CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

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:	Tonga
Request title:	Please reflect the objective of the technical assistance in the title (maximum 200 characters). Tonga Circular Economy Project - Biogas Feasibility Study The objective of the TA is to conduct a feasibility study of using biogas to lower the power tariff in Tonga.
NDE	Please add name of organization, name of individual, position, email and address. Mr Paula Pouvalu Ma'u Chief Executive Officer Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communication. Nuku'alofa, Tonga paulam@mic.gov.to
Request Applicant:	Please add name of organization, contact person, position, email and address of the organization requesting assistance from the CTCN. Energy Division Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communication. Nuku'alofa, Tonga Contact Person: Dr Tevita Tukunga, Director of Energy – ttukunga@gmail.com

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.).

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

This section should answer the question "what is the problem?" Please summarize the problem related to climate change and/or the negative impacts of climate change in the country that the request aims to address.

Tonga is among the most vulnerable countries to the impacts of climate change, yet continue to be increasingly dependent on the imported fossil fuels that dominates its greenhouse gas emission. With this dependency, Tonga faces the double challenge of volatile fuel prices and exposing its fragile environment to air pollution, fuel spills and water and soil contamination.

In an effort to join the global community to reduce GHG emission, Tonga has adopted an energy target of 50% renewable energy by 2020 and 70% by 2030.

In 2015, the Government of Tonga finalized its Nationally Determined Contributions (NDCs) with energy targets as follow:

i) 50% of electricity generation from renewable sources by 2020 (from a 2015 baseline of approximately 9% of total electricity generation and with confirmed and funded investments taking this to 13% in 2016).
ii) 70% of electricity generation from renewable sources by 2030
iii) Improve Energy efficiency through reduction of electricity line losses to 9 percent by 2020 (from a baseline of 18 percent in 2010).
iv) Sector Emission Reduction Targets: Transport, Agriculture, Environment Friendly Waste Management and Reforestation

While access to electricity in Tonga is at a high of above 90%, the RE penetration in Tonga is consistently between 7% and 11% with the best month being 14%-16%. The power tariff is presently T$.81 per kWh or approximately US 40 cents and more than 70% of this is due to the fuel component of the tariff, which is considered very high.

Tonga's renewable energy development is currently based on solar and wind and Tonga is mindful that any further development in its energy sector should ultimately result in improving the energy security of the country in terms of energy dependency, affordability, reliability and environment integrity.
This project is therefore aimed at significantly reducing the GHG emission in Tonga by meeting its energy targets and significantly increasing on the affordability of electricity by lowering costs and the tariff. Tonga is therefore exploring feasible base load sources that can immediately lower costs and make immediate impacts on the affordability of the power tariff.

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

This section should answer the question "what has been done or is currently being done to address the problem?" Please describe past and on-going processes, projects or initiatives implemented in the country or region to tackle the climate problem as described above.

Tonga adopted its Tonga Energy Roadmap (TERM 2010-2020) in 2010 and has since accelerated its effort to meet its energy targets of 50% renewable energy by 2020 and 70% by 2030.

Tonga presently has 17.7 MW of installed diesel capacity with 6.2 MW of installed RE on-grid capacity (solar, wind, IPP), surpassing its diesel generation RE absorption limit of 4.3 MW. The RE penetration in Tonga is consistently between 7% and 11% with the best month being 14%-16%.

Tonga's renewable energy developments have focussed mostly on solar and wind power, which has resulted in a decrease in the power tariff. At the same time, the government wants to explore other base load opportunities like biogas and ocean-based energy sources to further make electricity more affordable to its people.

Tonga and other Pacific Island Countries has used biogas for quite some time now but mostly at the household and institutional levels. At this scale, it has demonstrated that biogas has a promising potential in Tonga and the region. In August 2018, through a partnership with the Institute for Applied Material Flow Management (IfaS) of the Trier University of Applied Sciences, Germany a mission composing of officials from the Tonga MEIDECCC and the Pacific Community (SPC) visited biogas plants in Germany and witnessed the significant contribution of biogas to the energy development of Germany. Some of the biogas plants visited are powered with biomatter derived from maize, are jointly owned by groups of farmers and operate as independent power producers, selling power to the utility and digestate to farmers.

