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OFFICE OF EVALUATION AND INTERNAL OVERSIGHT

INDEPENDENT TERMINAL EVALUATION

Global

PROMOTING ACCELERATED TRANSFER AND SCALED-UP
DEPLOYMENT OF MITIGATION TECHNOLOGIES THROUGH THE
CLIMATE TECHNOLOGY CENTRE & NETWORK (CTCN)

UNIDO PROJECT ID: 140307
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Abbreviations and acronyms

Term	Definition
AOP	Annual Operating Plan
CERDoc	CEO Endorsement Request Document (for GEF grant funding approval)
COP	Conference of the Parties
CTCN	Climate Technology Centre and Network
DANIDA	Danish International Development Agency
DG DevCo	European Commission Directorate-General for International Cooperation and Development
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Center for Renewable Energy and Energy Efficiency
FY	Financial Year
GCF	Green Climate Fund
GEF	Global Environment Facility
CER	CEO Endorsement Request
GHG	Greenhouse Gas
KMS	Knowledge Management System
KOM	Kick Off Meeting
Kton	Kilo Tonne
NAMA	Nationally Appropriate Climate Action
MEPS	Minimum Energy Performance Standards
MSP	Medium Scale Project (of GEF)
NDE	National Designated Entity
PIR	Project Implementation Report (of GEF projects)
SC	Steering Committee
SNV	Netherlands Development Agency
SMART	Specific, Measurable, Achievable, Realistic and Time-bound
TA	Technical Assistance
TE	Terminal Evaluation
TOR	Terms of Reference
UNEP	UN Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNU	UN University

Glossary of evaluation-related terms

Term	Definition
Baseline	The situation, before an intervention, against which progress can be assessed.
Effect	Intended or unintended change due directly or indirectly to an intervention.
Effectiveness	The extent to which the development intervention's objectives were achieved or are expected to be achieved.
Efficiency	A measure of how resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention.
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention.
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations.
Logframe (logical framework approach)	A management tool used to facilitate the planning, implementation, and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results-based management) principles.
Outcome	The likely or achieved (short-term and medium-term) effects of an intervention's outputs.
Outputs	The products, capital goods, and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Relevance	The extent to which the objectives of intervention are consistent with beneficiaries' requirements, country needs, global priorities, and partners' and donor's policies.
Risks	Factors, generally outside the scope of an intervention, which may affect the achievement of an intervention's objectives.
Sustainability	The continuation of benefits from an intervention, after the development assistance, has been completed.
Target groups	The specific individuals or organizations for whose benefit an intervention is undertaken.
Theory of Change	A set of hypotheses on how and why an initiative works.

Executive Summary

Conclusions

TA projects were relevant to country stakeholders and contexts and largely coherent with other initiatives

The assistance offered by the CTCN in general, and in the TA projects implemented, was found to be suitably demand-based and relevant to the countries' efforts to promote climate technologies. The specific assistance provided to support concrete efforts through know-how transfer at the early stage of transition towards climate technologies was generally complementary to other forms of assistance. Some of the projects were also usefully linked to other UNIDO and/or CTCN related initiatives, such as the regional Coalition of the Circular Economy for Latin America and the Caribbean initiated in March 2020 by CTCN as a result of the project supported Circular Economy TA in four South American countries, and synergies with the UNIDO supported PFAN (Private Financing Network) capacity in the project supported ECOWAS Women Gender TA, and the links with the UNIDO supported Vietnam Cleaner Production Centre (VNCPC) for the inception and ongoing support of the project supported Vietnam Rice Valorisation TA.

Specified deliverables/outputs produced but limited links to results

The project has been well integrated in the operations of CTCN. The lean and well-organized way the CTCN operated has led to an efficient project implementation in the sense that the actual number of TA projects exceeded the planned figure and most of the foreseen outputs were produced to good quality. Some of the outputs produced, however, were of poor quality or not well documented, which demonstrates a certain room for improvement of quality control processes and knowledge management at the CTCN. The individual TA projects had specific outputs detailed in their response plans. But the response plans had little detail on how the TA project outputs were expected to link to outcomes and then how the outcomes were expected to link to specific GHG mitigation or adaptation impact.

Project ownership strong but too narrow to ensure continuity

Most of the TA projects were developed and implemented in close cooperation with the National Designated Entity (NDE) and one or a few other stakeholders who showed strong ownership of the cooperation with the CTCN. Most of TAs involved a stakeholder identification activity to identify and involve key stakeholders. The results of the TAs were generally shared with all the stakeholders involved in the project. However, project outputs were largely not sufficiently owned by the wider range of actors who would need to be actively involved to ensure the follow up and mobilization of national or international resources that would lead to the longer-term outcomes and impacts that were envisaged.

Insufficient resources for following up on outcomes and impact

Overall, the TA projects implemented under the GEF project were found to be satisfactorily relevant in the given contexts of partner countries. But the high relevance (average rating of 5.1 (Satisfactory) out of 6) did not always lead to a clearly demonstrable contribution towards impact (average rating of 4.3 (Moderately Unsatisfactory) out of 6). As a result of the lean operational model being followed, the CTCN did not have a suitable mechanism in place to follow up on the progress of developments after the technical assistance is completed. Hence, there is very little information available at the CTCN on how the different TA processes contribute to longer term outcomes and impacts. This limits the possibility to systematically learn from past projects and improve impact orientation in the future.

Need more integration with related activities, especially those of UNIDO and UNEP

Linkages of the CTCN TAs with other initiatives were generally found to be insufficient to ensure a likely significant lasting effect to the interventions. Even in countries with UNIDO

representation and ongoing UNIDO technical cooperation portfolios the possible synergies were often not exploited, which is largely due to the limitations of the very lean CTCN operational model, and partly due to the UNIDO involvement in CTCN not being well integrated with UNIDO's wider technical cooperation activities.

Recommendations

The following recommendations are made in full awareness of the current limitations of the CTCN's very lean business operational model. The evaluation team considers that these recommendations can be implemented within that business model to a certain extent, leading to useful improvements of the CTCN's results orientation. A review of the CTCN business model under the premise of "less is more", i.e., fewer, more carefully selected, with wider ownership and more closely followed up upon projects, would allow a deeper involvement in projects and would lead to a more impact oriented CTCN TA provision.

Strengthen national ownership

The CTCN should include a prerequisite in both TA request and response plans to demonstrate that most of the key national actors endorse the proposed work and will be involved in and contribute to the TA processes and critically, to its ongoing replication/impact phase post project end.

Focus on entire technology deployment cycle

Response plans prepared by CTCN contractors should include a clear description of the pathway for the produced outputs to be actually used and how a contribution towards impact is expected to materialize.

Integrate TA activities with related UNIDO initiatives

The CTCN should undertake more outreach to key actors at the country level, including, but not limited to, UNIDO field offices.

Establish a follow up mechanism on TA outcomes and impacts

The CTCN should establish a mechanism, for example a dedicated position at the CTCN, to follow up on past CTCN supported TA projects and collect and record information on relevant TA websites on the CTCN supported TA project's outputs and outcomes and their contributions towards impact - including in particular their contributions post individual TA projects' end.

Provide 2nd stage support for most promising projects

The CTCN should consider establishing a facility for 2nd stage support for those projects that show good potential for impact. This could come under a new "less is more" approach, where slightly fewer TA projects are supported, but some targeted funding would be available to support the development and processing of the most promising projects to GCF or GEF or other multilateral or bilateral donors. This could target about 20-30% of projects to receive additional funding of approximately 20-50% of the original TA amount, to be balanced by a slightly reduced number of TA projects supported.

Lessons Learnt

Too lean a business model leads to unknown results and limited learning

There is an intrinsic trade-off between having a lean business model (as per CTCN operations) and the ability to capture TA results and the ability to learn from past experiences. As the case of the CTCN has shown, a lean business model that primarily focuses on efficient delivery of technical assistance can have limitations in defining results and faces limitations in learning from past experience as the necessary data is not captured. An organization that does not

learn from past mistakes or success is at risk of then investing resources in a non-effective way.

Small TA projects need broad ownership for impact

Small short-term technology support projects (as were supported by the UNIDO-GEF CTCN project) require broad national and donor ownership for the specific TA outputs to be supported towards sustainable outcomes to then ensure that contributions towards impact are achieved. Small technical assistance projects can make important contributions towards impact if outputs (e.g., studies, policies, feasibility assessments, etc.) are then used by relevant key actors, supporting existing partnerships for change.

1. Introduction

1.1 Evaluation objectives and scope

This Terminal Evaluation (TE) was commissioned to evaluate the UNIDO-GEF project titled “Promoting Accelerated Transfer and Scaled-up Deployment of Mitigation Technologies through the Climate Technology Centre & Network (CTCN)”; UNIDO Project ID: 140307, GEF Project ID: 5832; (the project). This TE covers the whole duration of the project from its start date up to the date of the terminal evaluation report. The TE assesses project performance for each of the ten (10) supported TA projects against the six (6) standard DAC project performance evaluation criteria of: relevance, coherence, effectiveness, efficiency, sustainability, and progress to impact plus the extra UNIDO criteria of project design. The UNIDO criteria of cross cutting performance; and performance of partners are assessed for the overall project as these are project-wide assessment criteria. All evaluation aspects are rated on the UNIDO six-point rating system. The evaluation was carried out by an evaluation team composed of Frank Pool (Team Leader) and Johannes Dobinger (Team Member) on the basis of the TE terms of reference¹.

A separate evaluation led by UNEP is underway to evaluate the wider CTCN programme. Evaluations of CTCN were undertaken for UNEP, UNFCCC, DANIDA and EU DevCo from 2015 to 2018. However, these evaluations were high level and thematic, not focused on the genesis, implementation and results of individual technical assistance projects, such as those supported by the UNIDO-GEF CTCN project.

This independent terminal evaluation (TE) focused in particular on the scope and purpose of the specific UNIDO-GEF CTCN project, in the context broader work of CTCN. As per best practice evaluation norms, the evaluation was undertaken by experts who have had no prior involvement with the UNIDO-GEF CTCN project or with CTCN. Due to ongoing COVID-19 travel related limitations, no field visits were undertaken for this evaluation. The evaluation team instead conducted video web-based interviews with key stakeholders, including those for some of the countries involved in the project activities.

A mixed methods evaluation approach was followed. An extensive range of project documents held by UNIDO/CTCN and available from open sources were gathered, sorted by project and date, reviewed, and collated in project-based summaries for all ten of the projects supported under the UNIDO-GEF CTCN project. This individual project-based analysis provides the primary evidence base of this evaluation. The summaries can be found in Annex 3. The assessment of all ten (10) specific UNIDO-GEF CTCN projects is the core analytical tool used in the development of the project’s evaluation findings, conclusions, and recommendations in the following sections.

The ten UNIDO-GEF CTCN funded projects were either studies or capacity building focused, and as such were each focused on a set of outputs/deliverables. Considerations about expected outcomes or impacts were limited in both the designs and the monitoring for each of the ten projects. Therefore, the evaluation has focused on the following aspects of the ten projects:

¹ <https://www.unido.org/resources-evaluation-and-internal-oversight-evaluation/terms-reference-ongoing-and-past-evaluations>

- how the scope of the Request Submission Forms made by the relevant NDEs had evolved by the TA Response Plan stage
- how the project implementing agency was chosen and their relevant skills and experience (or not) for the TA assignment
- how the project outputs (deliverables) matched those envisaged in the respective response plans
- the linkages (or not) with other relevant UNIDO activities in the same country or area of activity
- whether the post TA status of follow-on activities or subsequent projects was known
- the likelihood that project outputs/deliverables will lead to useful follow-on activities
- the likelihood that projects activities/deliverables will lead to sustainable results

These assessments at the ten projects level have then informed the assessment of the wider UNIDO-GEF CTCN project under its evaluation criteria headings along with the drawing of conclusions, lessons learned, and recommendations with a particular focus on GEF, UNIDO and CTCN balances of the leanness of CTCN overheads with: a potential weakness in value adding; KM (Knowledge Management) capture and dissemination of post intervention results; and facilitating post intervention additional donor support for follow-on project activities where this would be justified.

Table 1: UNIDO Evaluation Rating Scale Used

Score		Definition*	Category
6	Highly satisfactory	Level of achievement presents no shortcomings (90% - 100% achievement rate of planned expectations and targets).	SATISFACTORY
5	Satisfactory	Level of achievement presents minor shortcomings (70% - 89% achievement rate of planned expectations and targets).	
4	Moderately satisfactory	Level of achievement presents moderate shortcomings (50% - 69% achievement rate of planned expectations and targets).	
3	Moderately unsatisfactory	Level of achievement presents some significant shortcomings (30% - 49% achievement rate of planned expectations and targets).	UNSATISFACTORY
2	Unsatisfactory	Level of achievement presents major shortcomings (10% - 29% achievement rate of planned expectations and targets).	
1	Highly unsatisfactory	Level of achievement presents severe shortcomings (0% - 9% achievement rate of planned expectations and targets).	

Note: * For impact, the assessment will be based on the level of *likely* achievement, as it is often too early to assess the long-term impacts of the project at the project completion point.

1.2 Overview of the project context

The Climate Technology Centre and Network (CTCN) was formed as a new institution - following a decision of the 16th UNFCCC (UN Framework Convention on Climate Change) COP (Conference of the Parties) meeting held in Cancun in December 2010 to establish a Technology Mechanism to accelerate the transfer of climate change mitigation and adaptation technologies to developing countries.

The CTCN was established to help developing countries remove barriers hampering technology transfer, including limited technological, financial, and institutional capabilities, inadequate government policies and regulations, limited access to information, and a lack of necessary infrastructure.

At COP 17 in Durban, the GEF (Global Environmental Facility) was requested to support the operationalization and activities of the CTCN.

Following competitive bidding, COP 18 in Doha decided that the CTCN would be hosted by UNEP through a consortium to be co-led by UNIDO. A MoU to formalize the hosting of the CTCN was made between UNEP and the UNFCCC on 22 February 2013. However, the new CTCN programme did not come with any allied funding. Therefore, UNIDO and UNEP mobilized funding support from various donors and various funding mechanisms to support their practical support work hosting the CTCN. A total of USD62 million had been pledged to CTCN by the end of 2019 (per the CTCN 2019 Annual Operating Plan (AOP)).

The CTCN has three main functions:

1. Management of requests and responses in the technology cycle
2. Fostering collaboration to accelerate technology transfer
3. Strengthening networks, partnerships and capacity building for technology development and transfer, and collaboration to accelerate technology transfer.

The CTCN has an outreach and awareness programme and a knowledge management system (KMS) for learning and enhanced response quality. The CTCN is based in Copenhagen. The CTCN operates through a network of 633 consortium and knowledge partners.

Following a request from a National Designated Entity (NDE) focal point being accepted, the CTCN provides technical assistance of up to USD250,000 per project to access the expertise of technology organizations from both developed and developing countries.

A UNIDO-GEF CTCN project (GEF Project ID 5832 and UNIDO Project ID 120444) was formulated under the GEF-5 cycle and was developed from 2014. The USD1.8 million GEF Trust Fund financed project was approved by the GEF CEO in June 2015. Project implementation started in July 2015 for a then envisaged 36 months. The revised expected financial closure date was 30 June 2021, and the completion date is now 31 December 2021.

1.3 Overview of the project

In the approved UNIDO-GEF CTCN project design (the Request for (GEF) CEO Approval - CER), the majority of the project's budget (USD1.4 million of the USD1.8 million of GEF funding) was allocated in Component 1 to provide TA assistance to developing countries for scaled up deployment of climate technology measures. The targets in the GEF CER's project results framework were seven (7) technologies demonstrated², transferred, and with 490 kton (direct) and 1,500 kton (indirect) CO₂eq avoided GHG emissions, and three (3) follow-up GEF proposals developed.

There was also USD250,000 allocated to establishing partnerships in Component 2, USD124,000 allocated for networks and capacity building in Component 3, and USD26,000 allocated for monitoring and evaluation, including for this terminal evaluation (TE), in Component 4.

The UNIDO-GEF CTCN project has provided TA support to the following ten (10) specific projects (with total project-based expenditure of USD1,348,510 as below - and USD1,398,549 as per the GEF project's FY 2019 PIR) - as follows:

1. [Mali: Renewable energy use for food processing](#) - Completed 2016 – USD42,525 GEF funding
2. [Uganda: Geothermal energy](#) - Completed 2016 – USD143,470 GEF funding, plus USD50,000 funding from other sources
3. [Vietnam: Bio-waste valorization](#) - Completed 2017 – USD206,838 GEF funding
4. [Dominican Republic: Energy-efficient lighting](#) - Completed 2018 – USD195,358 GEF funding
5. [Chile: Replacement F-refrigerants](#) - Completed 2018 – USD72,229 GEF funding
6. [ECOWAS: Mainstreaming Gender Energy System](#) - Completed 2018 – USD119,425 GEF funding
7. [Zimbabwe: industrial energy efficiency](#) - Completed 2018 – USD158,656 GEF funding
8. [Paraguay: Environmental flows and river basin management](#) - Completed 2019 – USD124,828 GEF funding
9. [Gambia: Organic waste for Energy](#) - Completed 2019 – USD140,749 GEF funding
10. [Brazil, Chile, Mexico, and Uruguay: Circular Economy](#) – Completed August 2021 - – USD144,432 GEF funding plus USD36,108 other funding (as at 30 June 2021)

Total GEF project funding of USD1,738,702 had been expended by 30 June 2020 according to the latest available UNIDO GEF-CTCN project FY 2019 PIR (Project Implementation Report).

² Of the seven (7) initial selected county requests mentioned in the UNIDO-GEF CTCN project's Request for (GEF) CEO Approval, related projects in five (5) countries (Chile, Dominican Republic, Mali, Uganda, and Vietnam) were in the event supported by the UNIDO-GEF CTCN project.⁴

1.4 Limitations of the evaluation

The five key limitations to this terminal evaluation were: (1) the lack of in person evaluation mission visits and the consequential inability to talk to some key respondents; (2) limitations on the information and data provided to the evaluation team; (3) challenges in linking higher-level outcomes and impacts with immediate outputs; unavailability of project stakeholders as some of the projects ended some years ago and (5) potential response bias on the part of respondents.

Response bias is a challenge inherent in all evaluations. To mitigate this challenge, the evaluation team carefully compared answers from respondents with other respondents' responses and other sources of information, including those that could be found in internet searches.

2. Findings

The findings described in this section are primarily based on an analysis of the ten (10) technical assistance projects carried out within the overall GEF project. Table 2 below summarizes the assessment of these projects. The full table of findings by project and evaluation criteria can be found in Annex 3. The full description of each project and its analysis by evaluation criteria can be found in Annex 4.

