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TERMS OF REFERENCE (TOR)

Technical assistance to identify the most suitable direct use applications and technologies in low to medium temperature geothermal systems in six African countries

CTCN request ref: 2019000050

1 BACKGROUND INFORMATION

The Climate Technology Centre and Network (CTCN) is the operational arm of the United Nations Framework Convention on Climate Change (UNFCCC) Technology Mechanism and hosted by the United Nations Environment Programme (UNEP) in collaboration with the United Nations Industrial Development Organization (UNIDO) and supported by 11 partner institutions with expertise in climate technologies. The mission of the CTCN is to promote accelerated deployment and transfer of climate technologies at the request of developing countries for energy-efficient, low-carbon and climate-resilient development.

These requests for Technical Assistance (TA) are being submitted to the CTCN by the National Designated Entity (NDE) of the respective country. The scope of services under these Terms of Reference shall be executed based on a restricted solicitation process. By mandate, only accepted Members of the CTC Network are eligible to submit proposals and execute the required services to implement the response. Should the bidder partner with another institution to deliver a minor part of the services described in these Terms of Reference, it is expected that the partner institution also joins the CTC Network.

In case you are not a CTCN network member yet, you may bid for implementation of the technical assistance, subject to the condition that you submit your completed application for CTC Network membership before the bid closure and the same is acknowledged by the CTCN. Furthermore, the contract award – should your bid be selected – is conditional to your network membership application having been successfully approved by the Director of CTCN. Should the bidder partner with another institution to deliver the services described in these Terms of Reference, it is expected that the partner institution also joins the CTC Network.

The maximum estimated budget for this contract is **USD 225,000**.

2 PROJECT CONTEXT

The technical assistance for direct use of geothermal energy in low to medium temperature geothermal systems was requested by six (6) African countries in the Eastern Africa region. The



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countries lie within the Great East African Rift Valley (both at the eastern and western branches), a region that possess a remarkable geothermal energy resource potential that can be used for power generation and direct use application.

Availability of geothermal energy resources in these Eastern Africa region is promising for power generation and development of direct use projects. This region plans to utilize the opportunities emanating from geothermal energy which include power generation and direct use applications as it the case with Kenya which is leading the way in terms of geothermal power production. Use of these resources is highly prioritized due to its importance in bridging the energy demand gap. Most countries have conducted pre-liminary geoscientific studies to map the potential sites and their respective temperature ranges.

In order to drive this further it is therefore imperative to have wider understanding regarding opportunities for direct use projects from technical, financial, market viability perspectives. Understanding of these opportunities will help to make informed decisions regarding the direct use opportunities to develop and utilize. Further, implementation of direct use projects has direct impacts to the community in terms of livelihood income generation and job creation. This in turn is expected to contribute to the national efforts of resilience to climate change.

Participation of these regional countries to the global efforts to mitigate climate change provides an opportunity for them to also build climate resilience and promote sustainable economic growth. Direct utilization of geothermal resources will cut down on the emission of GHGs by reducing over-reliance on biomass and fossil fuels. Geothermal energy is one of the few renewable sources of energy able to produce steady power on a 24-hour basis which means countries can depend less on imported fuels and increase their energy security. Being a cleaner source of electricity, geothermal energy will thus play a major role in decarbonizing the power sector.

Population in this region relies heavily on agriculture and agro-industry as the predominant economic activities. However, a common challenge they face is the potential damage to agricultural produce occasioned by poor processing techniques of agricultural products which has resulted to post-harvest losses, whose 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 overfishing. 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 biomass used for this purpose



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There is immense untapped potential for direct use application of geothermal resources in the country's key sectors of Agriculture, Manufacturing and Tourism. This is broadly attributed to limitations in finance, personnel's capacity and therefore, this technical assistance will help to map out all the possible direct use opportunities and the relevant technologies capable of being supported by the vast geothermal resources, for the betterment of the lives of communities living around these geothermal prospects.

It is with this background that this TA aims to identify the potential direct use application and the most suitable technologies that can be used for geothermal utilization. It will also establish the economic and market viability of the identified direct use projects.

3 AIM OF THE CONTRACT

The technical assistance aims at identifying the resource and its viability of geothermal direct use as well as identification of the most suitable technologies for the resources direct use implementation. This will aim to support the countries to further advance their climate commitments as geothermal energy has great contribution to make in energy sector decarbonization.

4 SCOPE AND ACTIVITIES OF THE PROPOSED CONTRACTED SERVICES

To get a better understanding of the objectives of the request for technical assistance, the work elaborated beforehand by CTCN, as well as the necessary collaboration with the request proponent and National Designated Entity, it is recommended that the bidder refer to the complete Response Plan attached to this tender.

Once this contract is signed, the CTCN will organize a kick-off call among all relevant parties involved in the request to introduce the Contractor to the NDE and Proponent, to present the activities, their timeline and clarify roles and responsibilities.

