MONITORING & EVALUATION PLAN

Basic Information	
Title of response plan	Introducing Phase Change Materials (PCM) into the Gambia's cold chain to address post-harvest loss and other waste across the primary sector.
Technical assistance reference number	2025000014
Country/ countries	The Gambia
NDE focal point and organisation	Mr. Sambou Kinteh Senior Climate Change Officer, The Gambia Ministry of Environment Climate Change and Natural Resources (MECCNAR)
Sector(s) addressed	Agriculture, Poultry and fisheries
Technologies supported	Sustainable solar-powered cooling technologies based on Phase Change Materials (PCM)
Implementation period and total duration	15 Months
Total budget for implementation	Maximum estimated budget as per the resource plan is USD 180,000
Designer of the response plan	NDE
Implementer of response plan	Veolia | Engineering & Consulting |India

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection	(F) Comments
Output 1: Developing a mapping of stakeholders and a Steering Committee	Number of stakeholders mapped; Successful establishment of the Steering Committee; Execution of kick-off and inception meetings.	Deliverable 1.1: Large mapping of stakeholders and List of participants to the Steering Committee, a constitution document. Deliverable 1.2: Kick-off meeting report with list of participants, agenda, concept notes, list of reference documents etc.	Review of mapping reports, constitution documents, and meeting minutes (including agendas and participant lists) collected during the inception phase.	Challenge: Ensuring gender balance and adequate representation from vulnerable groups, as well as engaging all relevant entities effectively.
Activity 1.2: Kick-off (online) and regular hybrid meetings	Successful execution of the kick-off meeting; frequency of regular hybrid progress meetings.	Presentation of the consulting team, work plan, expected results, and identification of key stakeholders; Exchange of reference documents.	Meeting minutes, agendas, and participant lists (NDE, NDA, CTCN, ministries, communities).	Must involve organizations working on gender and vulnerable populations.

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Activity 1.3 Inception Meeting	Execution of an in-person inception meeting within the Greater Banjul Area (GBA).	Finalization of stakeholder mapping and the Terms of References of the Steering Committee.	Headcount and meeting reports from the in-person meeting.	SWG members will be paid a DSA of 30 USD, and transport will be covered for those travelling from outside Banjul.
Output 2: Feasibility & Needs Assessment and Technology Validation	Number of feasibility/needs assessments conducted; Number of cooling technologies compared; Number of sites identified.	Deliverable 2.1: Feasibility & needs assessments. Deliverable 2.2: Comparative matrix of PCM with other cooling technologies. Deliverable 2.3: List of sites.	Field visits, data collection, community meetings, and technical/economic cost-benefit analysis conducted during the assessment phase.	Challenge: Accurately mapping infrastructure limitations, environmental/climate risks (e.g., flooding, salt intrusion), and local cultural perceptions.
Activity 2.1: Conducting detailed feasibility & needs assessments for PCM technology	Identification of infrastructure, technical, cultural, and environmental constraints.	Clear understanding of the Mbolo Association's needs and the viability of PCM technology under local climate risks.	Desk research and consultations with the Mbolo Association and local communities.	Must clarify the specific challenges and needs of the Mbolo Association.
Activity 2.2: Compare PCM Systems with other Available Cooling Technologies.	Development of a comparative matrix scoring and ranking different technologies.	A detailed cost-benefit analysis comparing PCM technology to business-as-usual and other available cooling technologies.	Technical and economic comparisons against solutions like solar direct-drive fridges, evaporative coolers, and solar PV + battery systems.	Will be used to justify the selection of the technology and inform broader deployment strategies.
Activity 2.3: Feasibility study to identify most suitable sites for pilot Installations	Number of pilot sites selected across agriculture, fisheries, and poultry sectors.	Finalized list of optimal pilot locations based on technical feasibility, climate vulnerability, and community readiness.	Field visits, infrastructure mapping, demand analysis, and participatory community meetings (women's groups, farmers, fishers).	The implementing partner will consult with the NDE to identify relevant focal points; travel costs for focal points will be covered.
Output 3: Piloting and testing PCM cooling solutions	Number of PCM units procured/installed; Number of business models developed; Number of user guides produced.	Deliverable 3.1: Installation and pilot testing reports. Deliverable 3.2: Define key indicators for M&E and their respective business models. Deliverable 3.3: Piloting and getting trained in PCM solar technology. Deliverable 3.4: Users' guide.	Procurement records, installation reports, and tracking of M&E indicators over a 6-month piloting period and beyond.	Assumption: The maximum amount available for piloting should not exceed 20% of the total budget.

