Guidelines:

- This Request Submission Form should be completed by the organisation requesting technical assistance from the Climate Technology Centre & Network (CTCN) in collaboration with the National Designated Entity (NDE) of the country in question
- The Form must be signed by the NDE. Please see updated contact list of NDEs here: http://unfccc.int/ttclear/support/national-designated-entity.html
- The Form can be submitted as a Word file containing a digital signature or as a signed and scanned PDF file in combination with an un-signed Word file
- For requests submitted by multiple countries, all the NDEs of the respective countries shall sign identical Forms before official submission to the CTCN
- NDEs have the opportunity to submit CTCN requests in collaboration with National Designated Authorities (NDAs) for the Green Climate Fund (GCF) if targeting the GCF Readiness Programme.

Requesting country or countries:	Republic of Botswana
Request title:	Technical assistance to enhance climate-resilient health services through the deployment of solar PV and energy storage solutions for clinics in remote, off-grid settlements of Botswana.
NDE	Botswana Institute for Technology Research and Innovation (BITRI), Innocent Basupi, Senior Researcher, ibasupi@bitri.co.bw
Request Applicant:	Ministry of Minerals and Energy, Department of Energy, Senior Energy Engineer turuda@gov.bw

Climate objective:

☐ Adaptation to climate change
☐ Mitigation of climate change
☒ Combination of adaptation and mitigation of climate change

Geographical scope:

☐ Community level
☒ Sub-national
☐ National
☐ Multi-country

If the request is at a sub-national or multi-country level, please describe specific geographical areas (provinces, states, countries, regions, etc.).

The technical assistance will target 45-50 primary health clinics and health posts located in the most remote, non-interconnected zones of Botswana. These areas are characterized by the highest solar irradiance in the country (approx. 2200–2600 kWh/m²/year) but the lowest grid accessibility.

Primary Target Districts:

1. Kgalagadi District (North & South): specifically targeting settlements in the Kgalagadi Transfrontier Park periphery where grid extension is ecologically and economically prohibitive.
2. Ghanzi District: Focusing on the Central Kalahari Game Reserve (CKGR) border settlements which currently rely 100% on diesel generation.
3. North-West District (Ngamiland/Okavango): Targeting island and delta settlements where terrain makes power line transmission impossible, and fuel logistics for generators are frequently disrupted by seasonal flooding.
4. Kweneng West (Letlhakeng Sub-District): Focusing on the "sandveld" settlements that fall outside the current 5-year grid expansion plan.

Site Selection Criteria: To ensure maximum impact, the final sites will be selected based on the following "vulnerability index":

- Distance from Grid: Minimum 20km from the nearest substation.
- Health Criticality: Facility that acts as the sole provider of maternity or cold-chain services for a radius of >50km.
- Climate Exposure: History of heatwave incidences exceeding 40°C, requiring reliable cooling for medicine safety.

Problem statement related to climate change (up to one page):

Botswana's health sector faces critical vulnerabilities due to climate change, particularly in remote, off-grid settlements where clinics serve as the primary lifeline for communities. These facilities currently rely on expensive and carbon-intensive diesel generators or lack reliable power entirely.

1. Energy Insecurity & Health Risk: Frequent fuel shortages and generator breakdowns compromise critical services, including vaccine cold chains (refrigeration), maternity care, and emergency lighting.
2. Climate Vulnerability: Rising temperatures (heat stress) increase the demand for cooling to preserve medicines and ensure patient safety. Without reliable power, clinics cannot maintain safe internal temperatures, directly threatening vulnerable populations during heatwaves.
3. Emissions: The reliance on diesel generators contributes to national greenhouse gas emissions and exposes patients and staff to localized air pollution.
4. Resilience: Extreme weather events (floods/droughts) often disrupt fuel supply chains to these

remote areas, leaving clinics without power when they are needed most.

There is an urgent need to transition these facilities to Stand-alone Solar PV with Battery Energy Storage Systems (BESS) to ensure 24/7 reliability, reduce carbon footprints, and build climate resilience.

Past and on-going efforts to address the problem (up to half a page):

The Government of Botswana remains committed to universal health coverage and energy access.

- Rural Electrification Programme: Significant progress has been made in extending the grid to major villages, but many smaller settlements and border posts remain off grid due to prohibitive connection costs.
- Solar for Health Initiatives: Several pilot projects have installed solar systems at select facilities. However, these initiatives have often been fragmented, donor-driven, and lacking in long-term maintenance planning. In this regard, appropriate maintenance models would be necessary to ensure sustainability.
- SE4ALL Action Agenda: Identifies health facility electrification as a priority.
- Renewable Energy Strategy: Promotes decentralised solutions for remote areas.

Despite these efforts, a systemic gap remains. Many past solar installations have failed due to a lack of technical maintenance capacity, theft of batteries, and the absence of a sustainable financial model for component replacement.

