Technical Assistance Closure Report Template

Objective of the technical assistance (TA) Closure Report:

- To communicate publicly in one document a summary of progress made and lessons learned during the TA towards the anticipated impact (sections 1-4).
- To document qualitative and quantitative data collected during TA, for use in donor and UN reporting (Annex 1).

Steps for completing the TA closure report:

1. The lead TA implementer submits the closure report at the end of the technical assistance as a final deliverable. The TA closure report will capture outputs, outcomes and impacts of all activities conducted under the TA. Please copy and summarise relevant material from previous TA outputs/deliverables and the Response Plan, as relevant.
2. A CTCN Manager will review and revise the closure report before final approval by the CTCN Deputy Director.

Important note on public and internal use of the closure report:
Once approved by the CTCN Deputy Director, the TA closure report will be a public document available on the CTCN website www.ctc-n.org. Selected content will be used for targeted communication activities. Annex 2 is for internal use only and will not be publicly available.

Closure Report for CTCN Technical Assistance

1. Basic information

Title of response plan	**Development of Medium- to Long-Range Hydrologic Forecasting System for Ganges-Brahmaputra-Meghna River Basins**
Technical assistance reference number	**2023000003**
Country / countries	**Bangladesh**
NDE organisation	**Department of Environment**
NDE focal point	**Dr. Abdul Hamid**
NDE contact information	*dg@doe.gov.bd*
Proponent focal point and organisation	*Name: Sazzad Hossain* *Organization: Bangladesh Water Development Board* *Email: se.pffc@bwdb.gov.bd*
Designer of the response plan	*Jonghun Kam, Pohang University of Science and Technology (POSTECH), jhkam@postech.ac.krl*
Implementer(s) of technical assistance	*Pohang University of Science and Technology (POSTECH), Weatherpia Co., Ltd*
Beneficiaries	*Government of Bangladesh, Bangladesh Water Development Board*
Sector(s) addressed	*Medium- to Long-Range Flood Forecasting*
Technologies supported	*Subseasonal to Seasonal (S2S) forecast data and VIC-River routing model*

Implementation start date	*(09/2023)*
Implementation end date	*(08/2024)*
Total budget for implementation	*USD 150,655*
Description of delivered outputs and products as well as the activities undertaken to achieve them. In doing so, review the log frame of the original response plan and refer to it as appropriate	• ***Output 1: Development of implementation planning and communication documents*** - *Activity 1: Drawing the work plans deliverables, outputs for the project* - *Activity 2: Drawing monitoring and evaluation plan* - *Activity 3: CTCN Impact Description and Closure report* • ***Output 2: Creation of a steering committee, mapping of stakeholders and kick-off meeting*** - *Kick-off meeting and deliver materials such as meeting minutes, online meeting snapshot* • ***Output 3: Construction of 25-km resolution ECMWF S2S hydro-meteorological forecast data using VIC-River Routing model*** - *Activity 3.1: Construction of past hydrological reanalysis data and S2S weather/hydrological forecast data* - *Activity 3.2: Quantitative evaluation of simulated river discharge data by the VIC-River Routing model* - *Activity 3.3: Verification of historical intra-seasonal and seasonal hydro-meteorological forecast data* • ***Output 4: Workshops for technology transfer and strengthening disaster management stakeholder capacities*** - *Activity 4.1: Workshop for understanding the mid- and long-term flood forecast data (Workshops for technology transfer)* - *Activity 4.2: Capacity building workshop conducted for central and local government disaster management personnel* - *Activity 4.3: Establish a plan for developing an integrated dissemination system* • ***Output 5: Deriving proposal for subsequent project implementation and resource integration*** - *Activity 5.1: Establishing follow-up project plans for maximizing the effectiveness of TA and ensuring long-term sustainability*
Methodologies applied to produce outputs and products	• *Data-driven flood forecasting analysis* • *Workshops with key stakeholders* • *In-country capacity building workshops for personnels in charge of flood forecasting*
Reference to knowledge resources	None
Deviations	As agreed with CTCN Project Manager, and due to delays in the implementation of the project, kick-off meeting was delayed to the January 2024.

