The utility of the data, model, and guidelines made available as part of this assistance will be demonstrated using a local use case.
g. Dissemination and outreach activities including training and workshops will be carried out to ensure that local decision-makers and stakeholders are able to make use of the data, model, and guidelines.

1.4 Expected use of outputs

The outputs from the CTCN assistance will be of immediate use to fulfil goals outlined in strategic documents on water resource planning in Uganda including the TNA and the NAMA. They will be key tools for accomplishing the goals specified in the TNA and NAMA related to the water and energy sector in Uganda.

LVBC and key institutes in Uganda have a very specialised knowledge and focus on climate change adaptation and the CTCN technical assistance is being developed as a natural part of the outcomes of

previous projects related to this topic, e.g. Nile Basin Adaptation to Water Stress (UNEP 2013), LVEMP-I and II (LVBC 2009) and Water Resources Information System (WRIS, DHI 2014), all showing a need for further refining and adjusting the existing technologies for climate change impact and planning within the Lake Victoria region. The outputs of the CTCN assistance will be used actively in future planning efforts and will help increase capacity and knowledge at LVBC and other organization working with climate change adaptation in Uganda and the Lake Victoria region.

The 2014 National Water Resources Strategy for Uganda identifies a number of different future scenarios under which water resources management and infrastructure play an important role in national economic and social development. These include scenarios related to water use in the domestic and livestock sectors; increased hydropower production on the Nile River; increased irrigation; and oil and gas production. The strategy also identifies areas where increased water use has the potential to have adverse impacts, including impacts on tourism and wildlife; water quality; navigation; and fisheries. The 2014 strategy presents a blueprint for water resources management and development, as well as a framework for prioritizing future actions. As Uganda moves forward to implement the plan, it may be useful to prioritize actions that are likely to contribute to economic and social development regardless of future conditions, including climate change conditions. The robust decision-making approaches implemented as part of this assistance have the potential to provide valuable insight to decision-makers as implementation of the 2014 plan moves forward.

The outputs of the CTCN assistance will be used to disseminate updated information of relevance for climate change adaptation and provide improved tools for planning within the water resource and energy sectors. In addition, they will also contribute to address a current knowledge gap and provide an essential platform for future projects and funding. The outcomes will be a catalyser for financing of larger projects focusing on drought and climate adaptation within the Lake Victoria region.

2. Description of the Assistance

2.1 Activities

The activities are divided among three main categories, as detailed below. The first activity is an outreach campaign to present the technical assistance to relevant stakeholders and solicit feedback. The second activity is the technical assistance itself, including activities related to data access, model refinement, and formulation of guidelines for decision making under uncertainty. The final activity consists of technical training in the use of the technical outcomes and regional dissemination.

Activity 1 – Stakeholder outreach

The activity will introduce the technical assistance to stakeholders involved in decision making or planning within the water or energy sector in Uganda (eg. government offices or universities). The stakeholders will be selected by LVBC and the NDE based on their knowledge of national stakeholders of relevance for the CTCN assistance. Stakeholder outreach activities will also offer an opportunity to learn about important decision problems in the water and energy sectors in Uganda and the Lake Victoria basin. Feedback from the outreach will be used to refine the approach and develop case studies for testing and demonstration.

Activity 1.1 – National workshop to introduce CTCN assistance and solicit feedback

A national workshop with relevant stakeholders will be organized (2-day workshop with a maximum of 15 participants) in order to present the scope of the CTCN assistance and learn about decision problems in the water and energy sectors in Uganda and the region. The NDE and LVBC will assist in identifying the relevant stakeholders for the workshop. The scope of the workshop will be to present the scope of the CTCN response plan, solicit feedback regarding the proposed work plan and identify decision problems that can be used as case studies for testing and demonstration of the outcomes.