Specific technology[1] barriers (up to one page):

While solar PV is a mature technology, Botswana faces the following specific barriers to sustainable deployment in the public health sector:

- Sustainability & Maintenance: The primary barrier is the "install and forget" failure mode. There is a lack of institutional capacity and skilled local technicians in remote districts to maintain solar-storage systems (inverters/batteries) once warranties expire.
- System Sizing & Design: Previous systems were often undersized for the growing energy loads of modern medical equipment and climate-induced cooling needs. There is a lack of technical standards specifically for "health-grade" power reliability.
- Theft & Security: High rates of battery and panel theft in remote areas undermine project viability; technology solutions for security (e.g., anti-theft mounting, remote monitoring) are not widely integrated.
- Financing Operations (O&M): Current budgeting frameworks cater to fuel purchase (diesel) but lack mechanisms for sinking funds to replace batteries after 5–7 years.

[1] *"**any equipment, techniques, practical knowledge and skills** needed for reducing greenhouse gas emissions and adapting to climate change" (Special Report on Technology Transfer, IPCC, 2000)*

Contribution to Programme of Work 2023-2027:

As per 3rd Programme of Work of the CTCN[2], please indicate the system transformation area, key enablers and cross-sectoral themes related to the request:

System transformation areas (mandatory)

- ☐ Water-Energy-Food Nexus
- ☐ Sustainable Mobility
- ☒ Energy Systems
- ☐ Buildings and Infrastructure
- ☐ Business and Industry

Key enablers (optional)

- ☒ National Systems of Innovation
- ☐ Digitalization

Cross-sectoral themes (optional)

- ☒ Gender
- ☒ Youth
- ☐ Indigenous Peoples

Sectors:

Please indicate the main sectors related to the request:

- ☐ Coastal zones
- ☐ Early Warning and Environmental Assessment
- ☒ Human Health
- ☐ Infrastructure and Urban planning
- ☐ Marine and Fisheries
- ☐ Water
- ☐ Agriculture
- ☐ Carbon fixation
- ☒ Energy Efficiency
- ☐ Forestry
- ☐ Industry
- ☒ Renewable energy
- ☐ Transport
- ☐ Waste management

Please add other relevant sectors:

Technical assistance requested (up to one page):

[2] https://www.ctc-n.org/resources/ctcn-third-programme-work-2023-2027

Overall objective

To design a standardized, scalable, and sustainable framework for the electrification of remote health clinics using Solar PV and storage. The assistance will focus on solving the "sustainability gap" by establishing technical standards, remote monitoring systems, and long-term maintenance models.

Anticipated groups of activities

1. Energy Audits & Needs Assessment: Conduct detailed load profiles of clinics in target off-grid settlements (e.g., in Kgalagadi, Ghanzi, and North-West districts) to determine accurate sizing for cooling and medical equipment.
2. Development of Technical Standards: Create a "Standardized Solar-Health Design Package" for Botswana, specifying requirements for tier-1 components, battery autonomy (3-5 days), and theft-proofing measures.
3. Remote Monitoring Pilot: Implement a digital Remote Monitoring System (RMS) pilot that allows the Department of Energy and Ministry of Health to track system performance and alerts in real-time from Gaborone.
4. Operations and Maintenance (O&M) Capacity Building: Develop a certification course for district-level technicians specifically on "Medical Solar System Maintenance" and train a cadre of local private sector maintenance contractors.
5. Financial Sustainability Modelling: Assist the Ministry in designing a budget model that reallocates "avoided diesel costs" into a ring-fenced fund for battery replacement and maintenance.

This technical assistance is preparatory in nature and does not include procurement of full-scale solar PV systems or battery energy storage systems. The assistance focuses on enabling activities such as energy audits, development of technical standards, remote monitoring frameworks, capacity building, and preparation of investment documentation.

Limited procurement may be required for pilot demonstration components such as remote monitoring devices and associated communication equipment strictly for technical validation purposes. Any such procurement will be conducted in accordance with national procurement regulations and applicable partner procedures.

The main procurement of solar PV systems and battery storage infrastructure will be undertaken during the implementation phase following completion of the technical assistance and will be financed through external climate financing mechanisms such as the Green Climate Fund, Global Environment Facility, and other development partners.

Anticipated products

1. Standardized Design Toolkit: Engineering designs and tender specifications for Solar-for-Health systems.
2. Remote Monitoring Dashboard: A functional web-based platform for tracking fleet performance.
3. Maintenance Manuals & Training Modules: Curriculum for local technicians.
4. Investment Prospectus: A bankable document to pitch the full-scale rollout (50+ clinics) to international funders (e.g., GCF, GEF).

