Technical Assistance Response Plan – Terms of Reference

Country	**Tanzania**
Request ID#	2023000026
Title	Development and Piloting of a Digital Platform for Irrigation Insights in Tanzania
NDE	Dr. Gerald Majella Kafuku Acting Director, Centre for Development and Transfer of Technology Tanzania Commission for Science and Technology P.O. Box 4302 Dar es Salaam, Tanzania kafukugm@gmail.com, gerald.kafuku@costech.or.tz +255766604977
Proponent	Tanzania Commission for Science and Technology

Summary of the CTCN technical assistance

The summary should provide a brief description of the problem (barrier to climate technology deployment) and how the technical assistance will address it (brief summary of outputs and activities). Please also briefly indicate national actors involved and the anticipated timeline. Please note this summary will be used for public communication purposes so it is important that it is well written (maximum 1250 characters including spaces).

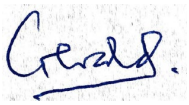
With the advent of climate change, Tanzania's agriculture sector has been facing increasingly severe drought and flood patterns. The Tanzanian Government has proposed the creation of a digital platform to assist in managing regional irrigation schemes, to provide remote detection of water availability/scarcity related to these climate change events. The objective is to drive more targeted irrigation management in support of increased food crops production, and provide early warning capability to Tanzanian farmers to enable a collective response to these challenges. Satellites and sensors will remotely analyze irrigation and groundwater levels, and the digital platform will send alerts to farmers and local communities to help manage these valuable resources.

The project will create wider awareness and motivation for stakeholders to support sustainability and resource management. A strategic business model will also be developed in partnership with regional farming cooperatives and communities, to help drive adoption and participation from local support. Two parallel tracks will be initiated - one focusing on the technical design and development of the digital irrigation GIS platform with water balance algorithms, and the other focusing on the socialization and training of relevant communities. This includes supporting national stakeholders in the process of development and implementation of the AI (Artificial Intelligence) technology, so Tanzania will acquire complete knowledge transfer and derive the maximum benefit from this project.

With this project's launch, another aspect of leveraging this digital platform to serve as the foundation of an open-source early warning system for climate events becomes possible. This platform can be expanded to include a hub or catalog of AI functions that may be openly shared to help monitor multiple aspects of climate change for all nations.

Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

National Designated Entity to the UNFCCC Technology Mechanism
Name: Dr. Gerald Majella Kafuku
Title: Acting Director, CDTT, COSTECH
Date: 08th October 2023
Signature: 

Proponent (signature of the Proponent is optional)
Name:
Title:
Date:
Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Rajiv Garg
Title: CTCN Director (a.i.)
Date: 9 Oct 2023
Signature: 

1. Background and context

Please provide a brief description of the background and context for the CTCN Response Plan. Please include national and sectoral information using recognized and publicly available sources. (maximum 2500 characters including spaces).

Irrigation development in Tanzania is critically important for the purpose of increasing food and cash crops, pastures and aquaculture.[1] This in turn generates higher incomes, increases food security and stimulates economic growth.[2]

Currently, the government is actualizing strengthening irrigation as a priority and reducing rainfall dependence. In order to achieve this, Tanzania has made historic investments in the irrigation sector with an unprecedented political profile, and this will certainly lead to a significant expansion of the irrigated areas guaranteeing more considerable irrigation agriculture value chain uptake involving the public and private sectors.

The Tanzania Irrigation Policy of 2010 envisages sustainable and dynamic irrigation management that transforms agriculture into a stable, highly productive and diversified sector. [3] It is estimated that about 7.1 million hectares of land is suitable for irrigation in Tanzania. The policy identifies the need for research in the planning, development, management and maintenance of irrigation schemes. And currently there are few appropriate recommendations or technologies that address water resources related to irrigated agriculture.

Tanzania has developed a national e-government policy that among others the policy framework ought to enable the Ministry of Water and Irrigation (MoWI) to develop a long-term ICT strategy, which includes using GIS, radio and cell phones, to deliver irrigation and water services. This strategy targets to help enhance data collection processes and increase the reliability of information to help managers and engineers to identify areas suitable for and in need of irrigation.

In order to improve data collection processes and enhance the reliability of information, MoWI ICT strategy advocates the use of remote sensing and GIS technology to gather information on soil quality and available water resources at all water points in the country. It involves recording and later collating coordinates using the GPS receiver complemented by the efforts to map cellphone and internet connectivity, and access to traditional ICTs such as radio, across the country.

The National ICT Policy of 2016 stipulates the government's commitment to encourage all productive sectors to incorporate ICTs in their development plans. It drives the promotion and implementation of nation-wide ICT systems for rural development and agriculture sector support. This includes use of ICT in enhancing automation as well as readily information on status of irrigation schemes with use of ICT technologies such as GIS and maps.[4]

The Tanzania government has invested in a national ICT backbone that has the potential to provide affordable broadband to productive sectors like agriculture. However, the use of ICT is facing challenges: lack of awareness of potentials of ICT; inadequate human capital to facilitate the use of ICTs within sectors such as irrigation; shortage of sectors-specific ICT solutions tailored to local production and operational requirements; lack of linkages between productive sectors, relatively high total cost of ownership of the ICT solutions; and general lack of an enabling and conducive

environment for uptake of ICTs in productive sectors.

Although in many cases ICT provides technical solutions to various problems facing the irrigation sector in Tanzania and across Africa. The challenge is still to develop suitable technology appropriate for the target group. Not every farmer has a cell phone or can read and understand messages in text form. The poorest farmers usually have no access to digital technology; thus, the introduction of ICTs can lead to further marginalization. Furthermore, introduction of ICTs in the irrigation sector has financial implications such that it involves costs to access technology such as smartphones, airtime and the Internet, but also costs to finance the service providers. Therefore, in order to improve performance in the sector will require a range of solutions at different scales. Some of these will be technical or managerial in nature, but many relate to the political or institutional environment and are likely to be more challenging to implement.

The assistance as proposed is in line with Tanzania's Nationally Determined Contributions which aim at upscaling the level of improvement of agricultural land and water resources management as well as increasing productivity in an environmentally sustainable way through, inter alia, climate-smart agriculture interventions. [5]

2. Problem statement

Founded on the national and sectoral context as detailed in the section above, please include a brief problem statement clarifying the main problems and barriers for climate change mitigation and/or adaptation in terms of climate technologies that the CTCN Response Plan will address and overcome. (maximum 1250 characters including spaces.

Tanzania has drafted policies and strategies that aim at supporting irrigation as means of sustainable agriculture. These include the National Irrigation Policy, the National Irrigation Master Plan, The Nationally Determined Contributions, National Climate Change Strategy, The Science and Technology Policy, The National ICT Policy and many more. However, there is little integration between irrigation management and the use of digital technologies, including awareness among farmers and scientists.

The irrigation sector in Tanzania still faces a number of challenges that limit its potential contribution towards achieving the intended goals. The challenges include badly designed/built infrastructure; difficulties adapting institutions for water management and enforcing rules; limited finance for maintenance and repairs; costly inputs set against unreliable markets and low prices and vulnerability to seasonal floods or water shortages. Other limitations are a Lack of political incentives, a proliferation of institutions responsible for irrigation development and a severe lack of capacity for implementation, particularly in district offices. These challenges result in various technical, political and institutional factors and drivers for change of practice and performance in order to plan effective ways for future agricultural sector development.