The outputs of activity 1.1 will be:

- Presentation of the CTCN assistance with proposed objectives and outputs for the key national stakeholders
- Feedback from stakeholders on the proposed approach, including suggestions for refining the approach.
- Identification of important decision problems in the water and energy sectors in Uganda and the region, including both seasonal and long-term planning problems. The identification exercise will also take into considerations gender impacts related to the decision problems encountered.
- Identification of potential case studies for demonstration and testing of the technologies

Deliverables	**Delivery date**
List of relevant stakeholders drafted	*Week 2*
National workshop (minutes from workshop) reports	*Week 8*
Assessment report (maximum of 30 pages)	*Week 10*

Activity 1.2 – Description of outcomes and identification of case studies

The outcomes from the national workshop and the needs assessment report will lead to a more detailed description of the proposed technology implementation in a specifications or design report. The following issues will be described in the report:

Data access and model refinements: Outcomes from the stakeholder consultation will be used to develop detailed specifications for data to be added to the WRIS, as well as refinements to the impact model. Specifications will include:

- Data that will be added to the WRIS, including climate projections, seasonal forecasts, and satellite-based historical data.
- Procedures for updating seasonal forecast information.
- Description of proposed refinements to the Lake Victoria basin impact model.

Identification of case studies: Feedback from the stakeholder consultation will be used to identify appropriate case studies for demonstration and testing. The case studies will be used to test the data access and impact model components, and demonstrate how ensemble climate projections and seasonal forecasts can be used to support decision-making under uncertainty. A demonstration and testing plan will be developed, and then implemented in activity 2.2.

The technology specification report and demonstration/testing plan should be approved before activity 2 is initiated.

The main outputs of activity 1.2 are:

- Detailed description of the technologies to be included in the CTCN assistance
- Document describing the testing and demonstration of the tools.

Deliverables	**Delivery date**
Technology specification report (maximum of 50 pages)	*Week 20*
Methodology for testing and demonstration	*Week 21*

Activity 2 – Data access, model refinement, and development of guidelines for decision support

The activity will implement access to data, refine the Lake Victoria impact model, and develop guidelines for decision-making under uncertainty. Data access, model refinements, and the guidelines for decision-making will then be tested using local case studies.

Activity 2.1 – Implementation of technical components

This activity will implement the technical components of the CTCN assistance, including data access, model refinements, and guidelines for decision-making. In addition, this activity will also develop tools for ongoing dissemination of data and model results.

- **Data access:** Climate projections are essential for long-term planning in the water and energy sectors. The CTCN assistance will enable access to state-of-the-art projections from regional climate models. Climate projections will be made available as ensembles that reflect the range of possible variation of climate variable given different assumptions about greenhouse gas concentrations, physical processes, and model representations. Access to these data will be provided through the Lake Victoria WRIS, which is managed by LVBC and used by national focal points throughout the region. The WRIS will enable remote access to projections through a web-based entrance. This activity will also make up-to-date seasonal forecasts available through the WRIS, and outline procedures for continuous updating. Because historical data are needed for statistical processing of climate projections and seasonal forecasts (i.e., bias correction), this activity will make state-of-the-art satellite based data available through the WRIS.
- **Impact assessment:** A simulation model is currently used by LVBC to assess the impact of climate variables such as rainfall and evaporation on the water balance of Lake Victoria. The existing model will be refined and updated to ensure that the model is useful for estimating how changes to climate drivers will affect the water and energy sectors in Uganda. Case studies will be used to check that model results provide useful information related to decision-making problems identified in the stakeholder outreach activity.
- **Decision-making under uncertainty:** Guidelines for using ensemble climate projections and seasonal forecasts in decision making will be developed as part of the CTCN assistance. Decision-makers in the water and energy sectors in Uganda must make decisions that are affected by climate and other drivers without certainty about the likelihoods of these drivers. In this context, it may be useful to use an approach that helps identify decisions that are likely to result in reasonable outcomes regardless of future climate. The assistance will provide guidelines for decision-making that are based on the robust decision making methodology (Bryant and Lempert, 2010). In this methodology, ensembles are used to characterize a range of values for climate and other drivers that may be expected in the future. Ensemble impact model simulation is then used to estimate how variation in drivers affects the outcome of

plans. For example, if a new hydropower facility is under consideration, the approach would simulate the performance of the facility under a range of drivers and estimate the performance of the facility given different driver values. The approach then offers tools for identifying driver values that result in unacceptable performance, which can be used to refine plans (in this case, perhaps the design of the hydropower facility) in order to reduce the likelihood of unacceptable performance. The guidelines will be tested on case studies identified in the stakeholder outreach activity, and will be based on software tools and data that are either part of this assistance, already available at LVBC, or else freely available.