Tonga's tropical climate is favourable for biomass planting and is therefore interested in exploring the feasibility of a biomass-fuelled biogas plant of an industrial scale to provide baseload power to its power supply and make an immediate impact on **lowering the power tariff**.

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

This section should answer the questions "what are the technology barriers that hinder national efforts described above" and "how will the CTCN technical assistance complement these efforts?" Building upon the problem statement and taking into consideration the existing efforts described above, please describe the specific technology barriers encountered by the requesting applicant to identify, assess or deploy climate technology (ies) in an effort to address the problem statement. The described barriers should be within the scope of the requested CTCN technical assistance (described in the section below).

Tonga, as well as the Pacific Islands, have only used biogas at the household and institutional scales. Furthermore, when these small scale projects were developed they did not have circular economy as a major considerations behind their design, installation and financing.

This project will introduce biogas at the industrial scale, capacity of .5 Mega Watt and above, and to implement it through a circular economy strategy.

[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)*

The feasibility study should therefore:

- identify the size of a biogas plant(s) that would help to reduce the power tariff in Tonga
- confirm whether Tonga has the feedstock (biomass and green matter) for such plant(s)
- identify the business and financing models that would make the project economically feasible
- identify the co-benefits from pursuing the biogas project through a circular economy strategy

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:

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):

Founded on the problem statement, past/on-going efforts and technology barriers, please describe the requested technical assistance. The technical assistance should clearly contribute to mitigation or adaptation to climate change as described in the problem statement and contribute to overcome the specific technology barriers.

Within a clearly defined scope, the description of technical assistance should be structured into the following:

- **Overall objective**

The study aims to identify the feasibility of adding biogas to Tonga's portfolio of power generation sources.

The General Objectives are to:

i. Introduce biogas at an industrial scale so as to immediately reduce the power tariff, in particular, to household consumers
ii. Contribute to achieving government's 50% RE by 2020 and 70% RE by 2030 targets as well as its energy efficiency targets
iii. Create new jobs and catalyze value adding activities
iv. Use biogas technology to trigger other related socio-economic developments

- **Anticipated groups of activities to be performed by the technical assistance**

The study would be based on a biogas plant using local biomass resources e.g. grass and other greens as feedstock and would be based on 3 phases:

i) **Baseline and Resources Assessments (BRA)**

The BRA would be a fact finding to assess the current and future supply of feasible biomass and preferably grass and other greens for the biogas plant.

ii) **Institutional, Business and Investment Assessment (IBIA)**

The IBIA would identify the capacity of the biogas plant(s) and to devise innovative financing and investment arrangements for the biogas plant.

The IBIA would identify suitable locations for the biogas plant taking into consideration, which the use of excess heat will heavily contribute to the economics of the biogas plant.

iii) **Technical Design (TD)**

This component will be the selection of suitable biogas technology and the design of the actual physical plant on the ground, with a co-located box digester and CSTR digester project as among the options. It will also include an assessment of the social and environmental impacts of the project.

The actual installation of biogas projects on the ground will be subject to a separate arrangement and call for proposals.

Besides the 3 Phases above, the TA will also include extensive local consultations with stakeholders and a series of national workshops to build the confidence and buy-in to the biogas. All matters relating to the gender aspects of the project will be dealt with in the workshops.

There will also be a component dealing with visits to nearby projects in NZ, Australia and Asia to build the confidence on the technology by actually seeing projects that works closer to the shores of Tonga.

- **Anticipated products to be delivered by the technical assistance.**

Please note that the CTCN facilitates technical assistance and is not a project financing mechanism.
It is expected that the TA will produce the following deliverables:

i) Inception Report

ii) List of existing and potential feedstock for biogas plant including gate costs for each biomass resource

iii) Analysis of the CE potential of Biogas for the Tongan economy

iv) Draft Biogas Feasibility Study

v) Final Biogas Feasibility Study

vi) GCF Financing Proposal for the funding of the biogas plant

vii) Draft RFP for the physical implementation and supervision of the Tonga Biogas Project

viii) Final RFP for the physical implementation and supervision of the Tonga Biogas Project

ix) Consultations and workshop reports

x) Trip Reports

Expected timeframe:

Please indicate the expected duration period for the requested technical assistance. Please note CTCN technical assistance is limited to a maximum duration of 12 months.
The TA will take place over a period of at least 6-8 months.