Irrigation practice in Tanzania is also characterized by reliance on the run-of-the river water abstractions for gravity-fed irrigation schemes. This makes the schemes reliant on climate conditions as rivers depend on rains to flourish. And Tanzania, like other countries, is experiencing the adverse impacts of climate change, and therefore needs to put in place adaptation and mitigation actions in

order to safeguard development gains and achieve its development targets, including the irrigation sector.[6] Rainfall in Tanzania is increasingly variable, and projections indicate that rainfall will now decrease during dry seasons and increase during wet seasons, with unequal distribution where long dry spells are witnessed particularly in semi-arid areas like the Dodoma and Singida regions. This translates to higher risks for drought and flooding, where shifting to irrigation and related early warning systems is inevitable.

In this regard, Tanzania is seeking assistance in the development of a Digital Platform for Irrigation Insights to help Tanzania farmers to remotely analyze and manage irrigation schemes. This assistance is aligned with Tanzania's Nationally Determined Contributions which aim at upscaling the level of improvement of agricultural land and water resources management, as well as increasing productivity in an environmentally sustainable way through, inter alia, climate-smart agriculture interventions.

1 Tanzania National Irrigation Policy 2010

2 Tanzania Nationally Determined Contributions 2021

3 Tanzania National Irrigation Policy 2010

4 Tanzania National ICT Policy 2016

5 Tanzania Nationally Determined Contributions 2021

6 Tanzania's high climate vulnerability in all parts of the country was confirmed through a stocktaking analysis involving all local governments as part of the National Adaptation Plan (NAP) process. https://www.adaptationcommunity.net/mainstreaming-nap/examples/tanzanianap-process/

3. Logical Framework for the CTCN Technical Assistance:

(Guidance: Please note that multiple activities lead to one Output, and multiple Outputs lead to one Outcome. There can be several Outputs, but only one Outcome description capturing the CTCN technical assistance. Deliverables are the products or services to be delivered to the NDE/Proponent/CTCN based on the Activities and the Outputs.)

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
***Objective**: To conceptualize, develop and pilot a digital platform for irrigation insights in Tanzania that is freely accessible to farmers and improves irrigation practices in light of increased pressure from climate change.*												
Outcome: *The technical assistance will build capacities for climate technology development and adoption at multiple levels:* *1. Through cooperatives and irrigation groups, farmers have access to insights for improved irrigation practices and thereby increase their resilience to climate change, yields, economic livelihoods and food supply* *2. Ministry of Agriculture, COSTECH and other stakeholders have a proof-of-concept for a digital irrigation insights platform which can be scaled up across the entire country to serve a larger audience of farmers*												
Output 1: Development of implementation planning and communication documents												
Activity 1: *All implementers must undertake the following activities at the beginning and at the end of the CTCN technical assistance.* i) A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan; ii) Based on the work plan, a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (please refer to item iv below and section 14 in the Response Plan); iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered (a template will be provided); iv) A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided).												

Deliverable 1: i) Detailed work plan ii) Monitoring and evaluation plan iii) CTCN Impact Description iv) Closure and Data Collection report												
Output 2: Assessment of the agricultural and irrigation landscape in Tanzania												
Activity 2.1: Inception meeting An inception meeting will be organized to introduce the project objectives, activities and timelines to key stakeholders and discuss implementation modalities. This will be an in-person meeting in Tanzania with all parties, as a formal project initiation. Meeting topics: a) Project Objectives a. Baseline list of features and functions required for successful launch. b. Social engagement goals – farming communities, agricultural marketing cooperative societies, informal irrigation groups and local governments. c. Regulatory permits; modality of system piloting and actual implementation. d. Definition of success – adoption and awareness, metrics, and knowledge transfer. e. Sustainability of the intervention and possible ways for system upscaling across Tanzania. b) Project Activities a. Project meetings and coordination. b. Project team requirements: i. List of initial tasks ii. Project team composition iii. Tanzania personnel – preference given for in-country resources wherever possible iv. Project management structure and reporting v. Hiring requirements vi. ICT infrastructure requirements												

vii. Associated costs and budget
- c. Satellite data
  - i. Initial data sources and satellite firms/organizations.
  - ii. Project team composition and personnel requirements.
  - iii. Data characteristics and formats.
  - iv. Integration with digital platform – initial considerations and planning.
  - v. Integration with existing ICT infrastructure (National ICT Backbone, Mobile Network Operators, etc.).
  - vi. Associated costs and budget.
- d. Ground sensor data
  - i. Sensors required and sourcing.
  - ii. Team composition and personnel requirements.
  - iii. Identify farming communities / regions for proof of concept.
  - iv. Transportation logistics for personnel.
  - v. Associated costs and budget.
- e. Digital platform development
  - i. Development team composition (UI/UX, web developers, architect).
  - ii. Wireframe designs.
  - iii. Web platforms.
  - iv. Data / Map Integration.
  - v. Messaging and Alerts.
  - vi. Focus group testing.
  - vii. Associated costs and budget.
- f. Development environment
  - i. Initial hardware/GPU and software infrastructure requirements (PoC).
  - ii. Cloud development environment (donation possible - TBD).
  - iii. Access and security planning.

c) Implementation Modalities
- a. Technical deployment:
  - i. Digital platform deployment and support.
  - ii. Satellite data integration and support.
  - iii. Local sensor deployment, data integration and support.
  - iv. Local and remote IT / data centers / Cloud instance / continuity & failover .
  - v. AI / data pipeline deployment and support.

vi. Mobile network deployment and resiliency review. vii. Storage (hot/cold) and data retention planning. viii. Annual lifecycle/TCO/next generation technology planning. b. Community Deployment – emphasis on engagement and awareness. i. Farming Communities and Cooperatives: 1. Direct outreach and engagement planning (initial and long-term). 2. Education and training requirements. 3. Personnel requirements (in-country hiring, transportation). 4. Associated costs and budget. ii. Scientific community: 1. Related agriculture and climate organizations. 2. List of related scientific leaders for engagement. iii. Academic community: 1. List of schools - local universities (e.g. Moshi Co-operative University - 13 regional offices working with cooperatives and farming groups) and high schools. 2. List of educators for engagement. 3. Student engagement. 4. Program creation. iv. Ministries, Local Governments and Agencies: 1. Initial regions for proof of concept. 2. Local government leadership / contact list. 3. Deployment support. 4. Adoption and endorsement of system by Government. v. Regional media options. c. Regional and remote team structure. d. Onsite and remote support considerations. e. Initial Cost-benefit Analysis (see 5.1 – included here for reference): i. Platform management ii. Farmer												
Activity 2.2: Screening of available data sources for agricultural and irrigation insights												