Anticipated follow-up activities and next steps	• Stakeholders in Bangladesh (BWDB) showed their interest in proceeding the follow-up projects with the implementers of this projects (POSTECH, Weatherpia) • During the CTCN project, GCF Concept Note was structured as one of the deliverables for this project. As a part of a scale-up project, a Concept Note for a grant by the Green Climate Fund would be revised based on the requests and comments from the stakeholders • Throughout the revision and preparation of the project, the concept of the project would be shared with the personnel in National Designated Authority (NDA) for the better supports and receiving Non-objection Letter (NOL), which is a mandatory document for applying GCF projects

2. Lessons learned

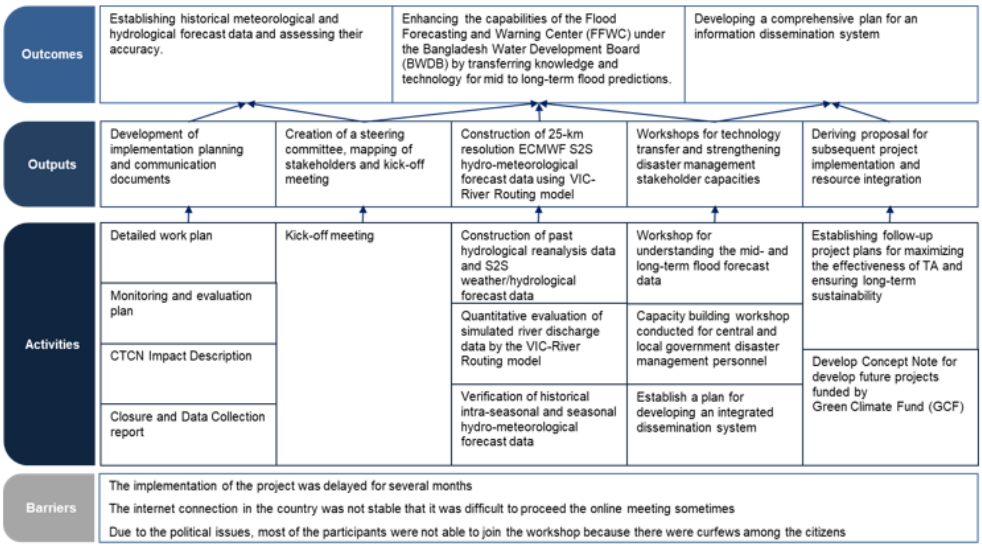
	Lessons learned	**Recommendations**
Lessons learned from the CTCN TA process	In this project, it took time to choose the focal point in the receiving country. The time in the first half of the project was not able to be used thoroughly. It gave us lessons that figuring out the focal point could be difficult and time-consuming that finding the personnel could be initiated right after the implementation of the project or even before the implementation of the project. In addition, during the implementation of the project, there were national issues in the country that it was difficult to proceed the workshops smoothly.	Recommendations include • Considering the time it takes for figuring out the focal point, the implementation period could start from the sign of the Response Plan • Making a guideline for implementing a project adapting to various issues
Lessons learned related to climate technology transfer	*Lessons from the project include* • *Due to the topography of the country, the sediments that are accumulated in the basins are key factors for the flood that further research are required in the sediment accumulation* • *The Flood Forecasting & Warning Center (FFWC) of Bangladesh*	*Recommendations include* • *Capacity buildings and technical assistances are required in various sectors such as sediment accumulation and precipitation forecasting* • *Utilize more ensemble for the forecasting*

	Water Development Board (BWDB) is still suffering from median- and long-term flood forecasting ● *Runoff data is required for the better resolution of hydro-dynamic model utilization and forecasting* ● *Runoff is mainly utilized for the VIC-River Routing model, and this model can well simulate the naturalized river discharge in Bangladesh.* ● *The internet connection of the country is sometimes under the optimal*	

3. Illustration of the TA and photos

For communication purposes, please provide 2-4 Power Point slides, including illustrations or charts, describing barriers, opportunities, methodology, activities, outputs and achieved results. The illustrations must be copied into the TA Closure report but must also be delivered as power point files. Also, please provide at least five high-resolution pictures in jpg format, capturing technical assistance. The pictures should illustrate how the TA has impacted the lives of the beneficiaries in particular and the communities in general.