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

Please describe the activities with gender linkages as well as the anticipated gender and other co-benefits (e.g. biodiversity, economic, social, cultural, etc.) that are likely to be generated as a result of the technical assistance.

This TA will address gender in the following ways:

- The feasibility study will look at ways in which both men and women as well as children and the disadvantaged can contribute to and benefit from the project.
- The consultation meetings and training workshops planned under the TA will address the gender aspects of the project to ensure there is unrestricted access and participation in the project
- The training workshops will cover ways in which communities and households can productively use products from a biogas plant

For more information you can find guidelines on the CTCN's website here:
https://www.ctc-n.org/technologies/ctcn-gender-mainstreaming-tool-response-plan-development

Further reading on gender can be found on the CTCN website here:
https://www.ctc-n.org/technology-sectors/gender

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
National Designated Entity	Overall Oversight of the TA
Request Applicant	Day to day management and coordination of the TA
Pacific Community's (SPC) Pacific Centre for Renewable Energy and Energy Efficiency.	Technical Advice and support to the NDE and Request Applicant Lead in coordination and conduct of the national consultations, training workshops and the arrangements of the technical visits and confidence building visits.
Ministry of Agriculture	Coordination with its agriculture, livestock and forestry divisions
Farmer's Federation	Coordination with its members in terms of the supply of grass and

	green biomass
Statistics Department	Supply of data regarding oil, food and fertiliser imports
Communities	Information regarding their experiences with household biogas plants

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

Please describe how the technical assistance is consistent with national climate priorities such as: Nationally Determined Contribution, national development plans, poverty reduction plans, technology needs assessments, Low Emission Development Strategies, Nationally Appropriate Mitigation Actions, Technology Action Plans, National Adaptation Plans, sectorial strategies and plans, etc.

Tonga is currently implementing its Strategic Development Framework: 2015 – 2025. Pillar 4 of the Framework is on **Infrastructure and Technology Inputs** with Organisational Outcome 4.1 being **More reliable, safe, affordable and widely available energy services built on an appropriate energy mix moving towards increased use of renewable energy** (see page 20).

In 2015 Tonga adopted a target of 50% renewable energy by 2020 and 70% by 2030 in its NDC (see pages 3, 10 & 11).

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.). Tonga Intended Nationally Determined Contributions (INDCs), Dec 2015. Pages 3, 10 & 11.
Technology Needs Assessment	
National Adaptation Plans	
Nationally Appropriate Mitigation Actions	
Tonga GCF Country Programme (2018).	The Tonga GCF Country Programme refers to Tonga's Response Policies and Strategies regarding climate change as contained in the following strategic documents: 1. Tonga Strategic Development Framework: 2015 – 2025 *National Outcome* E is on successful provision and maintenance of infrastructure and technology (Figure 11, Page 23) 2. Tonga Budget Statements The 2018/19 budget by Government Priority Area, both recurrent and development allocations reflect Government priority intervention areas in developing human capital— health, education and other social services—enhancing private sector development, enabling business climate, **energy efficiency**, infrastructure and tourism (page 24) 3. Tonga National Climate Change Policy The following National Climate Change Policy Targets are listed in Table 4,

page 25:

*#3 - Resilient homes, schools, and community halls (i.e. incorporating design for Category 5 cyclones, a minimum of 30,000 litre water storage capacity for homes, solar power and hot water, **bio-digesters for biogas production**, organic gardens, food preservation)*
#4. A transport system that is not reliant on fossil fuels (biogas can produce gas for vehicles and / or charge batteries for vehicles too)

#5 - 100 percent renewable energy (biogas is renewable)

#6. Resilient low chemical input or organic farming systems (biogas will produce organic fertilisers for farming).

