CTCN Technical Assistance
Request Submission Form

Please fill in the form in the grey spaces, by following the instructions in italic.

Requesting country:	*Uganda*

Request title:	*A strategy for national pay-as-you-go policy and mechanisms **for households and social institutions** to enhance rural off-grid solar energy access and the usage of clean cookstoves and their related impacts on the environment and human health.*

Contact information:

{Please fill in the table below with the requested information. The request proponent is the organization that the request originates from, if different from the National Designated Entity (NDE).}

	National Designated Entity	**Request Applicant**
Contact person:	*Maxwell Otim Onapa*	*Olivia Byanyima*
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Technology Needs Assessment (TNA):

{Select one of the three boxes below:}

The requesting country has conducted a TNA in .... (please insert date of TNA completion)

☐ *The requesting country is currently conducting a TNA*

☐ *The requesting country has never conducted a TNA*

{If the requesting country has completed a TNA, please indicate what climate technology priority this request directly relates to. Please indicate reference in TNA/TAP/Project Ideas.}

CTCN Request Incubator Programme:

{Please indicate if this request was developed with support from the Request Incubator Programme:}

☐ *Yes*
☒ *No*

Geographical focus:

{Select below the most relevant geographical level for this request:}

☐ *Community-based*
☐ *Sub-national*
☒ *National*
☐ *Multi-country*

{If the request is related to the sub-national or multi-country level, please indicate here the areas concerned (provinces, states, countries, regions, etc.)}

Theme:

{Select below the most relevant theme(s) for this request:}

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

Sectors:

Energy, Human Health, Businesses and Education

Problem statement *(up to one page):*

Overall problem: no access to affordable power and improved cookstoves[1]; and therefore large negative impact in relation to climate change

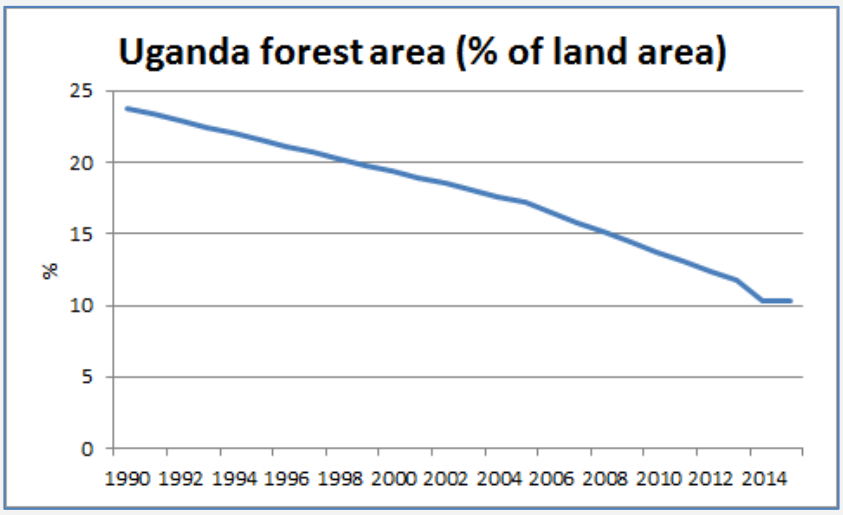
Over 90% of the rural population in Uganda lacks access to clean and affordable power. In addition, the vast majority of these households cook on woodfuels (wood/charcoal). Lack of access to clean power and affordable improved cookstoves has a large negative impact in relation to climate change. One should think of:

- Deforestation[2]
- Product of incomplete combustion from inefficient stoves and kerosene lamps
- Usage of off-grid, domestic diesel generators[3]

Besides a negative impact on climate change, the issue of energy poverty in general hinders economic growth, social development, education and spending power. Using the traditional kerosene lamps and low-peforming cookstoves has a large negative impact on people's health.

[1] Energypedia.info Uganda Energy Situation
[2] Forests play a huge role in the carbon cycle on our planet. When forests are cut down, not only does carbon absorption cease, but also the carbon stored in the trees is released into the atmosphere as CO2 if the wood is burned or even if it is left to rot after the deforestation process.
[3] As an example, in Nigeria, diesel emissions from domestic generators surpass those from workplaces, trucks, and buses, and pose greater risks to human health and the environment due to proximity to homes and prolonged duration of use.

Cooking; deforestation
Wood fuels are largely used for cooking in rural areas while charcoal mostly provides for the cooking needs of the urban population. High demand for wood fuels used inefficiently results in overuse and depletion of forests, as shown by the below figure (source).