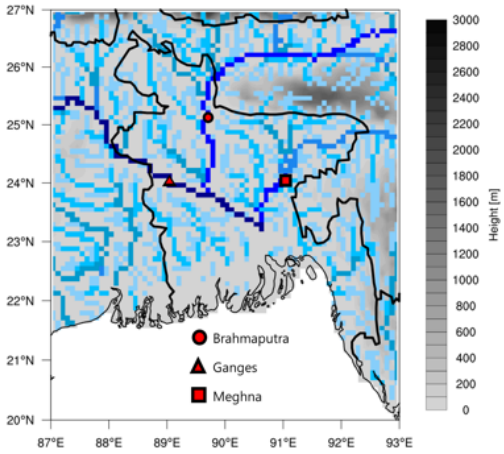
01 Barriers, Activities and Outputs



02 Opportunities

Deliverables	Opportunities
Technical Meetings & Workshop	• Implementation of the Technical Assistance would benefit not only the participants of the technical meetings, but also the other personnels in the country through knowledge sharing programs among the country
Integrated Dissemination System Improvement Plan	• Throughout researching the current dissemination system of Bangladesh, several barriers were discussed. This improvement plan would assist stakeholders and policy makers to improve and amend their related policies and standards which would improve the climate change adaptation capacity
Concept Note	• Bangladesh Water Development Board is highly interested in developing this Technical Assistance into GCF project that Concept Note that was delivered through out the project would be developed with the consultations among the stakeholders of both Bangladesh and South Korea

03 Summary of the medium- to long-term hydrologic forecasting system



- High temporal and spatial resolution data
  : Overcoming temporal and spatial limitations of observational data
- Predicted data generated based on the laws of physics
  : Utilization for medium- to long-term hydrologic forecasts
- Improved prevention and preparedness for hydrological disasters by enabling early detection and prediction of extreme weather events.
- Continuous updates on the latest hydrological information available.

POSTECH Weatherpia 4

04 Pictures for technology transfer & capacity building workshop

POSTECH Weatherpia 5

4. Impact Statement

The information in the table below will be used to communicate results and anticipated impacts of this technical assistance publicly. Please copy information from impact statement developed in the M&E Plan and update as relevant.

Challenge	*Current deterministic flood forecasts in Bangladesh are often insufficient and medium to long-range forecasts are required for effective planning and management. Even though forecast and warning messages reach national and district-level stakeholders, due to the deficient disseminating capacity, existing flood forecast, and warning are poorly disseminated to flood-prone communities. Even when the forecast reaches the community level, there is often a shortage of expertise to interpret and apply the forecast effectively.*
CTCN Assistance	*·Aim of developing the Medium- to Long-Range Hydrologic Forecasting System for Ganges-Brahmaputra-Meghna River Basins by utilization of VIC-River Routing model* *·Calculates slope, flow direction, and stream order to estimate river discharge, water movement at each grid points* *·Produce historical river discharge data, medium to long-term forecast data for flood forecast information* *·Establish an early warning system which could further expand to other regions/countries and support embodiment of adaptation planning*
Anticipated impact	*·Mitigation of flood and drought risks* *·Improvement of food security and livelihoods* *·Core Indicator 2: Anticipated increased economic, health, well-being, infrastructure and built environment, and ecosystems resilience to climate change impacts as a result of technical assistance. "Infrastructure and build environment", as well as "Health and wellbeing" Is expected to be increased*
Co-benefits: Achieved or anticipated co-benefits from the TA	*·Support for climate change adaptation by building resilience against climate change, extreme weather events and changing precipitation patterns* *·Enhanced water and food security by contributing clean water resource management and food production*
Gender aspects of the TA	*•Providing disaster knowledge for both men and women: This project offers knowledge on early warning systems and disaster response to both men and women, aiming to improve natural disaster*

	responses and rescue more people in advance, benefiting the entire population. *•Empowering women in disaster decision-making: The public awareness developed through this project will ensure that women, as well as men, are actively involved in making decisions and taking necessary actions during disaster responses.* *•Enhancing rescue interventions for vulnerable groups: The effectiveness of early warning systems and disaster response will particularly benefit women, especially those responsible for protecting the elderly and children, thereby reducing casualties during floods.*
Anticipated contribution to NDC	*·Median- and long-term (over 10 days) flood and floodgate predictions become possible, the forecasting, risk assessment capacity of local community can be increased, and thus the adaptation and preparation to flood disaster would be possible, based on the knowledge acquired by the technology.* *·By producing gridded data with a resolution of 9-km, it is possible to produce forecast data for all areas of Bangladesh, overcoming existing spatial limitations.* *·Through this project, early warning systems based on the data acquired by the presented technology could be implemented and structured in network with other collected data, to ensure a strong alert system within the covered area.* *·Enhancement of the meteorological data collection and availability through this project, a key factor in the realization of the NDC goal* *·Contribution to water resource management, specified in the Bangladesh NDC, and food security improvement, by promoting sustainable agriculture*
The narrative story	*Bangladesh is highly susceptible to floods with approximately 20-30% of the country experiences flooding, which can escalate to 70% during catastrophic floods. This recurrent flooding could lead to loss of life, disruption of livelihoods, and significant damage to crops, livestock, and infrastructure. Over recent decades, factors such as climate change, population growth, and human activity on floodplains have made floods more frequent and severe, and*