- **Dissemination tools:** Appropriate tools are critical for disseminating results and information to decision makers and non-technical stakeholders. This activity will produce reporting tools for dissemination of ensemble model-based impact assessment results, or dissemination of summary climate change information showing, for example, changes in rainfall. The dissemination tools will be targeted towards the different potential end users in Uganda (relevant national organisations and ministries).

The main outputs of activity 2.1 are:

- Access to climate projections and seasonal forecasts, as part of the existing WRIS system.
- Satellite-based historical climate information.
- A refined impact assessment model.
- Guidelines for using data and models to support decision making under uncertainty.
- Dissemination tools.

Deliverables	Delivery date
First version of the tools for quality assurance and testing to LVBC and the key stakeholders	*Week 35*

Activity 2.2 – Testing, demonstration, and documentation

This activity will test developments taking place in Activity 2.1 on relevant use cases. The use cases will be related to one of more decision-making problems identified during the stakeholder outreach activity. One use case will be related to long-term planning, while the other will be related to planning at a seasonal time scale. The use cases will be identified after the national workshop in collaboration with the key stakeholders and LVBC. The use cases will be related to a decision-making problem in either the water resource or energy sector, in which the success or failure of the decision is likely to be affected by climate. The purpose of the testing will be to ensure that the technical assistance is relevant for local decision-making problems, and to demonstrate the utility of the Activity 2.1 developments.

After testing, the new developments will be documented in order to support dissemination activities. The main outputs of activity 2.2 are:

- Testing and demonstration of activities taking place in Activity 2.1 (documented in the Technology testing and demonstration report)
- Summary of feedbacks from LVBC on activity 2.2
- Documentation and user guide

Deliverables	Delivery date
Review and comments from LVBC	*Week 45*
Technology testing and demonstration report	*Week 48*
Documentation and user guide	*Week 49*

Activity 3 – Dissemination and outreach

The activity will help stakeholders make use of the different components of the technical assistance.

Activity 3.1 – Second national workshop

A second national workshop will be held to inform relevant stakeholders and organisations in Uganda about the outputs of the CTCN assistance. The workshop will include a maximum of 15 participants for a duration of 1 day. At the workshop, the use cases will be presented in details in order to demonstrate how the assistance can be used to support decision-making. A summary report describing the key outcomes of the workshop will be produced.

The main output of activity 3.1 is:

- Workshop for national stakeholders in Uganda (documented in the summary report)

Deliverables	**Delivery date**
Summary report of the second national workshop	*Week 55*

Activity 3.2 – Technical training

A technical training (2-day) for selected staff within the key organizations (maximum 5 organisations and a total of 15 participants) will be organised with the objective of providing detailed knowledge and capacity in using the products of the technical assistance in Uganda on an ongoing basis. The products of the technical assistance include the data access component, refinements to the Lake Victoria impact model, and the guidelines for decision making under uncertainty, along with dissemination tools. Trainees will be selected by the implementers together with LVBC based on suggestions made by the five selected organizations. All training material will be made available to the trainees for further use after the training. In addition, a short summary report with outcomes of the training will be produced. This report will identify key areas where further training is required.

The main outcomes of activity 3.2 are:

- Capacity and knowledge for using the project outcomes on future climate adaptation projects

Deliverables	**Delivery date**
Technical training material (including exercises, presentations)	*Week 51*
Summary report of the technical training (including key outcomes, list of participants)	*Week 51*

Activity 3.3 – Regional dissemination to all countries in the Lake Victoria region

The outreach and dissemination part aiming at providing awareness and knowledge of the technology to relevant organizations within the Lake Victoria region. This activity includes:

- Regional dissemination to key organisations within the Lake Victoria basin through the council of ministers meetings. The regional dissemination will be performed by LVBC with the assistance of the CTCN implementer.

