Country	Bangladesh
Request ID#	2022000026
Title	Feasibility research of Solar Electric-Based Cold Warehouse equipped with Low-temperature Latent Heat Material for Fruit Storage in Bangladesh Climate Conditions
NDE	Dr. Abdul Hamid Director General Department of Environment, Ministry of Environment, Forest and Climate Change Email: dg@doe.gov.bd Address: Poribesh Bhaban, E/16, Agargaon, Sher-e-Banglanagar, Dhaka-1207, Bangladesh Phone: +88 02 81 81800
Proponent	Ibrahim Lodi Managing Director Pacific Solar & Renewable Energy LTD Email: pacific.xpo@gmail.com Address: House11, Road No4, Dhanmondi, Dhaka 1205, Bangladesh

Summary of the CTCN technical assistance

Bangladesh's agricultural sector faces significant post-harvest losses, particularly in perishable fruits and vegetables, due to inadequate cold storage facilities. These losses, estimated at 40% of total production, not only reduce farmers' incomes but also contribute to food insecurity, malnutrition, and increased greenhouse gas emissions. The current cold storage infrastructure is concentrated in urban areas and relies heavily on the national grid, which is both costly and unreliable, leaving smallholder farmers in rural areas without access to necessary storage solutions.

The CTCN technical assistance aims to address this critical challenge by developing and piloting portable solar-powered mini cold storage units tailored for Bangladesh's rural agricultural regions. This initiative will reduce post-harvest losses, improve food security, and enhance climate resilience by providing a sustainable, off-grid cold storage solution. Key activities include designing a feasible model for solar cold storage, piloting the units in particular regions, and developing a business model for revenue collection to ensure sustainability. The project will be implemented over 12 months, engaging national actors such as the Ministry of Environment, Forest and Climate Change, local governments, and farmers' cooperatives.

Agreement:

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

National Designated Entity to the UNFCCC Technology Mechanism
Name: Dr. Abdul Hamid
Title: Director General
Department of Environment

Date:

Signature: 28.11.2024

Proponent (signature of the Proponent is optional)
Name: Ibrahim Lodi
Title: Managing Director,
Pacific Solar & Renewable Energy LTD

Date:

Signature: 21.10.2024

UNFCCC Climate Technology Centre and Network (CTCN)
Name: ~~Jonathan Duwyn~~
Title: ~~Officer in charge, CTCN~~
Ariesta Ningrum, CTCN Director
Date: 9 December 2024

Signature:

1. Background and context

Bangladesh's agricultural sector, which is critical for food security and economic stability, suffers from significant post-harvest losses. These losses are primarily due to the absence of adequate cold storage facilities, especially in rural and marginalized areas. Fruits and vegetables are highly perishable, and without proper storage, these products often deteriorate before reaching markets, leading to food wastage and economic losses.

The current infrastructure is inadequate, with cold storage facilities concentrated in urban areas and reliant on the national grid, which is both expensive and unreliable. Additionally, existing facilities are designed for large-scale operations, leaving smallholder farmers and rural communities without affordable options.

The introduction of portable mini solar cold storage units offers a sustainable solution. By leveraging solar energy, these units provide an off-grid, cost-effective way to store perishable goods, reducing post-harvest losses and improving the livelihoods of rural farmers. The technical assistance will focus on developing a scalable model for these storage units, piloting them in selected regions, and creating a sustainable business model to ensure long-term viability.

2. Problem statement

Bangladesh's agricultural sector is a critical component of its economy and a primary source of livelihood for a significant portion of the population. However, the sector faces a challenge in managing post-harvest losses, particularly for perishable goods such as fruits and vegetables. These losses, which can reach up to 40% of total production, are exacerbated by the lack of adequate cold storage facilities. This situation not only leads to significant economic losses, estimated at approximately USD 450 million annually but also contributes to food insecurity and malnutrition, particularly in rural areas.

The current cold storage infrastructure in Bangladesh is limited and inadequate. Existing facilities are concentrated in urban and semi-urban areas, primarily serving large-scale operations. These facilities are often powered by the national grid, which is both expensive and unreliable, leading to high operational costs. Consequently, smallholder farmers and rural communities, who are most in need of cold storage solutions, are unable to access these services. The lack of cold storage facilities close to production areas further exacerbates post-harvest losses, as perishable goods cannot be stored appropriately and are often sold at lower prices or left to spoil.

In addition to logistical challenges, the cold storage sector in Bangladesh faces several technological barriers. These include outdated technology, poor cold chain networks, high energy costs, and a lack of skilled manpower to operate and maintain cold storage facilities. Moreover, the uneven distribution of cold storage capacity across the country means that many regions, particularly those that are not connected to the national grid, do not have access to these essential services. This has a direct impact on the livelihoods of smallholder farmers, who are unable to preserve their produce and sell it at competitive prices.

Given the significant post-harvest losses and the associated economic, environmental, and social challenges, there is an urgent need for innovative solutions that can address these issues. The

introduction of portable mini solar cold storage units represents a viable solution. These units, powered by renewable solar energy, offer a cost-effective, off-grid alternative to conventional cold storage facilities. By providing smallholder farmers and rural communities with access to reliable cold storage, these units can help reduce post-harvest losses, improve food security, and enhance the economic resilience of the agricultural sector in Bangladesh.

Furthermore, reducing post-harvest losses through improved cold storage solutions will have environmental benefits. Food waste is a major contributor to greenhouse gas emissions, and reducing these losses can help mitigate the impact of agriculture on climate change. The introduction of solar-powered cold storage units aligns with Bangladesh's commitment to reducing its carbon footprint and promoting sustainable development.

In summary, Bangladesh has a critical need for accessible, affordable, and sustainable cold storage solutions. The introduction of portable mini solar cold storage units is a strategic intervention that addresses the technological, logistical, and environmental challenges faced by the agricultural sector, with the potential to significantly reduce post-harvest losses and contribute to the country's broader development goals.

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 onlyone 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: Feasibility research of Solar Electric-Based Cold Warehouse equipped with Low-temperature Latent Heat Material for Fruit Storage in Bangladesh Climate Conditions												
Outcome: Bangladesh has an important need for accessible, affordable, and sustainable refrigerated storage solutions. The introduction of refrigerated storage devices using solar energy for portable or partial power replacement is a strategic intervention to address technological, logistical, and environmental challenges facing the agricultural sector, with the potential to significantly reduce post-harvest losses and contribute to the country's broader development goals.												
Mandatory Output: Project management *All implementers must undertake the following project management activities at the beginning of, during and at the end of the CTCN technical assistance.*												
Activity A: Pre-implementation 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; Based on the work plan, a monitoring and evaluation (M&E) 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). This M&E plan also includes a CTCN Impact Description formulated in the beginning of the technical assistance which will be revised in the Closure and Data Collection report once the technical assistance is fully delivered (templates will be provided). Furthermore, a gender evaluation and gender action plan (GAP) will be prepared and followed throughout the technical assistance (a template will be provided).[1]												

[1]Additional information is available under Section 10 of the response plan.

