CTCN Technical Assistance

Request Submission Form

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:	Kenya
Request title:	Technical assistance for assessment of direct utilization opportunities of geothermal resources in Kenya. The use of geothermal resources for direct use applications is a time-tested venture in Kenya. For instance, KenGen PLC has show- cased direct use application of geothermal resources at its Geothermal Spa and Demonstration Centre at Olkaria, the only one of its kind in Africa. In spite of this development, direct use applications of geothermal resources in the Country are still underdeveloped with less than one thousand of their technical potential currently being used. There is immense untapped potential for direct use application of geothermal resources in the country's key sectors of Agriculture, Manufacturing and Tourism. Therefore, this technical assistance will help to map out all the possible direct use opportunities capable of being supported by the vast geothermal resources, for the betterment of the lives of communities living around these geothermal prospects.
NDE	Please add name of organisation, name of individual, position, email and address. Kenya Industrial Research and Development Institute (KIRDI), Dr. Kelvin Khisa, Email: kelvinnamukhasi@gmail.com; kelvin.khisa@kirdi.go.ke
Request Applicant:	Kenya Electricity Generating Company PLC, Geothermal Development Division, Eng. Abel Rotich, Geothermal Development Director, Email: arotich@kengen.co.ke, Address: Olkaria Geothermal Project, P.O Box 785-20117, Naivasha.

Climate objective:

☐ Adaptation to climate change

☐ Mitigation of climate change

☒ Combination of adaptation and mitigation of climate change

Geographical scope:

☐ Community level

☒ Sub-national; The geothermal resources are mostly confined along the Kenya Rift Valley (KRV).

☐ 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.).

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

In most developing countries (Kenya being one of them) a large chunk of the population relies on agriculture and agro-industry as the predominant economic activities; thus, their fate is inextricably interwoven with that of farming. Potential damage to agricultural produce occasioned by poor processing techniques of agricultural products has resulted to post-harvest losses, whose end result is famine and increased levels of poverty. In addition, poor harvests are being recorded because of the erratic and unpredictable weather patterns. Additionally, there is a danger on the stock of fish in our water bodies due to over fishing. Enhanced fish farming practices using direct use application of geothermal resources will reduce the strain on fishing in our lakes. Fish drying using charcoal and biomass contributes significantly to GHG emissions. Deployment of geothermal resources for similar practice will reduce the biomass used for this purpose

Climate change caused by increased emission of Greenhouse Gases (GHG) into the atmosphere has negatively impacted in Kenya, including the project areas of interest. Specifically, adverse effects have been felt in the following sectors albeit to differing degrees; agriculture and food security, water resources, human health and terrestrial ecosystems. Rising fossil fuel combustion have emitted, and are continuing to emit increasing quantities of GHGs (CO_2, CH_4, N_2O, etc) into the Earth's atmosphere. Direct utilization of geothermal resources will cut down on the emission of GHGs by reducing over-reliance on biomass and fossil fuels.

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

Kenya is endowed with vast geothermal resources, with recent estimates suggesting a resource potential of between 7000 MWe and 10,000 MWe spread over 14 sites (Ngugi, 2012). Most of the geothermal resources are located within the Kenya Rift Valley (KRV). Out of the estimated geothermal potential, about 690 MWe has been developed by KenGen PLC and Orpower-4 (a subsidiary of the Ormat technologies) in the Olkaria and Eburru geothermal fields. Construction of the 165 MWe Olkaria V power plant is currently at its final stages, with commissioning of the first unit (83 MWe) scheduled in April, 2019. In addition, Geothermal Development Company (GDC) has contracted three Independent Power Producers (IPPs) to construct three power plants (with an aggregate capacity of 105 MWe) under phase 1 of Menengai development. Presently, expansion of geothermal energy (for both direct and indirect applications) is major component of Kenya's nationally determined contributions (NDCs) to global climate change mitigation and integral to the country's ambition to become a middle-income country based on a climate-resilient green economy (Government of Kenya, 2007). Furthermore, the government's Least Cost Power Development Plan (LCPDP) 2017-2037 and third Medium Term Plan (2018-2022) both envisage a four-fold expansion of geothermal power generation from 650 MW to around 2500 MW in 20 years (Government of Kenya, 2018).