- Dissemination of reports, materials and tools to all relevant national and regional stakeholders. This will be done through LVBC, to be published on their web site.The CTCN implementer will make the required documents and tools available.
- Roadmap documentation describing recommendations for regional transfer of the technology and scaling up within future projects (maximum of 20 pages).
- Evaluate funding options through regional partnerships and donors for post response interventions. This will be reported in the roadmap document.

Deliverables	**Delivery date**
Lesson learned and recommendation report (maximum of 30 pages)	*Week 52*
Roadmap documentation in transfer of technology and scale up (maximum of 20 pages)	*Week 52*
Minutes and recommendations from the bilateral meetings.	*Week 52*

2.2 Synergies and Baseline Setting

There are a number of past and ongoing initiatives, which the CTCN assistance will have to link to or take into consideration. Examples of relevant projects or initiatives are:

- **LVEMP-I and II** (http://lvemp.eac.int/).
  - Purpose of the Lake Victoria Environmental management plan is to contribute to the EAC's Vision and Strategy Framework for a sustainable management of the Lake Victoria basin
- **Water Resources Information System** (http://lvbc.wris.info/)
  - The WRIS is a data and knowledge repository that enables stakeholders to easily identify access and share information related to the Lake Victoria basin.
  - The system operates with a spatial and temporal database and is capable of handling large amount of data such as geo-spatial, temporal or document based information.
- **Nile Basin Adaptation to Water Stress** (UNEP 2013)
  - Climate change assessments of the entire Nile basin, including the Lake Victoria region
- **Flood and drought Management Tools project** (http://fdmt.iwlearn.org/en)
  - GEF funded project implemented by UNEP aiming at delivering tools for embedding flood and drought issues into water related planning at basin and catchment scale. The developed tools are to be applied at a global level and could be used as the starting point for the CTCN support.
- **African Adaptation project** (https://www.undp-aap.org/)
  - Designed to assist 20 countries across Africa to incorporate climate change risks and opportunities into their national development processes
  - Uganda is not included but Kenya, Tanzania and Burundi from the Lake Victoria basin is included in the project and it's of relevance for the CTCN assistance.
- **Strategic Action Plan for the Lake Victoria Basin** (African Development Bank, 2011)
- **Nationally Appropriate Mitigation Actions** (NAMAs) in Uganda
- **Technology needs assessment** (TNA)

The sustainability of Lake Victoria depends on a fine balance between rainfall and evaporation on the lake itself, which makes the lake very vulnerable to climate changes. For this reason, a number of initiatives and projects have been initiated over time, and there are existing knowledge and experience which needs to be captured during the CTCN assistance.

2.3 Timeline

Activity	Weeks											
	4	9	13	17	22	26	31	36	40	44	49	52
1 Stakeholder consultation												
1.1 National workshop to identify priorities for the CTCN assistance	■											
1.2 Technology description	■	■	■									
2 Technology development												
2.1 Technology development to local conditions		■	■	■	■	■	■	■				
2.2 Technology testing and validation			■	■	■	■	■	■	■	■		
3 Technology transfer and dissemination												
3.1 Second national workshop to create awareness and knowledge of the outcomes											■	■
3.2 Technical training											■	■
3.3 Outreach and dissemination											■	■

2.4 Expertise required

This section describes the expertise required to deliver a successful technical assistance, in order to achieve the described objectives and outcomes. This expertise to deliver the CTCN assistance includes:

- *Documented knowledge of institutional setup and capacity in Uganda.*
- *Demonstrated experience in climate change adaptation and dissemination in the Lake Victoria region*
- *Experience in stakeholder consultation and knowledge of the institutional setup in Uganda*
- *Experience with planning solutions used for seasonal and long term planning of climate adaptation measures*
- *Expert in climate change adaptation in the Lake Victoria region*

- *Expert water resource planning and planning methods, including expertise on related impacts on gender and vulnerable groups*
- *Proficient analytical and writing skills (English)*