4. Joint National Action Plan 2 on Climate Change and Disaster Risk Management: 2018 – 2028

   Objective 4 is on Resilience-Building Actions and to be achieved by designing and implementing on-the-ground adaptation, clean and efficient energy and disaster risk management actions that focused on building a Resilient Tonga at the national, outer-island and community levels

5. Tonga Nationally Determined Contribution and Energy Road Map (see page 27)

50% of electricity generation from renewable sources by 2020

70% of electricity generation from renewable sources by 2030

6. The GCF Country Programme
   - SPC is listed on Table 5, page 43 as a Partners Supporting Tonga in building Resilient Development with energy being one of its areas of engagement. **SPC is now an Accredited Entity of the GCF**.
   - On page 48, Renewable Energy (Solar, Wind, and Biomass) and reducing emissions for the Transport Sector are listed as priority mitigation areas.
   - Table 6 in the Tonga GCF Country Programme Priorities on page 48 lists Biomass / Biogas as a project title. The Description of the project idea is *Feasibility and implementation of using grass and other greens for biogas at the district/community level and contributing to the Tonga NDC targets* (nationwide)
   - Reducing emission from the land transportation (energy efficiency) is a country programme priority (Table 6 page 48) and the biogas project will also address this priority as gas can be used for transport fuel or converted to electricity to power electric vehicles.

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

Please describe how the request was developed at the national level and the process used by the NDE to approve the request before submitting it (who initiated the process, who were the stakeholders involved and what their roles were?) and describe any consultations or other meetings that took place to develop and select this request, etc.

The interest on the circular economy began in early 2018 when the Pacific Community (SPC) was in contact with an Australian biogas consultant who had earlier expressed interest to assist Pacific Island

Countries to explore the opportunities of biogas through a circular economy strategy. The consultant has contacts with the Institute for Applied Material Flow Management (IfaS) of the Trier University of Applied Sciences, Germany – a leading agency on circular economy in Germany. The consultant made an exploratory visit to Tonga.

In April 2018, SPC wrote to IfaS expressing an interest to work with them and promote circular economy in the Pacific Islands. In May, IfaS wrote to SPC to confirm the collaboration.

The biogas consultant and representative of IfaS visited Tonga in June and had a group meeting with MEIDECCC, PCREEE and NGOs. There were also site visits to see the landscape of Tonga and some existing small scale biogas plants There were also one-to-one meetings with:

- Chamber of Commerce
- Tonga Development Bank
- Tonga Power Ltd
- Livestock Division of the Ministry of Agriculture
- Ministry of Fisheries
- The GCF team at the Division of Climate Change at MEIDECCC
- Tonga Farmers' Federation
- Poultry Farm Owners
- NZ High Commission

All these meetings confirmed the stakeholders' interest to pursue biogas in Tonga through a circular economy strategy.

In August 2018, a mission composing of the Minister for MEIDECCC and the Director of Energy as well as two representatives from the Pacific Community (SPC) visited biogas plants in Germany and witnessed the significant contribution of biogas to the energy development of Germany. Some of the biogas plants visited are powered with biomatter derived from maize, are jointly owned by groups of farmers and operate as independent power producers, selling power to the utility and digestate to farmers.

The head of the IfaS as well as the biogas consultant visited Tonga in November and had the opportunity to brief the Minister of MEIDECCC as well as the Cabinet on the project. While there was overwhelming support for the project, Tonga also made it clear to IfaS that its interest is actually on reducing the power tariff rather than anything else.

With all the interests shown in Tonga, the next logical step was to seek financial resources to conduct a feasibility study and set the stage for installing an industrial scale biogas plant in Tonga so as to assist in reducing the power tariff.

Being in the same Ministry, the TA applicant has consulted the NDE and the GCF team in the Climate Change Division.

Background documents and other information relevant for the request:

- *Please list all relevant documents that will help the CTCN analyze the context of the request and national priorities. Please note that all documents listed/provided should be mentioned in this request in the relevant section(s), and that their linkages with the request should be clearly indicated. For each document, please provide web-links (if available) or attach to the submission form. Please add any other relevant information as required.*

  Kindly refer to Reference Document part above.

- *Please indicate if this request has been developed with the support of the CTCN Request Incubator.* N/A

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: **Paula Pouvalu Ma'u**
Date: **8th March 2019**
Signature:

MINISTRY OF METEOROLOGY, ENERGY, INFORMATION DISASTER MANAGEMENT, ENVIRONMENT CLIMATE CHANGE & COMMUNICATIONS
MEIDECC TONGA

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

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

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: **Paula Pouvalu Ma'u**

Date: **8th March 2019**

Signature:

MINISTRY OF METEOROLOGY, ENERGY, INFORMATION DISASTER MANAGEMENT, ENVIRONMENT CLIMATE CHANGE & COMMUNICATIONS
MEIDECC TONGA

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.