1. Identify initial / existing data sources on weather, soil, crops, etc. 2. Data source consultation - regional experts and government officials 3. Satellite and ground sensors as a specific subset for incorporation a. Imported sensor types and power source options (local power availability, battery life, etc.) b. Evaluate complexity of local platform operation, following the full integration of all data sources. c. Edge (sensor) to core (rack server) IT and data architecture. d. Interoperability of IoT protocols and standards (LoRa and LoRaWAN, AMQP, CoAP, etc.). e. Associated cost and budget. f. Identify possibility of integration via API.											
Activity 2.3: Analysis of farming and irrigation practices and needs 1. Identification of primary food and cash crops for initial pilot / longer term monitoring. 2. Analyze and map current irrigation practices and needs, including areas that can be further enabled with ICT. 3. Provide recommendations on ICT in support of irrigation best practices.											
Activity 2.4: Identification and analysis of farmers participating in the pilot project. 1. Establish selection criteria for farmers participating in the pilot project. a. Geographic distribution. b. Type of crops. c. Size of farm (small to large-scale & commercial farms). d. Existing irrigation schemes and equipment. e. Ownership of farm/land (whether farm is owned by farmer, or leased/hired). f. Type of irrigation (drip, sprinkler or furrow). 2. Identification of interested farmers, followed by confirmation of participation. 3. Conduct focus group of farmers and cooperative members representing multiple regions/crops, to discuss irrigation needs. 4. Sensor deployments, collection of soil samples – methodologies and personnel. 5. Associated costs and budget.											
Deliverable 2:											

• Deliverable 2: Assessment report on agricultural and irrigation landscape, including list of participating farmers				■								
Output 3: Concept Development of the Digital Platform												
Activity 3.1: Ideation meeting on the digital platform concept (virtual meeting) a. Digital Platform Development iii. Platform design requirements 1. Target audience 2. Language considerations (English and Swahili for phase 1) 3. User Interface (UI) design and ease of use for two groups: a. Platform Management b. Farmers 4. Web platforms 5. Privacy and ethics considerations iv. Platform access 1. Mobile devices supported 2. Laptops, iPads, etc. 3. Access equity (mobile device distribution, low-to-no cost, etc.) v. AI models and related analytics 1. Model types for use case 2. Data sources for training / labeling 3. Cross-correlation of results 4. Output to digital platform vi. Infrastructure 1. General architecture and sustainability discussion 2. Data center (assess local IT resources, locations, green status, associated cost, failover plan) 3. Hardware (servers, networking and storage, green status) 4. Software frameworks (Kubernetes, Skupper.io, hybrid cloud patterns, etc.) 5. IoT considerations (standards, data formats, power conservation, APIs, etc.) 6. Cloud providers (backup, failover, test and development environments)		■										

7. Telecom providers and their available resources 8. Satellite uplinks, etc. 9. Security frameworks 10. Associated cost and budget (focus on low-cost and sustainability requirements) 11. Annual total cost of ownership and next generation technology reviews												
Activity 3.2: Definition of data and governance infrastructure a) Data – baseline requirements: 1. User data (target participants, inputs, validation, privacy considerations) 2. Satellite sources 3. Sensor sources 4. Upstream analysis – data labeling, privacy frameworks 5. Storage (regulatory environment, privacy considerations) b) Ongoing access to satellite data. c) Integration of external data in Tanzania. d) Collection of ground data and associated data frameworks. e) Communication options (regional wireless carriers, etc.). f) Definition of platform governance, including: a. Institution to host and maintain ICT platform. b. Body that governs new feature development. c. National AI & data regulations and governance. g) Data Infrastructure – database, data networks and messaging, IoT data standards, security, etc. h) Associated cost and budget (focus on low-cost and sustainability requirements). i) Business continuity – redundancy and hot failover planning with requisite data access. j) Data retention plan – hot data/cold data storage strategy to support long term analysis & backup. k) Data Security and Privacy – regulatory compliance, anonymized data. l) Equity and Bias Management – best practices to create unbiased data profiles & ensure equity in water distribution and access (single family vs. commercial farmers, etc.).												
Activity 3.3: Definition of services and development of wireframes. 1. Define use cases and types of services (early warning, real-time alerts, SMS, maps, etc.). 2. Differentiate interfaces between platform management side and user side – farmers, local												

administrators, irrigation officials, emergency management, and platform maintenance and upgrades. 3. Development of wireframes to assist in design of web page elements and user experience. 4. Related visual examples in preparation for validation meeting.												
Activity 3.4: Validation meeting of the digital platform concept (virtual meeting). 1. Review of all digital platform design objectives. 2. Presentation of the final digital platform concept, initial design and development roadmap. 3. Readout of all prior activities that achieved the current design, including wireframe examples. 4. Agreement by all parties on the design specifications as presented. 5. Discuss next steps for interactive prototype, followed by proof-of-concept test parameters. 6. Update on budget tracking.												
Deliverables 3: • Deliverable 3: Report on data and governance infrastructure, as well as platform services and designs: 1. Data and Governance Infrastructure – Data Sources, Data Transfer Process and Considerations, Labeling, Secure Connectivity, Data Center Requirements and Uptime Strategy, AI Training, AI Federation, Regulatory Compliance/Privacy, Data Security, Data Storage & Compliance. 2. Platform Services – Updates and Alerts, Satellite Images (by region/nation), Sensor Readings, Maps of Irrigation Areas, Recommended Actions, Messaging Services (neighboring farmers, government offices) 3. Platform Design – User Types, User Interface (UI) examples including regional languages and maps, Wireframes and Mockup, Messaging Features, Support Updates.												
Output 4: Development and Piloting of the Digital Platform												
Activity 4.1: Development and identification of backend elements 1. Network design (mobile, IT, IoT networks). 2. IT hardware components (existing vs. required production HW- servers, CPU/GPUs, storage, green power system). 3. IT software components (production SW - Linux, container platform, API management, security, etc.).												

4. Data Center (existing vs. required server and storage racks, cabling, green power options and cooling systems). 5. Cloud infrastructure (development environment / backup, Hybrid Cloud Patterns, failover plan, etc.). 6. Data infrastructure (Skupper.io, data mesh, databases, national-level security/privacy architecture). 7. AI algorithms for analysis (descriptive), forecasts (predictive) and irrigation recommendations (prescriptive). 8. Communication protocols (IoT, mobile networks, satellite). 9. Next generation pricing and technical assessment strategy (hardware/software technology refresh, etc.) o Total cost of ownership assessment & lifecycle plan. o RFP review process (annual or as needed). o Quarterly security and performance review of Digital Platform. 10. Support infrastructure/personnel (system administrators, maintenance, etc.).												
Activity 4.2: Development of front-end elements 1. Web development environment. 2. Production-level deployment platform. 3. Platform management interface: a. User profiles – system administrators, farmers. b. Management features – APIs, manual inputs, sensor integrations (TBD). c. Security. d. Support and bug fix escalation path. 4. User Interface (UI): a. Web Application features and functions. b. SMS and messaging. c. Focus group / pre-development feedback.												
Activity 4.3: Prototype demonstration and feedback meeting 1. Demonstration of Digital Platform prototype to Tanzania colleagues and platform management user group, including satellite and sensor data. 2. Include a small focus group of famers with varying technical backgrounds, for prototype acceptance testing, feedback and guidance. 3. Following feedback, apply learnings and modify platform as needed.												