	the frequency and severeness of these natural disasters would worsen due to the climate change in upcoming years. With its flat topography and location at the confluence of the Ganges-Brahmaputra-Meghna river basin, Bangladesh faces challenges in forecasting floods through structural measures. The flood management approach has shifted since the early 2000s, emphasizing the use of non-structural solutions like flood forecasting and early warning systems. However, the forecasting capacity is often insufficient for long-term predictions and disaster scenarios. Early warning capacities to communities also lack development and there is often a shortage of expertise to effectively interpret and apply the forecast. The medium- to long-term hydrological forecasting system presented through this project can overcome existing temporal-spatial limitations by simulating river discharge not only at regional scale but also for the entire Ganges-Brahmaputra-Meghna River basins.
Contribution to SDGs A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/	*SDG 2. (End hunger, achieve food security and improved nutrition, and promote sustainable agriculture)* *The TA will have the ancillary benefit of promoting sustainable agriculture by collecting necessary meteorological data and forecasting river discharge, which, when disseminated to the people of Bangladesh, including farmers, can help mitigate the impact of hydrological disasters.* *SDG 6. (Ensure availability and sustainable management of water and sanitation for all)* *Using the acquired data, agricultural management can provide advice to emergency response teams before the flood season. This can be achieved as an ancillary benefit stemming from the data-driven system.* *SDG 11. (Make cities and human settlements inclusive, safe, resilient and sustainable)* *The forecasted medium to long-term river discharge data will be used for disaster preparedness measures, thus minimizing the damage to densely populated cities and*

	enabling them to become more resilient and sustainable. *SDG 13. (Take urgent action to combat climate change and its impacts)* *The TA will seek to ensure the flow of information from the urban centers to the rural communities where the information is quite thin. It will supply scientific based information on drought and other climate related disasters over a distributed network that is owned and managed by local communities (13.1 – Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries)* *The VIC-River Routing model, utilizing forecast data openly provided by ECMWF, enables the prediction of river discharge. This can be utilized in national policies, strategies, and plans related to measures and prevention of damages from droughts and floods caused by climate change. It holds the potential to minimize the impact of natural disasters on the people of Bangladesh* *(13.2 – Integrate climate change measures into national policies, strategies and planning)*

Annex 1 Technical assistance data collection

Please add quantitative and qualitative values for the indicators selected in the M&E plan and monitored throughout the technical assistance in the tables below. Indicators which have been monitored in addition to the proposed indicators below may be added at the end of table A. Non-relevant indicators should be left blank.

A. Output and outcome indicators

Indicator Please note indicators below highlighted as **anticipated**	**Quantitative value** *Numerals only; disaggregates must sum to the total*	**Qualitative description** *List the various elements corresponding to the quantitative value as well as timelines and responsible institutions*
Total number of events organized by proponents and implementing partners	*7*	
Number of participants in events organized by proponents and implementing partners	*21*	
a) Number of men	*14*	
b) Number of women	*6*	
Number of climate technology RD&D related events	*6*	
Number of participants in climate technology RD&D events	*21*	
a) Number of men	*15*	
b) Number of women	*6*	
Number of training organized by proponents and implementing partners	*6*	- *Introduce of VIC-River Routing model and forecast system* - *Discussion of GCF concept note outline for ongoing business progress* - *Hydrologic forecast system intermediate progress update and discussion* - *Assessment of forecasted streamflow data for Ganges-Brahmaputra-Meghna River basins* - *Development of Medium-to Long-Range Hydrologic Forecasting System for Ganges-Brahmaputra-Meghna River Basins* - *Medium-to long-term streamflow forecasting system*