The land available is becoming scarce and households prefer to use the land for food crops rather than planting trees. In addition, illegal cutting of trees increases. Since 1990 the forested area decreased from 49,240 km² down to 29,880 km². This means that from 1990 until 2010 more than 19,360 km², equaling 39 % of the existing forest disappeared. Currently about 90,000 hectares (equals 900 km²) of forest cover are lost annually, which leads to fuel wood scarcity in rural areas and increasing price levels of charcoal and fuel wood.

Urban and rural households are facing increasing energy costs or spend more time collecting firewood. Furthermore, the traditional use of firewood is responsible for high indoor air pollution levels, thus causing respiratory diseases that affect women and children in particular. Moreover, the latter spend many hours and travel long distances to collect fuel wood. This deprives women of valuable time to engage in income generating activities and children to go to school and study.

Cooking[4]; charcoal
Between 2005 and 2008 the charcoal price rose at an enormous nominal rate of 14% per year. The production of charcoal is carried out under primitive conditions with an extremely low efficiency at 10 to 12% on weight-out to weigh-in basis and an efficiency rate on calorific value basis at 22%. Production of charcoal also results in illegal logging; hence further increasing deforestation levels.

Cooking; stoves
At the same time, households use biomass in a very inefficient way as the three-stone fire is still widely spread.

No access to electricity: lighting and kerosene lamps
A total of 93% of rural households without access to electricity are currently using traditional lighting technologies such as candles or kerosene lamps that give poor quality lighting, emit noxious fumes (black carbon) and present hazards in terms of fires or burns (in particular for small children).

No access to electricity: larger applications and diesel generators
Furthermore, the majority of social institutions (e.g. schools and health centres) in rural areas do not

[4] http://www.illegal-logging.info/regions/uganda

have access to electricity, which leads to inferior health and education services in comparison to electrified institutions. Lack of access to electricity also severely constrains the economic development of rural areas of Uganda, preventing the establishment of businesses that require electric power or forcing companies to buy diesel or petrol generators that are costly to operate and negatively impact the environment. Furthermore, job creation is being seriously constrained by the lack of adequate investment in the provision of rural infrastructure services, of which electricity is a key component. Lack of electricity also prevents access to information and communication technologies (e.g. mobile phones, computers, internet). This contributes to further isolation of rural areas from the rest of the country. Further, the quality of rural life is hampered by lack of electricity, particularly as rural public institutions such as health, educational and water facilities would be able to provide better services if they had access to electricity.

Barriers and solutions
While these problems have been identified, concrete solutions are yet to be offered. An obvious solution is providing households and social institutes with solar energy and improved cookstoves. The re-occurring problem is the relatively high upfront costs. We believe that mobile banking, as the concept *PAYG*, could contribute to reduce these barriers. This is the main focus for this programme[5].

Proof that mobile banking could be part of the solution
Experiences with mobile banking as PAYG gives us the impression that this indeed mitigates the barrier of the relatively high upfront costs. One example is this article; explaining that solar kits are paid off after about 18 months and subsequent electricity is free to the new owner. The PAYG concept is a familiar one for hundreds of millions of Africans who purchase mobile phone minutes and kerosene fuel incrementally. Another experience comes from Waka Waka in Rwanda; prepaid technology is combined with a small solar device. After a one-time deposit on the device, weekly scratch cards are bought to activate the unit. The code on the scratch card, along with a unique code from the device, is sent by text to a free local service number. A text is instantly returned containing an activation code for the unit. Last one to mention here, is the Renewable Energy Microfinance and Microenterprise Program (REMMP) of ArcFinance; whereby Arc is testing, piloting and expanding a number of business models that are focused on financing for sustainable energy including microfinance, remittances, asset finance, crowd-funding and PAYG mechanisms. Obviously the best practices of these programmes and projects will be studies in this CTCN project. We hope that the *combination* of a solar energy device and an improved cook stove could be financed through a mobile banking system. In Uganda, micro-finance institutions are working with instruments such as "group lending" to ease flow of capital to a group living at the base of the pyramid, whereby the members of the group stand collateral to the other groups members. We will take into account the capacity of the devices as well; e.g. from smaller solar devices meant for lighting only, until larger systems providing several families or social institutes with electricity as well as the concerns from micro-finance institutions regarding after-sale services.