Activity 4.4: Finalization of the prototype 1. Final test and hardening for connectivity, security, resiliency and uptime 2. Review of architecture and infrastructure 3. Multi-phase rollout plan established 4. Finalize data retention and hot/cold data storage plan												
Activity 4.5: Pilot test with selected farmers 1. Trial period - 2 months (farmers can use their own smartphones, and phones can be provided free of charge if needed) 2. Preliminary UI training and support for farmers 3. Ongoing guidance and outreach once a week for a) user feedback and b) to assist with adoption 4. Impact measurement and metrics for pilot 5. Budget tracking update												
Activity 4.6: Development of final digital platform 1. Following successful pilot phase, meeting will be held to review results and launch production platform. 2. Finalize architectures and wide scale distribution planning 3. Roadmap of production deployment, milestones and success metrics 4. Expand data center and cloud resources as needed, for initial scaling in advance of deployment 5. Version 2 planning – more flood/drought predictive granularity, incorporation of added species sensor in direct support of agriculture (bees), etc. 6. Note - regional promotion efforts to commence in this period												
Deliverables 4: • Deliverable 4.1: Digital platform, version 1 • Deliverable 4.2: Pilot and proof-of-concept report												
Output 5: Financial Analysis and Business Modelling												
Activity 5.1: Cost-benefit analysis												

Platform management: 1. Operations – in-country and remote 2. Maintenance and support of infrastructure elements 3. Hosting – cloud vs. on-premise/data center, redundancy and failover plan 4. Scaling 5. Data retention and compliance Cost-benefit analysis on farmer side: 1. Satellite data only 2. Sensor enhanced (larger scale) 3. Increase in agricultural output– a) estimates and b) long term tracking and reporting												
Activity 5.2: Development of business model / financing mechanism Explore different business models and financing mechanisms, such as: 1. Financing arrangements with farming equipment providers 2. Pro-bono support from technology providers (cloud credits, hardware and software, mobile network access and related cloud resources, consulting) 3. Fundraising through Non-profit / NGOs 4. Data-as-a-service												
Deliverables 5: • Cost/benefit analysis document • Business model/Financing proposal												
Output 6: Scale-up of the Digital Platform												
Activity 6.1: Development of a scale-up roadmap 1. Next steps after proof-of-concept and first production deployment 2. Eventual capacity - population of farmers in Tanzania by crops and regional distribution 3. Farms and irrigation locations for sensor network expansion 4. Resource requirements												

5. Associated cost and budget estimates to finance expansion, and ongoing operation												
Deliverables 6: • Deliverable 6.1: Scale-up roadmap												
Output 7: Capacity Building and Awareness Campaigns												
Activity 7.1: Capacity building for operators on platform management 1. Development of a platform management manual. 2. Training IT team for platform hosting and support. 3. Training regional support staff on platform management.												
Activity 7.2: Capacity building for NGOs, tech providers and financial institutions on distribution and commercialization of irrigation platform 1. Development of information material / technology sheets for distribution and commercialization. 2. Capacity building session with NGOs, tech providers and financial institutions how to approach distribution and commercialization. 3. Differentiate between digital-only and sensor-enhanced.												
Activity 7.3: Awareness campaigns for farming communities and Government personnel 1. Series of awareness campaigns digitally and in-person: a. Digital: Identify amplifiers (cooperatives, influencers, ministry, agencies, etc.); create campaigns. b. In-person: Awareness sessions across the country through partners (cooperatives, local governments, etc.). c. Early-stage assessment of associated costs and budget.												
Deliverables 7: • Deliverable 7.1: Platform management material and training report • Deliverable 7.2: Information material and capacity building report • Deliverable 7.3: Awareness campaign material and report												

4. Resources required and itemized budget:

Please provide an indicative overview of the resources required and itemized budget required to implement the CTCN technical assistance, including for M&E-related activities, using the table below. Important to note that minimum 1% of the budget should explicitly target gender specific activities related to the technical assistance (please see section 10 for further information on gender). Once the Response Plan is completed, a Response Implementation partner(s) will be selected by the Climate Technology Centre (CTC). A detailed activity-based budget for the CTCN assistance will be finalized by the CTCN and selected Implementer.

Activities and Outputs	**Input: Human Resources** *(Title, role, estimated number of days)*	**Input: Travel** *(Purpose, national vs. international, number of days)*	**Inputs: Meetings/events** *(Meeting title, number of participants, number of days)*	**Input: Equipment/Material** *(Item, purpose, buy/rent, quantity)*	**Estimated cost** *Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan*	
					Minimum	**Maximum**
Output 1: Development of implementation planning and communication documents	IE1: 5 days NE1: 5 days				**3,500**	**3,850**
Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.	IE1: 5 days NE1: 5 days				3,500	3,850
Output 2: Assessment of the agricultural and irrigation landscape in Tanzania.					**39,500**	**43,450**

Activity 2.1: Inception meeting. Project objectives, activities and timelines to key stakeholders, and implementation modalities.		International travel – team onsite in Tanzania (3 to 4 members). Two day working session + three nights/hotel.	Meeting title: ICT Digital Platform for Irrigation Analysis. Duration: 2 days Participants: 1 – CTCN 3 - EN 5 – Tanzania representatives from COSTECH, the ICT Ministry, Ministry of Agriculture, Ministry of Water, Tanzania Meteorological Agency, ICT Commission and Commission for Irrigation.		22,000	24,200
Activity 2.2: Screening of available data sources for agricultural and irrigation insights.	IE2: 5 days IE4: 5 days NE1: 5 days NE2: 5 days				7,000	7,700
Activity 2.3: Analysis of farming and irrigation practices and needs	NE1: 15 days	National travel may be required for accurate assessment of irrigation infrastructure.			4,500	4,950
Activity 2.4: Identification and	IE1: 3 days NE1: 10 days	National travel. Requires local		- Sample kits for soil testing.	6,000	6,600

analysis of farmers participating in the pilot project	NE3: 10 days	representatives (# TBD) to visit farms and stakeholders.		- Soil sensors and transmission infrastructure (as needed). LaMotte Model SCL-12: $4999 2-3 models = **$9998 - $14997** Spectral Analysis Machine (optional) **$50,000**		
Output 3: Concept Development of the Digital Platform					**20,000**	**22,000**
Activity 3.1: Ideation meeting on the digital platform concept			Tanzania ICT Digital Platform: Irrigation Analysis – Ideation Session (virtual meeting) 12+ attendees			
Activity 3.2: Definition of data and governance infrastructure	IE3: 5 days IE4: 5 days IE5: 10 days NE2: 5 days				11,000	12,100
Activity 3.3: Definition of services and development of wireframes	IE1: 5 days NE1: 10 days NE4: 30 days			May require access to soil and irrigation sensors, and will require server/software	9,000	9,900

				infrastructure for testing and development.		
Activity 3.4: Validation meeting of the digital platform concept (virtual meeting).			Digital Platform Validation Meeting 12+ attendees (virtual meeting)			
Output 4: Development and Piloting of the Digital Platform					**103,000**	**113,300**
Activity 4.1: Development of backend elements	IE1: 15 days IE3: 10 days IE4: 20 days IE5: 20 days		Regularly scheduled meetings (virtual)	Will require soil and irrigation sensors, and server (CPU and GPU) and software infrastructure for testing and development. Will request donation of software infrastructure for AI proof of concept development. Satellite analysis software (AgroSpace) is proprietary and will incur a cost of **$200,000** for a twelve-month development window.	32,500	35,750