Activity B: Implementation A project steering committee will be formed, consisting of the implementing team (international and local consultants), the NDE, the project proponent(s), and CTCN. This project steering committee will meet at least on a bi-annual basis in order to report project progress and discuss any questions and challenges.												
Activity C: Post-implementation A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided). Project-end communication and dissemination activities will be conducted in collaboration with the CTCN Secretariat, which will include: • Development of a press release • Delivery of a knowledge sharing webinar • Organization of a dialogue with financial institutions for potential follow-on support												
Mandatory deliverables: Deliverable A: Detailed work plan; M&E plan; gender assessment and gender action plan Deliverable B: Project Steering Committee meeting reports Deliverable C: Closure and Data Collection report; press release, webinar, dialogue with financial institutions	X X					X						X X
Output 1: Diagnostics for cold storage installation in Bangladesh												
Activity 1.1: Establishment of Steering Committee and in-person inception workshop The activity aims to identify relevant stakeholders among governmental institutions at the national and sub-national levels, sector professionals, the private sector, civil society, academic institutions, and beneficiaries. Based on this list of stakeholders, a limited Steering Committee will be created to supervise the implementation of this Technical Assistance. The committee will maintain a gender balance and ensure adequate representation of vulnerable groups. It will provide technical oversight and high-level guidance at every stage of implementation. A multi-stakeholder inception workshop will be organised to inform stakeholders of the start of the project and ensure their active participation throughout the implementation process. This meeting will be held in person. Consultative meetings will be held with each member of the Steering Committee to understand previous initiatives and discussions will focus on where the data collection equipment should be hosted, how to operate it and who the future users and administrators of the equipment will be.												

Activity 1.2: Diagnostics for cold storage installation in Bangladesh Local demonstration site is required due to the need to build a local warehouse in Bangladesh. In order to determine the local demonstration site, a checklist will be prepared and a local preliminary survey will be conducted. The main research content includes not only mangoes, which are agricultural products that require refrigeration, but also other agricultural products. This is because they can obtain higher added value. In addition, information on the location and infrastructure for constructing cold storages warehouse is also needed. This will allow decisions to be made on how to install the warehouse, the type of power supply, etc. In addition, the warehouse to be installed will be designed based on the survey results. 1) Basic training for chilled warehouse system - Latent heat application technology - Insulation materials.	
Deliverable 1.1: Workshop report including: 1. List of stakeholders and steering committee 2. Minutes of the consultative meetings. 3. Minutes of the inception workshop with the list of participants, disaggregated by gender, materials used for the workshops and photos of the event.	X
Deliverable 1.2: Diagnostics report	X
Output 2: Development of 20-ft. cold warehouse by solar power system	
Activity 2.1: Design of 20-ft. cold warehouse for agricultural product by solar power system We decided on the demonstration site and the type of agricultural products in activities 1-2. Design of the warehouse considering the characteristics of the determined agricultural products. In addition, the warehouse operating conditions can be secured according to the local solar radiation pattern and applied in the heat load design. 1) Heat load calculation for warehouse according to local climate conditions and stored goods: EXCEL programming	

2) Optimal capacity calculation of latent heat storage system considering interruption of power supply through solar power generation: EXCEL programming 3) Optimal capacity calculation of refrigeration system considering warehouse heat load and latent heat storage system capacity: EXCEL programming 4) Optimal capacity calculation of solar power generation system: EXCEL programming 5) Design of 20-ft. cold warehouse: P&ID In order to analyze the warehouse operating characteristics, a monitoring control system for data collection and control must be developed. Therefore, a design that enables stable operation through data collection methods and control is required. The design of the system for warehouse production is being carried out, and the optimal structure will be derived by performing heat flow analysis inside the warehouse. In addition, continuous temperature maintenance of refrigerated goods is required when transporting from pre-cooling to cold storage. Therefore, a connection unit should be installed at the connection parts of each warehouse to minimize heat loss. 6) Operation monitoring &control system design : P&ID 7) Numerical simulation for cold warehouse: COMSOL Multiphysics data module 8) Design of connection unit to minimize heat loss: Design sheet	
Activity 2.2: Manufacturing of 20-ft. cold warehouse for agricultural product by solar power system The warehouse system will be manufactured as a semi-finished product and supplied to the demonstration site to minimize the risk of damage or increased transportation costs during local transportation. The refrigeration system and insulation panels for warehouse will be manufactured in Korea, transported as SKD, and assembled locally. The solar power generation system requires the full support of local Bangladeshi companies for installation and operation. Further review is needed on the application of energy storage systems (ESS). Item 1) Insulation panels for warehouse Item 2) Refrigeration systems Item 3) LHM modules Item 4) Solar power generation systems (Bangladesh cooperation)	
Activity 2.3: Setup of 20-ft. cold warehouse for agricultural product by solar power system	

After the installation of the refrigerated system and warehouse panels shipped locally and the integration of the solar system with the support of a local company, basic testing is performed. Training is provided on how to operate the installed LHM along with how to operate the installed warehouse. 1) Installation of low-temperature latent heat-based cold warehouse system 2) Training on operation technology of low-temperature latent heat-based cold warehouse system - Pre-cooling warehouse and storage warehouse operation plan - LHM storage warehouse operation plan	
Activity 2.4: Evaluation of 20-ft. cold warehouse for agricultural product by solar power system In the analysis of data acquired through the warehouse test, the optimal operation plan is derived according to the amount of solar power generated and the optimal operation plan for cooling with LHM and cooling with the refrigeration system. It will be applied to the warehouse operation. Based on these results, the feasibility of applying a solar-powered cold storage with low-temperature latent heat materials will be examined. 1) Proposal of optimal operation methodology considering solar power generation 2) Providing the optimal operating methodology based on measurement data	
Deliverable 2.1: Design of 20-ft. cold warehouse	X
Deliverable 2.2: Manufacturing of 20-ft. cold warehouse	X
Deliverable 2.3: Setup of 20-ft. cold warehouse	X
Deliverable 2.4: Evaluation of 20-ft. cold warehouse	X
Output 3: Feasibility research of the technology	
Activity 3.1: Technical feasibility (commissioning and operational aspects) The feasibility study will address but not be limited to the following. The feasibility study will be conducted in consultation with stakeholders. 1. Overview of technology 2. Potential size 3. Performance and cost 4. Challenges and barriers with references from other projects 5. Sustainable operation of the cold warehouse throughout the technical lifetime of the technology	