Project ratings

Table 2: Summary Findings by TA Project and Evaluation Criteria

Project	Progress to Impact	Project design	Relevance	Effectiveness	Efficiency	Sustainability	Coherence
Mali: RE for food processing	5	5	5	5	5	4	5
Uganda: Geothermal energy	5	5	5	5	5	5	6
Vietnam: Bio-waste valorization	5	5	5	5	5	6	5
Dominican Republic: EE lighting	2	5	5	4	5	2	4
Chile: Replacement F-refrigerants	4	5	5	4	5	4	5
ECOWAS: Mainstreaming Gender	5	5	5	5	5	5	5
Zimbabwe: industrial EE	4	4	5	4	5	4	5
Paraguay: Env. flows & river basin management	5	5	6	5	6	5	5
Gambia: Organic waste for Energy	4	5	5	4	5	5	5
Brazil, Chile, Mexico & Uruguay: Circular Economy (CE)	4	5	5	5	5	5	5
Average Rating	4.3	4.9	5.1	4.6	5.1	4.5	5

2.1 Progress to impact

Did the project achieve, or is likely to achieve, the expected results in terms of climate change mitigation, adaptation, and the accelerated uptake of climate technologies?

There is a wide range of progress to impacts for the 10 projects, with ratings ranging from 2 (unsatisfactory) to 5 (satisfactory). The projects in Mali, Uganda, Vietnam, ECOWAS, and Paraguay appear likely to provide significant ongoing climate change benefits. The ongoing climate change benefits of the Dominican Republic, Chile, Zimbabwe, Gambia and Brazil-Chile-Mexico-Uruguay regional CE projects range from limited in the Dominican Republic TA to moderate in the other TAs. It remains possible that the Chile, Gambia and Zimbabwe projects may have led or may be likely to lead to enhanced impacts over their current ratings but that there is just a lack of suitable progress to impact information available, so the best

that can be said is that their progress to impact remains unclear pending further information. However, it should be noted that the GEF funded TA activities were by their nature indirect and hence expecting significant specific impacts was not very realistic.

In terms of direct GHG mitigation impacts, the expected direct GHG benefits in the project design over the initiative's lifetime were 490,000 tons CO₂eq and the indirect GHG benefits totaled 1,500,000 tons CO₂eq.

The actual direct GHG mitigation impacts of the project are something like 15 tonnes of charcoal briquettes equivalent to 90 tons CO₂eq (annually 60 tonnes/year charcoal and 360 tonnes CO₂eq/year) produced in The Gambia TA project and around 450 tonnes CO₂eq/year in the three (separately to the TA or UNIDO or PFAN) funded (as of June 2021) Waste Transformers 50-100kWe containerized biogas units in Freetown, Cote d'Ivoire from the ECOWAS TA project. At the full scale up levels in follow on projects (if and when they eventuate) 20,000 tonnes of charcoal briquettes the direct project GHG mitigation results would be equivalent to 120,000 tonnes CO₂eq/yr in the Gambia and 45,000 tonnes/yr CO₂eq in Sierra Leone.

In terms of the investment mobilized for climate technology transfer and deployment of USD5.5 million expected in the project design, it was reported in the FY2020 PIR (Project Implementation Report – for the year to June 2020) that - following the Technical Assistance in Mali - investment through ARAA (Agence Régionale pour l'Alimentation et l'Agriculture) amounting to EUR 333,337 was leveraged. The potential leverage in The Gambia project is USD2 million, according to the Concept Note for a scale up project produced by the implementing agency for GCF funding in March 2019. For the Sierra Leone biomass project that received project funded PFAN support under the ECOWAS TA, the project proponent of Waste Transformers (NL) has advised (in June 2021) that around EUR 1.8 million has been invested to date and that the raising of USD25 million full project funding is continuing apace.

There appear to be direct GHG mitigation impacts attributable from the Vietnam project, but the exact amounts attributable to the project remain unknown.

In terms of climate change adaptation, the ECOWAS and Paraguay projects have strong links to ongoing climate change adaptation, albeit indirectly for the Paraguay TA.

Taking into account that most of the projects were focusing on the early stages of technology transfer (policy making, feasibility, decision making tools, etc.) some moderate direct impacts on GHG emission reductions appear to have been achieved by the project. With regards to indirect GHG emission reduction impacts, the available information does not allow the evaluation team to come to any robust conclusions, but it can be said that all the ten (10) project funded interventions are linked to the accelerated uptake of climate technologies to some degree.

Average Rating 4.3 out of 6 (Moderately Satisfactory)

2.2 Project design

Was the project design clear, with suitable links from outputs to outcomes to impacts, and able to be implemented broadly as anticipated?

The project design is taken as being encapsulated in the GEF CEO Endorsement Request that was agreed and signed in June 2016.

2.2.1 Overall and TA design

The overall project design had a suitable coverage and description of key issues, problem statement, and components, outputs/activities, outcomes and expected impacts.

A deficiency in the overall project design was a lack of linkages to mechanisms and/or funding for follow-on support for specific technical assistance (TA) projects.

The lack of project follow-on support (as per the overall project's design) can be seen from the 10 TA projects having mostly met their specified deliverables (outputs) which are generally available on the project links on the CTCN website, but with generally no information on the website on the current status/outcomes/impacts/follow-on project status of the TA project interventions. There may be more positive longer-term results arising from the TA supported activities than were found in this assessment, but there is no current tracking system to ascertain such longer-term results as this was not part of the overall projects' design approach.

Interviewing the relevant CTCN staff and reviewing the data available on the relevant parts of the CTCN website, it is clear that CTCN staff were not sufficiently well resourced to follow up on the specific assistance projects post individual TA project closure. So, in that sense the project design's M&E framework was inadequately resourced to monitor beyond deliverables/outputs and hence the design's M&E framework was not sufficiently resourced for the CTCN to capture individual TA project outcomes and progress toward impact once the deliverables/outputs were delivered and the individual TA projects' implementation were closed. This is an issue that goes beyond this UNIDO-GEF project, as the CTCN was explicitly established to be lightly resourced to minimise project overheads, with a result that very little is known about the post-project end related outcomes and progress towards impacts of CTCN supported interventions. This limits the CTCN's capacity to provide feedback to partners on effects and impacts and it also limits the possibility to learn from the projects' implementation.

The TA projects were designed through a response plan based on the original project requests. This was not part of the original, overall project design. However, the analysis showed that most of the specific TA project designs were based on a solid analysis of the TA related issues in the countries concerned and included a description of the expected deliverables. This then provided a sound basis for CTCN partners (contractors) to carry out their work.

Rating 4.9 out of 6 (Satisfactory)

2.2.2 Logframe

The Logical Framework (Logframe) had suitable objectives, components, outcomes, outputs/activities, indicators, targets and means of verification. If the follow-on/M&E component had been better resourced, then the Logframe would have enabled the project results to be better captured and to be better quantified.

Rating 5 out of 6 (Satisfactory)

2.3 Project performance

2.3.1 Relevance

Were the project objectives and approach relevant for the evolving international climate architecture and climate technology developments?

The project objectives and approach were, and still are, extremely relevant to the international climate architecture which remains the architecture of the Paris Agreement of 2015-2016 - and hence country driven via NDCs (Nationally Determined Contributions) with increasing ambition. A key component of the Paris Agreement is the transfer of clean technology and knowledge, and the UNIDO-GEF project was established precisely to address this need via CTCN which was established by the UNFCCC explicitly to address this issue.

CTCN had raised USD62 million by the end of 2019 from multiple donors. The CTCN operating through 633 consortium and knowledge partners is also positive for its relevance.

The TA projects covered by the overall project were in most cases evaluated to be very relevant in the given country contexts (see overview table 2 and Annexes 3 and 4) and all projects rated between 4 and 6 out of 6, so all ten projects were rated to be Satisfactory in term of their relevance.

Average Rating: 5.1 out of 6 (Satisfactory)

2.3.2 Effectiveness

Has the project met its climate change and development output and outcome objectives?

The project has been very effective in meeting its numerical target of climate technology assistance requests met with five of the original seven requests funded and successfully completed, and five new more relevant projects sourced, supported and completed to replace the two originally envisaged projects that were not supported. The ten supported projects were all rated as “Satisfactory” in terms of their relevance and the results generally met the expected results of the requesting country requests for assistance. The actual expenditure on the main TA assistance component was very close to the budgeted USD1.4 million. So, in inputs (USD) and outputs (project numbers, relevance and deliverables) terms the project was successful.

Where the project has more questionable effectiveness, is in the translation of outputs into outcomes and progress towards impacts, where there is generally a lack of clear data. This is not to say that the desired outcomes and progress towards impacts was not achieved, but rather to say that the funding of this area was too low to say for sure what was achieved. This lack of ongoing support, M&E, and data of outcomes and progress towards impacts is intrinsic in the CTCN mode of operation with its strong focus on a lean implementation model and low “overheads”.

In some of the TA projects analysed, concrete contributions to impact can be assumed (e.g., in the case of the Uganda geothermal energy policy), while in others the rather small CTCN projects were possibly not adding much incremental value to other ongoing work in the same popular TA area that was already being supported by multiple donors and in-country efforts (e.g., the Circular Economy regional project in Chile and Uruguay), although in Brazil the Circular Economy project had wide stakeholder involvement and in Mexico the CE project led to a follow on separately funded TA to update the CE Law. Overall, it seems that the more specific feasibility studies (e.g., Vietnam and Gambia) or policy development (e.g., Uganda, ECOWAS and Paraguay) was, the more effective the TA projects were. The effectiveness of individual TA projects is highly variable, ranging from 4 (Moderately Satisfactory) for four projects to 5 (Satisfactory) for six projects.

Average Rating: 4.6 out of 6 (Between Moderately Satisfactory and Satisfactory)

2.3.3 Efficiency

How effectively were resources used to deliver results in an economic and timely way?

The project was efficient in utilising its USD1.4 million budget (of the USD1.8 million total budget) for technical assistance (component 1) to implement ten projects instead of the projected seven projects. The five new projects were at least as relevant and potentially as impactful as the Colombia and Senegal project proposals that in the end did not receive UNIDO-GEF CTCN project support. Hence, in numerical terms, ten projects were supported instead of the originally envisaged seven projects, serving as an indicator of the efficient use of project funding. From the point of view of assisting 8 countries and working in 2 regions this is also a sign of the project being effective in fulfilling the mandate to spread its support as widely as possible.

In terms of timeliness, the project’s implementation start date was May 2015 although active implementation really started at its first steering committee meeting in September 2015, and the project was essentially completed in December 2020 which was the last date for circular economy project deliverables. Hence the actual project duration can be taken as May or September 2015 to December 2020 or 67-63 months duration. This can be compared with the originally envisaged 36 months project duration. The impact of the Covid-19 pandemic would have added at least three months to the project duration as travel and in-person meeting restrictions delayed stakeholder meetings for the circular economy project as the meeting had to be shifted to virtual meetings. Another cause of project implementation delays was the high turnover of relevant UNIDO staff. In CTCN, there were also capacity constraints, for example

the LAC team in 2019 had five (5) members, while in the beginning of 2020 it only had two (2) consultants (the CTCN LAC regional manager also left and was not replaced until Nov 2020).

In terms of efficiency of turning monetary inputs into useful outputs at an individual project level, there are two projects with low ratings of 2 (Unsatisfactory) and 3 (Moderately Unsatisfactory), and four projects with a rating of 5 (Satisfactory).

Average Rating: 5.1 out of 6 (Satisfactory)

2.3.4 Sustainability of benefits

Are the funded TA projects likely to lead to results that will continue to provide benefits?

The sustainability of benefits was very variable with ratings ranging from 2 (Unsatisfactory for the Dominican Republic TA) to 6 (Highly Satisfactory for the Vietnam TA). It is likely that five of the projects (Uganda, Vietnam, ECOWAS, Paraguay, and Gambia will provide ongoing climate change benefits. The Brazil-Chile-Mexico-Uruguay project has led to ongoing efforts (in Brazil, in another TA to provide inputs to the CE law in Mexico and for the exploration of a CR platform for LAC region by CTCN). However, ongoing climate change benefits of four projects (Mali, Dominican Republic, Chile, and Zimbabwe are much less likely. The factor leading to an average rating of 4.5 out of 6 (Between Moderately Satisfactory and Satisfactory) is that post project end results have generally not been gathered nor not recorded on project websites. The countries involved may be following up on the specific TA benefits, but CTCN has no systematic way of gathering this information or recording it. The high UNIDO and CTCN staff turnover meant that accessing the CTCN institutional knowledge of the individual 10 TA's sustainability of benefits has been even more of a challenge.

Overall, the project's strategy to embed the technical assistance in wider initiatives in the target countries helped sustainability where follow on funding was an objective. In some policy or capacity building oriented projects, such as in Uganda, ECOWAS and Paraguay, securing follow on funding was not a key objective. However, several projects showed little signs of follow-on investments or funding for larger scale initiatives. In particular those projects that aimed at mobilizing funding (e.g., from the Green Climate Fund) required more follow up on funding success.

Average Rating: 4.5 out of 6 (Between Moderately Satisfactory and Satisfactory)

2.3.5 Coherence

Was the project's work compatible with other climate related initiatives and policies in and for developing countries?

The project is clearly coherent with the prevailing Paris Agreement climate change architecture approach, the strong focus on clean technology and knowledge transfer in the Paris Agreement, and the UNFCCC establishment of CTCN and the request to GEF to support CTCN.

In principle, the CTCN provides assistance that can be regarded as complementary and thus coherent with other forms of climate cooperation as it is a flexible and well-structured mechanism for solving, in a demand-based way, concrete problems at the early stages of the transition to climate technologies.

The GEF CTCN project fitted well in the CTCN overall programme and was coherent with other CTCN interventions.

The lean approach of the CTCN provides resources that are not always sufficient for coordinating projects with those of other actors. This includes even the initiatives of the CTCNs implementing agencies UNIDO and UNEP in the countries of coverage.

This lean CTCN project management approach has led to some projects with lower coherence such as the Dominican Republic energy efficient lighting project where the coherence was only rated at 4 (Moderately Satisfactory) on the 6-point rating scale. However, eight of the projects were rated at 5 (Satisfactory) and one project (Uganda geothermal) was rated as 6 (Highly Satisfactory).

Average Rating: 5 out of 6 (Satisfactory)

2.4 Cross-cutting

The extra UNIDO criteria of cross cutting performance and performance of partners are assessed for the overall project as these are project-wide assessment criteria.

- *Was the project suitably aligned with gender, environment, and socio-economic goals?*
- *Did the project have a suitable M&E framework to capture project results and adapt for changing circumstances?*
- *Was a Results-based Management approach used?*

2.4.1 Gender mainstreaming

In terms of gender perspectives, the intervention was classified in its design as a project with “limited gender dimensions” according to the UNIDO Project Gender Categorization Tool. However, in practice the project supported two strongly women focused projects in the Gambia and ECOWAS which led to tangible ongoing sustainable projects on the ground that employ and benefit women. Gender disaggregated data is available on participation in training and capacity building activities undertaken by most of the 10 projects supported by the UNIDO-GEF CTCN.

Rating 5 out of 6 (Satisfactory)

2.4.2 M&E

The planned M&E aspects of the project design were limited in scope and had no allocated GEF funding beyond this terminal evaluation exercise. There was also minimal UNIDO allocated funding (as per the project design) for the project scale and complexity of seven

planned (and ten actual) TA projects to be initiated and supported. This lack of allocated resources was not helped by the CTCN then being very lean in terms of staff resources, by design. The project end point then logically follows with the ten project's deliverables being available on the CTCN website, but post project outcomes and progress towards impacts not having been gathered and not being systematically available. In some cases, there were relevant positive results and follow-on activities available in other parts of the CTCN website, but these were not linked to the specific project part of the CTCN website. In other cases, the positive results and follow-on activities were personally known to relevant CTCN staff but did not seem to have been recorded in a systematic way for their successor staff. Hence this terminal evaluation has struggled to ascertain what the outcomes and progress towards impacts on the ten projects that accounted for USD1.4 million of the project's USD1.8 million funding.

Rating 3 out of 6 (Moderately Unsatisfactory)

2.4.3 Results-Based Management (RBM)

The project followed RBM approaches to the extent of producing the desired number of relevant and suitable quality outputs within the budget and based on suitable nationally generated requests for TA support in the desired climate change mitigation and adaptation areas. The expected results of the project interventions are well described in the assistance requests and response plans.

However, the project did not follow RBM approaches in that the links to outcomes and progress towards impact were generally not supported or recorded during the technical assistance supports, nor were the post technical assistance project outcomes and progress towards impacts followed up on and recorded.

Rating 4 out of 6 (Moderately Satisfactory)

2.5 Performance of partners

How did the project partners perform during the project's implementation?

2.5.1 UNIDO

The UNIDO performance during the project's implementation exceeded the expected numerical number of TA support projects (ten versus seven) within the specified budget, selected and managed suitable implementing agencies, and managed the projects to produce suitable deliverables (outputs), and made the project deliverables publicly available through the CTCN website.

However, the UNIDO performance was undermined by the project taking 63-67 months to implement instead of the scheduled 36 months, partly by a high turnover of UNIDO staff assigned to the project. There was also a noticeable general lack of integration of project TA

activities to relevant UNIDO efforts in the countries in question, such as reducing the ODP of refrigeration gases used in agro-industry cooling in Chile, and the promotion of the circular economy concept in Latin American countries. And finally, there is the lack of UNIDO provided ongoing promotion of links of project outputs to outcomes and progress towards impact.

Rating 5 out of 6 (Satisfactory)

2.5.2 National counterparts

The national counterparts in the first instance were the project proponents and the NDEs that endorsed the project concepts and then endorsed the response plans. The necessary national bodies supported the individual project implementations as required, and there was suitable attendance at capacity building events.

It should be noted though, that the participation of a wider range of counterparts in the CTCN TA process would be required in order to ensure improved effectiveness, impact and sustainability of the individual projects. Due to the small size and intrinsically catalytic role of CTCN TA projects, enhanced linkages to ongoing, wider multi-stakeholder partnerships, would better ensure long term effects.

Rating 5 out of 6 (Satisfactory)

2.5.3 Donor

Following the COP decisions requesting GEF to support the operationalisation and activities of the CTCN extensive discussions resulted in a PIF (Project Identification Form) was developed and approved in June 2014 for formal submission to GEF in April 2015. The PIF was for a UNIDO-GEF medium scale project aiming for USD1.8 million of GEF funding support that would support seven already pre-identified CTCN TA requests. A subsequent UNIDO-GEF CTCN project Request for (GEF) CEO Endorsement was signed by UNIDO in June 2015. Hence it appears that GEF, as the donor, engaged with the UNFCCC request to support CTCN operations, and working with UNIDO that a suitable project was developed, approved and funded. However, the project had too little funding allocated to ensure translation of outputs into outcomes and to document progress towards impacts.

Rating 5 out of 6 (Satisfactory)

2.6 Overall assessment

Based on the project performance and progress towards impact, the overarching assessment of the project across its 13 criteria is that it has been mostly successfully implemented,

Overall Rating 4.65 out of 6 (Between Moderately Satisfactory and Satisfactory)

3. Conclusions and recommendations

3.1 Conclusions

3.1.1 TA projects were relevant to country stakeholders and contexts and largely coherent with other initiatives

The assistance offered by the CTCN in general, and in the TA projects implemented, was found to be suitably demand-based and relevant to the countries' efforts to promote climate technologies. The specific assistance provided to support concrete efforts through know-how transfer at the early stage of transition towards climate technologies was generally complementary to other forms of assistance. Some of the projects were also usefully linked to other UNIDO and/or CTCN related initiatives, such as the regional Coalition of the Circular Economy for Latin America and the Caribbean initiated in March 2020 by CTCN as a result of the project supported Circular Economy TA in **four** South American countries, and synergies with the UNIDO supported PFAN (Private Financing Network) capacity in the project supported ECOWAS Women Gender TA, and the links with the UNIDO supported Vietnam Cleaner Production Centre (VNCPC) for the inception and ongoing support of the project supported Vietnam Rice Valorisation TA.