		for Ganges-Brahmaputra-Meghan River basins using the VIC-River Routing Model
Number of participants in trainings organized by proponents and implementing partners	**6**	
a) Number of men	**6**	
b) Number of women	**0**	
Total number of institutions trained	*1*	
a) Governmental (national or subnational)	**1**	Flood Forecasting & Warning Center (FFWC), Bangladesh Water Development Board (BWDB)
b) Private sector (bank, corporation, etc.)	**N/A**	
c) Nongovernmental (NGO, University, etc.)	**N/A**	
Percentage of participants reporting satisfaction with CTCN training (from CTCN training feedback form)		*Satisfied= 4+ on 5-pt scale*
Percentage of participants reporting increased knowledge, capacity and/or understanding as a result of CTCN training (from CTCN training feedback form)		*Increased knowledge, capacity and/or understanding= 4+ on 5-pt scale*
a) Percentage of men		
b) Percentage of women	**0**	
Total number of deliverables produced during the assistance (excluding mission, progress and internal reports)	*12*	
a) Number of communication materials, including news releases, newsletters, articles, presentations, social media postings, etc.	**N/A**	*List the name of the documents*
b) Number of tools and technical documents strengthened, revised or developed	**2**	- **GIS** - **VIC-River Routing Model**
c) Number of other information materials strengthened, revised or created (For example training and workshop reports, Power Points, exercise docs etc.)	**10**	- *Medium- to long-range hydrological forecasting system tutorial for Ganges-Brahmaputra-Meghna River Basins* - *Improvement Pland for Developing an Integrated Dissemination System in Bangladesh* - *Concept Note for SAP process* - *6 online meeting reports including Kick-off meeting (in Korean)*
Total number of policies, strategies, plans, laws, agreements or regulations supported by the assistance	*List total number here*	*List the type and name of documents supported*
a) Adaptation related	**N/A**	
b) Mitigation related	**N/A**	
c) Both adaptation- and mitigation related	**N/A**	
Anticipated number of policies, strategies, plans, laws, agreements or regulations proposed, adopted or implemented as a result of the TA	*List total number here*	*List the type of documents anticipated to be proposed, adopted or implemented*
a) Adaptation related	**N/A**	

b) Mitigation related	**N/A**	
c) Both adaptation- and mitigation related	**N/A**	
Anticipated number of technologies transferred or deployed as a result of CTCN support	*List total number here*	*Instruction: List the type of technologies supported by this assistance. Technologies must be identified from the CTCN taxonomy of climate sectors and technologies (download in pdf format and choose from column C): https://www.ctc-n.org/resources/ctcn-taxonomy*
Anticipated number of collaborations facilitated or enabled as a result of technical assistance	*N/A*	
a) Number of South-South collaborations	**N/A**	
b) Number of RD&D collaborations	**N/A**	
c) Number of private sector collaborations	**N/A**	
Number of countries with strengthened National System of Innovation as a result of CTCN support	**1**	*Bangladesh*
Insert any additional indicators here		

B. Core impact indicators

Please fill in the tables for anticipated impacts of the CTCN assistance. Every technical assistance should contribute to at least one of the indicators below. For guidance on how to report on core indicators see the 'M&E Guidance Document for TA Implementers'.

Core indicator 1	**Anticipated metric tons of CO_2 equivalent (CO_2e) emissions reduced or avoided as a result of CTCN TA** *Please add your calculations in word or excel format as an Annex to this Closure Report, where applicable.*	
	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **on annual basis**	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **in total**
Quantitative value *(emissions reductions)*	*Total number (numerals only, no rounding or abbreviations)*	*Total number (numerals only, no rounding or abbreviations)*
Unit	tCO_2e	tCO_2e
GHG assessment boundary (project emissions) Identify expected post-TA activities, associated effects and assess boundary for quantification of GHG emission reductions	*The project is focused on climate change adaptation*	

Baseline emissions Describe baseline scenario, baseline candidates, emission factors and emissions calculated	*The project is focused on climate change adaptation*	
Methodology Explain the method or process of verifying the indicator and how data was gathered	*The project is focused on climate change adaptation*	
Assumptions Describe assumptions made during calculation and quantification of GHG reductions	*The project is focused on climate change adaptation*	