				Irrigation sensors and field data infrastructure for PoC estimated at **$150,000** Shipping for all **$800** *Optional:* Data center hardware components - Six single socket blade servers with NVIDIA A100 GPUs, switch and router with EBx cooling enclosure. **$492,000**		
Activity 4.2: Development of frontend elements	IE2: 20 days NE4: 20 days		Regularly scheduled meetings (virtual)	May require soil and irrigation sensors, and server/software infrastructure for website functional testing and related software development.	14,000	15,400
Activity 4.3: Prototype demonstration and feedback meeting.		International travel - EN team members onsite in Tanzania ---- ---- Farmers may require transportation to central testing site.	Meeting title: ICT Digital Platform: Irrigation Analysis – Internal Prototype Demo and Review 3 – EN (est.) 2 – Development team	Prototype will require soil and irrigation sensors, a server (CPU and GPU) and software infrastructure for testing. May require satellite dish, and will require wireless	22,000	24,200

			5 – Tanzania Gov't --- User testing will follow, and should have at least five representative farmers with a spectrum of technical knowledge.	transmission capability. --- User testing would require handset phones, laptops, wireless access to Digital Platform.		
Activity 4.4: Finalization of the prototype	*IE1: 5 days* *IE3: 5 days* *IE4: 5 days* *IE5: 5 days* *IE2: 5 days* *NE4: 5 days*		ICT Prototype Finalization 14+ attendees (virtual meeting)	Will require access to soil and irrigation sensors and server/software infrastructure for testing and production use. May require satellite dish and wireless transmission capability.	13,500	14,850
Activity 4.5: Pilot test with selected farmers	IE1: 10 days NE6: 30 days	International travel – EN members onsite in Tanzania (# TBD).	Pilot Testing	Will require soil and irrigation sensors, servers (CPU and GPU) and software infrastructure for testing and development. May require mobile devices for farmers, satellite dish and wireless transmission components.	12,900	14,190
Activity 4.6: Development of final digital platform	*IE1: 3 days* *IE3: 3 days* *IE4: 3 days*		Ongoing virtual meetings.	Will require access to dedicated soil and irrigation sensors, servers (CPU and	8,100	8,910

	IE5: 3 days *IE2: 3 days* *NE4: 3 days*			GPU) and software infrastructure for testing, development and production use. Will require satellite dish and wireless transmission components. Separate support environment (servers and software) may be required for system triage.		
Output 5: Financial Analysis and Business Modelling					*Pro-bono*	*Pro-bono*
Activity 5.1: Cost-benefit analysis			Ongoing virtual meetings.			
Activity 5.2: Development of business model / financing mechanism			Ongoing virtual meetings.			
Output 6: Scale-up of the Digital Platform					*Pro-bono*	*Pro-bono*
Activity 6.1: Development of a scale-up roadmap						
Output 7: Capacity					**17,200**	**18,920**

Building and Awareness Campaigns						
Activity 7.1: Capacity building for operators on platform management	NE1: 5 days NE5: 20 days	National travel may be required for capacity building activities		Will require servers (CPU and GPU) and software infrastructure for platform hosting training. May also require satellite dish and wireless transmission components for instruction and demonstration.	5,000	5,500
Activity 7.2: Capacity building for NGOs, tech providers and financial institutions on distribution and commercialization of irrigation platform	*NE1: 5 days* *NE5: 15 days*	National travel may be required for capacity building activities		May need sensors for soil and irrigation, for training purposes.	4,000	4,400
Activity 7.3: Awareness campaigns with farming communities	NE1: 5 days NE5: 10 days NE6: 10 days	National travel required for Community Engagement managers and Tanzania government officials.		May need sensors for soil and irrigation, for presentations and training purposes.	8,200	9,020
Estimated range of costing for the entire Response Plan (covered by CTCN)					**$183,200**	**$201,520**

Equipment costs (covered by external resources)[1]	$360,897	$910,797

5. Profile and experience of experts

Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan.

Experts required	Brief description of required profile
International experts	
IE1 - Project Manager	• Bachelor's degree or equivalent experience required. • 10 years minimum experience leading IT and telecommunications projects. • Prior experience coordinating large-scale project activities and milestones. • Experience with facilitating projects with multiple international stakeholders. • Familiarity with CTCN, EN and Tanzania Ministry resources a plus. • Can be remote, but Tanzania resource preferred. • Fluent in English. •
IE2 - Satellite Analysis Expert	• Master's degree or higher in Electrical, Mechanical or Aerospace Engineering and/or Computer Sciences. • 10 years or more of experience in government or private sector satellite projects. • Satellite data analysts with software development experience preferred. • Open to international applicants – international project experience a plus. • Fluent in English. •

[1] Resource mobilization to be conducted after signature of the response plan

IE3 – IT Architect	• Master's degree in Computer Science, or equivalent experience in IT architectures preferred. • Requires a background in end-to-end Edge/Core software infrastructure and networking design. • Can be an international resource. • Fluent in English. •
IE4 - Data Scientist	• Master's degree in Computer Science, with emphasis on Data Science required. • Consideration given to AI programming experts who can assist with model development and cross-correlation of data. • Academic instructor-level preferred. • Open to international applicants, with Tanzania resources preferred. • Fluent in English.
IE5 - Data Engineer	• Master's degree in Computer Science, with an emphasis on Data Science required. • AI Data specialist with experience in database systems, distributed systems and data engineering tools. • Can be an international resource, with Tanzania resources preferred. • Fluent in English.
National experts	
NE1 - Agriculture and Irrigation Expert	• Bachelor's degree or equivalent experience required. • 10 years of experience in Tanzanian agriculture, related crops, irrigation schemes and technologies. • Regional expert in Tanzanian agricultural development and resilience. • Tanzania Ministry resource preferred. • Fluent in English.
NE2 - Communications Infrastructure Architect	• Master's degree in Computer Science or Applied Communications and Network Engineering, or equivalent experience required. • Telco/communications specialist for satellite/sensor/SMS/web communications & related integration. • Tanzanian telco provider resource preferred.

	• Fluent in Swahili and English.
NE3 - Sensor Field Deployment Specialist	• Bachelor's degree or equivalent experience required. • Regional technicians to be trained by EN for device deployment and support. • Tanzania resource required. • Fluent in Swahili and English.
NE4 – UI/UX Designer	• Bachelor's degree or equivalent experience required. • 5 years of experience with user interface and user experience design, for both web and app environments • Tanzania resource required. • Fluent in Swahili and English.
NE5 - Technical and content Writer	• Bachelor's degree or equivalent experience required. • Minimum of 5 years of experience or more in the creation of website content, brochures and press releases, whitepapers, technical documentation and user guides. • Tanzania resource preferred. • Fluent in Swahili and English.
NE6 - Community Engagement Manager	• Bachelor's degree or equivalent experience desired, but not required. • Regional representatives who can act as liaisons to farming cooperatives, commercial farmers and municipal officials. • Tanzania residents required. • Fluent in Swahili and English.