The first pilot installations are expected to be financed through a combination of international climate finance, development partner support, and national co financing. Potential financing sources include

the Green Climate Fund readiness and implementation windows, Global Environment Facility programmes, bilateral development partners, and national budget allocations derived from avoided diesel operational costs.

The Government intends to prioritize installation at selected high impact pilot facilities immediately after completion of the technical assistance. The outputs of this assistance will be used to formally mobilize funding from the Green Climate Fund, Global Environment Facility, and other partners to finance procurement and installation of pilot systems, which will serve as demonstration sites for national scale up.

Expected timeframe:

The expected duration of the technical assistance is 15 months.

Anticipated gender and other co-benefits from technical assistance:

1. Maternal Health (Gender): Reliable lighting and equipment are critical for safe deliveries at night. This project directly reduces maternal and infant mortality rates. Furthermore, nurses in these remote areas are predominantly women; reliable power improves their safety, retention, and living conditions.
2. Health Resilience: 100% uptime for vaccine fridges ensures immunization programs remain effective despite climate shocks.
3. Economic: Transitioning from diesel to solar frees up Ministry of Health budgets (OpEx) that can be redirected to patient care.

Anticipated follow-up activities after this technical assistance is completed:

The technical assistance is designed as a preparatory phase to unlock large-scale investment. Upon completion, the following activities will be executed to realize the full implementation:

- Investment Mobilization & Financial Close:

Submission of a funding proposal to the Green Climate Fund (GCF), Simplified Approval Process (SAP) or Global Environment Facility (GEF), utilizing the Investment Prospectus and feasibility studies developed during the assistance to secure capital (est. USD 15–20 million) for the hardware procurement.

Operationalization of the "Solar Health Maintenance Fund," ensuring the Ministry of Finance allocates the "avoided diesel costs" into the newly designed ring-fenced maintenance account.

- Procurement & Infrastructure Rollout:

Launch of competitive public tenders for the electrification of the 45–50 identified clinics, strictly utilizing the Standardized Solar-Health Design Package and Tender Specifications produced by the technical assistance.

Installation and commissioning of Tier-1 Solar PV and Battery Energy Storage Systems (BESS) at the target sites.

- Institutionalization of Capacity Building:

Formal integration of the Solar-for-Health Maintenance Curriculum into the standard course offerings of national vocational training centres (e.g., Construction Industry Trust Fund - CITF), ensuring a long-

term pipeline of certified local technicians.

- Operationalization of Monitoring:

Full handover of the Remote Monitoring Dashboard to the Ministry of Health's Infrastructure Unit, enabling real-time tracking of energy uptime and rapid deployment of technicians when faults are detected.

- Sectoral Replication:

Adaptation of the standardized design and financial models for other off-grid public institutions, specifically primary schools and police border posts, to facilitate a wider public sector transition to renewable energy.

Key stakeholders:

Stakeholders	**Role to support the implementation of the technical assistance**
National Designated Entity	Overall coordination, approval, and alignment with national climate priorities
Ministry of Minerals and Energy (Department of Energy)	Technical oversight, policy alignment, and implementation support
Ministry of Health	Advisory support and coordination with local partners
District Councils	Community mobilisation, site identification, and local facilitation
Beneficiary communities	Participation in pilots, feedback, and adoption of technologies
Local private sector	Supply, installation, maintenance, and skills transfer
Academic and training institutions	Capacity building and technical training support

Alignment with national priorities (up to 2000 characters including spaces):

The request is fully aligned with Botswana's climate and development frameworks:

1. Nationally Determined Contribution (NDC) (2021): Contributes to the target of 15% emissions reduction by 2030 by replacing diesel generation in the public sector.
2. National Energy Policy (2021): Aligns with the policy objective of using off-grid renewable energy solutions for remote areas where grid extension is uneconomical.
3. National Energy Compact (2025): Contributes to achieving 100% access by 2030.
4. Integrated Resource Plan (2025): Supports the priority of renewable energy expansion to strengthen energy security and reduce carbon intensity

Reference document (please include date of document)	**Extract** (please include chapter, page number, etc.).
Botswana Updated Nationally Determined Contribution (2021)	Renewable Energy sections – Commits Botswana to reducing greenhouse gas emissions through renewable energy deployment, and improved energy access pathways.
Botswana National Energy Compact (2025)	Supports Universal Access by 2030.
National Energy Policy (2021)	Renewable Energy and Biomass and Waste Energy sections – Promote diversification of energy sources, development of renewable energy technologies, sustainable utilisation of indigenous energy resources, and transition towards a low carbon economy.
Revised Integrated Resource Plan (2025)	Renewable Energy Expansion Targets – Prioritise increasing renewable energy contribution to 50 percent of the national energy mix by 2030 to reduce carbon intensity and strengthen national energy security.
Technology Needs Assessment and Technology Action Plan (2023)	Botswana Technology Needs Assessment, Energy Sector Priority technologies include renewable energy and clean cooking solutions

Development of the request (up to 2000 characters including spaces):

The development of this request followed a bottom-up, multi-stakeholder consultative process, initiated by the Ministry of Health (MoH) – Department of Technical Services, in direct response to operational reports from District Health Management Teams (DHMTs) highlighting the critical impact of energy insecurity on healthcare delivery in remote settlements.