To demonstrate on the efforts to drastically reduce over-reliance on biomass and fossil fuels, and consequently reduce on GHGs emissions, various direct use applications have been adopted even though these are still less developed. Other than the direct use application of geothermal resources at Olkaria Geothermal Spa and Demonstration Centre, Kenya has a direct use demonstration project in Menengai geothermal project with prototypes for milk pasteurization, greenhouse heating and a laundromat using heat harvested from brine before re-injection. Greenhouse heating is also widely practiced at Oserian Development Company (ODC), one of the World's largest ethical flower farm to supply heat to the greenhouses at night.

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

The ongoing efforts to enhance the direct utilization of geothermal resources has been greatly hampered by the technical inadequacies that plague the country in the sector. Direct utilization of geothermal resources projects require feasibility studies before investment decisions are made. Innovative financing, deployment options and program planning are key for the success of these projects. Large scale infrastructural design is also necessary for the deployment of direct utilization distribution systems. Moreover, maintenance of the geothermal wells and pumps require clean-up and re-installation on a regularly scheduled timeframe. Furthermore, transporting the fluid from the point of production to the project area requires flow at optimal pressure, heat exchange and chemistry to deliver the fluids at the required optimal state. Lastly, extraction of the required therapeutical products from the fluid requires processing plants. All these requires technically knowledgeable human capacity for delivery. To successfully implement these projects, there is need to create awareness to the local communities to embrace and support these projects.

Kenya faces the challenge of fully implementing direct utilization of geothermal resources as a result of lack of human capacity to handle the mentioned tasks. The tasks require enhancement of the technical skills of geoscientists, economists, engineers, therapeutical experts, social experts, and environmentalists through practical training tailored to address the mentioned challenges. Additionally, there is need for a tailored approach to the local communities´ engagement in order to demonstrate the benefits of such projects to the local community as well as address of the environmental pollution and gender related challenges. The missing link is the tailored training because the current geothermal task force already has the basic geothermal qualifications. The CTCN technical assistance will help in introducing and equipping the local capacity with the necessary technical skills required to handle the above specified technical challenges. Attaching the training on one local project will enable the trainees to be vast with the skills to address these challenges as defined within the local setup once the projects are rolled out in full capacity.

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	☐ Water	☒ Agriculture	☐ Carbon fixation

[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)*

Fisheries

☒ Energy Efficiency ☐ Forestry ☒ Industry ☒ Renewable energy

☐ Transport ☐ Waste management

Please add other relevant sectors:

Cross-sectoral enablers and approaches:

Please indicate the main cross-sectoral enablers and approaches

☐ Communication and awareness ☒ Economics and financial decision-making ☒ Governance and planning ☒ Community based

☐ Disaster risk reduction ☒ Ecosystems and biodiversity ☒ Gender

Technical assistance requested (up to one page):

The primary objective of the technical assistance is to provide a sound assessment of all the possible opportunities available for direct use application of the vast geothermal resources in Kenya. Adoption of clean energy technologies creates profound energy efficiency and is the best tool to reduce on CO_2 emissions by suppressing the use of biomass and fossil fuels. To this end, the technical assistance will focus on the economic and, the best engineering and design aspects that will ensure efficient and effective utilization of direct use applications of geothermal resources. The technical assistance will provide a framework for near- and long-term policy and strategy for exploitation of direct use applications. The technical assistance should be able to estimate the amount of thermal energy recoverable at a foreseeable time based on reasonable assumptions of technological improvement.

The technical assistance will cover a team of Geothermists (Geo-scientists, Engineers and Environmental Specialists) who already posses advanced knowledge in geothermal technology practices. The team through the support of CTCN will identify the most suitable direct use applications that will improve livelihoods of communities in specific geothermal localities. The team will then develop the required engineering and design technologies, which include but not limited to heat exchanger systems, piping systems, etc. The viability and sustainability of the proposed projects has to be tested at the end.