Activity 3.2: Socio-economic and financial analysis This project will encompass a comprehensive socio-economic analysis, balancing the costs and benefits from a socio-economic perspective. Additionally, it will entail a financial analysis to evaluate the feasibility and profitability of the technology, along with an exploration of various financing options. The environmental impacts will also be factored into this analysis. 1. The socio-economic impact assessment will adhere to globally recognized methods while being tailored to local conditions. It will be structured to address the specific needs of the targeted communities, including considerations of gender inclusivity, employment, food and water security, and capacity building. 2. A financial analysis will be conducted to determine the profitability of the technologies, and diverse financing options will be identified.												
Activity 3.3: Feasibility report and stakeholder consultations (Communities and government) 1. The analysis conducted in activity 3.1 will be complemented by a socio-economic and financial analysis in activity 3.2, which will be presented in the draft feasibility study report. 2. Tools like Multi-Criteria Decision Analysis (MCDA) will be used to undertake the feasibility of the technologies. 3. The preliminary outcomes of the report and the underlying tool will be discussed with stakeholders, including communities and government agencies. 4. Stakeholder feedback will be incorporated into the revised feasibility study report.												
Deliverable 3 1. Draft feasibility study report with worksheets on the socio-economic and financial analysis conducted 2. Stakeholder consultation/Webinar with follow-up online consultation survey 3. Final feasibility study report with worksheets on the socio-economic and financial analysis conducted												X
Output 4: Scale-up project concept note and Final in-person workshop												
Activity 4.1: Scale-up project concept note The implementing partner will provide a concept note for a scale-up project after concluding this TA project with the best available data and information generated from this project. Therefore, the guidelines to prepare this concept note are to be considered throughout all the activities listed above for better alignment of the deliverables with the requirements of the concept note. The concept note should also serve as a successful case for the other countries in the region to replicate the approach.												

Activity 4.2: Final in-person workshop The Implementing Partner will prepare presentation materials and compile previous deliverable reports into a final, publicly available report for the country. The Implementing Partner will organize an in-person workshop to deliver the final project presentation and disseminate materials. During this final workshop, relevant financing organisations, including MDBs, international organisations, government institutions, NGOs and private sector companies, will be identified and invited. Additionally, the GCF NDA and GEF focal points need to be invited to explore opportunities for scaling up after the conclusion of this project.												
Deliverable 4.1: One scale-up project concept note with the package of supporting documents, as applicable.												X
Deliverable 4.2: Final report and in-person presentations Final compiled deliverable, combining deliverables 1, 2, 3 and 4 into a final report												X

Appendix

Step 1: Diagnostics for cold storage installation in Bangladesh

Step 2: Design and manufacturing of 20-ft. cold warehouse by solar power system
Item 1) Cold warehouse for pre-cooling
Item 2) Cold warehouse for storage
Item 3) Cold thermal storage system with LHM
Item 4) Solar power generation systems (Bangladesh cooperation)

Step 3: Setup of 20-ft. cold warehouse by solar power system
1) Installation of low-temperature latent heat-based cold warehouse system
2) Training on operation technology of low-temperature latent heat-based cold warehouse system

Step 4: Evaluation of 20-ft. cold warehouse by solar power system
1) Operation data collection and analysis for cold warehouse

2) Optimal operating methodology for cold warehouse based on measurement data

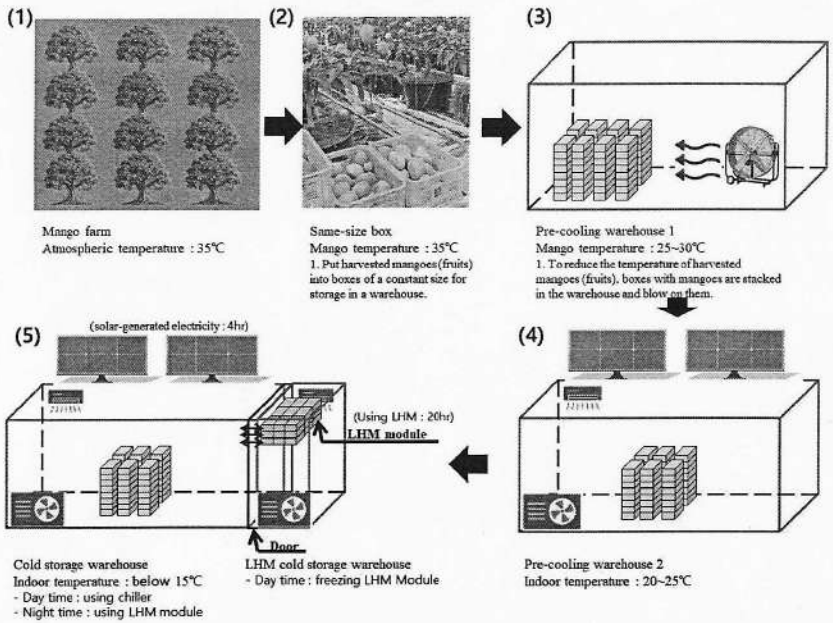


Figure 1 Cold storage process for mango

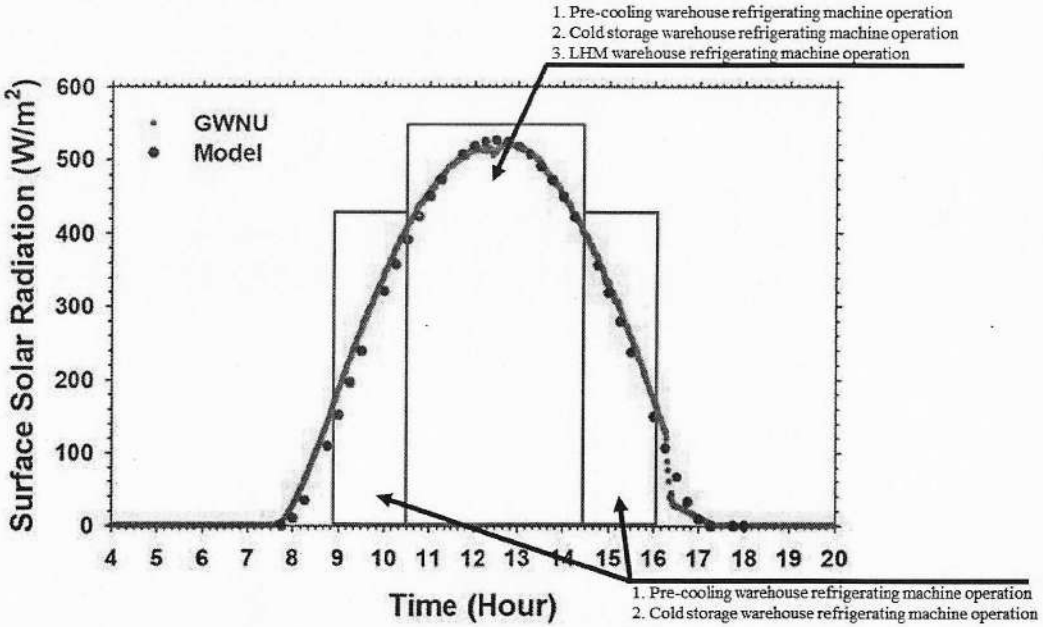


Figure 2 Examples of surface solar radiation and refrigerating machine operation time