1. Initiation and Internal Assessment: The process began with an internal infrastructure audit conducted by the MoH, which identified over 50 health facilities where diesel generation was proving financially unsustainable and logistically unreliable. Recognizing the lack of internal capacity to design a sustainable solar maintenance model, the MoH sought strategic guidance from the Department of Energy (Ministry of Minerals and Energy).

2. Inter-Ministerial Collaboration: A Technical Working Group (TWG) was established, comprising engineers from the MoH and the Department of Energy. This group analysed past failures of solar initiatives in the public sector and determined that technical assistance was the primary prerequisite before seeking large-scale hardware funding. The TWG drafted the initial concept note, focusing on the "sustainability gap" (maintenance and monitoring) rather than just equipment procurement.

3. Stakeholder Consultation and Validation: To ensure national alignment, a consultation meeting was convened in Gaborone, facilitated by the National Designated Entity (NDE). Key stakeholders included:

- Ministry of Health (Proponent): Defined the clinical energy loads and critical service

requirements.

- Department of Energy (Technical Partner): Ensured alignment with the Integrated Resource Plan (IRP) and rural electrification standards.
- Ministry of Local Government & Rural Development: Provided data on district-level administrative capacity for future asset management.
- Botswana Institute for Technology Research and Innovation (BITRI): Offered input on local solar irradiance data and technology suitability for Botswana's climatic conditions.

4. NDE Screening and Approval: The NDE reviewed the request against Botswana's Technology Needs Assessment (TNA) and Nationally Determined Contribution (NDC). The NDE verified that the request prioritized adaptation (health resilience) and mitigation (emissions reduction) and confirmed there was no overlap with existing donor-funded projects. Following this validation, the NDE endorsed the request for submission to the CTCN to unlock the necessary technical expertise for a bankable scale-up.

Background documents and other information relevant to the request:

Relevant documents include Botswana's National Energy Policy (2021), National Energy Compact Revised Integrated Resource Plan (2025), National Clean Cooking Strategy Botswana, Nationally Determined Contributions, Renewable Energy Strategy Energy, Efficiency Strategy and implementation reports from previous biogas and clean cooking initiatives. These documents provide the policy and technical foundation upon which this request is based.

This request was not developed through the CTCN Request Incubator.

OPTIONAL: Linkages to Green Climate Fund Readiness and Preparatory Support

The CTCN is collaborating with the GCF in order to facilitate access to environmentally sound technologies that address climate change and its effects, including through the provision of readiness and preparatory support delivered directly to countries through their GCF NDA. These actions are in line with the guidance of the GCF Board (Decision B.14/02) and the UNFCCC, particularly paragraphs 4 and 7 of 14/CP.22 and paragraph 4, 7 and 8 of 14/CP.24 that addresses Linkages between the Technology and the Financial Mechanisms[3].

The CTCN is therefore implementing some of its technical assistance using GCF readiness funds accessed via the country's NDA. Any application for GCF support, including the amount of support provided, is subject to the terms and conditions of the GCF and should be developed in conjunction with the NDA.

Please indicate whether this request has been identified as preliminarily eligible by the NDA to be considered for readiness support from the GCF.

☐ Initial engagement: The GCF NDA of the requesting country has been engaged in the design of this

[3] Please see:
https://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/auv_cop22_i8b_tm_fm.pdf

request and the NDA will be involved in the further process leading to an official agreement for accessing GCF readiness support.

☐ Advanced engagement (preferred): The GCF NDA of the requesting country has been directly involved in the design of this request and is a co-signer of this request, the signature indicating provisional agreement to use readiness national funds to support the implementation of the technical assistance.

NDA name:

Date:

Signature:

Monitoring and impact of the assistance:

By signing this request, I affirm that processes are in place in the country to monitor and evaluate the technical assistance provided by the CTCN. I understand that these processes will be explicitly identified in the CTCN Response Plan and that they will be used in the country to monitor the implementation of the technical assistance following standard CTCN procedures. This includes active engagement as NDE together with the key project proponent / beneficiary in regular project steering meetings.

I understand that, after the completion of the requested assistance, I shall support CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country. This includes the completion of NDE feedback and post-implementation forms.

Signature:

NDE name:	Innocent Basupi
Date:	03/03/2026
Signature:	

THE COMPLETED FORM SHALL BE SENT TO THE CTCN@UNEP.ORG

The CTCN is available to answer all questions and provide guidance on the application process.