6. Intended contribution to impact over time

Please provide a brief description of the intended contribution to impact over time of the outcome and outputs provided by this technical assistance on resilience to climate change and/or carbon abatement. To the extent possible, please quantify the intended impact contribution, for example by indicated estimated number of people potentially impacted over time, GDP contribution of the focus sector, carbon emissions by the focus sector, etc. This intended contribution to impact is what will happen if the objective (as articulated in section 3) is met. Please ensure relevant complementarity with text in sections 7 to 12. (maximum 1250 characters including spaces)

The main objective is to ensure availability of water for irrigation, and its efficient use for enhanced crop productivity. This will be achieved when the farmers of Tanzania actively utilize the Digital Platform for irrigation information and alerts, and can take the indicated action to help preserve their water supplies. This will directly contribute to food security and poverty reduction.

And these are measures meant to mitigate impacts of land and water degradation, drying up of rivers and reduced environmental flows. This project addresses a core need, and proactive irrigation management will only help the situation from a conservation perspective.

The irrigated agricultural sector in Tanzania has contributed to the improvement of crop production, productivity and profitability. Production in irrigated agriculture is higher by 3 to 4 times than rain-fed agriculture. And there are a variety of other species, like pollinators, that are highly important for agriculture and require monitoring. We view this solution as a single system, and plan to add new areas of study over time, and monitor the Tanzanian ecosystem in a more complete manner.

By optimal use of irrigation schemes and resources, crop yields (maize in particular) can increase, and new farmland can be enabled for planting over time. We anticipate significant crop yield increases at 20% or more with additional or new irrigation management, which brings an enormous benefit to the 67 million people of Tanzania.

7. Relevance to NDCs and other national priorities

National Irrigation Policy 2010:
The project will contribute to realization of the policy objective which is to ensure sustainable availability of irrigation water and its efficient use for enhanced crop production, productivity and profitability that will contribute to food security and poverty reduction. The policy specifically aims to promote efficient water use in irrigation systems as well as to ensure reliable water for irrigation so as to facilitate optimization, intensification and diversification of irrigated crop production including pasture and aquaculture.

National Agriculture Policy 2013:
The project will contribute to realization of the main objective of the policy, which is to develop an efficient, competitive and profitable agricultural industry that contributes to the improvement of the livelihoods of Tanzanians and attainment of broad-based economic growth and poverty alleviation.

National ICT policy 2016:
The project will contribute to realization of some of policy-specific objectives, such as to promote effective use of ICT in the productive sectors for increased productivity; to promote use of ICT in disaster management; and to promote use of ICT in environmental conservation.

Nationally Determined Contributions 2021:
The project will contribute to:

a) Upscaling the level of improvement of agricultural land and water resources management.
b) Increasing productivity in an environmentally sustainable way through, *inter alia,* climate-smart agriculture interventions.
c) Promoting accessible mechanisms for smallholder farmers against climate related shocks, including crop insurances.

8. Linkages to relevant parallel on-going activities:

Please identify relevant previous and ongoing public and private sector initiatives, projects or programmes that the CTCN assistance will specifically build on and contribute to. To the extent possible, please add practical and operational details on the linkages between existing activities and the CTCN assistance. (maximum 2500 characters including spaces)

The Ministry of Agriculture, through its National Irrigation Commission, has different agricultural irrigation schemes, ranging from planning to full operation. The Ministry targets to attain an area of irrigation of 1,200,000 ha in year 2025, however, as of April 2023, the area with irrigation schemes is 727,280.6 ha; the Ministry plans to add more 95,005 ha of irrigation area in the year 2023-2024[2]. Most of the schemes and farms are managed through agricultural cooperatives and they form a basic means for technology transfer, as of April 2023, a total of 4,252 Irrigator Organizations were registered with the Ministry of Agriculture through the National Irrigation Commission.

The government of Tanzania in its effort to enhance agriculture in the country has enacted two phases of Agriculture Sector Development programs that among others aim to promote irrigation activities in the country. The major target is to transform the agricultural sector (crops, livestock & fisheries) towards higher productivity, commercialization level and smallholder farmer income for improved livelihood, food and nutrition security and contribution to the GDP. The project further ought to improve sustainable water and land use management for crops, livestock and fisheries with a priority on Land use planning and watershed management, Irrigation infrastructure development, Irrigation scheme management & operation, Water sources development for livestock & fisheries; and Promote Climate Smart Agriculture (CSA) technologies and practices.

Additionally, Tanzania and JICA signed a new technical cooperation project called TANCAID, which stands for TANzania CApacity-building for Irrigation Development, and aims at Formulation and training on Guidelines for Irrigation Scheme Development. The major target is to establish and disseminate an effective technical guideline which is incorporated in the National Irrigation Act 2013 covering the whole lifecycle of irrigation development - that is to say, from planning to design, construction, operation and maintenance. The guideline ought to provide a standardized

[2] Ministry of Agriculture 2023; Budget speech 2023-2024, Parliament session.

technical foundation for Irrigation development to improve its efficiency and quality and build capacity for irrigation engineers so to smoothen the alignment of the guideline to all activities related to irrigation development. Approximately a total of 3,000 irrigation engineers and staff, 3,400 local government officers, and 9,300 farmers were trained and capacitated during the implementation period. To ensure sustainability, the project have engaged academic institutions such as Sokoine University of Agriculture (SUA), Arusha Technical College (ATC), and the Ministry of Agriculture Training Institutes (MATIs) so that these institutions may introduce and use the guideline in their relevant training courses/curriculum.

COSTECH did a simple survey to some of the irrigation schemes owned by the Tanzania Agricultural Research Institute (TARI) in year 2022 and established that most of the schemes are not integrated with digital technologies for water management and monitoring. The surveyed schemes are the TARI Tengeru, Tumbi & Makutupora drip irrigation schemes; the Uyole sprinkler scheme; Uyole bower hall scheme; and Serian farrow scheme.

This calls for piloting of ICT based technologies to enable efficient water usage in irrigation schemes. As of the year 2021; about 599 schemes were registered in various regions of Tanzania, and it is observed that their irrigation water sources are either perennial and/or seasonal, which calls for a predicted water management as the means to deal with the impact of climate change. In addition, some of the irrigation schemes such as Gawaye and Chinangali II grape producing cooperatives with about 240 ha in Dodoma region perform inefficient because of high cost of pumping water using generator electricity and/or national grid electricity which can partly be addressed by ICT based technologies.

Some of the private sectors which deal with irrigation schemes for crops include sugarcane cultivation for sugar production (e.g. Kilombero Sugar Company, Mtibwa Sugar Company and the Kagera Sugar Company in the Morogoro, Kagera and Kilimanjaro regions). This includes the Madibira Irrigation scheme in Mbarali district- Mbeya region, the Tububwe juu irrigation scheme in Kongwa district, the Ngage Irrigation scheme in Simanjiro district (Manyara region), mixed crop production through drip irrigation at Donbosco irrigation scheme, and the drip irrigation scheme by smallholder farmers (David Mwaka) in the Dodoma region.

Other firms focus on tea production, especially in the Njombe, Mbeya and Tanga region. Some of the public owned irrigation schemes include Manyara Irrigation Scheme; Ruvu Irrigation Scheme; Wami-Ruvu Basin Irrigation Scheme; Lake Victoria Basin Irrigation Scheme; Pangani River Basin Irrigation Scheme; Kilombero River Basin Irrigation Scheme; Rufiji River Basin Irrigation Scheme; Ruaha River Basin Irrigation Scheme; Great Ruaha River Basin Irrigation Scheme; Lake Nyasa Basin Irrigation Scheme; Rukwa River Basin Irrigation Scheme; Lake Tanganyika Basin Irrigation Scheme; Lake Eyasi Basin Irrigation Scheme; Lake Natron Basin Irrigation Scheme; Lake Rukwa Basin Irrigation Scheme and the Bahi irrigation scheme. These schemes form a starting point to choose for piloting the proposed irrigation platform, and will contribute to efficient water management and transfer of technology.