Deliverable of the project
When, at the end of this project, some form of mobile banking / PAYG indeed would be recognized as being part of the solution, additional *governmental* policy instrument will be needed to make implementation a success. One could think of general policy tools as information and awareness campaign and appropriate financial incentives for certain stakeholders within the supply chain. Therefore, this project will be completed with a *concept* NAMA proposal, using the UNFCCC format. This proposal we intent to discuss with relevant National governmental departments, to draw their attention. This hopefully will lead to a next phase, designing together a governmental policy programme, focussing on implementation, taking into account existing initiatives and programmes, seeking for international financial and/or technical assistance.

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The table below summarizes the identified problems and gives an impression of the steps within the study that we want to follow.

Focus:	Problems:	Investigate and quantify:	Improvement?	Investigate and quantify:
Light: solar systems compared to kerosene lamps	Kerosene lamps: -GHG emissions (environment, country) -Black carbon emissions (environment, country) -Smoke inhaling (health, medical costs) -Fire risk: injury and death (health, medical costs) -Fire risk: loss of property (household) Solar systems: -Investement costs (households and trade)	1. Problems kerosene lamps and original stoves 2. Benefits and problems 'normal' solar systems and 'normal' improved stoves 3. Willingness to pay households 4. Trade value carbon credits 5. Other effects: local businessess biomass bricks, time saving cooking	Positive effect of mobile banking systems?	6. Benefits, problems, challanges added by different mobile banking systems (e.g. working capital, financial models, upfront costs)
Cooking: improved stoves compared to original stoves	Original stove: -GHG emissions (environment, country) -Black carbon emissions (environment, country) -Smoke inhaling (health, medical costs) -Fire risk: injury and death (health, medical costs) -Fire risk: loss of property (household) -Fuel costs (households) Improved stove: -Investment costs (households and trade) -Availability fuel (household)			

Past and ongoing efforts *(up to half a page):*

This project builds on the government of Uganda's aim to reach millions of households with access to clean energy and cooking technologies, as described under topic 'Alignment with National Priorities'.

This proposal also contributes to Uganda's ambition to reduce GHG emissions and deforestation. The sale of carbon credits generated from avoided GHG emissions can be sold into the market to generate additional revenue. Subject to further development, notably the effort of the World Bank (see below), additional revenues may come from the sale of black carbon credits.

Assistance requested *(up to one page):*

The NDE of Uganda is seeking technical assistance and cooperation to form a consortium with an international partner from the CTC Network that can contribute to the quantitative and qualitative aspects of this project. International literature studies will be utilized to assess and analyse the current situation. After this analysis, additional benefits (and challenges) of mobile banking / PAYG systems, in combination with solar systems and improved cookstoves will be quantified.

Topics to analyze in short (rural households and rural social institutions):

1. Investigate problems kerosene lamps and original stoves
2. Benefits and problems basic solar systems and improved cookstoves
3. Willingness to pay
4. Trade value carbon credits and other impacts/benefits
5. Other effects as local businesses biomass bricks, time saving cooking

6. Benefits, problems, challenges added by different mobile banking / PAYG systems (e.g. working capital, financial models, upfront costs)
7. Benefit on a national level from reduction in GHG, black carbon emissions, and medical costs. Once methodologies are in place and certified, these benefits possibly can be sold into the market to generate additional revenue.

These topics will be analyzed in two phases:

Phase I – Impact analysis

1. Avoided kerosene consumption and black carbon emissions from kerosene lamps. Black carbon is known to be a very powerful absorber of sunlight, and behind CO2, is the highest contributor to global warming.
2. Avoided medical cost. Two contributions to medical costs when kerosene lamps or open fired cooking are used:
   - There is evidence that exposure to indoor kerosene lamps and indoor smoke from cooking impairs lung function and increases the risk for respiratory disease, cancer, eye problems, and is suspected to weaken the immune system.
   - Kerosene lamps and open fire cooking methods also pose safety and fire risks. For example, kerosene is highly flammable and there is a high risk of accidents, burns, and even fatalities associated with lamp use. In Nigeria, for instance, thousands of people are maimed each year by lamp explosions, with a 13% fatality rate. In India, 2.5 million people suffer severe burns caused by overturned kerosene lamps each year. The data on infants falling into open fires and being severely burned and maimed are almost non-existent as most have little access to hospitals and clinics, but the problem is known to be significant.
3. Avoided greenhouse gas emissions from improved cookstoves and the related effect on the country's carbon credit sales.
4. The effect on local businesses making suitable biomass bricks used by improves cookstoves
5. Saved time for gathering pieces of wood and cooking from improved cookstoves
6. Willingness to pay under plausible payment plans as well as through cash up front.