Core indicator 2	**Anticipated increased economic, health, well-being, infrastructure and built environment, and ecosystems resilience to climate change impacts as a result of technical assistance** *Please provide a **qualitative** description of the anticipated impacts on the categories below*
Infrastructure and built environment Anticipated increased infrastructure resilience (avoided/mitigated climate induced damages and strengthened physical assets)	**Bangladesh is highly prone to flood and lots of infrastructures have been damaged during the inundation of the land. From this TA program, developed capacity to forecast the flood in both national and regional level would enable timely and proper actions for mitigating the damages. It would help prepare measures to reduce flood damage, such as building levees to prevent sudden flooding and moving citizens in areas expected to be affected to safe areas.**
Ecosystems and biodiversity Anticipated increased ecosystem resilience (areas with increased resistance to climate-induced disturbances and with improved recovery rates)	**The increased frequency and severity of the flood from the climate change is highly devastating to the local ecosystems and the biodiversity. Building flood forecasting capacity cannot directly prevent flood damage, but it can secure preemptive response time through medium- to long-term forecasts of more than 10 days, allowing for rapid measures to build temporary embankments around expected flood areas, which will indirectly improve the resilience of the region's ecosystem and biodiversity.**
Economic Anticipated increased economic resilience (e.g. less reliance on vulnerable economic sectors or diversification of livelihood)	**The damage of the flood disrupts not only the individual economic status, but also the country level economy by hindering economic growth because lots of budgets are required for flood damage recovery. The early detection of water level rise would prevent the flood from damaging infrastructures and economic assets.**
Health and wellbeing Anticipated increased health and wellbeing of target group (e.g. improved basic health, water and food security)	**Flood is highly devastating to the health and wellbeing of the populations. Even though the direct damage of the flood is disruptive, the indirect damage such as poor water security and sanitization, diseases, and loss of economic resilience are tremendous. Allowing sufficient time (10 days or more) to respond proactively to flooding will minimize damage and improve the health and well-being of the community.**

Core indicator 3	**Anticipated number of direct and indirect beneficiaries as a result of the TA**	
	Quantitative value	**Means of verification**
Total beneficiaries	*9,000,000*	
Number of adaptation beneficiaries	9,000,000	*The flood has adversely impacted on human well-being and economy in various ways. Thanks to the better forecasting of the flood, it would improve the climate resilience of the populations in community near Ganges-Brahmaputra-Meghna River Basins in both direct and indirect manner. Even though all the communities in the country would get benefits from the improved forecasting capacity, the beneficiary was calculated based on one of the most vulnerable province, Barishal. The beneficiary is the total population living in Barishal province and the indirect beneficiary would be the total population of the country.*
Number of mitigation beneficiaries	N/A	*The project is focused on climate change adaptation*
Number of adaptation-and mitigation beneficiaries	N/A	*The project is focused on climate change adaptation*

Core indicator 4	**Anticipated amount of funding/investment leveraged (USD) as a result of TA (disaggregated by public, private, national, and international sources, as well as between anticipated/confirmed funding)**			
	Quantitative value confirmed *in USD*	**Quantitative value anticipated** *in USD*	**Qualitative description** *List the institutions, timelines, and description or title of the investment*	**Methods** *Describe methods used for quantification of funds leveraged*
Total funding	*$25,000,000*	*$25,000,000*		
Anticipated amount of public funding mobilised from national/domestic sources	**N/A**	-	-	-
Anticipated amount of public funding mobilised from international/ regional sources	**$25,000,000**	**$25,000,000**	**As a follow-up project of the CTCN project, we would apply for the GCF project. The institutions of the country (BWDB) has already showed their interests and the next steps would be**	**GCF funding as a Grant**

			delivered and manged with the implementers of the project. The amount is based on the maximum amount of the funding that could be applied as a Simplified Approval Process (SAP), which is a faster tract to proceed the project do meet the high demand of the country in need.	
Anticipated amount of private funding mobilised from national/domestic sources	**N/A**	-	-	-
Anticipated amount of private funds mobilised from international/regional sources	**N/A**	-	-	-

Annex 2 (for internal use – to be filled in by the CTCN)

CTCN evaluation

This section will be completed by the relevant CTCN Technology Manager.

- Evaluation of the timeliness of the TA implementation as measured against the timeline included in the response plan;
- Evaluation of TA quality as defined in the response plan;
- Overall performance of the Implementers;
- Overall engagement of the NDE and Proponent;
- Lessons learned on the CTCN process and steps taken by the CTCN to improve.