Activity 1 – stakeholder consultation	**Required expertise**
Activity 1.1 - National workshop to identify priorities for the CTCN assistance	*Experience in stakeholder consultation and knowledge of the institutional setup in Uganda* *(expected input: 2 experts, 5 to 6 days each)* *Gender expert (3-4 days)*
Activity 1.2 – Technology description	*Knowledge of institutional setup and capacity in Uganda.* *Experience in climate change adaptation in the Lake Victoria region* *Experience in water resource planning and planning methods* *(expected input: 3 to 6 days)*
Activity 2 – Technology implementation	
Activity 2.1 – Technology adjustment and development	*Documented knowledge of institutional setup and capacity in Uganda* *Expert in climate change adaptation in the Lake Victoria region* *Expert in water resource planning and planning methods* *Proficient analytical and writing skills (English)* *(expected input: International expert 60 to 70 days and IT/web developer 20 to 30 days)*
Activity 2.2 – Technology validation	*Expert in climate change adaptation in the Lake Victoria region* *Expert in water resource planning and planning methods* *Proficient analytical and writing skills (English)* *(expected input: 30 to 35 days)*
Activity 3 – Technology transfer and dissemination	
Activity 3.1 – Second national workshop to create awareness and knowledge of the outcomes	*Experience in stakeholder consultation and knowledge of the institutional setup in Uganda* *Expert in climate change adaptation in the Lake Victoria region* *Demonstrated experience in climate change adaptation and dissemination in the Lake Victoria region* *(expected input: 7 to 9 days)*
Activity 3.2 – Technology training	*Expert in climate change and water resource modelling* *Expert in water resource planning and planning methods* *Experience with planning solutions used for seasonal and long term planning of climate adaptation measures* *(expected input: 6 to 8 days)*
Activity 3.3 – Outreach and dissemination	*Experience in stakeholder consultation and knowledge of the institutional setup in Uganda* *(expected input: 12 to 20 days)*

2.5 Main partners

Stakeholder	Role to support the implementation of the CTCN assistance
Lake Victoria Basin Commission	*Main applicant and assisting the CTCN implementer in the implementation of the CTCN supported technology. In addition, the LVBC will support this technical assistance in:* *1. Requirements for needs assessment* *2. QA and review of the proposed technologies* *3. Review of the validation report* *Host for the national and regional workshops*
Uganda National Council of Science and Technology (UNCST)	*The Uganda National Council for Science and Technology was established in 1990 for the purpose of inter alia advising on and coordinating the formulation of national policy on all fields of science and technology, and for assisting in the promotion and development of indigenous science and technology. The Council cooperates closely with other organizations involved in scientific and technological activities.* *As CTCN NDE, the UNCST will assist the implementer in this technical assistance providing guidance and reviewing the relevant documents. UNCST will also be consulted and informed of the progress of the technical assistance.*
Ministry of water and environment, Uganda	*Responsibility for setting national policies and standards, managing and regulating water resources and determining priorities for water development and management*
Climate change department, ministry of water and environment	*Works with implementation of the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol (KP)*
Uganda National Meteorological Authority (formerly Department of Meteorology) under Ministry of Water and Environment (UNMA)	*UNMA Provide meteorological information since they collect, process, archive and analyse meteorological data*
National Environment Management Authority (NEMA)	*NEMA's Development objective is to create, establish and maintain an efficient mechanism for sustainable environment and natural resources management at the national, district and community levels.*
Ministry of Energy and Mineral development, Uganda	*The ministry carries out policy guidance in the development and exploitation of the energy and mineral resources.*
Uganda Ministry of Gender, Labour and Social Development, Uganda	*Responsible for coordinating Gender Issues in Uganda*
Mbarara University of Sciences and Technology	*Carries out water related research including impacts of climate change*

2.6 Indicative budget

Activities	Estimated Budget (USD)
Activity 1	37,000
Activity 2	145,000
Activity 3	67,000
Total	**249,000**

Implementation of this Response Plan will be led by the Climate Technology Centre (including selection, contracting, supervision and monitoring of implementation partners) in close coordination with the corresponding National Designated Entity and relevant national actors. Implementation will be led by an International Consortium or Network Partner of CTCN.