When possible, energy savings scenario's and related GHG mitigations, will be modelled using LEAP, the Long range Energy Alternatives Planning System.

Phase II - Mobile banking / PAYG systems

Mobile banking systems from several private companies will be compared, both for solar and cookstoves. In particular, the issue with solar kits and cookstoves is the upfront costs that the people in Uganda cannot afford. Current mobile banking systems in place include a combination of scratch card payments as a form of pre-payment making use of the mobile network and existing distribution channels. In this part a comparison will be made of:

1. Mobile banking systems making use of scratch cards and not dependent on any mobile phone, Systems making use of scratch cards and dependent of mobile phone operators, and mobile phone operator versus a system making use of an integrated analog modem in the solar charger that "talks" with the customer's mobile phone to authenticate a transaction.
2. Consumer acceptance & willingness to pay for these systems, including the upfront payment to purchase the solar kit and the (weekly) scratch cards
3. (Weekly) energy savings per system compared to other means to get access to electricity.
4. Flexibility, outreach, and distribution capacity of the systems, including after-sale services
5. Barriers that impact growth, distribution capacity and consumer uptake
6. Possible means to alleviate the barriers identified.

The CTCN assistance will develop a national framework for mobile banking / PAYG energy solutions. The CTCN consortium will work closely with various stakeholders to determine which solution will mitigate the identified problems and possibilities to upscale the selected solution to

national levels to increase uptake of solar power usage and improved cookstoves.

Final product

The above should lead to a concept NAMA proposal, as the final deliverable of the project, as described under 'Problem Statement'.

Expected benefits *(up to half a page):*

Kerosene lamps and open fire cooking generates pollutants, e.g. black carbon (BC) and particles, that endanger the health of billions of people and contribute to climate change. As noted above, BC has an extremely high global warming potential. With support from the Climate and Clean Air Partnership (CCAP), The World Bank has established a Black Carbon Expert Panel to assess and prioritize financing mechanisms to catalyze BC reductions. This project will build on the work of the World Bank's panel by establishing a BC baseline from use of kerosene lanterns and estimating emissions reductions against the baseline through the use of solar lighting in tons of CO2e equivalent in global warming potential terms. Both of these measures could be assigned economic values for trade and support each respective government's claim that they are mitigating climate change but also put a value on the trade of BC reductions that could be used in the future to finance the implementation of a solar lighting program.

Avoided medical costs through a reduction in e.g., burns is also a marketable product under results based financing. As part of the project it will assess the avoided medical costs of e.g. burns to children and others from kerosene lamps and open fire cooking in the baseline and argue that solar lamps and improved cookstoves remove this risk. It will assess the willingness to pay of health sector donors and foundations for an avoided severe burns for infants, and make an estimate of the financial value of these bundles attributes and whether these payments might be sufficient in to stimulate expanded investment in solar lighting and clean cookstoves.

The study will explore whether monetization of these benefits is sufficient to underwrite consumer financing schemes through mobile banking / PAYG to make solar systems for off-grid rural electricity and cookstoves more affordable, while keeping the price of the solar systems and cookstove at a level that provide satisfactory margins to the manufacturer and distributors.

Post-technical assistance plans *(up to half a page):*

{Please describe here how the results of the CTCN technical assistance will be concretely used by the applicant and national stakeholders, to pursue their efforts of resolving the problems stated above after the completion of the CTCN intervention (list specific follow-up actions that will be undertaken).}

As said, the final deliverable of this project will be the concept NAMA proposal. To finalize the NAMA for upload on the UNFCCC website, further support is needed from relevant national governmental departments to upload the NAMA proposal on UNFCCC website and secure further implementation of the project together with extensive awareness campaigns.

Key stakeholders:

Stakeholder	Role to support the implementation of the assistance
National Designated Entity	*International co-ordination with CTCN network. Regional co-ordination with other NDEs. National coordination with line ministries (Ministry of Environment, Energy and Industry)*
National Governments and their Ministries of Energy and of Health	*i.e. Ministry of Energy for the establishment of MEPS or refrigerant standards*
Mobile Telephony companies	*Input to the project: existing systems, data collection, experiences, barriers, etc.*
Companies that provide solar kits and advanced cookstoves	*Input to the project: existing systems, data collection, experiences, barriers, etc.*
World Bank (including its Black Carbon Expert Panel)	*Expertise, advise*
Climate and Clean Air Partnership	*Expertise, advise*

Alignment with national priorities *(up to half a page):*

Uganda describes its energy action agenda towards 2030 in the SE4ALL: Sustainable Energy for All. Relevant element for this CTCN proposal:

- Access to modern and clean energy services is a necessary precondition for achieving development goals that extend far beyond the energy sector, such as poverty eradication, improved public health and education.
- Energy access: 15% of the population has access to grid services, out of which 7% in rural areas. Taking into account ongoing projects and existing plans to enhance access to electricity, new interventions are suggested targeting about 3.17 million households with off-grid solutions. Off-grid solutions include solar home systems for households living under the poverty line.
- Cooking energy: in 2012, only 500,000 households (7% of the population) were using clean and efficient cookstoves. The major existing plan is to provide 5 million new households with clean and efficient stoves by 2020; reaching by then 64% of the projected population. To target universal access by 2030 several additional interventions are needed, including providing 5.4 million households with improved wood and charcoal stoves by 2030.
- Clean cooking: Developing better and innovative improved cookstove technologies, providing a longer lifespan; Promoting international affordable standards and rigorous testing protocols and enhancing monitoring and evaluation; Supporting the Green charcoal Initiative, and dissemination of alternative viable fuels (LPG, ethanol,etc.).

This proposal could assist two programs that are currently running in Uganda

1. Africa Community Centre for Social Sustainability (ACCESS) under which the Uganda Government together with the World Bank is supporting two improved cookstove projects, one related to willingness to pay and one related to distribution models.
2. United Nations Development Program that in cooperation with MEMD is carrying out a study

called "*Addressing Barriers to Adoption of Improved Charcoal Production Technologies and Sustainable Land Practices through an Integrated Approach ("Green Charcoal Project")"*

Development of the request *(up to half a page):*

On January 29, 2016, Caroline van Tilborg and Olivia Byanyima met with Dr. Maxwell Otim Onapa, Deputy Executive Secretary, Uganda National Council for Science and Technology to discuss the lack of affordable power and the low uptake of improved cookstoves by households and social institutions in Uganda. At that time, both Caroline van Tilborg and Olivia Byanyima were working on the aforementioned cookstove projects of the World Bank and the Green Charcoal Project in Uganda and together with representatives of the Dutch research institute ECN studied this problem in more detail. Dr. Maxwell Otim Onapa fully acknowledged the problem and agreed to discuss this further internally. Consequently this CTCN application was drafted and discussed within the Uganda National Council for submission to the CTCN.

Expected timeframe:

Phase I,
2 months from date of contract. This includes reviewing international literature and contacting experts in order to quantify the benefits of making use of solar systems and improved cookstoves.

Phase 2,
4 months from date of contract. This includes the on-the-ground analysis and comparison of existing mobile banking / PAYG systems and consumer acceptance and willingness to pay for these systems, at household level and social institutions.

In total it is expected that the project will take about 4 months.

Phase 3,
6 months from date of contract. Concept NAMA proposal for further discussions with the National government.

In total it is expected that the project will take about 6 months.

Background documents:

{Please list here relevant documents that will help the CTCN understand the context of the request and national priorities. For each document, provide weblinks if available, to attach to the submission form while submitting the request. Please note that all documents listed/provided should be mentioned in this request in the relevant question(s), and that their linkages with the request should be clearly indicated.}

[1] Energypedia.info Uganda Energy Situation

[1] Forests play a huge role in the carbon cycle on our planet. When forests are cut down, not only does carbon absorption cease, but also the carbon stored in the trees is released into the atmosphere as CO2 if the wood is burned or even if it is left to rot after the deforestation process.

[1] As an example, in Nigeria, diesel emissions from domestic generators surpass those from workplaces, trucks, and buses, and pose greater risks to human health and the environment due to proximity to homes and prolonged duration of use.

[1] http://www.illegal-logging.info/regions/uganda

CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

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Monitoring and impact of the assistance:

{Read carefully and tick the boxes below.}

☒ By signing this request, I affirm that processes are in place in the country to monitor and evaluate the assistance provided by the CTCN. I understand that these processes will be explicitly identified in the Response Plan in collaboration with the CTC, and that they will be used in the country to monitor the implementation of the CTCN assistance.

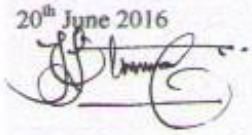
☒ I understand that, after the completion of the requested assistance, I shall support CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

Signature:

NDE name: Maxwell Otim Onapa

Date: 20th June 2016

Signature:



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

Need help? The CTCN team is available to answer questions and guide you through the process of submitting a request. The CTCN team welcomes suggestions to improve this form.

>>> Contact the CTCN team at ctcn@unep.org