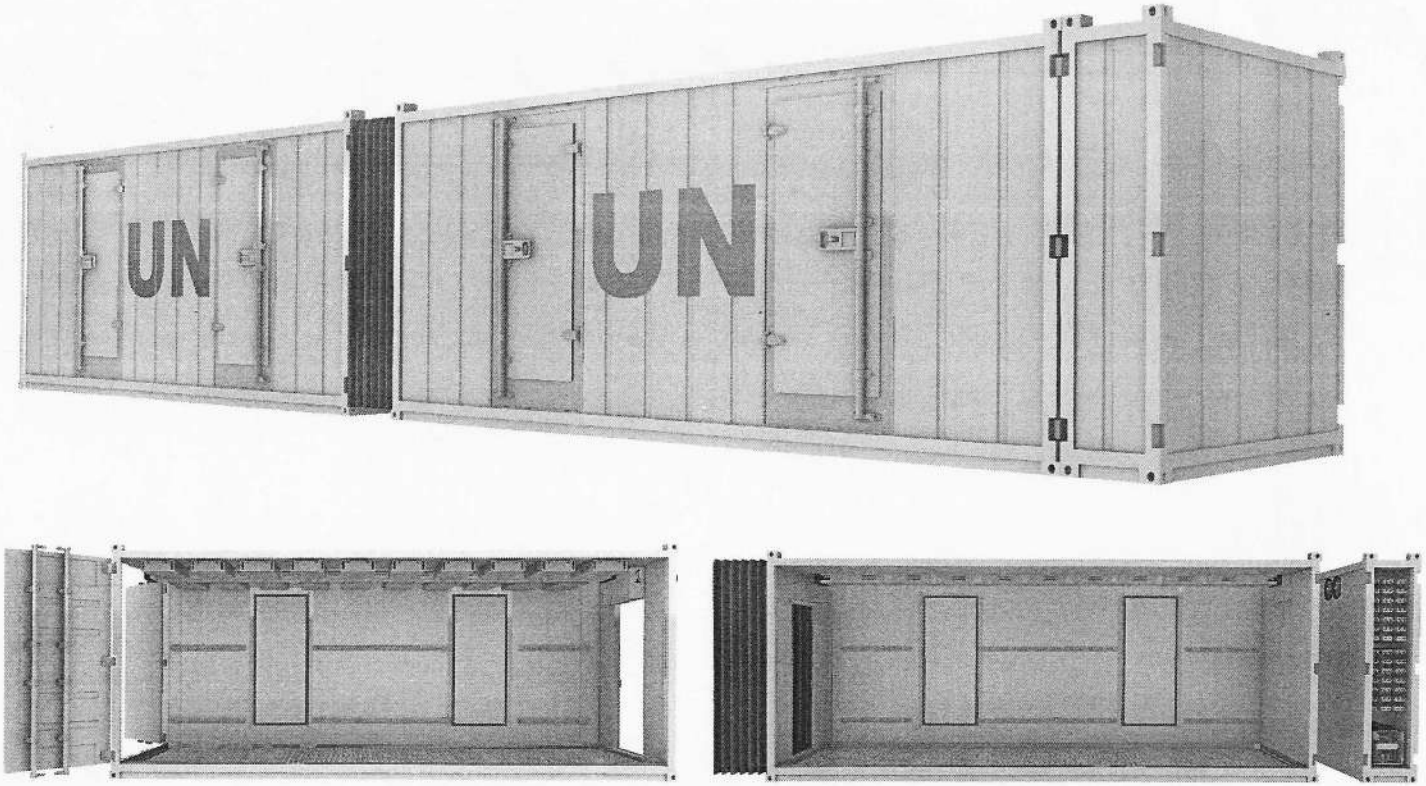


Figure 3 Concept design for cold storage warehouse

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 5% 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**
Mandatory Output: Project Management	*Researcher1, 15 day* *Researcher2, 15 day* *Researcher3, 15 day*				*1,796*	*1,995*
Mandatory Activities: A: Pre-implementation B: Implementation C: Post-implementation	Please allocate 1-5 working days for each of the mandatory reports under Activities A-C				*1,796*	*1,995*
Output 1: Diagnostics for cold storage installation in Bangladesh					*34,950*	*38,833*
Activity 1.1: Establishment of Steering Committee and in-person inception workshop	*Researcher1, 6 day* *Researcher2, 6 day* *Researcher3, 6 day* *Expert 1, 5 day* *Expert 2, 5 day*	*Meeting, international, 5 day*	*Kick-off meeting, 6 person, 5 day*		*13,449*	*14,943*

	Expert 3, 5 day					
Activity 1.2: Diagnostics for cold storage installation in Bangladesh	*Researcher1, 33 day* *Researcher2, 33 day* *Researcher3, 33 day* *Expert 1, 5 day* *Expert 2, 5 day* *Expert 3, 5 day*	*Local survey, international, 5 day*	*Basic training and local survey meeting, 6 person, 5 day*		*21,501*	*23,890*
Output 2: Development of 20-ft. cold warehouse by solar power system					*153,981*	*171,090*
Activity 2.1: Design of 20-ft. cold warehouse for agricultural product by solar power system	*Researcher1, 33 day* *Researcher2, 33 day* *Researcher3, 33 day*				*3,848*	*4,275*
Activity 2.2: Manufacturing of 20-ft. cold warehouse for agricultural product by solar power system	*Researcher1, 66 day* *Researcher2, 66 day* *Researcher3, 66 day*			*Cold warehouse for pre-cooling, Cold storage warehouse, buy, 1* *Cold warehouse for storage, Cold storage warehouse, buy, 1* *Cold thermal storage system with LHM, Cold storage warehouse, buy, 1*	*62,438*	*69,376*
Activity 2.3: Setup of 20-ft. cold warehouse for agricultural product by solar power system	*Researcher1, 22 day* *Researcher2, 22 day* *Researcher3, 22 day* *Expert 1, 5 day*	*Setup of cold warehouse, international, 5 day*	*Training on operation technology related to cold storage*	*Solar power generation systems (Bangladesh cooperation),*	*79,065*	*87,850*