2.7 Gender considerations

Climate change impacts within the water resource and energy sector impacts vulnerable groups in the form of farmers, industry workers, households and other groups relying on a stable and robust distribution of water and energy. Many of these groups will be affected by reduced availability to water or frequent power disturbances affecting their wellbeing and livelihood. Many of these will be vulnerable groups with little capacity for adaptation measures and the CTCN assistance will improve the conditions for these groups through climate resilient management and planning towards a changing climate. Gender considerations will be taken as part of the national workshop and subsequent training events to ensure gender equality within the capacity and dissemination part of the project.

2.8 Risk identification and risk mitigation

Risk	Consequence	Probability	Mitigation measure
Inadequate information or data not available for the CTCN assistance	Local validation of the technologies will not be successful.	Less than 10 %	The main applicant is hosting the existing Water Resource Information System (WRIS) and will be a guarantee for access to the available data and information needed for the CTCN assistance. The use of freely available remotely sensed data limits the need for local information.
Inadequate stakeholder mapping	Required information for the local conditions in Uganda might not	Less than 10 %	LVBC and the NDE will be responsible for the stakeholder

	be embedded in the technology		mapping and they have extensive knowledge of the local stakeholders
Political instability or other forms of unrest	Impact the local presence in the country	Less than 10 %	The situation in Uganda and the region is relatively stable at the moment and it is not foreseen that the country will be affected by any form of unrest within the period of the CTCN support.
Difficulties in identifying use case or location for validation of the outcomes	Technologies not validated within the project period	Less than 25 %	The outcomes will initially be validated by using the existing information and looking at all the technical functionalities ensuring that they work as intended. The use case will serve as a practical validation and focus will be on identifying a proper use case for validation purposes.

3. Long-term impacts of the assistance

3.1 Expected climate change-related benefits

	CTCN climate technology impact	Anticipated contribution from CTCN assistance
1	Climate technologies adapted to national context are identified and prioritized to enable their deployment and/or transfer in the requesting countries	The technologies will be adapted to the local context in Uganda through a series of workshops and training sessions. The main applicant LVBC will be responsible for ensuring the final technologies to be embedded into a local context.
2	New national Technology Needs Assessment (TNA) and Technology Action Plan (TAP) as a result of the response	The CTCN assistance will include technologies and methods within the existing TNA (Uganda 2007), and will be a key component for a future revision of the TNA.

3	Progress made against mitigation objectives (i.e. energy and carbon intensity reduction) as a result of the response	
4	Progress made against adaptation or resilience objectives (e.g. climate vulnerability index improvement) as a result of the response	The technologies will improve the information base for future adaptation measures and climate resilient solutions within Uganda and the Lake Victoria region.
5	New mitigation or adaptation technology projects/initiatives implemented as a result of the response	The results will identify focal areas for new adaptation initiatives, e.g. technical, structural or community, and provide recommendations and/or guidelines to achieve the objectives.
6	New or strengthened policies/ laws developed, approved and enacted as a result of the response	The recommendations resulting from the assistance could be used to enhance the regulatory framework within climate mitigation and adaptation policies.
7	New policies/laws where climate change was mainstreamed as a result of the response	Technologies could be used to develop new policies or laws aiming at climate resilient solutions or adaptation measures.
8	Country integrating climate change mitigation and/or adaptation issues into its planning and policies as a result of the response	The technical assistance is aligned with the National Development Plan 2010 to 2015 (Uganda 2010) and the Nationally Appropriate Mitigation Actions (NAMAs) in Uganda and the resulting technologies will enhance the capacity to integrate new solutions and technologies into planning and policies.
9	New or strengthened Public-Private Partnerships (PPP) created directly as a result of the response	There is likely to be an enhanced partnership between the technology recipient (public) and local industries, farmers or farming corporative. Further development of the technology will likely strengthen this partnership.
10	New or strengthened twinning arrangement created as a result of the response	The assistance will be looking at creating new partnerships with regional organisations as NBI.
11	Capacities to access and attract public and private finance increase to enable financing of technology deployment	The initial stakeholder workshops will be used to identify options for local financing mechanisms to be used in the response.
12	Post-response intervention funding attributable to the response.	
13	Framework and analysis of local production developed to enable deployment of national production of climate technologies	The technology transfer will increase the capacity and role of LVBC within climate change adaptation in the region, and result in an increased focus on deployment and

		production of climate technologies in relation to climate change adaptation.