3.1.2 Specified deliverables/outputs produced but limited links to results

The project has been well integrated in the operations of CTCN. The lean and well-organized way the CTCN operates has led to an efficient project implementation in the sense that the actual number of TA projects exceeded the planned figure and most of the foreseen outputs were produced to good quality. Some of the outputs produced, however, were of poor quality or not well documented, which demonstrates a certain room for improvement of quality control processes and knowledge management at the CTCN. The individual TA projects had specific outputs detailed in their response plans. But the response plans had little detail on how the TA project outputs were expected to link to outcomes and then how the outcomes were expected to link to specific GHG mitigation or adaptation impact. Some of the TA projects had reasonable logical links, but in many project the links were too general to be useful or were missing or were ignored. However, the GEF funded TA activities were by their nature indirect and hence expecting significant specific impacts was not very realistic during the GEF funded project's implementation period.

3.1.3 Project ownership strong but too narrow to ensure continuity

Most of the TA projects were developed and implemented in close cooperation with the National Designated Entity (NDE) and one or a few other stakeholders who showed strong ownership of the cooperation with the CTCN. Most of TAs involved a stakeholder identification activity to identify and involve key stakeholders. The results of the TAs were generally shared with all the stakeholders involved in the project. However, project outputs were largely not sufficiently owned by the wider range of actors who would need to be actively involved to ensure the follow up and mobilization of national or international resources that would lead to the longer-term outcomes and impacts that were envisaged.

3.1.4 Insufficient resources for following up on outcomes and impact

Overall, the TA projects implemented under the GEF project were found to be satisfactorily relevant in the given contexts of partner countries. But the high relevance (average rating of 5.1 (Satisfactory) out of 6) did not always lead to a clearly demonstrable contribution towards impact (average rating of 4.3 (Moderately Unsatisfactory) out of 6). The project support model

was explicitly designed (as per the wider CTCN operational model being followed) to be very lean in its resourcing, with USD1.4 million allocated towards TA support of specific projects out of a total GEF budget of USD1.8 million. As a result of the lean operational model, the CTCN did not have a suitable mechanism in place to follow up on the progress of developments after the technical assistance is completed. Hence, there is very little information available at the CTCN on how the different TA processes contribute to longer term outcomes and impacts, as can be seen for the low average ratings for Progress to Impact (34.3), Effectiveness (4.6) and Sustainability (4.5), which are partly due to a lack of information available to evaluate these aspects of the TA projects. This limits the possibility to systematically learn from past projects and improve impact orientation in the future. The lean operations approach has an important trade-off in terms of evidence-based learning from technical assistance projects, as it tends towards just completing the project and not following up on post-project sustainability options and not capturing post project end results.

3.1.5 Need more integration with related activities, especially those of UNIDO and UNEP

Linkages of the CTCN TAs with other initiatives were generally found to be insufficient to ensure a likely significant lasting effect to the interventions. Even in countries with UNIDO representation and ongoing UNIDO technical cooperation portfolios their possible synergies were often not exploited, which is largely due to the limitations of the very lean CTCN operational model, and partly due to the UNIDO involvement in CTCN not being well integrated with UNIDO's wider technical cooperation activities.

3.2 Recommendations

The following recommendations are made in full awareness of the current limitations of the very lean CTCN business operational model. The evaluation team considers that these recommendations can be implemented within that business model to a certain extent, leading to useful improvements of the CTCN's results orientation. A review of the CTCN business model under the premise of "less is more", i.e., fewer, more carefully selected, with wider ownership and more closely followed up upon projects, would allow a deeper involvement in projects and would lead to a more impact oriented CTCN TA provision.

3.2.1 Strengthen national ownership

The CTCN should include a prerequisite in both TA request and response plans to demonstrate that most of the key national actors endorse the proposed work and will be involved in and contribute to the TA processes and critically, to its ongoing replication/impact phase post project end³.

3.2.2 Focus on entire technology deployment cycle

Response plans prepared by CTCN contractors should include a clear description of the pathway for the produced outputs to be actually used and how a contribution towards impact is expected to materialize.

³ However, this would lead to somewhat longer lead times developing individual TA implementation plans, and ongoing changes in government and related staffing and structures would not guarantee success in every case. At the response plan development stage, not all countries know what actions could be taken or how to articulate how project outputs would link to and support other relevant projects or initiatives as every national stakeholder will have their own interests. However, the assessment of the evaluation is that this is an area where greater focus would be beneficial in CTCN operations going forward.

3.2.3 Integrate TA activities with related UNIDO initiatives

The CTCN should undertake more outreach to key actors at the country level, including, but not limited to, UNIDO field offices.

3.2.4 Establish a follow-up mechanism on TA outcomes and impacts

The CTCN should establish a mechanism, for example a dedicated position at the CTCN, to follow up on past CTCN supported TA projects and collect and record information on relevant TA websites on the CTCN supported TA project's outputs and outcomes and their contributions towards impact - including in particular their contributions post individual TA projects' end.

3.2.5 Provide 2nd stage support for most promising projects

The CTCN should consider establishing a facility for 2nd stage support for those projects that show good potential for impact. This could come under a new "less is more" approach, where slightly fewer TA projects are supported, but some targeted funding would be available to support the development and processing of the most promising projects to GCF or GEF or other multilateral or bilateral donors. This could target about 20-30% of projects to receive additional funding of approximately 20-50% of the original TA amount, to be balanced by a slightly reduced number of TA projects supported.

3.3 Lessons learnt

3.3.1 Too lean a business model leads to unknown results and limited learning

There is an intrinsic trade-off between having a lean business model (as per CTCN operations) and the ability to capture TA results and the ability to learn from past experiences. As the case of the CTCN has shown, a lean business model that primarily focuses on efficient delivery of technical assistance can have limitations in defining results and faces limitations in learning from past experience as the necessary data is not captured. An organization that does not learn from past mistakes or success is at risk of then investing resources in a non-effective way.

3.3.2 Small TA projects need broad ownership for impact

Small short-term technology support projects (as were supported by the UNIDO-GEF CTCN project) require broad national and donor ownership for the specific TA outputs to be supported towards sustainable outcomes to then ensure that contributions towards impact are achieved. Small technical assistance projects can make important contributions towards impact if outputs (e.g., studies, policies, feasibility assessments, etc.) are then used by relevant key actors, supporting existing partnerships for change.

ANNEXES

Annex 1: Documents reviewed

GEF CTCN Related Documents

- 20130821 Joint UNEP-UNIDO Programme Document - to host & manage the CTCN - from Q3 2013 for 5 years
- 20141106 GEF-CTCN Revised PIF for UNIDO Support to CTCN as a GEF 5 Project – signed
- 20150515 Report from GEF on Poznan Tech Transfer Programme to UNFCCC SBI-42
- 20150602 GEF-CTCN Request for CEO Approval (CER) - UNIDO GEF 5 MSP resubmission
- 20150918 GEF-CTCN Project 1st SC & Kick-off Meeting - Draft Minutes
- 20160413 GEF-CTCN Project 2nd SC Meeting - Draft Minutes
- 20160413 GEF-CTCN Project 2nd SC Meeting - Draft Minutes
- 20170405 GEF-CTCN Project 3rd SC Meeting - Draft Minutes
- 20171108 GEF-CTCN FY 2017 Project Progress Update Report
- 20171108 GEF-CTCN FY 2017 Workplan
- 20171123 GEF-CTCN FY 2017 PIR UNIDO-Global
- 20180329 GEF-CTCN in Questionnaire for Inputs to Poznan Program to GEF Agencies
- 20180715 GEF-CTCN FY 2017 Annual Monitoring Report (PIR) - Global Activities
- 20181005 GEF-CTCN 4th Steering Committee (SC) Meeting Minutes
- 20190117 GEF-CTCN FY 2018 Annual Monitoring Report UNIDO-Global
- 20190118 GEF-CTCN FY 2018 Project Progress Update Report
- 20190118 GEF-CTCN FY 2018 Workplan-Timeline for July 2015 - Aug 2019
- 20190830 GEF-CTCN FY 2018 PIR - UNIDO Global Project
- 20191204 GEF-CTCN 5th Steering Committee (SC) Meeting Minutes
- 20191231 UNEP-UNIDO CTCN FY 2019 Progress Report
- 20200630 GEF-CTCN FY 2019 PIR - UNIDO Global Project
- 20200631 UNEP Open Data Project Summary to June 2020
- 20200722 Joint UNIDO-UNEP CTCN Evaluation Approach Paper Revised v2 clean
- 20201016 Project Summary in UNIDO Open Data Platform
- 20201030 Final TOR for ITE for CTCN GEF Project
- 20201201 Development Tracker Project Progress Summary
- 20201211 GEF Website - Project Summary
- 20210312 GEF-CTCN Expenditure by Project to Date

Previous Evaluation Related Documents

- 20150519 UNEP-CTCN Case Study TOR - draft for comments @ 28Sep15
- 20160215 UNEP-CTCN Case Study for TE of Projects 12-3 P1&P2 – final
- 20161015 UNEP-CTCN TE of Projects 12-3 P1&P2_Greenhouse Gas Mitigation and Renewable Energy – final
- 20170825 UNFCCC Independent Review of 4 yrs of CTCN Operations
- 20180426 UNFCCC Independent Review of 4 yrs of CTCN Operations - UNEP Response
- 20180516 DANIDA Review of CTCN

The list of specific Project Related Documents that were obtained and reviewed can be found in relevant entries in Annex 3

Annex 2: People - Organizations Interviewed

TA	Contact person
Mali: Renewable energy use for food processing - Implementation completed (2016)	<ul style="list-style-type: none"> Rajiv Garg, gargr@un.org
Uganda: Geothermal energy - Implementation completed (2016)	<ul style="list-style-type: none"> Patrick Nussbaumer, P.NUSSBAUMER@unido.org Dr. Paul Zakkour, Carbon Counts – TA Contractor and Consortium lead, paul.zakkour@carbon-counts.com
Vietnam: Bio-waste valorization - Implementation completed (2017)	<ul style="list-style-type: none"> Rajiv Garg, gargr@un.org
Dominican Republic: Energy-efficient lighting - Implementation completed (2018)	<ul style="list-style-type: none"> Rajiv Garg, gargr@un.org
Chile: Replacement F-refrigerants - Implementation completed (2018)	<ul style="list-style-type: none"> Judit Rodriguez, J.RODRIGUEZMANOTAS@unido.org
ECOWAS: Mainstreaming Gender Energy System - Implementation completed (2018)	<ul style="list-style-type: none"> Patrick Nussbaumer, P.NUSSBAUMER@unido.org Lara van Druten, CEO and Founder of Waste Transformers (NL), lara.van.druten@thewastetransformers.co Monica Maduekwe, former ECOW-GEN Coordinator at ECREEE, (Centre for RE & EE) monicamaduekwe@puttru.com
Zimbabwe: Industrial Energy Efficiency - Implementation completed (2018)	<ul style="list-style-type: none"> Rajiv Garg, gargr@un.org
Paraguay: Environmental flows and river basin management - Implementation completed (2019)	<ul style="list-style-type: none"> Ramiro Salinas, ramiro.salinas@un.org Ms. Flavia Fiore Mades and Mr. José Silvero from the Directorate General for the Protection and Conservation of Water Resources (DGPCRH), Secretariat for the Environment (SEAM)
Gambia: Organic waste for Energy - Implementation completed (2019)	<ul style="list-style-type: none"> Rajiv Garg, gargr@un.org
Brazil, Chile, Mexico and Uruguay: Circular Economy	<ul style="list-style-type: none"> Judit Rodriguez, J.RODRIGUEZMANOTAS@unido.org Manuel Albaladejo, UNIDO Rep for Uruguay, Chile, Argentina and Paraguay
Overall project management and processes	<ul style="list-style-type: none"> Judit Rodriguez, J.RODRIGUEZMANOTAS@unido.org and Patrick Nussbaumer, P.NUSSBAUMER@unido.org

Annex 3: Project summary ratings and rationales

	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
1. Mali: Renewable energy use for food processing	Private sector engagement and market creation	42,525	PFAN investment of USD1.14 million was apparently under final signature at June 2017, but was not sighted. €333,337 investment in pilot plant by ARAA reported to June 2019. Progress appears reasonable for budget.	5	Response Plan reported by NDE to be of good quality and in line with request. Response Plan had clear and appropriate deliverables for specific TA activities.	5	Solar crop drying is very relevant for Mali in principle. However, major political instability and security threats remain.	5	Closure & NDE feedback reports provide some useful info re project sites, partners, replications.	5	Budget broadly commensurate with deliverables and apparent impacts.	5	Some doubts as to sustainability of private investment pilot or any replications from ongoing instability & security threats.	4	Overall, TA was coherent with SDGs and likely coherent with other donor priorities	5
2. Uganda: Geothermal energy	Decision-making tools and/or information provision	143,470	Draft Geothermal Policy & Law key findings were indirectly reflected in 2019 Draft National Energy Policy. Any tangible geothermal impacts will be in long term as geothermal field resource proving is in early stages. Large donor resource proving support needed is likely to occur.	5	Response Plan was of good quality and in line with request. Response Plan established clear and appropriate deliverables for specific TA activities.	5	Uganda has a clear geothermal energy resource, but temperatures are likely only moderate, and Uganda has large hydro energy resources that are still to be utilized.	5	Key deliverables (Draft Geothermal Policy and Law) were of good quality and key high-level findings were independently well reflected in following 2019 Draft National Energy Policy	5	The project produced its specified outputs within its budget and timeframe.	5	The key relevant geothermal energy high level policy issues and mitigation steps were indirectly reflected in the subsequent 2019 Draft National Energy Policy	5	The project was highly coherent with other development partner activities to assist geothermal energy development in Uganda.	6
3. Vietnam: Bio-waste valorization	Feasibility of technology options	206,838	Optimization Tool produced. FS for new ASA & biochar business models. Biochar from rice husks being produced & upscaled with UNIDO support & linked to TA results. ASA is being pursued.	5	Response Plan was of good quality and in line with request. Response Plan established clear & appropriate deliverables.	5	Vietnam is a major rice producer. New ways to add extra value to the large rice husk resource are very relevant	5	The key deliverables were produced, were of good quality, and were used in subsequent market development activities.	5	The project produced its specified outputs within its budget.	5	Rice husk biochar is being commercially scaled up as soil conditioner. Rice husk ASA is commercially promising.	6	Project was coherent with government and other donor rice husk valorisation efforts.	5

	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
4. Dominican Republic: Energy-efficient lighting	Financing facilitation	195,358	No evidence found of any significant progress to impact, esp. for large budget involved.	2	Response plan was not sighted, but from description in Closure Report & from NDE feedback, the TA was relevant at the TA design stage.	5	Electricity generation strongly dependent on fossil fuels, so lighting MEPS and Labelling would have reduced GHG emissions if it had eventuated.	5	All 6 planned deliverables produced according to Closure Report & NDE Feedback. Lack of local ownership meant NAMA/GCF projects did not proceed.	4	NDE feedback states that all planned outputs were produced to a suitable standard & in a timely fashion.	5	No sustainability of results as Lighting MEPS/Labelling/ LED lamp financing did not proceed.	2	A lighting NAMA or GCF funded LED financing mechanism would have been coherent with country UNFCCC priorities & regional strategies.	4
5. Chile: Replacement F-refrigerants	Private sector engagement and market creation	72,229	NDE reports that TA outputs were very useful. However, follow on actions from TA are still unclear	4	Response Plan was of good quality and in line with request. Response Plan established clear and appropriate deliverables.	5	Chile has significant agribusiness sector with a need to reduce ODS & high GWP refrigerant use.	5	NDE reports high quality outputs we're produced. One company reported to be considering implementation following pilot.	4	The project appears to have produced its specified outputs within its budget & timeframe.	5	Workshops and seminars reported as being of high quality. Sustainability of pilot and other actions still unclear.	4	UNIDO was a logical implementing agent. Coherent with other government initiatives.	5
	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	

	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
6. ECOW AS: Mainstreaming Gender Energy System	Decision-making tools and/or information provision	119,425	Gender Training led to increased Gender Focal Point staffing in most countries. Women entrepreneur business support & investor exposure indirectly supported three pilot institutional modular biogas projects in Sierra Leone with good scale up prospects. Insufficient data available on supported Nigeria solar project.	5	Response Plan was of good quality and in line with request. Response Plan established clear and appropriate deliverables.	5	Weak gender dimension of climate change. Many barriers for women entrepreneurs developing climate change mitigation businesses.	5	Gender training was effective in increasing National gender unit staffing. The women entrepreneur support through PFAN was useful but partly duplicative of similar efforts through PFAN and other donors.	5	The project produced its specified outputs within its budget and timeframe.	5	The enhanced staffing in national Gender Focal Points was reported as sustainable with other donor support ongoing. Modular Sierra Leone institutional biogas plants reportedly have multiple and sufficient income streams.	5	The Gender Training was coherent with prior ECOW-GEN activities at ECREEE. Women entrepreneur support activity coherent with PFAN activities and work of other donors.	5
	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
7. Zimbabwe: industrial energy efficiency	Technology identification and prioritisation	158,656	Useful ISO50001 classroom & 10 lots of 3-day hands-on Energy and Water (E&W) audits done. However, "free" E&W audits may not lead to significant investments based on experience with "free" energy audits worldwide over last 50 years - given the limited recipient company ownership of the energy audit findings and recommendations	4	Response Plan of good quality, in line with request & established clear and appropriate deliverables but was light on need to fully implement ISO 50001 approach prior to any energy audits being undertaken to generate real recipient ownership for actual investments to follow energy audits.	4	Project was relevant as Zimbabwe subject to major limitations on energy and water supply - and industries had large potentials for energy and water efficiency gains.	5	Useful awareness of ISO 50001 approach & Hands-on E&W audits provided. But questionable if necessary prior client ownership established before "free" E&W audits undertaken. So likely limited implementation of findings.	4	The project produced its specified outputs within its budget and timeframe.	5	Increased awareness of cost-effective E&W efficiency measures & ISO 50001 produced in relevant business body, government agencies & key industries, but unlikely to be sustainable without significant ongoing donor support.	4	The project was broadly coherent with government priorities and CTCN priorities.	5

	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
8. Paraguay: Environmental flows and river basin management	Sectoral roadmaps and strategies	124,828	The TA was completed as expected and the outputs were reported as being utilized as expected.	5	Response Plan was of good quality and in line with request. Response Plan established suitably clear and appropriate deliverables.	5	The NDE (DGPCRH) report that the TA was highly relevant for a more evidence-based approach to river basin management.	6	The key beneficiary (DGPCRH) reported that the outputs produced were as expected & were of very good quality. The outputs were used for a review of the national water resources policy.	5	Implemented on time & within budget. DGPCRH report that the contractor, staff were highly qualified & motivated. Contact maintained after the TA had ended	6	Post TA, DGPCRH were optimistic that river basin management would further improve in Paraguay, albeit at a rather slow pace.	5	DCPCRH report that the project was coherent with government priorities and will facilitate Paraguay catching up with Brazil in river basin management capacity.	5
	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
9. Gambia: Organic waste for Energy	Piloting and deployment of technologies in local conditions	140,749	Ground nut briquette pilot project developed. Follow-on expanded project concept developed for GCF funding. However, claimed GHG mitigation impacts are questionable as fuelwood replaced appears to be from eucalyptus plantations.	4	The Response Plan showed suitably evolution of the concept and was in line with the request	5	Ground nut shells were being dumped while urban demand for charcoal was putting pressure on scarce forest resources.	5	Briquetting pilot & GCF scale-up follow-on project concept developed. But GHG mitigation benefits depend on reducing net deforestation - which is questionable.	4	Project was implemented on time and within budget.	5	The pilot project & any scale up project should be capable of sustainable operation without ongoing donor or government support.	5	The project was broadly coherent with government and CTCN priorities.	5

	Type of TA (as per CTCN categories)	Budget (USD)	Progress to Impact		Project design		Relevance		Effectiveness		Efficiency		Sustainability		Coherence	
10. Brazil, Chile, Mexico, and Uruguay: Circular Economy (CE)	Recommendations for law, policy and regulations	144,432	In Brazil and Mexico the CTCN TA was connected to follow on CE initiatives. However, roadmaps were generic & lacked the broad based ownership to make any likely specific impact.	4	Response Plan was of good quality and in line with request. Response Plan established clear and appropriate deliverables.	5	The CE concept was relevant in principle for the 4 countries concerned & for the time it was submitted.	5	Proposed pilot projects & roadmaps unspecific & vague. Follow on activities reported in Brazil & Mexico.	5	The project produced its nominal specified outputs within budget & timeframe.	5	For Brazil, Mexico & for CTCN project led to ongoing CE efforts. For Uruguay & Chile TA produced capacity building effects.	5	Coherent with other CE initiatives of the time. But questionable specificity and wide ownership not apparent.	5
Average Rating	Total/Average	1,348,510		4 . 3		4 . 9		5 . 1		4 . 6		5 . 1		4 . 5		5

Annex 4: Project summaries

The following project summaries cover the specific TA projects, but do not cover the GEF-CTCN wider project aspects of overall design, M&E processes, performance of partners, etc.