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Activity 3.1: Procurement for PCM and construction	Definition of ToRs for PCM solutions; Number of units purchased and installed.	Successful procurement and installation of PCM equipment across the 3 targeted sectors.	Procurement logs, installation reports, and Steering Committee reviews.	If 3 pilots cannot be implemented within the 20% budget cap, sectors will be prioritized by the Steering Committee
Activity 3.2: Defining Monitoring Indicators and a Business model for the maintenance of PCM technology under the 3 sectors that will be piloted.	3 sector-specific business models defined; Number of M&E indicators established.	Baselines, expected results, and tracking of real impacts (costs, benefits, product shelf-life, and selling prices).	Data tracking over 6 months of implementation by the IP, and at 1, 2, 3-4, and 5-years post-implementation by the Project Proponent.	Must include expected increased revenues and maintenance costs to ensure the sustainability of the technology.
Activity 3.4: Redact a user´s guide of the technology for the 3 sectors	1 practical Users' guide redacted based on the 6-months piloting.	A comprehensive manual outlining technology specifications, maintenance requirements, lessons learnt, and good practices.	Document compilation and validation following the 6-month pilot phase.	Designed to ensure efficient technology use across the 3 sectors.
Output 4: Scaling up roadmap and Closure Workshop	Development of a replication strategy; Volume of knowledge materials generated; Execution of the closure workshop.	Deliverable 4.1: Manual for training program. Deliverable 4.2: Photo reportage, story, technology factsheet. Deliverable 4.3: Minutes of closure workshop with list of participants.	Document validation of the roadmap and communication materials; Headcount and meeting minutes at the closure workshop.	Assumption: The 6-month pilot yields successful data to formulate bankable post-pilot business models for national scale-up.
Activity 4.1: Formulate a roadmap that could help the Mbolo Association to scale up the technology.	1 Scaling-up roadmap developed.	Clear pathways defined for post-pilot business models (e.g., revolving funds or public-private partnerships).	Document review and validation.	Crucial step to ensure long-term financial viability and technology replication.
Activity 4.2: Develop Communication and Knowledge materials	1 photo reportage; 1 story; 1 technology booklet/factsheet produced.	High-quality communication and KMS materials ready for government promotion of the technology.	Review of media outputs produced by a local professional photographer.	Materials must be developed in English and translated into the local languages of the pilot areas.

Impact Statement	
Challenge	The Gambia faces severe food insecurity, exacerbated by climate change and massive post-harvest losses reaching up to 40% in perishable goods. A critical barrier is the lack of accessible, reliable, and affordable cooling technologies in rural areas. Compounded by unpredictable rainfall, rising temperatures, and highly unreliable, expensive rural energy infrastructure, these high losses severely threaten national food security, economic stability, and the livelihoods of farmers
CTCN assistance	• Conduct feasibility studies and technical assessments for Phase Change Material (PCM) cooling deployment. • Validate and pilot solar-powered PCM cooling technologies across agriculture, fisheries, and poultry sectors. • Build local capacity and empower women through targeted training programs and business models. • Support policy development and identify financing mechanisms to scale up the technology
Anticipated impact	• Post-harvest losses significantly reduced to 10-15%. • Measurable increase in incomes for rural farmers and fishers. • Avoided GHG emissions by replacing diesel-powered cold storage
Anticipated co-benefits from the TA	• The TA will generate significant economic and social co-benefits by creating sustainable jobs and business opportunities within the targeted value chains. It will reduce dependence on expensive, unreliable fossil fuels and ice, while improving overall food safety, product quality, and nutritional security for the population
Gender aspects of the TA	• Yes, the TA will be supported by a detailed Gender Assessment and Gender Action Plan (GAAP), overseen by a dedicated National Gender Expert. Expected benefits include empowering women-led groups through prioritized pilot deployments, tailored capacity-building training, and equitable financial support mechanisms. This ensures active participation, job creation, and enhanced income for women in rural primary sectors
Anticipated contribution to NDC	• Energy mitigation: Replaces diesel and inefficient grid cooling with solar-powered PCM, directly lowering emissions. • Agriculture mitigation: Reduces post-harvest losses, avoiding embedded agricultural emissions (methane, fertilizers). • Adaptation: Strengthens climate-resilient cold chains for communities.
The narrative story	The Gambia's economy heavily relies on agriculture, fisheries, and poultry, which employ over 70% of the rural labor force and contribute significantly to the national GDP. However, the country faces a critical food insecurity challenge, compounded by severe climate change impacts such as rising temperatures, erratic rainfall, and saltwater intrusion. These climate-induced stressors are worsened by staggering post-harvest losses of up to 40% for perishable goods. A primary barrier driving these losses is the severe lack of adequate, reliable, and affordable cold chain infrastructure. In rural areas, the electricity grid is highly unreliable and costly, making conventional refrigeration impractical and forcing reliance on expensive diesel generators or forcing farmers to sell produce immediately at reduced prices. To address these mitigation and adaptation barriers, this CTCN technical assistance will introduce sustainable, solar-powered Phase Change Material (PCM) cooling technologies. By storing thermal energy without relying on continuous grid electricity or expensive batteries, PCM technology provides an affordable,

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	decentralized solution to preserve food, boost incomes, and build a resilient food system
Contribution to SDGs	• SDG 2 (Zero Hunger): By introducing sustainable cooling technologies, the TA will address post-harvest losses and improve food preservation, thereby enhancing food security and promoting sustainable agriculture. • SDG 5 (Achieve gender equality): to achieve gender equality and empower all women and girls the TA will actively support women's cooperatives such as Mbolo Association. • SDG 7 (Affordable and Clean Energy): The TA promotes renewable energy sources by deploying solar-powered PCM cooling systems, providing rural communities with affordable, reliable, and modern off-grid energy services. • SDG 13 (Climate Action): The project strengthens the adaptive capacity of farmers, fishers, and women's cooperatives against climate-related hazards, and integrates climate measures into national policies to reduce GHG emissions.