3.2 Co-benefits

	Sustainable Development Goal	Contribution from CTCN assistance
1	End poverty in all its forms everywhere	Improved water resource management and hydropower production based on climate resilient and robust solutions.
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Improved water resource management resulting in increased water availability and crop security.
3	Ensure healthy lives and promote well-being for all at all ages	Impacts on the energy sector will improve the well-being and livelihood through a more robust and stable energy supply.
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	Gender equality will be promoted through the impact of the outcomes reducing the vulnerability of women.
6	Ensure availability and sustainable management of water and sanitation for all	Improved water resource management increasing the availability and sustainability of the water resource.
7	Ensure access to affordable, reliable, sustainable, and modern energy for all	Improved hydropower production through robust and climate resilient climate change interventions.
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Robust and climate change resilient solutions for the energy sector provides economic growth through a more stable energy production.
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among countries	A robust and climate resilient water resource management will reduce the inequality within and among the countries.
11	Make cities and human settlements inclusive, safe, resilient and sustainable	
12	Ensure sustainable consumption and production	

	patterns	
13	Take urgent action to combat climate change and its impacts	The response plan will ensure improved technologies and information to combat climate variability and climate change.
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	The technologies for improved water resource management could assist in reversing land degradation and desertification through improved water management during the dry season.
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	The response will interact with regional organisations with the aim of strengthening synergies in building resilience to climate change in the region

3.3. Post-assistance plans and actions

Post assistance plans include actions that may support and increase the ownership of the outcomes, the scaling up of the technologies and deployment in the region outside of Uganda. Some of the immediate actions might include:

- The outcome of the CTCN assistance will be an important step towards fulfilling some of the specified goals in the TNA and NAMAs and the outcomes will be used actively in this process, ensuring a local ownership of the technologies.
- The main applicant will actively facilitate that the outcomes of the CTCN assistance is embedded in future projects related to climate change adaptation
- The developed roadmap documentation in transfer of technology and scale up will be used actively to pursue further funding within climate change adaptation in future national or regional projects.
- The linkage to regional organisations and institutes (activity 3.3) will be used to pursue further collaboration on climate change adaptation in the region.

3.4 Monitoring and Reporting of technical assistance results and impacts

Expected activities and milestones under this assistance are explicitly described in section 2.1 and the performance indicators table below (see also log frame in annex). Activities progress and deliverables will be monitored closely by the CTCN implementer of this Response Plan with the collaboration of the NDE in Uganda, the main applicant – Lake Victoria Basin Commision – and CTCN. The CTCN implementer is responsible for verifying project progress against timeline and associated milestones and communicates these results to the NDE and CTCN. At the end of each activity, the CTCN implementer will provide a short summary of lessons learned of the activity reflecting on the progress, successes and challenges encountered during the activity. Every month a teleconference with country

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and international partners is held to communicate the state of advancement of the project, challenges, possible needs for adjustments etc. The CTCN implementer is responsible for planning these. All suggested changes to the activities, processes and/or approaches as outlined in current response plan must be accepted by the CTCN and NDE before they can be applied.