Annex 4.1 Mali: Renewable Energy for Food Processing

TECHNOLOGY DESIGN AND PRIVATE SECTOR INVESTMENT IN CLIMATE RESILIENT CROP PRODUCTIVITY IN MALI

Contract No.	Contracting Party	Start date	End date	Amount
(Status: completed)	ENDA PFAN / CTI	04/24/2015 ⁴	8 months duration ⁵	USD42,525 for PFAN and USD5,816 for ENDA

Stakeholders:

- National Agency of Meteorology (Direction Nationale de la Météorologie du Mali – Mali Météo)
- Action Group for the Modernization of Agriculture (GAMA, Groupe d'Appui à la Modernisation de l'Agriculture)

CTCN Partner (Response Expert Team)

- Environment and Development Action in the Third World (ENDA)
- Private Financing Advisory Network (PFAN) of the Climate Technology Initiative (CTI)

This CTCN technical assistance was led by the Private Financing Advisory Network (PFAN) of the Climate Technology Initiative (CTI), in collaboration with Environment and Development Action in the Third World (ENDA).

Key Mali Counterpart

- Action Group for Modernization of Agriculture (GAMA)
- Ministry of Agriculture
- Ministry of Environment
- Mali Folk Center

Request of CTCN assistance received from:

Action Group for the Modernization of Agriculture (GAMA)

Request Submission Form:

The Request Submission Form was dated 24 April 2015 and was signed and submitted by the National Designated Entity, NDE (Mr. Birama Diarra, National Agency of Meteorology) on 14 April 2015.

Objectives: Adaptation / Mitigation

⁴ https://www.ctc-n.org/technical-assistance/data?f%5B0%5D=ta_page_countries_ref_facets%3A25048

⁵ As per Impact Brief: https://www.ctc-n.org/system/files/dossier/3b/mali_impact_brief_private_sector_investment_in_crop_productivity.pdf

- Use renewable energy sources for drying, processing and storage technologies for mangoes, potatoes and gombo (okra).
- Increase resilience to climate change and food security.
- Improve agricultural productivity and availability of crops in local/international markets.
- Private sector investment in crop drying and storage technologies.

PFAN and ENDA specialists worked with GAMA to address the technical and financial barriers faced in implementing their project, as well as to showcase the bankability of such initiatives.

Context

Mali is a landlocked country in the Sahel region of West Africa, 51% of which is desert. 43.9 % of the population (19.6 million) resides in urban areas. Mali's climate is subtropical to arid. Mali depends on gold mining and agricultural exports for revenue; cotton and gold make up around 80% of export earnings; about 80% of the labor force are engaged in farming and fishing; and it is heavily dependent on foreign aid.⁶

Agriculture accounts for 42% of Mali's GDP.

Electricity from fossil fuels: 68% of total installed capacity (as of 2016)

Electricity from hydroelectric plants: 31% of total installed capacity

Electricity from other renewable sources: 1% of total installed capacity

Potential of Renewable energy (solar)⁷ Average solar radiation in Mali is well distributed over the national territory with an estimated 5-7 kWh/m²/day and a daily sunshine hours duration of 7-10 hours. The global typical average is only around 4-5 kWh/m²/day.

Mali is a carbon sink country that relies on the reduction of GHG emissions from the agriculture (29%) and energy sectors (31%).

The Action Group for Modernisation of Agriculture (GAMA) aims to improve farming stability in the face of increasing vulnerability of crop production due to climate change. A key piece of their strategy is to use renewable energy technologies for drying, processing and storage of mangoes, potatoes and gombo (okra). These technologies increase the shelf life and availability of the products to the market, thereby increasing resilience to climate change and food security. The project has considerable potential to attract private sector financing, but the upfront investment constitutes the main obstacle, and investors were not convinced of its bankability.

The GAMA project apparently involved the construction of a semi-industrial storage and processing facility drawing its entire power needs from the installation of an 80KW capacity Solar PV plant at Bougouni in Mali. Bougouni, the project location is situated in a zone of commercial production of mangoes, okra and potatoes and serves as an exit route to local, regional and international markets.

Although there is market for the produce both locally and internationally, post-harvest losses remain high when not all the produce are able to be sold fresh in the market. Prices tank in periods of peak harvest and rise thereafter when they are out of season. Farmers are at the mercy of buyers and price fluctuations and produce losses serve as disincentive to the farmers.

⁶ <https://www.cia.gov/the-world-factbook/static/528796f6bf297cf743620ec72961f794/ML-summary.pdf> (April 2020)

⁷ <https://www.ctc-n.org/ctcn-countries/ml>

GAMA realizes the opportunity to add value by seeking to extend the shelf life of the harvested produce through drying and storage using Solar PV technology. The choice of Solar PV technology was seen as a cost competitive approach to powering the business operations as it is reliable, cost efficient and has environmental benefits.

According to the NDE Feedback form of April 2018, there was then ongoing development activity to realize the commencement of business operations.

Estimation of GHG benefits⁸

Mali: Agricultural Productive Use (crop drying and processing)

Direct greenhouse gas emission reductions were expected to increase through investment in solar PV technology to offset baseline diesel consumption. Indirect emission reductions were to be achieved through upscaling and replication. According to the proponent, the project would replace an annual volume of 95,340 litres of diesel, thereby avoiding greenhouse gas emissions totalling 274,579 kg CO₂eq per year.

Over a 10-year period, the GHG benefits would be approx. 2,750 ton CO₂eq.

Indirect benefits are assumed to be 3-fold and to take place through the financial match-making mechanism, yielding an additional 8,250-ton CO₂eq.

Current status

The project is completed.

CTCN Response⁹ (to be confirmed by PM as the Response Plan was not made available):

- Conduct review of local project aiming at installing technologies using solar potential, to store and dry mangos, potatoes and gombos
- Finalize the business plan and related documents
- Develop a cash flow model
- Produce an independent feasibility audit to support investment decisions
- Provide coaching and support of project members
- Design a scaling up and communication strategy

Expected Results

- Deployment of simple semi-industrial drying and storage facilities enabling off-season availability of mangoes, potatoes and okra
- Access to higher margin markets at national and international level for dried fruits and vegetables is increased
- More than 500,000 USD injected every year in local economy, creating a multiplier effect in the economy
- Increased food security for households throughout the year

Interim Findings and Next Steps

Business training was apparently provided through three training sessions and capacity building activities. A business plan, an executive summary, financial and cash flow models, and an investor pitch were apparently provided.

⁸ CEO Endorsement, ProDoc 140307

⁹ CTCN Progress Report. FINAL.

Relevance

- Mali has good climate conditions, and a high potential for solar renewable energy.
- Climate change threatens Mali's agriculture productivity and farmer livelihoods.
- Current crop conservation leads to significant waste in the value chain, thus reducing farmers' access to markets.
- The project advances Mali's Intended National Determined Contribution (INDC) with the priority to develop smart and resilient agriculture, including through the use of renewable energies. The promotion of solar drying technologies is well aligned with UNIDO's ISID goals and principles as it combines increased productivity with environmental benefits.
- The ongoing political instability and continuous security threats in Mali reduce the relevance of an intervention aimed at mobilizing private investment.
- The project appears to have supported a pilot project with reasonable prospects of being implemented.

Coherence

- Inclusive growth and environmental sustainability are two of six key priorities of the UN Development System in Mali¹⁰, The project fits quite well in this priority as it combines all three elements (inclusive business model, economic growth and environmental sustainability).
- There is no evidence of any unintended effects with regard to other SDGs.

Effectiveness

- The deliverables made available to the evaluation team are: one project impact brief (2-page summary of the planned intervention), one summary of the proposed technology solution (10-page power point). These deliverables do not contain any detailed information about the project sites, partners involved, replication and suggestion to overcome the barriers for private investment. These deliverables are not yet sufficient to ascertain the effectiveness of the expected outcomes and impact.

Efficiency

- The NDE feedback was positive that the objective to develop a business plan for Fakoly Farm, in order to facilitate their access to financing, was well suited to their need. The project budget of USD42,525, while small, therefore appears to be commensurate with the deliverables produced.

Sustainability

- Although some follow-on actions were claimed, there are some doubts as to the sustainability of any private investment pilot or any replications from ongoing instability & security threats.

¹⁰ UN Sustainable Development Group Mail (<https://unsdg.un.org/un-in-action/mali>)

Progress to impact

Some information on impact is contained in project reports and the NDE Feedback Form:

- Project Progress Update Report FY 2017 (1 July 2016 – 30 June 2017)
- *Following the Technical Assistance in Mali, investment was reported to be under finalisation through CTCN financial partner PFAN amounting to 1.14 MUSD, pending final signature. However, no reference exists regarding this investment on the PFAN webpage)*

- Project Progress Update Report FY 2019 (1 July 2018 – 30 June 2019)
- *Following the Technical Assistance in Mali, investment for a pilot project through the ECOWAS ARAA (Agence Régionale pour l'Alimentation et l'Agriculture) amounting to €333,337.02 was apparently leveraged.*
- The GAMA beneficiary is apparently a cooperative whose shares are wholly owned by private operators. The assistance also made it possible to put GAMA in touch with an incubation company and a bank.
- The business model developed apparently operates with an almost entirely female workforce. 85% of the workers in the unit will be women. Women will also be very present in the network for the supply of raw materials and the distribution of finished products.
- The technical assistance also apparently made it possible to put GAMA in touch with the SPEA (Society for the Promotion of African Businesses) which is currently providing support to the beneficiary for fundraising. A financing file was put together with the support of the SPEA submitted to the BIM. The SPEA asked for the transformation of the cooperative society into a limited liability company. A new company (GAMA Séchage) was the apparently created.
- Following the technical assistance, GAMA and Enda Energie of Senegal apparently implemented a pilot project with a grant from ECOWAS / ARAA. This initiative aimed to demonstrate the technical and economic feasibility of the business model of drying / storing fruits and vegetables with solar energy. This grant made it possible to construct an industrial building, and to acquire 'solar equipment. and test them. The results of this pilot project were capitalized.
- The challenge now to go to industrial scale based on the results of the pilot project

It was not possible to independently verify all these claims. However, the NDE feedback form partly corroborates the progress update reports and the project completion report so it seems likely that the pilot project actually did go ahead following the TA Support.

Relevant documents:

- Formulaire de Requête pour Assistance Technique du Centre et Réseau des Technologies Climatiques. (Request). April 2015.
- Climate Technology Centre & Network. Progress Report. January 2014 – August 2015.
- République du Mali. Contribution Prévues Déterminées au Niveau National. COP 21. September 2015.
- Draft TA Closure report Mali 2 PFAN al – EN. 25 July 2017
- NDE Response Feedback Form -avec commentaires en français2. 30 April 2018
- Design and financing for crop drying and storage technologies to strengthen food security in the face of climate change. CTCN Website. <https://www.ctc-n.org/technical-assistance/projects/design-and-financing-crop-drying-and-storage-technologies-strengthen>

- INDC of Mali: <https://www.ctc-n.org/content/indc-mali>
- Key technology addressed. Solar dryer. CTCN Website.
- <https://www.ctc-n.org/technologies/solar-dryer>

Additional information/documents (yet to be obtained)

- Response plan
- The CTCN process for evaluating the request for assistance
- CTCN appraisal of the Mali request for assistance
- The project's formal start and completion date
- Project Inception Report
- Project Progress Reports
- GEF Reports

Mali Policy papers

- Strategic Framework for Growth and Poverty Reduction
- National Growth and Poverty Reduction Strategy Paper (CSCR¹¹)
- New CSCR 2012-2017
- National Policy for Environmental Protection (PNPE)
- National Policy for Climate Change
- National Energy Policy (NEP), adopted in 2006.
- National Strategy for the Development of Renewable Energy adopted in 2006

¹¹ Cadre Stratégique pour la Croissance et la Réduction de la Pauvreté

Annex 4.2 Uganda: Geothermal Energy

Formulation of Geothermal Energy Policy, Legal, and Regulatory Framework in Uganda (Uganda Geothermal Policy TA)

Contract No.	Contracting Party	Start date	End date	Amount
2015-022/UGA-01 (Status: Ended)	Carbon Counts (UK) led consortium	November 2015	October 2016	USD143, 470

46 weeks scheduled project duration

Stakeholders:

Consortium Partners:

- Carbon Counts – an Energy and Climate Change Consulting firm and a CTCN Knowledge Partner
- ECA (Economic Consulting Associates) – a UK based economic and regulatory advisory firm with prior experience on geothermal energy development in East Africa
- Shonube, Musoke & Co Advocates, a corporate and commercial law firm in Uganda
- PU – Pro Utility – a utility consulting firm in Uganda
- Norton Rose Fulbright – a global law firm with a renewable energy specialization, including for geothermal energy

Key Uganda Counterpart

GRD (Geothermal Resources Dept), Directorate of Geological Survey and Mines, MEMD (Ministry of Minerals and Energy Development), Government of Uganda.

The request of CTCN technical assistance was dated October 2014 and was signed in January 2015 from the NDE - Uganda National Council for Science and Technology (UNCST) on behalf of GRD, MEMR.

Objectives:

Draft a geothermal policy, law and review existing supporting policies and regulations with the intent of attracting private sector investments.

Activities Completed/Deliverables:

- Background analysis undertaken of existing policies and laws impacting on geothermal development, as well as a review of the geothermal resources available and challenges for geothermal development in Uganda
- Conducted stakeholder analysis to inform analysis, draft law prepared
- Developed recommendations for new geothermal policy, including a stakeholder engagement plan
- Drafted a geothermal policy: Based on inputs from stakeholders and background analysis, experts drafted the geothermal policy including an approach for developing geothermal at national level and framework/basis for developing the draft law. The draft policy includes a monitoring and evaluation plan/component for assessing the effectiveness of the new law and regulations.
- Drafted a Geothermal Energy Law: Technical experts drafted an outline of the geothermal law, highlighting key components informed by the geothermal policy.

Current Status

CTCN supported consultants drafted a geothermal-specific draft Policy and draft Legislation for Uganda. The Draft documents were apparently reviewed by EAGER¹² hired experts and were apparently internally reviewed by a Uganda government inter-Ministerial committee. It is not clear if a Regulatory Impact Assessment was undertaken or if drafts were submitted to Cabinet and Parliament. If approved by Cabinet, the draft geothermal policy and legislation was then envisaged to be transformed into a Bill which could then have been considered and passed into law by Parliament. The Bill would have then addressed outstanding issues that are facing the geothermal industry by providing the necessary legal and policy clarity for the tangible development of geothermal energy in Uganda.

A new Draft National Energy Policy for Uganda was released by MEMR in October 2019, presumably designed to replace the very outdated Uganda 2002 Energy Policy and the 2009 Renewable Energy Policy. The new 2019 Draft National Energy Policy for Uganda makes explicit mention of the key issues, provides a policy statement, and provides strategies for geothermal energy in a way that was not done previously in Uganda. In particular, it is stated that the Uganda Government shall promote the sustainable commercial development of geothermal resources based on an integrated resource plan, and will:

1. Establish and strengthen the institutional, legislative and regulatory framework for the geothermal industry
2. Develop a Geothermal Resources Master Plan to guide optimized resource development
3. Establish a Geothermal Communication Strategy to raise public awareness and engage communities affected by geothermal development
4. Formulate innovative financing mechanisms for private geothermal resource development through provision of fiscal and other incentives
5. Carry out feasibility studies and take over geothermal resource exploration
6. Support and solicit funding for the management of geothermal exploration risk and attract investors

Hence, although the project did not directly lead to the envisaged separate specific geothermal energy policy and law, the issues that the project raised have been largely subsumed and articulated in the new high level 2019 Draft National Energy Policy for Uganda.

Context

Uganda's geothermal resources in hot springs in the Western Branch of the EARS (Eastern Africa Rift System) are estimated at 450 MWe (McNitt, 1982)¹³. Twenty-three (23) geothermal resource locations have been identified in Uganda, four of which are considered to be the most promising for energy development. Government-led geothermal energy exploration activities have been underway in Uganda since 1993, comprising surface studies and not yet including deep well test drilling.

¹² The East African Geothermal Energy Facility (EAGER) received GBP 6 million DFID (UK) funding and ran from May 2015 to Nov 2018. An Advisor to GRD was apparently funded to assist with policy, exploration methods and conceptual modelling, resource analysis and prioritization, financial modelling, business development models, data management, and TGH planning in Uganda.

¹³ Uganda's Vision 2040 has an aim of installing 1500 MW of geothermal power capacity.

To spearhead government geothermal energy development efforts, in 2014 the Uganda Ministry of Energy & Mineral Development (MEMD) established a Geothermal Resources Department (GRD) within the Directorate of Geological Survey and Mines¹⁴.

Only about 900 MWe of geothermal power has been developed to date in East Africa via steam cycle power plants in Ethiopia and Kenya (with only Kenya having large operational plants), using their high enthalpy geothermal resources.