	Expert 2, 5 day *Expert 3, 5 day*		*warehouse, 6 person, 5 day*	*Cold storage warehouse, buy, 3*		
Activity 2.4: Evaluation of 20-ft. cold warehouse for agricultural product by solar power system	*Researcher1, 47 day* *Researcher 2, 47 day* *Researcher 3, 47 day* *Expert 1, 5 day*	*Evaluation of cold warehouse, international, 5 day*			*8,630*	*9,589*
Output 3: Feasibility research of the technology					*9,167*	*10,186*
Activity 3.1: Technical feasibility (commissioning and operational aspects)	*Researcher1, 10 day* *Researcher 2, 10 day* *Researcher 3, 10 day* *Expert 1, 5 day*				*2,192*	*2,436*
Activity 3.2: Socio-economic and financial analysis	*Researcher1, 10 day* *Researcher 2, 10 day* *Researcher 3, 10 day* *Expert 3, 8 day* *Expert 4, 8 day* *Expert 5, 8 day*				*5,308*	*5,898*
Activity 3.3: Feasibility report and stakeholder consultations (Communities and government)	*Researcher1, 14 day* *Researcher 2, 14 day* *Researcher 3, 14 day*				*1,667*	*1,852*
Output 4: Scale-up project concept note and Final in-person workshop					*24,731*	*27,479*
Activity 4.1: Scale-up project concept note	*Researcher1, 9day* *Researcher 2, 9 day*				*1,718*	*1,909*

	Researcher 3, 9 day *Expert 1, 4 day*					
Activity 4.2: Final in-person workshop	*Researcher1, 5 day* *Researcher2, 5 day* *Researcher3, 5 day* *Expert 2, 5 day* *Expert 3, 5 day* *Expert 6, 5 day*	*Workshop, international, 5 day*	*Stakeholder workshop, 6 person, 5 day*		*23,013*	*25,570*
Add lines as needed						
Estimated range of costing for the entire Response Plan					*224,625*	*249,584*

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	
Project manager (Researcher 1)	- Master's degree or above (or equivalent experience) in Refrigeration, air conditioning and heat storage - Experience in leading and managing a project and a team of experts from different cultural backgrounds and fields of expertise - At least 10 years of experience in identifying, evaluating, designing Refrigeration, air conditioning and heat storage technologies - Experience in organising workshops and/or capacity building training - Previous experience in Bangladesh will be valued - Excellent written and communication skills in English are required
Expert in Refrigeration, air conditioning and heat storage (Researcher 2)	- Master's degree or above (or equivalent experience) in Refrigeration, air conditioning and heat storage - At least 10 years of experience in identifying, evaluating, designing Refrigeration, air conditioning and heat storage technologies

	- Experience in organising workshops and/or capacity building training - Previous experience in Bangladesh will be valued - Excellent written and communication skills in English are required
Expert in Refrigeration, air conditioning and heat storage (Researcher 3)	- Master's degree or engineering degree in Refrigeration, air conditioning and heat storage - At least 5 years of experience in identifying, evaluating, designing Refrigeration, air conditioning and heat storage technologies - Experience in organising workshops and/or capacity building training - Previous experience in Bangladesh will be valued - Excellent written and communication skills in English are required
National Experts	
Engineer in cold warehouse technologies (Expert 1)	- Master's degree or above (or equivalent experience) in Refrigeration, air conditioning and heat storage - Experience in setting up cold warehouse system - At least 10 years of experience in identifying, evaluating, designing Refrigeration, air conditioning and heat storage technologies - Excellent written and communication skills in English are required - It is expected that the expert will be based in Bangladesh or with the availability to travel frequently and for long periods of time in Bangladesh
Engineer in Refrigeration, air conditioning and heat storage (Expert 2)	- Master's degree or above (or equivalent experience) in Refrigeration, air conditioning and heat storage - Expert with over 10 years of experience with knowledge of refrigeration, air conditioning and heat storage - Experience in organising workshops and capacity building trainings - Excellent written and communication skills in English are required - It is expected that the expert will be based in Bangladesh or with the availability to travel frequently and for long periods of time in Bangladesh
Gender expert (Expert 3)	- Relevant master's degree in Gender studies or other disciplines with a focus on the field of gender issues in a developing country context - At least 5 years of experience in gender studies and/or management of equality policies - At least 3 references demonstrating experience in gender studies in the agriculture sector in developing countries - Written and communication skills in English are required - It is expected that the expert will be based in Bangladesh or with the availability to travel frequently and for long periods of time in Bangladesh

Expert in socio-economic analysis (Expert 4)	- Master's degree or above (or equivalent experience) in Socio-economic analysis - Expert with over 10 years of experience with socio-economic analysis in climate technology projects - Written and communication skills in English are required - It is expected that the expert will be based in Bangladesh or with the availability to travel frequently and for long periods of time in Bangladesh
Expert in financial analysis (Expert 5)	- Master's degree or above (or equivalent experience) in Financial analysis - Expert with over 10 years of experience with financial analysis in climate technology projects - Written and communication skills in English are required - It is expected that the expert will be based in Bangladesh or with the availability to travel frequently and for long periods of time in Bangladesh
Engineer in solar power generation or cold chain system (Expert 6)	- Expert with over 10 years of experience with knowledge of solar power generation or cold chain system - Experience in organising workshops and capacity building trainings - Written and communication skills in English are required - It is expected that the expert will be based in Bangladesh or with the availability to travel frequently and for long periods of time in Bangladesh

6. Intended contribution to impact over time

The technical assistance is expected to significantly reduce post-harvest losses in Bangladesh, thereby improving food security and the economic resilience of rural communities. The introduction of portable mini solar cold storage units in Bangladesh is expected to have a significant and lasting impact on the agricultural sector's resilience to climate change and its contribution to carbon abatement. By reducing post-harvest losses, which currently account for up to 40% of fruit and vegetable production, this project will directly enhance food security and increase the incomes of smallholder farmers, thereby improving their economic resilience.Over time, the project will contribute to reducing greenhouse gas emissions associated with food waste and reliance on fossil fuels. The project could impact over 1 million smallholder farmers and contribute to a reduction in food loss valued at approximately USD 450 million annually.

The project's focus on solar energy further supports Bangladesh's transition to renewable energy sources, reducing reliance on fossil fuels and contributing to national carbon reduction targets. The successful implementation and scaling of this project will demonstrate the viability of solar-powered cold storage solutions, encouraging wider adoption and contributing to sustainable development goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 7 (Affordable and Clean Energy), and SDG 13 (Climate Action).