The AIM For Climate initiative (joint U.A.E. and US government initiative for resilient agriculture) hosted an AI/ML Grand Challenge in May 2023 in partnership with the Enterprise Neurosystem, to select emerging AI/ML technologies for support and advancement. Three of those finalists are engaged in the planning and execution of this Digital Platform proposal and will support the

project's delivery – Dr. Tomas Acuna Ruz of AgroSpace, winner of the AI/ML Grand Challenge, for his firm's research in satellite irrigation observation and analysis, Dr. Rocky Talchabhadel, Research Scientist at Texas A&M University[7] and Grand Challenge finalist for his work in AI modeling and water supply analysis, and Leo Hoarty, startup founder of Earth Biometrics and Grand Challenge finalist, for his work in IoT sensors implanted in natural systems (beehives, mycorrhizal networks, mussel farms, etc.).

[7] https://sites.google.com/view/rockytalchabhadel

9. Anticipated follow up activities after this technical assistance is completed:

Please describe the expected future use of the outputs and deliveries produced by this technical assistance, after the CTCN implementation is completed, towards contributing to the anticipated impacts over time articulated in section 6. For example, what organizations or stakeholders will use the outputs of the technical assistance after it is completed, for what purpose, at what scale and scope the outputs and deliveries will be applied, when and what will be the next steps undertaken, etc. (maximum 2500 characters including spaces)

Anticipated follow-up activities, once technical assistance is completed:

- Formalization of government initiatives to adopt irrigation management, and early warning capabilities for other key natural resources and species.
- Ongoing training and public awareness campaigns targeted at the farming community and stakeholders, and to foster interest in farming in the youth of Tanzania.
- Agricultural resiliency program expansion to incorporate support of pollinators and targeted enhancement of crops.
- Ongoing technical support from Enterprise Neurosystem, and eventual buildout of the digital platform across multiple indicators of climate change.
- Open-source distribution of the irrigation and water supply solution to other nations, who require similar early warning systems.

10. Gender and co-benefits:

Imbedded in design of the activities:	*A gender mainstreaming analysis is mandatory to include for all technical assistances. A gender expert will be assigned to carry out an assessment and evaluation regarding gender mainstreaming during the implementation of the TA.* *In addition, please describe all support to gender aspects, women's equality and other co-benefits embedded into the Response Plan (please include a reference to the actual activities and outputs as described in section 3).*
Gender and co-benefits intended as result of the activities:	The majority of Tanzanian farmers are women, who constitute the majority of agricultural labour force. Over 90.4 per cent of active women in Tanzania are engaged in agricultural activities, producing about 70 per cent of the country's food requirements. However, there are inadequate skills and knowledge among women; inequitable access to productive resources; inappropriate technologies including low usage of ICT enabling tools; and inappropriate social-cultural practices and beliefs. The concept of equity

	access to water or irrigated lands and decision making is a challenge, as it has been established that women have significant participation in irrigation activities, and they simply use manually operated technologies with no inclusion of digital technologies. The program envisions to help women and children involving in the irrigation sector - to save time normally used for manually monitoring the schemes and allow them to focus on other farming activities. The program will further seek to involve women in the value chain of the technology by providing ICT skills for use of the platform on their farms. The technology user focus groups will also reflect the largely female farming population, including representation of smaller family farms, co-operatives, and large-scale commercial farms. And both promotional messaging and training with be delivered by female representatives, crafted with the female farmer in mind.

11. Main in-country stakeholders in implementation of the technical assistance activities:

Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance
National Designated Entity	Tanzania Commission for Science and Technology
Request Applicant	Tanzania Commission for Science and Technology
Tanzania National Irrigation Commission	Permissions to access of irrigation schemes and user of the platform. Program partner.
Ministry of Water	Water basins policy support.
Ministry of Agriculture	Line Ministry and agriculture and irrigation policy support.
Ministry of Communication and ICT	ICT policy support.
e-Government Agency	ICT infrastructure and platform anchoring access.
Tanzania Communications Regulatory Authority	Regulatory permits.
Local governments	Entry point to farmers and cooperatives.
Farming cooperatives	Use their associations to test the system, and they are the beneficiaries.
Farmers	Project beneficiaries.
Agricultural technology providers	Integration of agritech and ICT.
Financial institutions (micro-credit, etc.)	Future financing of the system.
University and colleges	Pool of ICT experts.
Tanzania Meteorological Agency	Weather data.

ICT Commission	Promotion of use of ICT in irrigation.

12. SDG Contributions:

*Instructions: Please complete the grey section below for **a maximum of three SDGs** that will be advanced through this TA. A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/.*

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	The planned digital irrigation platform will strengthen irrigation/water supply resiliency for agriculture, and support of regional farming communities to improve food security.
3	Ensure healthy lives and promote well-being for all at all ages	
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	
6	Ensure availability and sustainable management of water and sanitation for all	The digital platform for irrigation/water conservation in agriculture will improve the sustainable management of water.
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	
	7.3 - By 2030, double the global rate of improvement in energy efficiency	
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among 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	*All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).*
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	This Digital Platform will act as an early warning/social awareness system for farmers in Tanzania, given extreme flood and drought fluctuations due to climate change.
	13.2 - Integrate climate change measures into national policies, strategies and planning	
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	
	13.b - Promote mechanisms for raising capacity for effective	

	climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	
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	
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	

13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

Please tick off the relevant boxes below	*Primary*	*Secondary*
☐ 1. Decision-making tools and/or information provision	☐	x
☐ 2. Sectoral roadmaps and strategies	☐	☐
☐ 3. Recommendations for law, policy and regulations	☐	☐
☐ 4. Financing facilitation	☐	☐
☐ 5. Private sector engagement and market creation	☐	x
☐ 6. Research and development of technologies	☐	☐
☐ 7. Feasibility of technology options	☐	x
☐ 8. Piloting and deployment of technologies in local conditions	x	☐
☐ 9. Technology identification and prioritization	☐	☐

Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.