To ensure a successful implementation and proper interaction with national counterparts and stakeholders, it is recommended that enough days be allocated on site for most of the relevant activities. It is also recommended to include regional, or preferably, national experts or organisations from each countries in the proposed implementation team to ensure contextual understanding of different countries uniqueness.



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It is mandatory for the implementer(s) to allocate at least 1% of the budget to integrate a gender-approach to the activities. Please refer to the CTCN Gender Mainstreaming Tool for Response Plan Development for guidance at <https://www.ctc-n.org/technologies/ctcn-gender-mainstreaming-tool-response-plan-development> and it must explicitly contribute to the implementation of the Gender and Climate Change Action Plan available at <http://www.minam.gob.pe/cambioclimatico/wp-content/uploads/sites/11/2015/12/PLAN-G%C3%A9nero-y-CC-16-de-JunioMINAM+MIMP.pdf>

The tender includes the following Outputs, Activities and Deliverables:

Output 1: Development of implementation planning and communication documents.

(Note that this output is mandatory, the contractor should ensure they adhere to the deliverables of this output)

Activity 1.1: The subcontractor must undertake the following activities at the beginning and at the end of the CTCN technical assistance.

- A. Prepare a detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organizations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan;
- B. Based on the work plan, prepare a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (please refer to item iv below and section 14 in the Response Plan);
- C. Prepare two-page CTCN impact description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered (a template will be provided);
- D. Complete a closure and data collection report at the end of the technical assistance (a template will be provided).

Deliverable 1	Delivery date
A) Detailed work plan	1 month after signing contract
B) Monitoring and evaluation plan	1 month after signing contract



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C) CTCN impact description	1 month after signing contract
D) Closure and data collection report	10 months after signing contract

Output 2: Identification of the most suitable direct use applications in low to medium temperature geothermal systems that will have climate impacts and improve livelihoods of communities in specific geothermal localities

Activity 2.1; Review of existing low to medium temperature geothermal systems resource assessment and Identify gaps in data & information and select the suitable sites and or validate the suitability of selected sites. This will also include a review of any existing direct use of the resources (if any).

Activity 2.2; Stakeholders consultation, to include but not limited to, local communities, national geothermal practitioners, local and national authorities. This will map the livelihood and economic activities and will help to analyse and categorize possible opportunities for direct utilization of the geothermal energy

Activity 2.3: Assess and estimate the local energy demand for productive uses for the local communities in the identified sites -Based on the finding in activity 2.2- (e.g. crop drying, milk pasteurizing, fish farming, beauty therapy, horticulture etc.)

Activity 2.4; Systematic identification of local potential of geothermal direct use projects

Deliverable 2:	Delivery date
D2. -Report on the comprehensive review and analysis of existing data and information on low to medium temperature geothermal resources in the identified specific sites. -A report on stakeholders' identification, engagement and their contribution -A report on local livelihood sources, economic activities with various potential geothermal direct use applications and the climate impacts with estimated local energy demands for the selected sites communities. -A report on the application of the geothermal direct use and the viable projects	4 months after signing contract



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Output 3: Identification of direct use geothermal energy harnessing technologies

Activity 3.1; Select and prioritize the most appropriate technologies for identified geothermal direct use projects. For each technology option selected, the following will be detailed: (i) the description of the technology; (iii) the benefits; (iv) the disadvantages; (v) financial costs and needs; (vi) the institutional and infrastructural capacities required; (vii) factors hindering its implementation; (viii) the factors favoring its implementation; and (ix) a case study.

Deliverable 3:	Delivery date
D3: A report on technology options identified, assessed and considered appropriate for the identified direct use geothermal application. The report should include a preliminary analysis of the various available technology options for direct use application	6 months after signing contracting

Output 4: Market and economic assessment on Commercial viability of the identified technologies (to test the viability and sustainability of the proposed projects)

Activity 4.1; Estimate the expected costs of the identified geothermal energy technology direct use projects

Activity 4.2; Conducting a cost comparison of the identified geothermal energy technology direct use with conventional systems

Activity 4.3; comprehensive analysis of environment forces, market trends, entry barriers, competition, risks, opportunities the direct use projects (SWOT Analysis)

Activity 4.4; Develop business and financial models for selected geothermal technology direct use project projects (a case example)

Deliverable 4:	Delivery date
D 4: A Report on the Commercial viability (economic and market feasibility) of the selected geothermal technology direct use projects	9 months after signing the contract

Output 5: Capacity developed on the procedures for identification of technologies and development of conceptual models of low to medium geothermal systems for direct use application.