It is expected that any geothermal energy developments in Uganda would be smaller scale low enthalpy (<150°C) binary cycle power plants given the very different nature of Uganda's geothermal resources compared to the East Africa geothermal resources exploited to date. The Uganda Western Branch EARS geothermal resources are more akin to the numerous low-enthalpy geothermal resources developed in Nevada in the USA.

Geothermal power is a high capital cost form of renewable energy with very long lead times and the need for significant government or donor support in geothermal field resource proving over many years before it is realistic for the private sector to lead tangible energy investments.

Geothermal power plants are almost always grid connected and used in a baseload generation role, not as intermittent backup to complement the variable hydropower which is the main source of grid power generation in Uganda.

Geothermal energy developments can emit significant amounts of GHGs and can also discharge toxic minerals such as sulphur and arsenic into local waterways. So, re-injection of geothermal fluids back into the field is now best practice, which also helps keep geothermal field heat output more stable over time.

The direct use of geothermal energy as heat in agri-food value chains has the potential to support gender inclusivity if women are involved in aquaculture, greenhouse farming and post-harvest processing. Pre-feasibility studies undertaken by EAGER (IRENA, 2020) have found that a number of direct geothermal use options could be economic in Uganda, and that this could be combined with power generation. However, the CTCN project work did not consider non-grid electricity uses of geothermal energy in Uganda.

Relevance

- Uganda has a need for baseload power generation that is independent of its current hydro capacity, which is all based on the river Nile flowing out of Lake Victoria, and hence at risk of low generation in droughts, from damage in floods caused by high rainfall, and from expected future enhanced climate change related rainfall variability.
- Pre project intervention, Uganda clearly had an inadequate geothermal policy environment to allocate resources and balance development risks between government and private sector developers in the necessary high initial investment geothermal reality.

¹⁴ With a limited staff and recurrent (core) budget of USD 30,000, and with a geothermal energy development project budget of USD 1.2 million (1/3 that for uranium exploration) in 2015

Coherence

The project is coherent with other development partner activities to assist in geothermal energy development in Uganda. The project focused on priority geothermal energy development needs, and to avoid the common problem worldwide of “briefcase entrepreneurs” locking up geothermal resources and never actually mobilizing the necessary large scale, long term and high-risk appetite funding need to develop real geothermal energy power projects.

Effectiveness

As specified as key deliverables, the project developed a geothermal policy and draft geothermal law for Uganda that appears to be based on suitable international best practices

Efficiency

The project produced its specified outputs within its budget and timeframe.

Sustainability

The sustainability of project results can be confirmed by the explicit mention of the key relevant geothermal energy policy issues and mitigation steps in the 2019 Draft National Energy Policy for Uganda

Progress to impact

Post project end, 16 temperature gradient thermal wells were being drilled to help site subsequent deep exploration wells – with USD620,000 funding from the Ugandan Government, the Geothermal Risk Mitigation Facility of the African Union Commission (GRMF-AUC), and KfW. This work was suspended in April 2020 for environmental and social impact assessments to be carried out, after an incident at one well where a blowout resulted in the uncontrolled release of gas, drilling fluids, geothermal fluids and sediments. It does not yet appear that the drilling work has resumed as of June 2021.

The intended impact of the work supported by CTCN was 100MW of geothermal energy production in Uganda. Specific actions are underway post-project end towards this intended impact, but this is not an impact that the project could realistically have directly influenced.

Relevant project related reports:

- 20150116 Formulating Geothermal Energy Policy, Legal & Regulatory Framework (Request)
- 20150903 Formulating Geothermal Energy Policy Legal and Regulatory Framework (Response Plan)
- 20160629 About Geothermal Energy and Experiences Around the World - for Stakeholder Engagement Meeting - Carbon Counts
- 20160629 Experiences with geothermal energy development around the world (Deliverable) https://af3742b8-2980-471d-905b-be913a0fbb28.filesusr.com/ugd/fe2f5f_bcf9535ee4c942b282234fa224117121.pdf
- 20160708 Experiences with geothermal energy development around the world (Deliverable)
- 20160825 GRD Funding Application (from Carbon Counts) to GGA (Global Geothermal Alliance)
- 20161024 Geothermal Act - Final Draft (Deliverable)

- 20161103 Formulating A Geothermal Energy Policy, Legal and Regulatory Framework – Carbon Counts in Proceedings, 6th ARGeo Conf (Project Summary) https://docs.wixstatic.com/ugd/fe2f5f_48f8b4b53fce43d78527e059c94492ef.pdf
- 20170209 Geothermal Resources Policy - Draft Final (Deliverable)
- 20170331 Geothermal Energy Policy - Impact Brief (Deliverable)
- 20171129 Geothermal Exploration in Uganda - Status Report - UNU-GTP-SC-25-0705 Short Course – Kato <https://orkustofnun.is/gogn/unu-gtp-sc/UNU-GTP-SC-25-0705.pdf>
- 20191011 Draft Revised Energy Policy - MEMR
- 20210201 Formulating Geothermal Energy Policy, Legal and Regulatory Framework | CTCN Website
- Project website <https://www.carbon-counts.com/policy-law-development>

Other relevant reports:

- 20030915 Geothermal Energy in Uganda Country Update - UNU-GTP-IGC-2003-04
- 20080615 Geothermal Energy Potential of Uganda - 2008 - Dept of Geo. Survey & Mines
- 0111118 Status of Geothermal Exploration and Development in Uganda - UNU-GTP-SC-13-1004 <https://orkustofnun.is/gogn/unu-gtp-sc/UNU-GTP-SC-13-1004.pdf>
- 20131122 Geothermal Exploration in Uganda Status Report - UNU-GTP-SC-17-1004
- 20160704 Uganda's Electricity Outlook & Potential Role of Geothermal Energy -Bahati & Isabirye
- 20160708 Geothermal Energy Development in Uganda - A Country Update 2016 – Bahati
- 20160729 GGA Call for Proposals
- 20160825 GRD Funding Application (from Carbon Counts) to GGA (Global Geothermal Alliance)
- 20171129 Geothermal Exploration in Uganda - Status Report - UNU-GTP-SC-25-0705 Short Course - Kato
- 20180131 EAGER (DFID funded East Africa Geothermal Energy Facility) Presentation @ IRENA Conference <https://irena.org/-/media/Files/IRENA/Agency/Events/2018/Jan/Geothermal-financing/S2-p2-EAGER---Final-Draft-26Jan2018-for-Luca.pdf?la=en&hash=AB500A6D2552394751442A0C6585859CAFFD172C>
- 20180528 Africa geothermal steams ahead | Inside Africa blog | Norton Rose Fulbright <https://www.insideafricalaw.com/publications/africa-geothermal-steams-ahead>
- 20181102 Advancing Geothermal Development in East Africa - 2018 EAGER
- 20190930 Uganda: Country wants to produce 100 MW of geothermal energy by 2025 | Afrik 21 <https://www.afrik21.africa/en/uganda-country-wants-to-produce-100-mw-of-geothermal-energy-by-2025/>
- 20191011 Draft Revised Energy Policy - MEMR
- 20191223 Early exploration drilling work to start on two geothermal sites in Uganda | Think GeoEnergy <https://www.thinkgeoenergy.com/early-exploration-drilling-work-to-start-on-two-geothermal-sites-in-uganda/>
- 20191223 Exploration Drilling for Geothermal Energy to Start Next Month - Global Geothermal News
- 20200108 Royal Techno launches explorations on two geothermal sites | Afrik 21 <https://www.afrik21.africa/en/uganda-royal-techno-launches-explorations-on-two-geothermal-sites/>
- 20200117 New energy policy to promote solar and geothermal sectors in Uganda | Pumps Africa
- 20200324 Geothermal Country Overview/ Uganda - GeoEnergy Marketing - <https://www.geoenergymarketing.com/energy-blog/geothermal-country-overview-uganda/>

- 20200429 Geothermal exploration suspended in Kibiro, Panyimur and Buranga | Afrik 21 <https://www.afrik21.africa/en/uganda-geothermal-exploration-suspended-in-kibiro-panyimur-and-buranga/>
- Uganda 20201115 Geothermal Development in Eastern Africa - Nov 2020 - IRENA
- 20201115 IRENA (2020) Geothermal Development in Eastern Africa: Recommendations for power and direct use <https://irena.org/publications/2020/Nov/Geothermal-development-in-Eastern-Africa>
- Uganda Vision 2040 (2007)- <http://www.npa.go.ug/uganda-vision-2040/>

Organizations Interviewed

Carbon Counts was interviewed for confirmation of project evaluation findings, status of project outputs, and the next steps undertaken as result of project interventions.

Annex 4.3 Vietnam: Bio-waste Valorization

Bio-waste minimization and valorization for low carbon production in the rice sector

CTCN Request	Contracting Party	Start date	End date	Amount
2015-040/VIE-01	SNV Netherlands Development Organisation ¹⁵	04 July 2016	06 Sept 2017	USD206,838

Around 12 months originally planned project duration¹⁶

Stakeholders:

Key Vietnam Counterpart

Vietnam Cleaner Production Centre (VNCPC)

Request of CTCN assistance received from:

Department of Meteorology, Hydrology and Climate Change (DMHCC), Ministry of Natural Resources and Environment of Viet Nam (MONRE)¹⁷.

Request Submission.

The request to CTCN was dated 12 November 2014 and was submitted as “Bio-waste minimization and valorization¹⁸ for low carbon production in the rice sector” on 01 July 2015 by the Department of Meteorology, Hydrology and Climate Change (DMHCC), Ministry of Natural Resources and Environment of Viet Nam (MONRE) as requesting NDE on behalf of the Vietnam Cleaner Production Centre (VNCPC)¹⁹. The project was listed as a “Mitigation to Climate Change” project in its CTCN request. A response plan was submitted by MONRE to CTCN on 29 January 2016 that expanded on the request submission but contained the same general problem definition and scope as the request submission.

TA Request Objectives:

The stated problem in the Technical Assistance request of November 2014 was that large quantities²⁰ of rice husks were apparently being underutilized or dumped or burned, and that therefore rice husks represented an enormous potential in terms of organic material to be used as an energy source. The supposedly underutilized rice husks were then expected to be able to replace domestic or imported coal, noting that Vietnam’s domestic coal supply is limited and located in the north of Vietnam, while the primary rice producing area (with 2 crops per year as standard and with 3 crops/year in some areas) is in the Mekong Delta area in the south of Vietnam, which produces 50% of all paddy and almost all of the exported rice. Using the supposed excess rice husk to substitute for coal was then expected to directly reduce the

¹⁵ SNV is a CTCN network member

¹⁶ The project was implemented over 14 months. An additional one-year project extension was apparently requested at a meeting at CTCN in May 2017. This may have included an additional budget request. The status of this extension is currently unknown.

¹⁷ MONRE are the listed NDE of Vietnam, see <https://www.ctc-n.org/about-ctcn/national-designated-entities/national-designated-entities-by-country>

¹⁸ Valorization is the process of adding value to a product

¹⁹ VNCPC was established in 1998 with the assistance of UNIDO and with SECO support and continues its collaboration with UNIDO and UNEP as part of the Cleaner Production concept dissemination.

²⁰ In the Nov 2014 Request Submission, it was stated that (in 2013) seven (7) million tonnes/year of rice husks were available from 44 million tons/years of paddy rice. In the August 2016 Inception Report it was stated that around 9 million tonnes/year of rice husks were available in 2015 according to FAO estimates of 45 million tonnes/year rice production in Vietnam. The 2 million tonnes/yr of rice husk difference would presumably be the 15-20% of rice husks used by milling plants for rice paddy drying.

GHG emissions from coal use. The assistance requested was to support two state owned rice milling plants in the South of Vietnam, with potential replication to a further 100 similar rice milling plants. The original request was for a 24-month duration project, starting in 2015.

Scheduled Activities:

1. A decision-making tool for the selection of the optimal rice husk valorization (value addition) route
2. Validation of the developed tool and detailed assessment of technologies and valorization options. This included overview of a selected number of potential business models (description and analysis)
3. Detailed case study of a bankable project, in partnership with a nominated firm
4. Overview of access to financing options for different business models (different sizes and different ownership models)
5. Reporting, field visits and workshops

Deliverables:

- Inception Report
- Fact Finding Mission Report
- List of qualitative and quantitative indicators (not yet sighted)
- Valorization Optimisation Tool (not yet sighted)
- How to use the Valorization Tool Report 1.2
- Rice husk business models (not yet sighted)
- Proceedings Kick-Off Workshop (not yet sighted)
- Concept note for CTCN meeting in May 2017 in Copenhagen (in Section 5. Post Assistance Plans in Final Activity Report)
- Bankable Business Plan (not yet sighted)
- Feasibility study on ASA and bio-char business models (not yet sighted)
- Overview of access to financing options (not yet sighted)
- Final workshop and field visits (Annexes 1-3 in Final Activity Report)
- Final Activity Report

Current Status

The CTCN funded project was completed in August/September 2017.

The TA support Inception Phase found that rice husks were not being dumped or burned to waste, but rather that rice husks were well valorised (i.e., had suitable valuable uses) and rice husk prices had increased steadily from 2014 to 2017 with an upper limit set by the price of coal. There was (in 2017) an already well-established market for rice husk briquettes in Vietnam. There were already many technology suppliers, rice millers or companies that produced briquettes and there were many off-takers that used the briquettes for their boilers to produce steam.

A Valorization Optimization tool was developed, to assess which rice husk use route yields the highest rate of return in the context of a specific rice mill. The Tool only focused on existing technologies for which sufficient data was available, which is paddy drying, briquetting and pelleting technologies and raw husk sales. The use of rice husks for power generation, cogeneration/CHP or gasification was found to be not viable due to high husk prices, low

electricity feed-in tariffs and low electricity prices. Such uses were therefore not included in the valorization tool as options for rice husk use.

The first priority use of rice husks is fueling the rice husk furnace of a paddy dryer. Paddy drying is a priority at rice mills, as insufficient drying leads to low rice recovery and thus more broken rice resulting in lower prices. However, only 20% of the husks are required for paddy drying and 80% remains available for other uses. The route that then yielded the highest returns on investment is either briquetting or raw husk sales. The market for both products was already well established in 2017. When the distance between the mill and the off taker is large, briquetting will likely yield higher return on investment as briquettes are less expensive to transport owing to a much higher bulk density. An alternative densification method, pelleting, generally cannot compete with briquetting as the production costs are higher. In the past pelleting was very attractive as there were export opportunities. However, the export market collapsed and as a result pellets have to compete with briquettes on the domestic market.

The project highlighted new high value rice husk derived products of: (1) ASA (amorphous silica ash – a potential high value alternative for imported silica fume and an alternative pozzolan in cement with a potential to produce high performance concrete to compete on weight and strength with structural steel); (2) bio-char which can sequester carbon, can be used as a soil conditioner; can reclaim sulphate affected soils and bring them back to full productivity; and can eliminate the need to dispose of carcinogenic rice husk ash. It was concluded by the TA and agreed by stakeholders that ASA and biochar were potential new high value uses for rice husks and that more analysis was needed, such as market studies, technical analyses, assessments of policy and potential regulatory reforms creating improved market linkages with off-takers. and development of business models.

A follow-on project concept was developed by SNV for CTCN consideration, but its status and outputs are not yet known.

Web searches found that VNCPC and UNIDO have continued working on developing and disseminating rice husk biochar production and use as a soil conditioner in Vietnam, with the CTCN work referenced and the CTCN project consultant subsequently working in UNIDO affiliated projects. UNIDO has continued supporting the development of small-scale pyrolysis from agro-waste to produce biochar in Vietnam with SECO support in cooperation with technology and manufacturing partners in Europe and Vietnam. A follow-on project implemented by VNCPC entitled “Strengthening the business case of small-scale pyrolysis in Vietnam” is being hosted by UNIDO with SECO ([Swiss] State Secretariat for Economic Affairs) as the donor from July 2020 to June 2022 that will promote the formation of a biochar market in Vietnam and further explore the export orientation.

There is an active scientific literature on research into ASA characteristics for various uses in Vietnam and in other countries

Context & Project Evolution

Vietnam is a major rice producer and rice exporter, and rice husks are a major by-product of the rice industry. Contrary to the assumption in the TA request, rice husks were found to be already fully utilized in a vibrant market context of sellers, buyers and intermediaries as thermal fuels. Two new high value rice husk uses, ASA and biochar were identified and judged by stakeholders to be worth more detailed study.

Relevance

The project was very relevant to Vietnam as Vietnam is a major rice producer and exporter.

Coherence

The project was coherent with other initiatives to develop and utilise higher value rice husk uses.

Effectiveness

The project produced useful results in the area of new uses of rice husks, in particular biochar and potentially in future production of ASA for multiple uses.

Efficiency

The project was efficiently implemented.

Sustainability

The project results in biochar have been utilised in multiple UNIDO hosted follow-on projects in Vietnam.

Progress to impact

The project's identified new use of rice husk, biochar, is underway in Vietnam. The use of ASA continues under investigation from multiple research efforts.

Relevant project reports:

- <https://www.ctc-n.org/technical-assistance/projects/bio-waste-minimization-and-valorization-low-carbon-production-rice>
- 20150701 Bio-waste minimisation and valorization for low carbon production in rice sector - CTNC Request - NDE Signed
- 20160201 Bio-waste minimization and valorization for low carbon production in rice sector - signed response plan
- 20160801 Inception Report for CTCN bio-waste minimization et al – SNV (Deliverable)
- 20160926 SNV fact finding mission (21-31 Aug) report (Deliverable)
- List of qualitative and quantitative indicators (not yet sighted)
- Valorization Optimisation Tool (not yet sighted)
- Manual for the tool - How to use the Valorization report 1.2 (Deliverable)
- Rice husk business models (not yet sighted)
- Proceedings Kick-Off Workshop (not yet sighted)
- Concept note for CTCN meeting in Copenhagen (in Final Activity Report)
- Bankable Business Plan (not yet sighted)
- Feasibility study on ASA and bio-char business models (not yet sighted)
- Overview of access to financing options (not yet sighted)
- Final workshop and field visits (Annexes 1-3 in Final Activity Report)
- 20170906 SNV final activity report (Deliverable)

Other relevant reports:

- Vietnam 20161022 Seminar talks using rice husk - Economy - Vietnam News
- Vietnam 20171010 CTCN in Vietnam/ Exploring Rice Husk Valorisation in the Mekong Delta Region (photos) | Climate Tech

- Vietnam 20180925 High-purity amorphous silica from rice husk/ Preparation and characterization - Vietnam J. Chem. 2018 56(6), 730-736
- Vietnam 20210215 UNIDO Biochar - Agriculture applications and benefits for Vietnamese Farmers - UNIDO w SECO Support
- Vietnam 20210415 Pyrolysis Biochar Market Analysis Report - UNIDO w SECO funding
- Vietnam 20210909 Strengthening the business case of small-scale pyrolysis in Vietnam – VNCPCC w UNIDO as Host & SECO as Donor

Additional information/documents that could be obtained

- The CTCN process for evaluating the request for assistance
- Documentation on any CTCN appraisal of the request for assistance
- The bidding undertaken by CTCN to address the request for assistance
- Contract to SNV by CTCN
- Confirmation of the project's formal start and end dates
- Current status of the valorization tools use
- Current status and prospects of the follow-on proposal to CTCN
- Any reports from any follow-on project

Relevant Organisations/People

1. SNV as the project implementing contractor re current status of ASA and biochar - Mr. Bastiaan Teune, Energy Sector Leader; Eric Buysman, TL/Energy Expert; Nguyen Hong Hanh Deputy team leader.
2. VNCPCC as the project instigator/proponent/key project beneficiary – Mr Trung? And Mrs. Hoang Mai Van Anh, Program Officer of UNIDO Vietnam.
3. DHMCC, MONRE as the CTCN NDE in Vietnam and the authorising agency for the proposal.
4. Song Hau Food Company – Rice milling company beneficiary – Mr. Do Hoang Thanh, Vice director; Mr. Le Xuan Thinh, Deputy Director; Nguyen Thanh Trung, Project officer.
5. An Giang food company - Rice milling company - Mr. Huynh Quang Truong, Director; Mr. Nguyen Anh Minh, Factory manager.
6. Vinafood 2 - Rice milling company beneficiary - Thot Not branch: Mr. Tran Van Ven, Chief of Business Department cum Deputy Director.