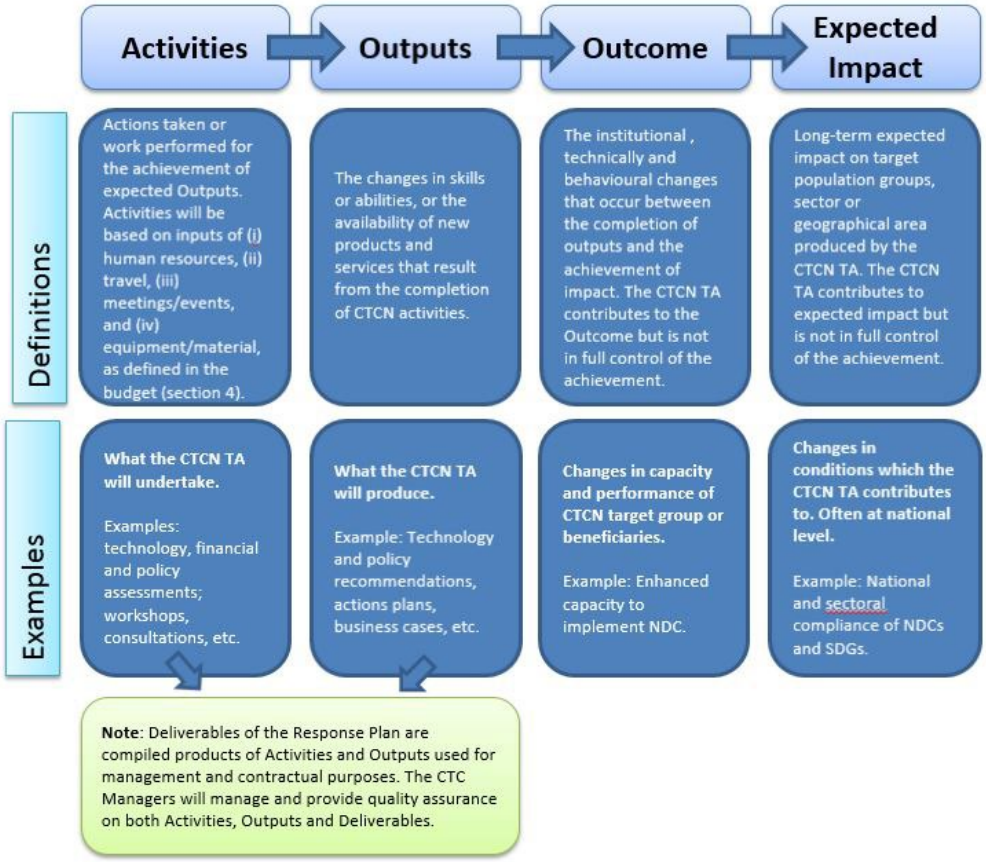
Annex 1: Guidance note for designing a Response Plan (to be deleted when submitting the Response Plan)

1. Objective of the Response Plan

The Response Plan is developed by CTCN specialists in response to a country request for technical assistance. It constitutes the Terms of Reference of the CTCN technical assistance that will be provided to the country and it provides the formulation of and subsequent basis for the monitoring and evaluation of the Response Plan implementation, as well as its expected outcomes and anticipated impacts.

2. Results chain and Logical Framework Approach to be defined in the CTCN Response Plan

The result chain is the causal sequence that stipulates the necessary flow of actions and processes to achieve desired objectives and results – beginning with inputs, moving through activities and outputs, and culminating in individual outcomes. The outcome will contribute to the desired impact in the society. The Logical Framework Approach is an analytical process used to support objectives-oriented project planning and management. It provides a set of pre-defined concepts which are used as part of an iterative process to aid structured and systematic analysis and management of the CTCN technical assistance.



3. Role of the Response Planning Design Team

The Response Planning Design Team is selected by the Climate Technology Centre (CTC). The composition of the team depends on each particular request but may include the National Designated Entity (NDE), the request Proponent, Climate Technology Manager of the CTCN, experts from the CTCN Consortium, UNIDO and UNEP experts from regional offices and other experts as needed.

The role of CTCN Consortium experts is to lead the design of the Response Plan. The NDE will provide overall guidance on national context and priorities whereas the request Proponent will provide more detailed information on the sector, barriers and requested assistance. The Climate Technology Manager of the CTCN will provide quality assurance of timeliness and appropriateness of the Response Plan.

The Response Planning Design Team will draft all sections of the Response Plan template building on the information contained in the CTCN Request, based on expertise on the given topic and potentially further data collection, as required. This will be done by the CTCN Consortium Experts in consultation with the NDE, request Proponent and relevant stakeholders. The Response Plan has to be agreed to and approved by the NDE and the CTCN Director. This Response Plan will serve as the basis to identify, select and engage an expert institution from the Climate Technology Network or Consortium to lead the implementation of the CTCN Response Plan in the requesting country.

To the extent possible, staff from UNEP and UNIDO Regional, Sub-Regional and/or National Offices should be involved in all stages of formulation of the Response Plan to maximize synergies and avoid overlap with ongoing initiatives, as well as ensure relevance to regional and national context.

4. Process for designing the Response Plan

The Response Planning process should be completed over a period of up to 60 working days (12 weeks). Indicative steps and related timelines are laid out below:

5. Design Considerations

Annex 1. Guidance Note for the Response Plan template

In order to maximize the impact of the technical assistance provided by the CTCN and provide an effective M&E process, the Response Plan should integrate as much as possible the considerations below:

Climate Technology focus: The Response Plan should have a clear focus on climate technologies, and identify activities that enable the identification, development, deployment or diffusion of one or several specific technologies (including equipment, techniques, knowledge and skills).

Barrier removal / Problem solving: The activities should contribute to address the specific problem statement identified in the Request. The barriers identified should be those hampering the identification, development, deployment or diffusion of one or several climate technologies or climate actions. Therefore, it may be necessary to limit the CTCN Response Plan to a set of activities for technical assistance commonly agreed with the NDE (and Proponent when needed) compared to the original request submitted. The CTCN will liaise with NDEs and Proponent in case the scope of the technical assistance deviates from the original request.

Use of the CTCN assistance by stakeholders: The Response Plan should identify clearly how the products of the CTCN assistance will be used in the short term once support is delivered, by who and when, to ensure it will lead to specific impacts in the country. The activities should engage the stakeholders that will use the concrete results of the assistance to deploy the technologies, including from the private sector, the public sector, research institutions, etc.

Within the scope of CTCN resources: The cost of the technical assistance provided by the CTCN cannot exceed USD 250,000 per Response Plan. Therefore, it may be necessary to prioritize activities and limit the CTCN Response Plan to a set of priority activities commonly agreed with the Proponent and the NDE to remain under this value. Under section 4 of the Response Plan template, an indicative activity-based budget should be presented. The proposed budget is indicative and should present an estimated costing range per activity, output as well as a total costing range for the delivery of the Response Plan. Once the Response Plan is finalised and published for tendering, interested parties will provide competitive offer against the indicative budget.

CTCN activities and outputs should be linkable to monitoring and evaluation indicators: All proposed activities and outputs must be linkable to monitoring and evaluation indicators that are specific, measurable, achievable, relevant, and time-bound. The monitoring and evaluation process and corresponding indicators will be developed by the Lead Implementer as part of the work plan and will allow the CTCN technology Manager to monitor the timeliness and appropriateness of the implementation.

Synergies with existing efforts: The Response Plan should focus on activities that are not already being fully supported or that are in the process of being fully supported by another national, regional or international organization. Synergies and complementarity also require that the CTCN assistance is not duplicating past activities. It is possible in the Response Plan to indicate co-financing from the government, the Proponent or another stakeholder, that will maximize the effectiveness of the CTCN assistance.

Gender mainstreaming: The CTCN mission is to build or strengthen developing countries' capacities to identify technology needs, to facilitate the preparation and implementation of technology projects and strategies taking into account gender considerations. The Response Plan must therefore describe how gender considerations will be included and monitored within the proposed activities, and any gender co-benefits that will be gained as a result of implementing the CTCN technical assistance.