Response output *(linking to sec 1.2)*	How output will be used to ensure creation of result	Expected result	Expected outcome of result *(linking to sec 1.1)*	Anticipated impact that outcome will produce *(linking to section 3)*
Enhance capacity for climate change adaptation and planning within Uganda	Capacity for using the transferred knowledge is required for ensuring the sustainability of the technologies after the proposed response.	Engaged stakeholders with the needed understanding and knowledge of climate change adaptation within the water resource and energy sector.	Technical training for selected staff within selected organizations with the objective of providing detailed knowledge and capacity in using the transferred technologies in Uganda.	Increased capacity for climate change and climate variability adaptation within Uganda. Ability to utilize the technology from the CTCN support.
Increase the data accessibility of relevant climate change information through the existing Water Resource Information system	Data availability is one of the key issues and is needed in order to provide the required technology solutions.	Data availability sufficient for orderly climate change assessments within the water resource and energy sector.	Web based access to the WRIS system allowing stakeholder to access relevant data and information for climate change adaptation.	Increased capabilities for climate change planning and management in general, not only using the technologies as result of the CTCN response.
Provide scientific based methods for improved planning taking the uncertainty from climate change projections into account	Scientific based information are critical for the sustainability and trust in the technologies, and for the future use of the technologies in Uganda.	Stakeholders with an active and confident engagement in the CTCN assistance in terms of climate change adaptation.	Tools supporting data availability, impact assessment and planning within Uganda and the region.	Linkage with existing and future initiatives and projects in Uganda, ensuring that the technologies from the response is captured and embedded into future climate change initiatives.
Demonstrate the utility of the technologies through applications to use cases from ongoing	Demonstration through applications to use cases are essential for the sustainability and the future use of the technologies.	Increased confidence in the developed technologies and increased potential for	Validated and demonstrated tools supporting climate adaptation within Uganda and the region.	Improved water resource management and hydropower production based on climate resilient and robust solutions using the

programmes or projects of relevance for the CTCN assistance		future use.		demonstrated tools and technologies from the CTCN assistance.
Enable decision makers and stakeholders to use the transferred knowledge, practices and technologies actively in planning in the water resource and energy sectors	Enhanced knowledge of information and adaptation measures for climate resilient solutions are critical for the sustainability of the proposed technologies.	Increased focus and engagement in the proposed CTCN response from all relevant stakeholders in Uganda	Tools supporting data availability, impact assessment and planning within Uganda and the region.	Increased focus on climate change adaptation for climate resilient solutions within a wide range of stakeholders in Uganda.

4. Signatures

Signatures of the requesting country

NDE

Name: *Mr. Maxwell Otim Onapa*
Title: *Deputy Executive Secretary, Uganda National Council of Science and Technology (UNSCT)*
Date: 20.01.2017
Signature:

Signatures of the CTCN

CTCN Director

Name: JUKKA UOSUKAINEN
Title: DIRECTOR
Date: 02/12/2016
Signature:

Annex 1: Response Logframe

Activity *(link to sec 2)*	**Description of sub-activities conducted by the CTCN**	**Output/ Deliverable** *(link to sec 2.1)*	**Expected Outcome** *(link to sec 1.2)*	**Main national partners involved**	**Objectively Verifiable Indicator** *(see Annex 5 guidance)*	**Means of Verification** (data source, method of collection, responsibility and periodicity)
Activity 1: Stakeholders consultation	*Activity 1.1: National workshop* *Activity 1.2: Technology description*	List of relevant stakeholders drafted Minutes from workshop Needs assessment report Technology specification report Methodology for testing and demonstration	Increased knowledge of existing adaptation measures and practices within a local context in Uganda.	LVBC	Recommendations and feedback received from stakeholders Number of participants Number of meetings with stakeholders in Uganda Description of the technology	Reported as part of the output. Responsibility: implementing organisation
Activity 2: Technology development	*Activity 2.1: Technology development to local conditions* *Activity 2.2: Technology testing and demonstration*	First version of the tools for QA and testing by the main applicant Review report from main applicant Technology testing and demonstration report Technology description and user guide	Validated and tested technology available for application within a local context in Uganda.	LVBC	Feedback and review from national partners Selected validation location Validation report drafted User guide drafted	Reported as part of the output. Responsibility: implementing organisation
Activity 3: Technology	*Activity 3.1: National workshop*	Summary report of the second national	Decision makers and stakeholders to	LVBC	Number of participants trained or training days	Reported as part of the output. Responsibility:

transfer and dissemination	*Activity 3.2: technical training* *Activity 3.3: Outreach and dissemination*	workshop Technical training material (including exercises, presentations) Summary report of the technical training (including key outcomes, list of participants) Lesson learned and recommendation report (maximum of 30 pages) Roadmap documentation in transfer of technology and scale up (maximum of 20 pages)	use the transferred knowledge, practices and technologies actively in climate change adaptation	received Number of female participants Post training evaluation and feedback Feedback or recommendations from regional organizations	implementing organisation