Annex 4.4 Dominican Republic: Energy-Efficient Lighting

Developing a NAMA to leapfrog to advanced energy-efficient lighting technologies in the Dominican Republic

Contract No.	Contracting Party	Start date	End date	Amount
UNIDO Contract No: unknown	UNEP DTU Partnership (UDP)	March 2015 (submission date) – II March 2016 for implementation	30 June 2018	USD 195,358

3 years project duration

Stakeholders:

Key Dominican Republic Counterpart

National Climate Change Directorate, Ministry of Environment and National Resources

Request of CTCN assistance received from:

Energy Efficiency Directorate, National Energy Commission

Request Submission.

The CTCN request was made as “Developing a NAMA to leapfrog to advanced energy-efficient lighting technologies” on 20 February 2015 by the relevant NDE, the Ministry of Environment and National Resources’ climate change directorate on behalf of the original proponent, the Energy Efficiency Directorate of the National Energy Commission. The project was listed as a “Climate Change Mitigation” project and labelled under “energy efficiency” and “financing facilitation”.

TA Request Objectives:

Assistance was requested from the CTCN to develop a Nationally Appropriate Mitigation Action (NAMA) that would enable the Dominican Republic to permanently transform their market to high efficiency lighting in the most important lighting applications. The NAMA would also facilitate the implementation of key lighting policy instruments that would enable the transition, as prioritized in the Central American and Dominican Republic’s Efficient Lighting Strategy (2013) sanctioned by the Dominican Republic’s Government.

The NAMA was to include a financial mechanism to enable the rapid deployment of high efficiency light emitting diodes (LEDs) in the residential, commercial and industrial sectors to achieve energy and financial savings together with other benefits including the improvement of electricity service, the mitigation of the frequent blackouts experienced by the country which put at risk the economy’s development, and the reduction of voltage fluctuations.

The planned duration was 24 months. The main in-country partner was the National Energy Commission (Comisión Nacional de Energía). The project was also expected to have the participation of the three (3) Electricity Distribution Companies (EdeNorte, EdeSur and EdeEste) for the large-scale distribution of LED’s component.

The key motivation appears to have been the development of a finance mechanism and the mobilisation of resources for the implementation of the regional strategy in the country.

Planned deliverables (response plan):	Current status
<ul style="list-style-type: none"> Lighting status report including a market study to determine existing products in the country. 	<ul style="list-style-type: none"> A market study was done by Fundacion Bariloche with reference to UNEP and DTU and the planned NAMA
<ul style="list-style-type: none"> Definition of mandatory minimum energy performance standards (MEPS) for lighting products in the residential, commercial and outdoor applications. 	<ul style="list-style-type: none"> A study was done by a local consultant in 2016, suggesting the introduction of minimum standards in 3 phases
<ul style="list-style-type: none"> Design of a monitoring, verification and enforcement (MVE) scheme for lighting products. 	<ul style="list-style-type: none"> A study was done by a local consultant in 2018.
<ul style="list-style-type: none"> Design of a sound financial and logistical scheme for the deployment of LED technology 	<ul style="list-style-type: none"> A financial model for LED deployment was developed according to the TA Closure report.
<ul style="list-style-type: none"> Development of a monitoring, reporting and verification (MRV) framework for the NAMA. 	<ul style="list-style-type: none"> An MVE design proposal was produced for MEPS design in the GCF Concept Note according to the TA Closure Report
<ul style="list-style-type: none"> Coordination with international financial partners to secure their participation in the NAMA design and incentivize subsequent financial investment in the execution of the project. 	<ul style="list-style-type: none"> A GCF concept note, and a full funding project proposal were produced according to the TA Closure Report - as the NAMA approach was found not to be viable.

Context & Project Evolution

Interim Findings and Next Steps

Relevance

The Dominican Republic's energy supply system has a high dependence on fossil fuels, confirming the relevance of the project for the reduction of CO2 emissions. The activity is also in line with a regional strategy for efficient lighting. The activity was in line with the Dominican republic's INDC (Intended Nationally Determined Contribution) to the UNFCCC.

Coherence

In principle, a lighting NAMA with follow on GCF funding would have been coherent with country priorities and would have been in line with regional strategies.

Effectiveness

- The 6 planned deliverables were produced according to the TA Closure Report, and 3 of the deliverables are available on the CTCN website.
- The deliverables were apparently used for the development of a GCF concept note and project proposal.
- There was a lack of necessary wider ownership in government, the three EDCs (Electricity Distribution Companies), key influential private actors, and customers for the lighting mandatory MEPS proposal to go ahead, but this likely could not have been predicted before the TA started.
- There is no project for energy efficient lighting registered at the GCF for the Dominican Republic, so it appears that the GCF funding proposal was not successful, which is not unexpected given the lack of necessary wider ownership of the lighting MEPS proposal.

Efficiency

- There is no concrete information on the amounts spent for any of the specific outputs. However, the TA Closure Report and the NDE Feedback Report state that the expected deliverables were produced and a high quality. The lack of uptake was a lack of acceptance by relevant Dominican Republic institutions, not a lack of quality or lack of timeliness.

Sustainability

- Sustainability of TA outputs appears unlikely as lighting MEPS does not seem to have gone ahead in the Dominican Republic. The change to high efficiency LED lamps will be occurring anyway to some extent through normal market forces.

Relevant project reports:

- 20150220 Request to CTCN – Signed
- 20180915 NDE Feedback Form - ES+EN
- 20180928 TA Closure Report - Final - EN
- 20210119 Government prepares to increase electricity generation – Americas
- Impact Brief - EE Lighting (Deliverable)
- Response Plan Developing a NAMA to Leapfrog to Advanced EE Lighting Technologies
- Response Plan Developing a NAMA to Leapfrog to Advanced EE Lighting Technologies - signatures

Additional relevant information/documents

- 20180416 Dominican Republic to Leapfrog to Energy Efficient Lighting
- Financial and contract details
- The CTCN process for evaluating the request for assistance
- Documentation on any CTCN appraisal of the request for assistance
- Evidence on any uptake and use of deliverables
- Confirmation of the project's formal start and end dates

- Current status and prospects of the scaling up proposal to the GCF
- Information on NAMA process (if any)

Relevant Organisations

- National Energy Commission
- UNEP DTU as implementer
- Local consultant who did studies
- Fundacion Bariloche on market study
- CTCN responsible manager

Annex 4.5 Chile: Replacement F-refrigerants

To support the replacement of fluoridated refrigerants used in refrigeration systems in food processing production and exports (fruits and vegetables)

Contract No.	Contracting Party	Start date	End date	Amount
(Status: Ended)	UNIDO	January 2017	15 March 2018	USD72.,229

15 Months scheduled project duration

Stakeholders:

- Clean Production Council (CPL) of the Ministry of Economy, Development and Tourism
- National Ozone Unit (NOU) of the Ministry of Environment
- Chile Alimentos [Food] Association
- Ministry of Energy (TBC)
- The Refrigeration and Air Conditioning Chamber and the Professional Association on Refrigeration and Air Conditioning (DITAR)

Project Implementation: undertaken by one UNIDO consultant and one contracted expert

Key Counterpart

Ministry of Environment

Request of CTCN assistance received from:

Ministry of Environment

Request Submission Form:

The request submission form was signed and dated 05 August 2015, and was submitted by NDE (National Council for Cleaner Production)

Objectives:

Facilitate a shift to coolants and refrigerants with zero or low GWP (Greenhouse Warming Potential) and higher efficiency equipment in the food preservation industry by:

- Developing an awareness raising campaign to highlight climate friendly (natural) refrigerant technologies from the use of ODS and high GWP HCFC and HFC refrigerant based systems
- Providing capacity building, training and advisory services to relevant government agencies
- Implementing a pilot conversion programme, including a training programme for local technicians and establishment of a knowledge platform on climate friendly technologies

Project Components:

1. Awareness campaign
2. Capacity building

3. Technology transfer and technical assistance

Current Status

3 reports + 1 Annex (in Spanish) completed on 3 sites suitable to natural refrigerant retrofits. One site had studies done for two different technologies. Project received positive ratings in most categories from NDE. Three workshops and two seminars held. High involvement of private sector and positive gender dimension reported by NDE. NDE reported that the quality of the work undertaken was excellent, despite a Final Report apparently not delivered to NDE by December 2018, when the project ended in March 2018. The NDE reported that “to define the next steps, is important to have the official report in order to implement a pilot and the support from CTCN. Not having this solved, is not possible to continue with any subsequent stage. This is a very important aspect because it was disseminated among the relevant stakeholders that a pilot will be developed. Not having any response about this affects the credibility and trust of the institutions involved (UNIDO/CTCN, Sustainability Agency of Chile, Ozone Unit of the Ministry of Environment of Chile and Chile Alimentos, who is the visible face before end users and relevant stakeholders).”

Context

Since the 1980s, agribusiness has developed dramatically in Chile, and the sector has become a key factor in the country’s economic development. Over 200 types of fruits and vegetables are now processed in Chile for food production and export, each requiring refrigeration throughout various aspects of processing.

At the same time, Chile has prioritized the elimination of fluorinated refrigerants, aiming for a 25% decrease by 2020. While the most common refrigerant alternative in the country has zero ozone depleting potential, it has a high global warming potential.

The CTCN harnessed UNIDO’s expertise in cold storage applications for food and agro-industry value chains to provide technical assistance that could ultimately reduce ozone depleting substances while improving energy efficiency and competitiveness in a strategic sector of the country’s economy.

By demonstrating the feasibility, profitability and environmental benefits of alternative technologies, complemented by policy/regulatory support and capacity building, the initiative was to contribute to the substitution of high global warming potential refrigerants with alternative refrigerants, and assist Chile in meeting its greenhouse gas reduction objectives.

The request was initially developed with an objective of being part of CTCN pilot projects during September 2013. It was decided that the best action was to wait for the full operation of the CTCN in early 2014 and not to undertake the work as an early pilot project.

Relevance

The action is relevant given Chile’s significant agribusiness sector and the need to reduce the use of ODS and high GWP refrigerants.

Coherence

UNIDO has relevant expertise in the area, so UNIDO was a logical implementing agent. Coherence with other government initiatives remains unclear.

Progress to impact

- 3 industrial site reports produced, one report has a separate annex (all reports in Spanish)
- 3 local and one national workshop held

Relevant project reports:

20150805 Natural Refrigerants - Request to CTCN | CTCN Website
20160513 Natural Refrigerants - Response Plan (Signed) | CTCN Website
20160515? Natural Refrigerants - Impact Brief | CTCN Website
20180315 Three Project Reports on Specific Industrial Sites - ES
20180315 PowerPoint Presentation by Andres Celave – UNIDO – ES
20180423 Transcritical CO2 Cooling Systems for Southern Zone LACs
20181110 CTCN Refrigeration TA Closure Report
20181122 Proyecto de Diseño de Conversión_Empresa 1 – ES
20181122 Proyecto de Diseño de Conversión Empresa 2 – ES
20181122 Proyecto de Diseño de Conversión Empresa 3 – ES
20181231? NDE Response Feedback Form from Chile Alimentos Project Partner
20190915 D2.1 Reporte KOM CTCN UNIDO - ES
20210222 Natural Refrigerants Summary Page | CTCN Website

Other relevant reports:

- Anhydrous Ammonia Refrigerant Systems in the Process Industries - The Good the Bad and the Ugly - DEKRA (USA), <http://dekra-insight.com/images/focus-articles/fa-The Good the Bad and the Ugly.pdf>

Additional possible relevant information/documents

- Minutes of meetings leading to the development and submission of the request for assistance to CTCN
- Where/how the decision was taken on the Chile side for the request to CTCN
- The CTCN process for evaluating the request for assistance
- Documentation on any CTCN appraisal of the request for assistance
- Any bidding undertaken by CTCN to address the request for assistance
- The project's formal start date
- 2015 and 2016 GEF reports
- Project Inception Report
- Project Progress Reports
- Project completion report
- Project completion date
- Current status and prospects of this project's outputs
- Confirmation of amount and date of government/counterpart's own funds spent on project activities

Key organizations

- GRD for value, timeliness, bureaucracy, current status etc. of CTCN support
- The (3) recipients of project funded reports
- Other donors and funding agencies active in the low or no GWP space in Chile
- Cool store/ agribusiness refrigeration industry associations/bodies relevant to Chile

Annex 4.6 ECOWAS: Mainstreaming Gender Energy System

Mainstreaming Gender for a climate resilient energy system in ECOWAS

Contract No.	Contracting Party	Start date	End date	Amount
Status: Ended	UNIDO	March 2017	July 2018	USD119,424

The project was a 12 Months scheduled duration project (as per final response plan of March 2017)

Project Implementation:

The Capacity Building/Training component was undertaken by “MDF West Africa” [a CTCN Network member] and Partners for Innovation (Ghana and Netherlands)” CTCN Network member) for ECREEE and UNIDO/CTCN, under a UNIDO/CTCN funded project.

The Gender Responsive Clean Energy Investment Promotion component was a UNIDO/CTCN funded project undertaken by PFAN, the Private Finance and Advisory Network that is hosted by UNIDO.

Key Counterparts

ECREEE (ECOWAS Centre for Renewable Energy and Energy Efficiency), its ECOW-GEN (ECOWAS Gender Mainstreaming in energy access) program, and the Gender Focal Points/Units (GFP/GFU) in each of the 15 ECOWAS (Economic Community of West African States) countries were the key counterparts for component 1. ECREEE was the key counterpart for component 2.

Request of CTCN assistance received from:

The request for CTCN assistance was submitted under the name of the Environmental Protection Agency, Ghana – on behalf of thirteen (13) named ECOWAS countries, namely Benin, Burkina Faso, Cote d’Ivoire, the Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

Request Submission and Response Plan - TOR

The request submission form entitled “Mainstreaming Gender for a climate resilient energy system in ECOWAS” was submitted to CTCN on 26 January 2016 and was submitted by the relevant NDE which was the Environmental Protection Agency of Ghana. The request applicant was ECREEE (an ECOWAS agency that is based in Cape Verde) and covered 13 of the 15 ECOWAS countries (not including Cape Verde and Guinea Bissau).

The TA Response Plan – TOR was signed by the NDE (EPA, Ghana) and the CTCN Director on 27 March 2017 under request ID 2016000005.

Objectives

The objectives of the project were to support ECOWAS member states to achieve their universal energy access goals and ambitions through integration of gender inclusive climate resilient energy policies and practices. The focus was on:

- Capacity building
- Knowledge management, awareness, and advocacy
- Investment promotion and business development

Project Components

1. Capacity building– gender mainstreaming in energy projects, products, and services – which was primarily delivered via a 3-day gender training held from 28 Feb to 02 March 2018 in Accra, Ghana.
2. Gender responsive clean energy investment promotion – comprising specific projects supported by PFAN for investment. Two projects supported by the intervention have gone on to receive funding from other sources and are underway to being implemented.

Current Status

The first known TA activity was in May 2018, and TA activities ended in December 2019.

Context

The 15 ECOWAS countries have a modest per capita GHG emissions profile. However, climate change adaptation is very relevant to ECOWAS countries, as they are highly vulnerable to climate change impacts, in particular through changing rainfall patterns in their largely rain fed agricultural systems that are the main source of employment, livelihoods and food supplies. Women are not just the victims of climate change impacts, but they also play a key role in the adaptation to climate change. However, women are underrepresented in climate change decision making and planning. In addition, women are underrepresented in clean energy entrepreneurial businesses that are involved in climate change mitigation and clean energy in West Africa. The project aimed to address both training needs in gender planning and policy, and to foster women-led clean energy entrepreneurial activities.

Relevance

The action is very relevant given the need to involve women in climate change adaptation policy development and planning, and the need for, and opportunity to, enhance women led clean energy entrepreneurial activities.

Coherence

UNIDO has a longstanding background of working with the project proponent, ECREEE. UNIDO, along with REEEP, also hosts and manages PFAN which had relevant expertise in supporting the development of clean energy entrepreneurial projects and had an established mechanism of Climate and Clean Energy Forums where the project supported women entrepreneurs could pitch their projects for next stage implementation funding support from grants and debt as appropriate.

Effectiveness

The project has produced significant outputs under both of the two components.

In the women entrepreneur investment component, two intervention supported projects received funding.

The TA supported biogas project in Sierra Leone subsequently received a USD155,000 grant (from non-project sources) towards developing a total of 7 MW of Waste to Energy (WTE) plants in Freetown. As of June 2021, one unit of the 20ft container based 50-100 kWe biogas units is operational, and two units are under implementation. The direct result of the three units is reported to be GHG reductions of 450 tonnes CO₂eq/year, with GHG reductions of 45,000 tonnes/yr CO₂eq being expected when all 7MWe of biogas units are installed. However, project support for eventual success was very indirect.

A 2 MWe lease-to-own solar powered business aimed at 1000 SMEs in Nigeria to replace their fuel generators subsequently received USD100,000 of 50% grant and 50% debt funding from non-project sources. The full GHG mitigation impact of the targeted 2 MWp of solar units is reported to be GHG reductions of 4,000 tonnes CO₂eq/year. It is claimed that 150 SMEs are using solar provided by the relevant company, but how much of this is due to project support, and the GHG implications of the 150 SMEs using solar are not known.

Efficiency

The project training component was started in 2017 and the objective of the project was to train 30 Gender Focal Units (GFU) persons (two from each ECOWAS country) and organize fifteen train-the-trainer trainings for selected replicator organizations (one from each country).

By the final deadline on 10th December 2017, 38 organizations had applied for participation in the ‘train-the-trainer’ programme. There were 27 GFU persons that attended the training, with a total of 15 participants for the English class and 27 participants for the French class.

The course was delivered between 28th February and 02 March 2018 in Accra, Ghana. From the training program material, and the post program evaluation by training participants with its 85% level of satisfaction for both trainee groups, the training provided was clearly appropriate and met the needs of the trainees.