Expected timeframe:

Since the technical assistance by CTCN is limited to a maximum duration of 12 months, the expected timeframe shall be as underlisted below;

1. 4 months- training and field work (actual assessment).
2. 4 months- data synthesis and report compilation.

Total duration- 8 months.

Anticipated gender and other co-benefits from the technical assistance:

With the global campaign for regulated GHG emission and gender equality, most of the national and regional energy policies, targets and white papers are tailored address these agenda. The technical assistance has both direct and indirect benefits.

For direct benefits, experts trained through this project will also offer regional and global technical assistance to other countries that will need to develop such direct utilization projects. Capacity building in community engagement will equip both young men and women with the required skills to engage the government and community stakeholders in other future energy-related projects. With such skills, the social scientist will be able to disseminate to the community in most understandable way, the effects of climate change and how the community can play a role in championing for reduced levels of emission.

The technical assistance will further equip our environmental scientists with the necessary environmental skills required to champion for cleaner environmental health. Most of those affected by unsound environmental practices are women who are forced to travel for long distances to search for firewood to dry the fish. These skills will be disseminated to the local community.

The technical skills attained through this project will equip women with the skills on how to champion for gender equality, skills which will be further transferred to the local community women. These skills will help the local community women attain expertise in negotiating for gender related benefits in other future projects that might be set up in their locality.

Indirectly, after the technical assistance, there is expected full implementation of the pilot projects on a larger scale. Implementation of aquaculture, horticulture, milk pasteurization and therapeutic plants will help alleviate poverty in the local community in which the projects are set. Men and women from the local communities will be employed in such firms hence, have a meaningful source of income which will improve their socio-economic standards. For instance, lake fishing which currently dominates the fish supply in the country, is mainly a man dominated industry. Women are found at the tail end of the chain which is limited to the drying and retail selling of the fish to consumers. Artificial fish farms (aquaculture) will open up opportunities for women to participate in the entire chain of the industry. This will create more employment opportunities for women.

The health effects of using crude/traditional methods (e.g. charcoal and biomass) for drying fish, which mainly affect women, will also be addressed. Additionally, reduced use of biomass will reduce environmental pollution and the deforestation risks. Furthermore, over extraction of fish from our lakes will be reduced hence, implementing natural checks on the fish population in the lakes. Food shortage exacerbated by poor storage will also be addressed through realization of projects, for example milk pasteurization plants.

Key stakeholders:

Please list the stakeholders who will be involved in the implementation of the requested CTCN technical assistance and describe their role during the implementation (for example, government agencies and ministries, academic institutions and universities, private sector, community organizations, civil society, etc.).

Stakeholders	Role to support the implementation of the technical assistance
KIRDI	Endorses proposals and provides oversight role. Monitors and evaluates the relevance and scope of the technical assistance provided.
Request Applicant	Collaborates in implementation of the project, monitors the progress

	and offers administrative and technical support to the team assigned by CTCN.
Universities in collaboration with the request applicant	Assigns appropriate expertise for knowledge transfer for future sustainability.
Ministry of Energy	Will work in collaboration during the study and implementation of the outcome of the project.
Ministry of Water and Sanitation	Will work in collaboration during the study and implementation of the outcome of the project.
Kenya Association of Hotelkeepers and Caterers	Will implement the results of the study through using hot water for laundry services, hot showers, etc.
Kenya Agribusiness and Agroindustry Alliance	Will implement the results of the study in aquaculture, food preservation, drying of cereals, milk pasteurization, etc.
Fresh Produce Exporters Association of Kenya (FPEAK)	Participate and invest in developing the resources for greenhouse heating.
Kenya Industrial and Technology Parks	Will implement the results of the study in different aspects.
Independent Power Producers (IPPs) and other private players in the geothermal sector	Implement cascaded direct use application of geothermal resources from their respective areas of operations.