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Activity 5:1. Prepare relevant training materials/guidelines from resource assessment to technologies

Activity 5:2; Implementation of the training. The training will target national technical staff working in the field of geothermal and preferably on the direct use. In this regard 2 experts from each of the 6 requesting countries will be selected. The aim will be to enhance their technical knowledge of the use of various geothermal technologies for direct use projects. A case studies/example of the identified projects will be used as a reference for training materials. The CTCN NDE and the GCF NDA will also be invited to increase ownership and discuss follow-up actions

Deliverable 5:	Delivery date
- D5: Guidelines on tools and methods for geothermal resources assessments for direct use application (whole value chain- resources assessment to technology identification to project designs). - A report on the training of geothermal technology direct uses.	10 months after signing the contract <i>(NB the development of the will be an ongoing tasks throughout the TA implementation as it will include information of all the above activities.)</i>

Output 6: Validation workshop on the results of the Technical assistance

Activity 6.1 conduct a final regional Validation workshop of the results of the technical assistance at the end of the technical assistance, a final validation workshop will be organized in Nairobi for the presentation technical assistance results. The workshop will target decision makers from the six countries, regional and local partners involved in this sector.

Deliverable 6:	Delivery date
D6.: Validated final Report of the technical assistance.	10 months after signing the contract

5 GENERAL TIME SCHEDULE

The activities under this contract should following the timeline presented for each deliverable and must be completed within a period of ten (10) months from signing the contract.

6 PERSONNEL IN THE FIELD (PROFESSIONAL EXPERIENCE AND QUALIFICATIONS)

The bidder shall as a minimum present the following qualifications of the team. Additional qualifications and experts may be added to the proposal.



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Experts required	Brief description of required profile
<i>Please use the same titles for all experts as applied in section 4.</i>	<i>Please provide a short description of expertise and experience needed (education, sectors of expertise, years of experience, country experience, language requirements, etc.).</i>
Team leader (TL) Senior geothermal Expert	The expert should have extensive knowledge on project management and development and should be conversant with conceptual model of low to medium geothermal systems. Minimum 10 years of relevant expertise in Renewable energy technologies and specific postgraduate (MSC and above) technical training in Geothermal low and medium heat systems. Country experience: Must have previous work experience in Africa countries; language skills: excellent command of oral and written English.
International expert- Geothermal Direct use expert	education and experience: -Master's degree with a minimum of 10 years expertise in Mechanical engineering/ renewable energy technology/Physics. With experience in thermal applications (heat extraction) to various productive uses - cascaded utilization; ORC; Food preservation technology and pasteurization; Agri-industrial processes, aquaculture, greenhouse among other Must demonstrate working experience in the 6 countries in the Geothermal systems. -language skills: excellent command of oral and written English.
Financial/business analyst	- minimum 5 years of experience post relevant master's degree; economics, business, finance with working experiences in the Energy sector -Expertise in energy value and supply chains, with knowledge of energy matters in development of business models for community-based projects - Excellent communication skills in English in speech and writing
Social scientist	- A graduate degree in social studies, psychology, environmental, economic, political science or other relevant discipline with focus on the field of gender issues in a developing country context - At least 7 years working experience with gender mainstreaming, community development focused on geothermal issues and projects social and Environmental Impact assessment



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The CVs of the respective experts assigned to this project by the Contractor must be provided.

7 LANGUAGE REQUIREMENTS

The working language for the purposes of this project is English, thus an excellent command of English is required of the proposed personnel. Knowledge other languages used in the 6 countries is an added advantage (Amharic, Kiswahili). The final deliverables must be submitted in English. The technical and financial proposal under this tender must also be submitted in English.

All delivered documents must be of such a quality, that no further editing will be required.

8 DELIVERABLES SCHEDULE

The table below details the indicative schedule for this assistance.

Deliverable 1:	Delivery date
A) Detailed work plan	1 month after signing contract
B) Monitoring and evaluation plan	1 month after signing contract
C) CTCN impact description	1 month after signing contract
D) Closure and data collection report	10 months after signing contract
Deliverable 2:	
- Report on the comprehensive review and analysis of existing data and information on low to medium temperature geothermal resources in the identified specific sites. - A report on stakeholders' identification, engagement and their contribution - A report on local livelihood sources, economic activities with various potential geothermal direct use applications and the climate impacts with estimated local energy demands for the selected sites communities. - A report on the application of the geothermal direct use and the viable projects	4 months after signing contract
Deliverable 3:	



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A report on technology options identified, assessed and considered appropriate for the identified direct use geothermal application. The report should include a preliminary analysis of the various available technology options for direct use application	6 months after signing contracting
Deliverable 4:	
A Report on the Commercial viability (economic and market feasibility) of the selected geothermal technology direct use projects	9 months after signing the contract
Deliverable 5:	
- Guidelines on tools and methods for geothermal resources assessments for direct use application (whole value chain- from resources assessment to technology identification to project designs). - A report on the training of geothermal technology direct uses.	10 months after signing the contract
Deliverable 6:	
Validated final Report of the technical assistance.	10 months after signing the contract