The gender responsive clean energy investment promotion opportunity, comprising specific projects supported for investment, call for proposals was published on 18 September 2017. Businesses seeking investment of up to USD50 million were invited to apply by 20 November 2017. Over 50 submissions were received. With PFAN coaching, 13 projects were developed, and four project supported women entrepreneurs pitched their proposals directly to investors at the PFAN second global Climate and Clean Energy Investment Forum in Vienna on 17 May 2018, held in conjunction with the Vienna Energy Forum Special Session 2018. Three projects were selected by the jury of investors and climate financing experts.

From the positive training report for component 1, and the 13 women entrepreneur projects supported by PFAN for which two (in Sierra Leone and Nigeria) received subsequent funding from non-project sources, the TA clearly was efficiently implemented.

Sustainability

The ECOWAS countries had gender inclusive regional policies in place though the ECOW-GEN program, but the challenge was to translate the regional policies to national policies and then to deliver tangible results from the relevant national policies. The training workshop was a useful first step in developing national capacities at both the GFP/GFU levels and at the civil society “training of trainers” level. Ongoing training support, on which sustainability depends, was subsequently received from other donors.

Two of the thirteen projects developed with TA support have indirectly been subsequently approved for funding support. Other projects may also yet also receive funding support.

Progress to impact

The TA project met its capacity building training goals.

The support of 13 specific women entrepreneurial projects exceeds the target of 10 projects supported. As a result of the training, the ECREE ECOW-GEN coordinator of the time (Ms. Monica MADUEKWE) reports that as a result of the project provided training that the GFUs have increased their capacities, with many now having more than 10 staff, and that gender

training is ongoing, additional funding has been provided by Spain and USAID, and that GIZ uses the training materials developed by the project.

Two projects subsequently receiving 2nd stage funding (from other non-project sources) is a bonus in progress-to-impact terms. The Sierra Leone waste to energy project funded support from PFAN led to ongoing support from the PFAN advisor (even after the advisor had left PFAN), a USD26 million loan is under active due diligence consideration, a containerized pilot funded by the German government is working successfully at a Freetown hospital using organic food waste selling heat and power to the hospital and also selling the organic fertilizer WTE residue, and systems that use the heat to produce cooling for cool stores is under development.

Relevant project deliverables:

The CTCN Website links to all available project documents is at: <https://www.ctcn.org/technical-assistance/projects/mainstreaming-gender-climate-resilient-energy-system-west-africa>

For the Request Submission Form: [request submission form - mainstreaming gender for a climate resilient energy system final .docx](#)

[Mainstreaming Gender for a climate resilient energy system in ECOWAS](#)

For the Response Plan: [Mainstreaming Gender for a climate resilient energy system in ECOWAS](#)

For the Final Response Plan: [ecowas final response plan.docx](#)

For the training component a Mainstreaming Gender for a Climate Resilient Energy System in ECOWAS Countries - Final Capacity Building Component Report was produced (Final Project Report) in May 2018 and is available in English and in French versions. See [ecowas final response plan.docx](#) in French and [ECOWAS Final Report EN](#) in English.

A TA Closure Report re Gender Training Aspects was provided by the NDE and is dated July 2018

For the gender responsive clean energy investment promotion component, no specific report has yet been sighted, however a call for proposals, a summary table for the 13 supported projects, and some news items relating to the May 2018 Investors Forum in Vienna are as follows:

- 20170918 Call for Proposals for Women-led Sustainable Energy Enterprises in West Africa, Investment of Up to USD50 Million
- 20180520 4 ECOWAS-CTCN West African Women-led Sustainable Energy Enterprises showcased at the Global Investment Forum in Vienna – on ECREEE website
- 20181018 CREEDS Energy - Off-grid energy challenge winners secure blended financing @ USADF Awards
- Summary for 13 CTCN PFAN ECOWAS Investment Projects received from UNIDO-CTCN/PFAN)
- Mainstreaming gender for a climate resilient energy system in West Africa | CTCN Website

Other relevant reports:

- 2014 ECOW-GEN Programme on Gender Mainstreaming in Energy Access - Programme Document 2015-2019 – EN
- 2014 ECOW-GEN Programme on Gender Mainstreaming in Energy Access | GN-SEC | UNIDO Website
- 20130515 Africa Leadership Centre - Climate Change, Gender, HDI etc. Working Paper No.11 - Kaddy Fofana

- 20180417 Sierra Leone's Masada Waste Management wins major award – SIERRA LEONE TELEGRAPH
- 20180516 PFAN Investment Forum 2018 Digital Programme
- 20180517 8 Selected West Africa and Asia Enterprises pitch their projects at the PFAN Climate & Clean Energy Investment Forum | UNIDO
- 20180516 PFAN Investment Forum 2018 - Digital Programme
- CTCN1 Sierra Leone - The Masada Waste Transformers Proposal Poster
- 20180518 SIERRA LEONE/ Waste Transformers receive USD25 million for a waste-to-energy project | Afrik 21
- 201912 Understanding Urban Risk Traps in Freetown - Masada 2012-2017 Collection
- ECOWAS 20210428 ECREEE Acting ED - ECOW-GEN program on Gender Mainstreaming a Milestone Project
- ECOWAS 2014 ECOW-GEN Programme on Gender Mainstreaming in Energy Access - Programme Document 2015-2019 – EN
- ECREEE Website – stating that ECREEE was established with UNIDO TA
- ECREEE Website – showing that UNIDO is one of the five ECREEE Core Partners
- 20210428 ECREEE Acting ED - ECOW-GEN program on Gender Mainstreaming a Milestone Project – on the ECREEE website

Relevant Organizations Interviewed

1. Ms. Monica MADUEKWE, former ECOW-GEN Coordinator at ECOWAS Centre for Renewable Energy and Energy Efficiency (ECEEE), info@puttru.com
2. Laura van Druten, CEO, lara.van.druten@thewastetransformers.com and 1 of 2 winners of investment pitching competition

Annex 4.7 Zimbabwe: Industrial Energy Efficiency

Technical Assistance for piloting rapid uptake of industrial energy efficiency and efficient water utilisation in the industrial sector in Zimbabwe

Contract No.	Contracting Party	Start date	End date	Amount
UNIDO Contract No: 3000056671 (Status: Ended)	PricewaterhouseCoopers Pvt. Ltd., India (PwC India)	2018	January 2019	USD158,656

Stakeholders:
BCSDZ - Business Council for Sustainable Development Zimbabwe (Project Proponent)
EMA - Environmental Management Agency (Key Stakeholder)
MEPD -- Ministry of Energy and Power Development (Key Ministry)
MEWC - Ministry of Environment, Water and Climate (NDE and Key Ministry)
MIC - Ministry of Industry and Commerce (Key Ministry) SIRDC - Scientific and Industrial Research and Development Centre (Key Stakeholder)
ZERA - Zimbabwe Energy Regulatory Authority (Key Stakeholder)
ZCPC - Zimbabwe Cleaner Production Centre (Key Stakeholder)

Key Zimbabwe Counterpart

Business Council for Sustainable Development Zimbabwe BCSDZ/UNIDO

Request of CTCN assistance received from:

Ministry of Environment, Water and Climate (MEWC); Climate Change Management Department

Request Submission.

The formal request to UNIDO by GoZ for TA in developing a Green Industry Initiative was made in 2013. A request was submitted by BCSDZ/NDE to CTCN in 2015 and accepted in 2016. The submission form is signed and dated 23 August 2017, and was submitted by the relevant NDE (Ministry of Environment, Water and Climate; Climate Change Management Department)

Objectives:

The objectives of the Technical Assistance were to:

1. Identify energy and water efficiency and management improvement potentials in ten selected demonstration companies.
2. Create capacities to replicate and implement such interventions autonomously in companies across Zimbabwe in the future.

Activities Completed/Deliverables:

The six stipulated deliverables were produced by the consultants.

- CTCN funded consultants undertook the specified energy and water efficiency audits in 10 selected industries.
- A side event at the BCSDZ Annual conference was attended by 67 delegates.
- For the training on the ISO 50001 Energy Management Systems approach and on specific relevant energy and water savings opportunities, the classroom training was provided to 42 participants, of which 17 were from industry and 12 from government. Hands on training was provided to 27 participants, of which 10 were from Industry, 14 from government, and 3 were consultants.
- A manual on energy and water management for the industrial sector in Zimbabwe was produced.

Current Status

USD4.53 million investment pipeline identified. However, the status and prospects for implementation of audit results are not known.

Context

Zimbabwe is facing an ongoing deficit of key resources, including enough power and water to meet demand. The water supply of the country has been affected by the adverse effects of climate change. The prevailing power deficit leads to unmet demand/load shedding in end-use sectors. Industry is one of the major contributors to the national energy consumption.

The total available water for Zimbabwe is around 20 million mega-liters (in the form of surface and underground water). After the agricultural sector, water use is highest in the urban, industrial and institutional sector (15%). Limited monitoring and measurement of water supply and use and of energy use, outdated equipment and inefficient processes have resulted in energy and water consumption that is well above global industry benchmarks. Zimbabwe is experiencing water scarcity, which greatly affects its industrial production.

Relevance

Zimbabwe's electricity and water supply struggle to meet demand. Industrial plants are old and inefficient in energy and water use terms, lacking in maintenance from years of underinvestment, they lack metering, and tariffs are unrealistically low. The TA is hence very relevant.

Coherence

The project fits well into the various efforts to achieve energy efficiency, increased competitiveness and overall reduction of GHG.

Effectiveness

- 10 industrial sites were selected, and energy and water efficiency audits were undertaken, and recommendations developed. Hands on training was provided during each 3-day duration energy and water audit to a total of 27 people, who also participated in the classroom training.
- A 3-day classroom training on ISO 50001 Energy Management Systems was delivered to 42 people and was rated by 79% of participants as “excellent” and as “good” by the remaining 21% of participants.
- A side event at the BCSDZ Annual conference was attended by 67 delegates with participants and speakers from 5 countries.
- ISO 50001 and energy and water savings classroom training was provided to 42 participants, Hands on training was provided to 27 participants.
- A manual on energy and water management for the industrial sector in Zimbabwe was produced.
- However, general awareness of ISO 50001 approach provided was not used to establish necessary prior client ownership before "free" energy and water audits were undertaken. So limited if any likely implementation of recommendations.

Progress to impact

10 Energy and water efficiency audits were undertaken in the following 5 sectors: agrochemicals (2), cables, cement, food and beverages (3) and mining (3) sectors. 161 energy and water saving recommendations were identified, 12% requiring no investment, 78% with less than 3 years simple payback, 10% with over 3 years simple payback. A total of 10MW of electrical energy savings and 0.61 million m³/year water savings were identified. Solar thermal, PV electric (and also with battery storage) self-generation opportunities were found to have respectively 5-, 6-7- and 7-9-year simple paybacks at current tariffs, and as such would be strategic investments for the industries involved. A number of policy recommendations were also provided.

It is not known what, if any, energy and water saving audit recommendations have been implemented from the USD4.53 million pipeline investments identified. However, the "Free" Energy and Water audits may not lead to significant investments based on experience with "free" energy audits worldwide over the last 50 years - given the possible limited recipient company ownership of the “free” energy audit findings and recommendations

Relevant project reports:

<https://www.ctc-n.org/technical-assistance/projects/piloting-rapid-uptake-industrial-energy-efficiency-and-efficient>

- 20170823 TA Response Plan - Final- NDE Signed
- 20181130 TA Findings Presented to BCSDZ Annual Conference (Deliverable)
- 20190131 Appendix 1 - Methodology - TA Closure Report (Deliverable)
- 20190131 Appendix 2 - Illustration of the TA - TA Closure Report (Deliverable)
- 20190131 Manual on Energy and Water Management in Zimbabwe (Deliverable)
- 20190131 TA Final Report (Deliverable)
- 20210223 TA for Piloting Rapid Uptake of Industrial EE and Efficient Water Utilisation - on CTCN website

Other relevant reports:

- USAID Country Development Cooperation Strategy (CDCS) 2016-2021, https://www.usaid.gov/sites/default/files/documents/1860/Zimbabwe_CDCS_2016-2021.pdf
- 20200215 ECONOMIC-OUTLOOK-2020 - Confederation of Zimbabwe Industries (CZI), <https://czi.co.zw/wp-content/uploads/2020/07/ECONOMIC-OUTLOOK-2020.pdf>

Additional information/documents that would be relevant

- Minutes of meetings) and relevant documents leading to the development and submission of the request for assistance to CTCN
- The CTCN process for evaluating the request for assistance
- Documentation on any CTCN appraisal of the Zimbabwe request for assistance
- The bidding undertaken by CTCN to address the request for assistance
- Contract to PWC India by CTCN
- Current implementation status and prospects of the energy and water audit recommendations
- Current status and prospects of ISO50001 implementation in Zimbabwe

Key Stakeholder Organisations

- MEWC & BCSDZ for value, timeliness, bureaucracy etc of CTCN support
- MEWC & BCSDZ for the status of energy and water audit recommendations implementation and for ISO 50001 implementation status
- The most active energy audit recipients
- Other donors and funding agencies active in the industrial energy and water management space in Zimbabwe

Annex 4.8 Paraguay: Environmental Flows and River Basin Management

Determination and evaluation of environmental flows and river basin management plans based on the Tebicuary River priority basin

Contract No.	Contracting Party	Start date	End date	Amount
(Status: Completed)	UNIDO	January 2018	February 2019	USD124,828

12 Months scheduled and actual project implementation duration.

Stakeholders:

Stakeholder	Role to support the implementation of the assistance
<i>Secretariat for Environment (SEAM)</i>	<i>Executive for public policies related to climate change and the use and management of water resources</i>
<i>Private sector – agricultural products</i>	<i>Assistance and support for carrying out monitoring</i>
<i>Departmental and local authorities</i>	<i>Support and facilitation in the area in question for the actions to be carried out</i>

Project Implementation:

Environmental Hydraulics Foundation (IH Cantabria, ES), CTCN Network Member N0120

Key Government Counterparts

Directorate General for the Protection and Conservation of Water Resources (DGPCRH), Secretariat for the Environment (SEAM)

Request Submission Form

The request submission form 20170000001 was signed on 30 December 2016, and was submitted by the NDE, which was the National Climate Change Office, Secretariat for the Environment (SEAM). The request applicant was the Directorate General for the Protection and Conservation of Water Resources (DGPCRH), Secretariat for the Environment (SEAM)

Objectives:

1. Establish an adequate methodology for calculating the minimum maintenance flows in Paraguay's river basins.
2. Apply this methodology to the Tebicuary River Basin.
3. Establish a methodology for designing integrated water resource management (IWRM) plans at the basin level. Apply this to the Tebicuary River Basin.
4. Conduct training and transfer of technology activities in relation to the above activities.

Project Components:

1. Identifying an integrated water resource management (IWRM) environmental flow methodology applicable to Paraguay that could be replicated in other basins throughout the country.
2. Developing an environmental flow (EF) tool for the integrated use and management of drainage basins in Paraguay as the basis for implementing measures to adapt to and mitigate climate change.
3. Capacity building of local technicians and government agencies responsible for the Tebicuary River Basin, with an emphasis on producing and applying the methodologies developed, both for determining environmental flows and for drawing up use and management plans for water resources via basins.

Current Status

DGPCRH report that the TA outputs produced were those expected and were of very good quality. The TA outputs have been used for a review of the national policy on water resources using a participatory process, including stakeholder workshops, for which the TA outputs proved to be very useful. The TA has also served as a basis for additional support provided from the Interamerican Development Bank (IDB) for review of the national water resources policy. Two other initiatives on water basin management are underway, one from IAEA and one from IDB, both of which are reported to be complementary. DGPCRH are optimistic that river basin management will further improve in Paraguay, albeit at a rather slow pace.

Context

The request was developed based on the participation of the representative of the National Office for Climate Change in a CTCN workshop in Costa Rica in 2015.

The request was then proposed based on the interest of DGPCRH in following up on previous work in one of the country's priority basins (the Tebicuary River Basin) and the need for innovative methodologies to support water management as the cornerstone of adaptation to climate change.

The request was drawn up with support from the Tropical Agricultural Research and Higher Education Center (CATIE), with two joint meetings, in addition to meetings with DGPCRH.

As such, this request has arisen from the direct initiative of the NDE and no tender or calls for proposals were undertaken on this occasion.

The specific context of the Tebicuary River Basin is highly significant, as up until the mid-twentieth century, the basin was showing hardly any change and there was a clear water surplus. As part of an ongoing shift from cattle ranching, agricultural use has increased exponentially over the last 50 years, focused primarily on rice growing (of more than 100,000 hectares of paddy fields), which is highly water intensive. Alongside this, a significant proportion of the headwater basin has been deforested which, added to possible climate alterations, has resulted in greater variability of flows. In dry years, it is now virtually impossible to meet existing demand, without even considering the need to maintain minimum flows for environmental reasons. The effects of climate change on extreme climatic phenomena have made an integral management of river basins more urgent for Paraguay. 2020 saw one of the most severe droughts in the country.

The control of flows, water intakes and discharges will result in a conserved and resilient environment. The study of flooding in the Tebicuary river basin will reduce the vulnerability to floods by 20% (benefiting around 112,000 inhabitants). The TA will have a direct impact on the Tebicuary River Basin population (around 560,000 inhabitants), and indirectly from the project the replicability of the tools developed in the project to other river basins will extend these benefits for the whole country.

Relevance

The action is highly relevant given Paraguay's ongoing shift from cattle ranching to more water intensive agriculture activities. Water-intensive activities (agricultural, urban and industrial) compete with each other at the river basin level alongside other less water-intensive activities such as cattle ranching, fishing, sailing, energy production, ecosystem conservation, maintaining landscapes, etc.

DGPCRH report that the TA was highly relevant for a more evidence-based approach to management of river basins. The TA focused on the Tebicuary river, which served as an "experimental river basin" for future enhanced management of river basins in the country.

The knowledge gained is also important for the management of international river basins in border regions, where solid evidence is important to reach agreements on joint management initiatives.

Neighbouring Brazil is far more advanced in the automated monitoring of flows in most of the river basins. Paraguay is lagging behind compared with its neighbors.

Coherence

The CTCN Network member chosen to develop the Response Plan and implement the TA, the Environmental Hydraulics Foundation (IH Cantabria, ES), had relevant expertise, as also confirmed by DGPCRH.

Other initiatives are reported on water basin management underway from IAEA and one from IDB, both of which were reported by DGPCRH to be complementary to the CTCN TA.

Effectiveness

The key beneficiary (DGPCRH) reported that the TA effectively met its objectives.

Efficiency

Project was implemented on time and within budget. DGPCRH report that the outputs produced were those expected and were of very good quality. DGPCRH report that the staff from the contractor, IHC, were highly qualified and motivated. IHC contact was maintained even after the TA had ended

Sustainability

Post TA, DGPCRH are optimistic that river basin management will further improve in Paraguay, albeit at a rather slow pace.

Progress to impact

The TA was completed as expected and the outputs are being utilised as expected.