7. Relevance to NDCs and other national priorities

The proposed technical assistance project aligns closely with Bangladesh's Nationally Determined Contributions (NDCs) and other national priorities focused on climate change mitigation, adaptation, and sustainable development. Bangladesh's NDCs emphasize the reduction of greenhouse gas (GHG) emissions through enhanced energy efficiency, increased use of renewable energy, and improved waste management practices. The introduction of portable mini solar cold storage units directly supports these objectives by reducing food waste, a significant source of GHG emissions, and promoting the use of clean, renewable solar energy in the agricultural sector.

Relevance to NDCs: Bangladesh's NDC sets an ambitious target to reduce GHG emissions by 5% by 2030 from business-as-usual levels, with a conditional target of a 15% reduction depending on international support. The proposed solar cold storage units contribute to this goal by reducing emissions associated with post-harvest losses and the energy-intensive cold storage facilities that rely on fossil fuels. The project also supports the NDC's focus on increasing the share of renewable energy in the national energy mix, as the cold storage units will be entirely powered by solar energy, reducing the agricultural sector's dependence on the national grid and fossil fuels.

Relevance to National Adaptation Plan (NAP): Bangladesh's NAP identifies agriculture as one of the key sectors vulnerable to climate change impacts, with specific emphasis on the need to improve food security and agricultural resilience. The introduction of solar cold storage units will help mitigate climate risks by preserving perishable goods, reducing post-harvest losses, and stabilizing food supply chains. This aligns with the NAP's objectives of enhancing the adaptive capacity of vulnerable communities and ensuring food security under changing climate conditions.

Relevance to Technology Needs Assessment (TNA) and Technology Action Plan (TAP): The TNA for Bangladesh highlights the importance of promoting climate-smart technologies in agriculture, particularly those that enhance energy efficiency and reduce emissions. Solar cold storage units are a prime example of such technology, addressing the need for low-carbon, sustainable solutions in the agricultural value chain. The project's focus on piloting and scaling up this technology also aligns with the objectives of the TAP, which aims to accelerate the deployment of climate-friendly technologies in key sectors.

Relevance to Nationally Appropriate Mitigation Actions (NAMAs): The project contributes to Bangladesh's NAMAs, which focus on reducing emissions through sustainable practices in agriculture and energy. By integrating solar energy into cold storage solutions, the project supports the NAMA goals of enhancing energy efficiency and promoting the use of renewable energy in rural areas. The reduction of post-harvest losses also aligns with NAMA objectives to improve resource efficiency and reduce waste.

Relevance to National Food Security Strategies: Bangladesh's national strategies for food security emphasize the need to reduce post-harvest losses and improve the resilience of food supply chains. The introduction of solar cold storage units is directly relevant to these strategies, as it provides a practical solution to preserve perishable goods, reduce food waste, and ensure a stable food supply, especially in rural and vulnerable communities.

In conclusion, this technical assistance project is fully aligned with Bangladesh's NDCs, NAP, TNA, TAP, NAMAs, and broader national priorities. It provides a sustainable and scalable solution to reduce GHG emissions, enhance agricultural resilience, and improve food security, thereby contributing to the country's long-term climate and development goals.

8. Linkages to relevant parallel on-going activities:

The proposed technical assistance project to introduce portable mini solar cold storage units in Bangladesh aligns with and builds upon several relevant ongoing public and private sector initiatives, projects, and programs focused on reducing post-harvest losses, promoting renewable energy, and improving food security.

Bangladesh Solar Energy Programme: Bangladesh has been actively promoting the use of solar energy through its Solar Energy Programme, which aims to increase the use of renewable energy in various sectors, including agriculture. This project will directly complement the national solar energy initiatives by introducing solar-powered cold storage units, thus extending the benefits of solar energy to rural and agricultural communities. The project can leverage existing solar energy infrastructure and expertise in Bangladesh to ensure the successful deployment and scaling of the solar cold storage units.

Agricultural Value Chain Development Projects: Several ongoing projects in Bangladesh focus on improving the agricultural value chain, particularly in reducing post-harvest losses and enhancing market access for farmers. For instance, the World Bank-supported National Agricultural Technology Program (NATP) Phase II aims to enhance agricultural productivity and reduce post-harvest losses through improved technologies and practices. The proposed technical assistance will build on these efforts by introducing a critical technology, solar cold storage, that directly addresses post-harvest loss challenges, particularly for perishable goods. The project will collaborate with stakeholders involved in these value chain initiatives to integrate cold storage solutions into broader agricultural development strategies.

Private Sector Initiatives in Cold Storage: There are ongoing private sector efforts to establish cold storage facilities in Bangladesh, particularly in urban and semi-urban areas. Companies like PRAN and ACI have invested in cold storage infrastructure to support their supply chains. However, these facilities are typically large-scale and grid-dependent, limiting their accessibility to smallholder farmers. The proposed project will fill this gap by providing a scalable, off-grid solution that is specifically designed for smallholder farmers in rural areas. Collaboration with private sector players can also open opportunities for co-financing and technical support, ensuring that the solar cold storage units are integrated into existing supply chains and benefit from private sector expertise in cold chain management.

FAO and IFAD-supported Food Security Projects: The Food and Agriculture Organization (FAO) and the International Fund for Agricultural Development (IFAD) have been supporting various food

security projects in Bangladesh aimed at improving agricultural productivity and reducing food losses. For example, the FAO's work on post-harvest management in Bangladesh has focused on capacity building and introducing improved storage techniques. The proposed CTCN assistance will build on these foundations by introducing an innovative storage solution, solar-powered cold storage, that is particularly suited to the needs of smallholder farmers. The project can also draw on FAO and IFAD's experience in community engagement and capacity building to ensure the successful adoption of the new technology.

Public-Private Partnerships in Renewable Energy: Bangladesh has been promoting public-private partnerships (PPPs) to expand renewable energy access in rural areas. The Infrastructure Development Company Limited (IDCOL), for instance, has been instrumental in financing solar home systems and other renewable energy projects in Bangladesh. The proposed technical assistance can leverage IDCOL's experience in financing and deploying solar technologies to support the roll-out of solar cold storage units. Engaging with PPPs will also facilitate access to financing and create a sustainable business model for the maintenance and expansion of the cold storage network.

Government's Agricultural Extension Services: The Department of Agricultural Extension (DAE) in Bangladesh provides support to farmers through training, technology transfer, and advisory services. The proposed project will align with DAE's efforts by introducing solar cold storage as part of the extension services offered to farmers. The project will collaborate with DAE to train local agricultural officers on the use and benefits of solar cold storage, ensuring that farmers receive the necessary support to adopt and utilize the technology effectively.