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

Kenya has put forth an elaborate Green Economy Strategy and Implementation Plan (GESIP) contained in Kenya's Vision 2030, which seeks to create a globally competitive and prosperous country with a high quality of life by 2030. The GESIP provides the overall policy framework to facilitate a transition to a green economy and outlines the need to mainstream and align green economy initiatives across the economic, social and environmental spheres. GESIP will aid Kenya's transition to a sustainable path through five thematic areas and strategies, including: food security, promoting energy efficiency, sustainable livelihoods through poverty reduction, equity and social inclusion, and decarbonised/low-fossil-fuel economy.

In this regard, application of direct use techniques of geothermal resources will be a significant contributor to reducing CO_2 emissions. According to forecasts about geothermal energy deployment, it is concluded that almost 195 million tonnes CO2 emission will be avoided by utilizing geothermal resources in the year 2030 (Hossein, 2019). For Kenya to meet her GHG emission, there is serious need to adopt the use of clean and efficient renewable energy technologies, which include direct use application of geothermal resources. These will help to suppress over-reliance in biomass and fossil fuels, eventually reducing hunger and poverty levels and improving the livelihoods of communities living in geothermal-rich localities.

Reference document (please include date of document)	**Extract** (please include chapter, page number, etc.).
Nationally Determined Contribution (NDC)	Direct alignment and contribution to NDC implementation is required for all CTCN technical assistances. Please include a direct reference to the INDC/NDC document (chapter, page number, etc.).
Technology Needs	

Assessment	
National Adaptation Plans	
Nationally Appropriate Mitigation Actions	
Add others here as relevant	

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

Kenya Electricity Generating Company PLC, is the leading electric power generation company in Kenya, producing about 75% of electricity capacity installed in the country. The company utilizes various sources to generate electricity ranging from hydro, geothermal, thermal and wind. In recent years, KenGen PLC has shifted its entire focus to geothermal energy and has created unprecedented growth in geothermal production with a current aggregate installed capacity of about 533.5 MWe from geothermal resources. Aside from the indirect uses of geothermal energy in electricity production, the company recently embarked on direct use application of geothermal resources, which has seen the establishment of the Geothermal Spa and Demonstration Centre at Olkaria. The company is continuing to explore on other direct use application opportunities of geothermal resources albeit the technical inadequacies.

In a side-event held during the ARGeo-C7 conference CTCN gave details of the technical mechanism. CTCN is looking to providing technical assistance that will use climate-related technology for non-conventional direct use applications. Specifically, CTCN is keen to provide technical assistance on resource assessment, financing appropriate technology and assessment of markets for crop drying, chilling of agricultural produce and fish farming, among a host of other applications. CTCN asserted that direct utilization of geothermal resources is one-way countries can meet their greenhouse gases reduction quotas since it will displace the use of biomass and fossil fuels. It is also great for fighting hunger and poverty by enhancing the livelihoods of communities living in geothermal-rich localities.

To qualify, CTCN urged all countries to submit a request using the CTCN template because this is a multi-country process that requires at least four countries for it to kick off.

In this regard, this request has been prepared using CTCN template.

Background documents and other information relevant for the request:

Lund, J.W., (2007): Characteristics, development and utilisation of geothermal resources. *Geo-Heat Centre Bulletin, Geo-Heat Centre, Oregon Institute of Technology, 9 pp.*

Lund, J.W., (2006): History, present utilization and future prospects of geothermal energy worldwide Geo-Heat Center, Oregon Institute' of Techno), Klamath Falls, USA.

Green Economy Initiative - Kenya | Green Growth Knowledge Platform
www.greengrowthknowledge.org/project/green-economy-initiative-kenya

Kenya Food Security Policy
http://www.foodsecurityportal.org/kenya/food-security-report-prepared-kenya-agricultural-research-institute

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 that addresses Linkages between the Technology and the Financial Mechanisms[2].

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 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.
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.

Signature:

NDE name: Kenya Industrial Research and Development Institute (KIRDI)	

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

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Date: April 2, 2019

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.