Operational Linkages: The TA project will specifically focus on integrating solar cold storage solutions into existing agricultural and energy initiatives. This will involve close coordination with government agencies, development partners, and the private sector to ensure that the solar cold storage units are effectively deployed and maintained. The project will also contribute to ongoing efforts to reduce post-harvest losses and enhance food security by providing a sustainable and scalable storage solution that can be replicated across the country.

In summary, the proposed technical assistance is well-aligned with several ongoing initiatives in Bangladesh and will build on these efforts by introducing an innovative solar cold storage solution that addresses key challenges in the agricultural sector. The project will engage with public and private stakeholders to ensure that the benefits of the solar cold storage units are widely distributed and contribute to the country's broader development goals.

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

Upon the completion of the CTCN technical assistance, the outputs and deliverables produced will serve as foundational resources for scaling and sustaining the introduction of portable mini solar cold storage units across Bangladesh. The anticipated follow-up activities are outlined as follows:

Scaling of Solar Cold Storage Deployment:

- Implementation: The feasible model developed for the solar-powered cold storage units will be scaled up across various agricultural regions in Bangladesh, particularly in areas with high post-harvest losses. The
- Department of Environment (DOE), in collaboration with local governments and farmers' cooperatives, will lead this expansion.
- Scope and Scale: The initially piloted model will be extended nationwide, with the goal of establishing solar cold storage units in all major fruit and vegetable production areas within five years. This will involve the procurement of additional solar cold storage units and their installation in key agricultural hubs.

- Next Steps: The DOE will work with financial institutions to secure funding to scale the deployment. Partnerships with private sector stakeholders, such as agri-businesses and renewable energy providers, will be pursued to co-finance and support the broader rollout.

Business Model Sustainability:

- Implementation: The business model developed for revenue collection will be adopted by local cooperatives and small businesses to ensure the financial sustainability of the solar cold storage units.
- Scope and Scale: The model will be customized for different regions based on local economic conditions and stakeholder needs. Revenue generated from the storage units will be reinvested into their maintenance and expansion, creating a self-sustaining cycle.
- Next Steps: Local governments and cooperatives will be responsible for implementing and adapting the business model. They will also monitor the financial performance of the storage units, making adjustments as needed to optimize revenue and sustainability.

Data Utilization and Knowledge Sharing:

- Implementation: The data collected on temperature calibration, energy use, and storage efficiency during the project will be compiled into a national database. This data will be used to optimize the operation of cold storage units and inform future technology deployments.
- Scope and Scale: The database will be accessible to farmers, researchers, and policymakers, enabling informed decision-making and continuous improvement of cold storage practices.
- Next Steps: The DOE and research institutions will manage and update the database regularly. Workshops and training sessions will be conducted to ensure stakeholders are aware of and can utilize this data effectively.

Expansion of Co-Benefits and Gender Inclusion:

- Implementation: The project's gender-sensitive approach and focus on community benefits will be expanded to other regions. Women and marginalized groups will be actively involved in the management and operation of new cold storage units.
- Scope and Scale: This will enhance socio-economic resilience and promote gender equality across rural communities in Bangladesh.
- Next Steps: The NDE and local governments will ensure that gender and social inclusion are prioritized in the scaling efforts. Additional training and support will be provided to women-led enterprises and community groups.

In conclusion, the outputs of this technical assistance will be leveraged to create a sustainable, scalable impact on Bangladesh's agricultural sector, contributing to enhanced food security, economic resilience, and climate change mitigation. The involvement of the NDE and project proponents in post-implementation monitoring will be crucial to ensuring the long-term success and adaptation of the solar cold storage units.

10. Gender and co-benefits:

Each technical assistance must integrate gender mainstreaming activities and lead to gender and other co-benefits. At least 5% of the technical assistance budget need to be allocated to gender mainstreaming activities.

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 and will develop a gender action plan (GAP) to be followed during the implementation of the TA. This will include the following components: • Analysis of gender disparities (assess the situation of gender disparities in the context of the project, including socio-economic, cultural and institutional factors. Identify areas where inequalities exist, etc.). • Data collection (collect and analyze gender-disaggregated data to understand the specific needs and preferences of different genders). • Adaptive and gender-responsive design (evaluate the project design to ensure that it takes into account the different roles, responsibilities and interests of different genders. Analyze how the project can empower marginalized genders and promote gender equality). • Gender and innovation ecosystem (evaluate how the proposed technologies could promote women as entrepreneurs). • Gender budgeting (budget allocation to guide gender mainstreaming activities. Also ensure that gender-specific needs are adequately funded). Gender Mainstreaming Analysis: A gender expert will be integrated into the project team to ensure a gender-responsive approach is adopted from the outset. This expert will conduct a thorough gender analysis to identify gender-specific barriers and opportunities within the context of technology development in Bangladesh. Capacity Building: The project will include gender-sensitive capacity-building sessions aimed at ensuring women's participation in the renewable energy sector. Training programs will be designed to address the needs of women and men equally, encouraging women's leadership in climate-resilient agriculture projects. Stakeholder Engagement: Special emphasis will be placed on inclusive stakeholder engagement processes that ensure women's voices are heard and considered in decision-making related to climate-resilient agriculture technology development. This will include targeted outreach to women's groups and communities. Employment Opportunities: The project will advocate for and promote the creation of employment opportunities for women in the emerging agriculture sector, including technical, managerial, and support roles, to ensure equitable access to the benefits of climate-resilient agriculture technology development.
Gender and co-benefits intended as result of the activities:	The project is expected to improve the economic conditions of women in rural communities by providing them with opportunities to store and sell perishable goods at better prices. This will enhance their financial independence and contribute to gender equality. Additionally, the project will contribute to environmental sustainability by reducing food waste and associated greenhouse gas emissions.

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 the implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance
Department of Environment, Ministry of Environment, Forest and Climate Change	NDE of Bangladesh. Responsible for coordinating activities and engaging with local governments. •Approve and overall monitoring of the setup of the solar cold storage with the technical assistance of CTCN. •Coordinate with all other stakeholders •Feedback to the CTCN
Designated Authority	•Coordinate of the applicant institute •Consult regarding the quality of the project •Monitor the implementation of the project
Applicant: Pacific Solar & Renewable Energy LTD	•Select the areas where fruits, vegetables and flowers grow round the year for set up the cold storage •Select & organize the farmers who will use the cold storage •Provide all logistic support such as office, manpower, legal and EPC support (if necessary) etc. when necessary. •Overall management of cold storage after implementation. •After setup of the cold storage, discuss with the proper channels of government & banks for providing policy support so that it can be launch commercially when technology is proven. •Educate and trained the marginalized farmers and trades so that they can properly use the technology
Bangladesh Bank	•To provide policy support for the commercial banks so that the banks will provide loan to individual or group of clients [mainly farmers] can purchase the solar cold storage by easy instalments •Include the solar cold storage under the green banking policy so that clients get the lower interest rate for purchasing the solar cold storage •Monitor the commercial banks so that the marginalized farmers and trades get the loan easily for purchasing solar cold storage.
Ministry of Agriculture, Government of Peoples Republic of Bangladesh	•For policy support so that the cold storage will be included under the agricultural machinery and get the import duties and other tax waiver. •Policy support so that the customer can get some portion of grant for purchasing the solar cold storage.

Local Governments	Key stakeholders in managing the solar cold storage units and ensuring community participation.
Farmers' Cooperatives	Primary beneficiaries and partners in piloting and sustaining the cold storage units.
Renewable Energy Providers	Partners in designing and installing the solar power systems for the cold storage units.

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	This TA contributes to SDG2 Zero Hunger by promoting food security and sustainable agriculture.
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	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	This TA contributes to SDG7 Affordable and Clean Energy through reduced GHG emissions and increased access to renewable energy.
	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	
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	
	13.2 - Integrate climate change measures into national policies, strategies and planning	This project will support achieving Bangladesh's net-zero carbon target.
	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	☑	☐
☐ 2. Sectoral roadmaps and strategies	☐	☐
☐ 3. Recommendations for law, policy and regulations	☐	☐
☐4. Financing facilitation	☐	☑
☐5. Private sector engagement and market creation	☐	☑
☐6. Research and development of technologies	☑	☐
☐7. Feasibility of technology options	☑	☐
☐ 8. Piloting and deployment of technologies in local conditions	☑	☐
☐ 9. Technology identification and prioritisation	☑	☐

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 thetechnical 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; and (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance. Furthermore, the NDE together with the project proponent(s) will complete a periodic post-implementation form to track the impact of the activities beyond the technical assistance end date.

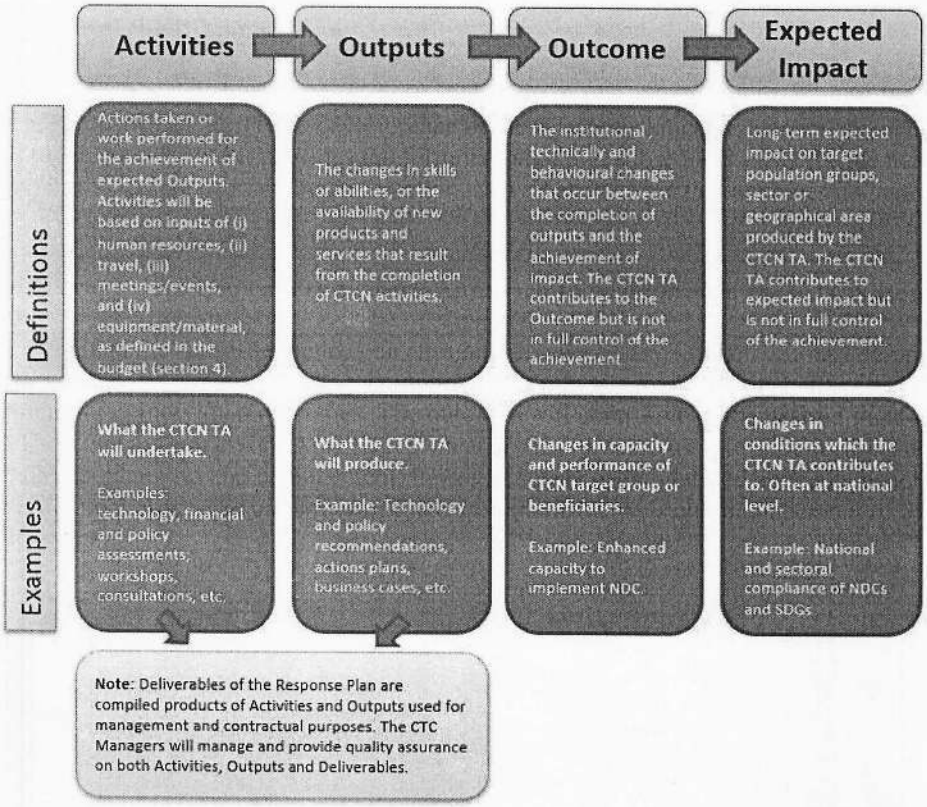
Annex 1: Guidance note for designing a Response Plan (to be deleted when submitting the Response Plan)

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.

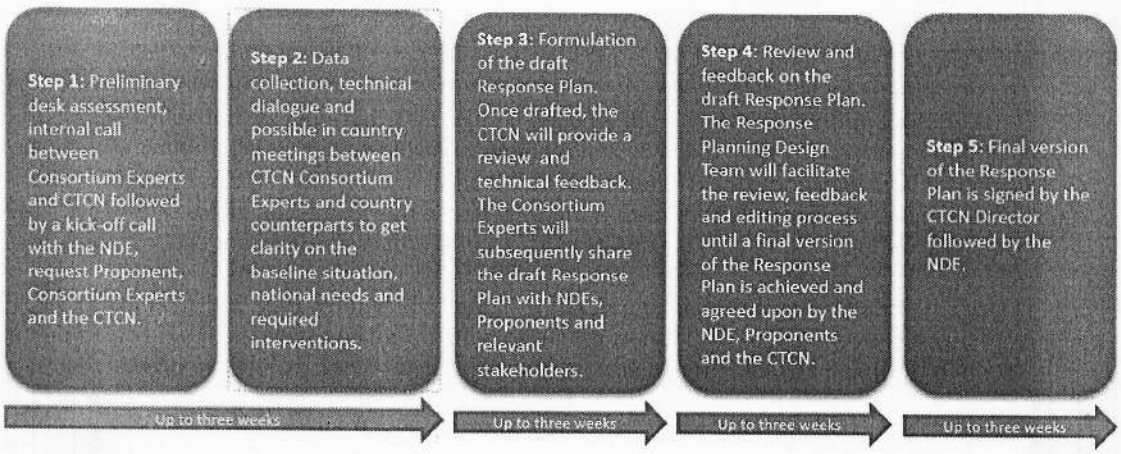
The role of CTCN Consortium experts is to lead the design of the Response Plan. The NDE will provide overall guidance on national context and priorities whereas the request Proponent will provide more detailed information on the sector, barriers and requested assistance. The Climate Technology Manager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

UN environment programme | CTCN UN Climate Technology Centre & Network

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.