Project reports:

- Paraguay 20161230 Request Submission Form – EN
- Paraguay 20180423 TA Response Plan - TOR - signed by all - ES
- Paraguay 20180503 TA Response Plan - TOR - EN

- Paraguay 20180910 D2.2 ESTADO DEL ARTE EN LA GESTIÓN INTEGRADA DE RECURSOS HÍDRICOS A NIVEL DE CUENCA
- Paraguay 20180910 D3.1 INVENTARIO Y ANÁLISIS DE LA INFORMACIÓN DISPONIBLE
- Paraguay 20180910 D3.2 METODOLOGÍAS DE DEFINICIÓN DE CAUDALES ECOLÓGICOS Y DESCRIPCIÓN DE LA HERRAMIENTA PROPUESTA
- Paraguay 20180921 D2.1. ESTADO DEL ARTE. CAUDALES ECOLÓGICOS
- Paraguay 20180921 D3.4 APLICACIÓN DE LA HERRAMIENTA PROPUESTA PARA LA DEFINICIÓN DE CAUDALES ECOLÓGICOS EN LA CUENCA DEL RÍO TEBICUARY
- Paraguay 20190107 D3.3 INFORME FINAL - CAMPAÑAS DE MEDICIÓN DE NIVELES Y CAUDALES EN LA CUENCA DEL RÍO TEBICUARY - ESTACIÓN DE ITURBE (RÍO TEBICUARY- MÍ)
- Paraguay 20190125 INFORME DE LA MISIÓN 3 (DEL 14 AL 18 DE ENERO DE 2019)
- Paraguay 20190125 MEMORIA DEL CURSO DE MANEJO DEL MODELO HEC-RAS Y APLICACIÓN A LA GESTIÓN DE INUNDACIONES
- Paraguay 20190218 D4 PROPUESTA DE UN MARCO GENERAL PARA LA GESTIÓN INTEGRADA DE LOS RECURSOS HÍDRICOS Y ADAPTACIÓN AL CAMBIO CLIMÁTICO
- Paraguay 20190218 TA Summary PowerPoint Presentation - CTCN Website
- Paraguay 20190219 Monitoring & Evaluation Plan - final – EN
- Paraguay 20190220 D4.1 DIRECTRICES PARA LA ELABORACIÓN DE UN PLAN DE GESTIÓN INTEGRAL DE LA CUENCA DEL RÍO TEBICUARY (PARAGUAY)
- Paraguay 20190318 NDE Feedback Form - ES
- Paraguay 20190329 TA Closure Report - Public - EN
- Paraguay 20200922 Application of environmental flows & river management - UNFCCC-INT – Main DB
- Paraguay 20210612 Application of environmental flows & river basin management framework for the Tobicuary river basin - CTCN website – EN

The above documents are all available on the CTCN website at: <https://www.ctcn.org/technical-assistance/projects/application-environmental-flows-and-river-basin-management-framework>

Other Open Source Reports

1. Paraguay 20190506 New tool to improve the management of watersheds & water resources in Paraguay - Smart Water Magazine
2. Paraguay 20200715 National Consultancy To Enhance The Elaboration Of Water-Related SDG Indicators- EN
3. Paraguay 20201015 ANÁLISIS DEL IMPACTO DEL CAMBIO CLIMÁTICO SOBRE EL CAUDAL DEL RIO TEBICUARY - Tesis de Maestría - Mary Gaona

Organizations Interviewed

Ms. Flavia Fiore Madés and Mr. José Silvero from the Directorate General for the Protection and Conservation of Water Resources (DGPCRH), Secretariat for the Environment (SEAM) were interviewed on 23 June 2021 regarding the TA's quality and applicability of results, relevance, coherence, effectiveness, efficiency, sustainability, and impact.

Annex 4.9 Gambia: Organic Waste for Energy

Recycling of Organic Waste for Energy and Small Holder Livelihood in The Gambia

Contract No.	Contracting Party	Start date	End date	Amount
UNIDO Contract No: 6000012712 (Status: Ended)	ECO Consult Sepp & Busacker Partnerschaft (Eco Consult) ²¹	15 Feb 2018	31 March 2019	USD140,749 ²²

1 year project duration

Stakeholders:

Key Gambia Counterpart

Women Initiative The Gambia (WIG)

Request of CTCN assistance received from:

Gambia Technical Training Institute (GTTI)²³.

Request Submission.

The CTCN request was made as “Recycling of Waste & Organic materials (charcoal and briquette Production)²⁴ on 30 May 2016 by Gambia Technical Training Institute (GTTI) as requesting NDE on behalf of the Women Initiative The Gambia (WIG). The project was listed as a “Mitigation to Climate Change” project in the Energy Waste and Business sectors of its CTCN request.

TA Request Objectives:

The stated problem in the Technical Assistance request of May 2015 was inadequate waste management, its accumulation in vacant land in urban and peri-urban areas of The Gambia and the potential health risk of waste accumulating on the streets.

The assistance requested was training women in 15 additional communities to “recycle non-biodegradable materials such as plastic bags”. The women were also “to be further trained on how to make or produce charcoal briquettes out of dry leaves, saw dust and coconut shells”.

²¹ ECO Consult is listed as a CTCN Network Member and Knowledge Partner, see <https://www.ctc-n.org/about-ctcn/knowledge-partners?page=3> Eco Consult is a wood energy focused consultancy, but does not list urban waste management amongst its expertise areas.

²² The stated total Budget is from the TA Closure Report

²³ GTI are the listed NDE of The Gambia, see <https://www.ctc-n.org/about-ctcn/national-designated-entities/national-designated-entities-by-country>

²⁴ The focus in the request was on solid waste (urban garbage) management and the prevailing informal dumping of urban waste and on producing charcoal briquettes from dry leaves, sawdust and coconut shells

The expected benefits in the original TA request were improved livelihoods and social cohesion amongst the women in the communities.

There was no link in the TA request stated between the proposed recycling activities and the “Mitigation to climate change” theme that was listed in its CTCN request.

A key focus throughout the project’s evolution was increasing the income generation by women groups, through waste management activities.

Deliverables:

- Baseline Situation Report (solely focussed on utilising agricultural residues for making briquettes to displace charcoal used for cooking).
- Briquette Production Manual – Basic and Advanced Technology.
- Synthesis Report – Recycling of organic waste for energy in the Gambia.
- A pilot project was developed to take landfilled ground nut (peanut) shells, burn them to charcoal, grind the charcoal, transport the charcoal to recipient women’s communities, mix the ground charcoal with an organic filler/binding agent, compress the mixture into briquettes, dry the briquettes, and have the women of the women’s ground use the briquettes instead of charcoal for cooking in existing charcoal stoves.
- Actors Analysis and Action Plan – which is essentially the TA funded follow-on full-scale project proposal developed for GCF consideration and funding.

Current Status

The pilot project has been completed. The TA supported equipment and trained women’s groups are presumably still making briquettes for cooking from ground nut (peanut) shells. The background material for a follow on GCF upscaling project was produced by the CTCN project in March 2019. The current status of this GCF proposal is unknown. The CTCN funded TA contractor, Eco Consult) is the proposed (GCF funded) Project Coordinator – hence Eco Consult used its CTCN pilot project 1-year USD140,749 duration funding to design a follow-on project where it would be employed for 3 years in a follow-on proposed USD2.1 Million project.

Context & Project Evolution

The Gambia is the smallest land area country in West Africa, with a population of around 2 million, of which nearly 60% are urban dwellers. Wood and charcoal are widely used for cooking in The Gambia. 43% of urban households use charcoal, while 15% of rural households use charcoal. Nearly all other households use wood for cooking, very few use bottled gas or electricity. Total charcoal use is estimated at 25,000 tonnes/yr (750 TJ/yr), while firewood use is estimated at 185,000 tonnes/yr (3500TJ/yr).

The project in its request submission form of May 2016 was originally entitled “Recycling of Waste and organic materials (charcoal and briquette production)”.

By the October 2017 Response Plan (designed by the World Agroforestry Centre²⁵ (ICRAF)), the project had become “Recycling of Organic Waste for Energy and Smallholder Livelihood” with a focus on reducing the demand for charcoal from wood and making fishmeal as chickenfeed out of fish wastes. This was the 2nd phase evolution of the TA.

In the 3rd implementation phase of the TA, the titles of the project work and deliverables phase reports stayed unchanged from the 2nd response plan stage. However, the project focus in the 3rd phase was further narrowed to a sole focus on utilising agricultural residues for making briquettes to displace charcoal used for cooking. The largest identified relevant agriculture waste stream was a large groundnut processing plant. This plant processes 35,000 tons of groundnuts annually. The groundnut shells are not currently mostly not used, and most are apparently dumped on landfills, located very close to the ground nut processing plant.

Main processing plants’ groundnuts shells mostly being dumped in a landfill



Relevance

The final project orientation is highly relevant to The Gambia, where the fuelwood supply is stated to be under pressure from a growing population and limited land area. However, no data is presented in project reports or available from open sources as to the extent of forest cover in the Gambia, forest cover changes over time, and if native forest species have been replaced by fast growing, drought and fire resistant exotic species such as eucalyptus. There is a hint that the baseline fuelwood is now fast-growing eucalyptus at the end of section 9.1 in

²⁵ ICRAF are a CTCN consortium and knowledge partner, but it is not clear why ICRAF was retained to develop the response plan, as ICRAF does not have expertise in the SWM focus of the original project’s CTCN request [ICRAF are an INGO based in Nairobi and in 2017, ICRAF released a study at the UN Climate Change Conference that centers on Agroforestry and the emission of carbons from deforestation. So ICRAF should have been aware that reducing deforestation is a pre-requisite for claiming GHG emission reductions from forestry] This change/evolution in focus needs detailed examination.

the Synthesis Report. On p7 of the TA Closure Report it is stated that the 15 tonnes of briquettes avoided the cutting of 50 tonnes of wood, that is the equivalent of 2 ha of eucalyptus plantations. There are various old and not very conclusive reports on the web that suggest that the original forest cover in The Gambia is now mostly gone. The 2006 Mongabay web item suggests that forests in The Gambia are now plantations, with no remaining intact primary forests. So if the briquettes are replacing wood from eucalyptus plantations, and if the area of the eucalyptus plantations is stable, then there will be no net GHG emission reduction savings as new eucalyptus growth will absorb the same amount of CO₂ that is released when the eucalyptus fuelwood is burned.

Coherence

The project was coherent with government and CTCN priorities.

Effectiveness

- 225 women organised in 15 women's groups were trained in the production and use of charcoal briquettes made from available agriculture wastes and waste charcoal fines.
- In the pilot phase 15 tonnes of briquettes were apparently produced, with apparently many enquiries for additional carbonised and ground nut carbonised powder or briquette supply. The actual direct GHG mitigation impacts of the project from 15 tonnes of charcoal briquettes is claimed to be equivalent to 90 tons CO₂eq (annually 60 tonnes/year charcoal and 360 tonnes CO₂eq/year). At the full scale up levels in follow on projects 20,000 tonnes of charcoal briquettes equivalent to 120,000 tonnes CO₂eq is expected to be produced.

Efficiency

Project was implemented on time and within budget.

Sustainability

The pilot project and any scale up project (if it goes ahead) should be capable of sustainable operation without ongoing government or donor support.

Progress to impact

The project analysis goes into significant detail into the GHG impact of charcoal and firewood use as cooking fuels. However, provided the source wood is from (eucalyptus) plantation forestry (as it appears to be), then according to UNFCCC conventions there is effectively no global GHG impact as a similar amount of CO₂ is absorbed in the tree growth as is emitted by wood or wood derived charcoal combustion. ICRAF, as the designer of the response plan should have been aware of this rather fundamental fact, as should have the funded implementing agency, Eco Consult. Similarly, the landfilled ground nuts may eventually rot, and not be in an effective anaerobic landfill condition, and hence have no net GHG emissions. So, it is possible that there is no net GHG mitigation impact of the project, yet this was its stated purpose to request CTCN funding.

The main impacts appear to be:

1. A large source of suitable and concentrated agro wastes that were being dumped to landfill (ground nut shells) was identified, along with useful amounts of (presumably dispersed and informal) charcoal dust (this latter was not specified in project reports).
2. A suitable business model was identified and developed for a pilot project
3. The pilot project was implemented with initial indications that it could be sustainable
4. More than 225 women (15 women each in 15 groups) were trained in ground nut charcoal briquette production and between December 2018 and January 2019, 12 tonnes briquettes were produced and used.
5. A USD2.1 million²⁶ 3-year duration full scale project was developed under the TA and a concept note was apparently developed for the GCF.

Groundnut's carbonization, and burning



Significant supplies of currently un-utilised crop residues (primarily groundnut (i.e., peanut) shells) were identified. The groundnut shells were pyrolyzed in an open drum into charcoal, then ground using a diesel engine driven hammermill into powder by one women's group, purchased by the intermediary organisation (WIG) and transported by WIG organised large trucks to where the charcoal substituting briquette fuel is needed, and made into briquettes by local women's groups using a commercially available binder which was obtained from the purification of cassava roots, in the future it may be possible to use lower priced rice starch instead. The charcoal powder and starch mixture were then mechanically compressed into briquettes by a simple hand operated press, and air dried over 3 days. To be competitive with existing charcoal, the production chain was split into (1) production of carbonised powder by trained former ground nut gleaners, and (2) transport arranged by WIG, and (3) briquette production by local women's groups arranged by WIG.

The TA provided the pilot equipment and demonstrated production of briquettes at a lower cost and acceptable as a charcoal cooking fuel substitute. The briquettes were used for self-consumption by the members of the women's groups involved in the pilot.

An annual production potential of 20,000 tonnes/yr of briquettes was identified, and a scaling up plan was developed and has been apparently presented to the GCF²⁷ using the CTCN TA results as the pilot project basis for the proposal. The full proposed upscaling briquetting

²⁶ See section 16 (b) in TA Closure Report

²⁷ As per the 20190331Actors Analysis & Action Plan (Deliverable)

project could reduce the national charcoal consumption by 57%, accounting for a 20% reduction in the total wood used for firewood plus charcoal production.

The current status of the upscaling project proposal is not known.

Relevant project reports:

<https://www.ctc-n.org/technical-assistance/projects/improving-capacity-recycling-waste-organic-materials>

- 20160523 Recycling of Waste Organic Materials Charcoal & Briquette Production Project - CTCN Request
- 20171006 Response Plan - signed all
- 20190115 Baseline Situation Report (Deliverable)
- 20190331 Actors Analysis & Action Plan (Deliverable)
- 20190331 Briquette Production Manual - Basic and advanced technology (Deliverable)
- 20190331 Synthesis Report - Recycling of organic waste for energy (Deliverable)
- 20190331 TA Closure Report (Deliverable)

Other relevant reports:

- 20060204 Rainforests Environmental Profile, <https://rainforests.mongabay.com/20gambia.htm>
- 20120215 UNDP Investments & Financial Flows Assessment of Forestry Sector,
- 20180615 National Forest Action Plan (NFAP) 2019 – 2028, [https://chm.cbd.int/api/v2013/documents/72F99C09-A17F-497F-7B00-EE38CDE69E5D/attachments/NFAP%20\(2019%20-%202028\).pdf](https://chm.cbd.int/api/v2013/documents/72F99C09-A17F-497F-7B00-EE38CDE69E5D/attachments/NFAP%20(2019%20-%202028).pdf)

Additional information/documents that would be relevant

- Minutes of meetings and relevant documents leading to the development and submission of the request for assistance to CTCN
- The CTCN process for evaluating the request for assistance
- Documentation on any CTCN appraisal of the request for assistance
- Documentation on the selection and funding of ICRAF to develop the response plan
- The bidding undertaken by CTCN to address the request for assistance
- Contract to Eco by CTCN
- Confirmation of the project's formal start and end dates
- Current status of the pilot ground nut based charcoal briquette production facility
- Current status and prospects of the scaling up proposal to the GCF
- A copy of the Concept Note for the scaling up project as sent to GCF
- Any subsequent full proposals and any correspondence related to this concept/proposal

Key Organisations

- Eco as the project implementing contractor
- WIG as the project instigator/proponent/key project beneficiary

- GTTI as the CTCN NDE in The Gambia and the authorising agency for the proposal
- University of The Gambia (UTG), Department of Forestry (DF)
- Future In Our Hands (FIOH) NGO
- United Future (NGO)
- Swegam – equipment provider for CTCN TA/pilot plant and for upscaled project
- Other donors/funding agencies active in sustainable energy/forestry in The Gambia

Annex 4.10 Brazil, Chile, Mexico and Uruguay: Circular Economy

Study of the circular economy for roadmap development - A regional multi-country project covering Chile, Brazil, Mexico and Uruguay

Contract No.	Contracting Party	Start date	End date	Amount
FP/UNIDO/7000003530 (Status: Ended)	UNIDO	19 November 2019	Ended August 2021	USD144,4342

The scheduled project duration was 15 months

Project Implementation:

Undertaken by “Factor - Ideas for change” [CTCN Network member] and ASDF (Americas Sustainable Development Foundation – and CTCN Network member) under UNIDO/CTCN-funded project FP/UNIDO/7000003530

Key Counterparts

1. Ministry of Science, Innovation and Communications (MCTIC), Brazil
2. Sustainability and Climate Change Agency, Chile
3. National Institute of Ecology and Climate Change, Mexico
4. Ministry for Social Housing, Territory Planning and Environmental Affairs of Uruguay

Request of CTCN assistance received from:

Ministry of Environment, Head of the Circular Economy Office jointly with the Sustainability and Climate Change Agency, Chile – for a regional project on behalf of the four (4) countries.

Request Submission and Response Plan - TOR

The request submission form entitled “Assessment of the current status of the circular economy for developing a roadmap for each requesting country” was signed and submitted to CTCN on 19 November 2018 and was submitted by the NDE Sustainability and Climate Change Agency, Chile – on behalf of the NDE’s of the 4 countries. The TA Response Plan – TOR dated 19 March 2019 for request ID 2018000028 entitled “Analysis of the current situation of the circular economy for the development of a road map for each requesting country” was submitted by the NDE (Chile) with the Goal: “Development of a road map for the circular economy in Brazil, Chile, Mexico and Uruguay”

Objectives

The general objectives in this project were to assess the current state of circularity in the economies of Chile, Brazil, Mexico and Uruguay, and to develop a roadmap towards country-specific circular economy strategies.

The analyses undertaken before the final roadmaps were undertaken was to identify the key actors, stakeholders, private and public initiatives, geographical areas, as well as opportunities and barriers to implement a circular economy.

The framework was to incorporate and focus on the climate benefits that come from a circular economy model and to identify the advantages that enhanced circularity would bring to the

implementation of National Determined Contributions (NDCs) and the achievement of the Paris Agreement objectives.

Project Components

1. Development of implementation plans and communication documents
2. Analysis of key players and existing circular economy initiatives in the participating countries
3. Identification of the perceived value of the circular economy and of benefits, weaknesses, and challenges in each participating country
4. Compilation of international experiences
5. Mapping of cases of successful implementation of Industry 4.0 for the Circular Economy at the international level and adoption of relevant practices at the local level, taking into account technological developments in these countries
6. Identification of potential circular economy projects for each requesting country

Current Status

The TA appears to have been completed in August 2021.

Context

The Circular Economy concept as “the realization of a closed loop of materials flow in the whole economic system” was formally adopted in China in 2002.

Work in developed countries on the circular economy concept was started by the Ellen MacArthur Foundation (EMF) from 2013 and in the EU from 2014-2015.

The circular economy concept is highly relevant to climate change mitigation and adaptation.

The circular economy concept is also compatible and supportive of the Industry 4.0 (the 4th industrial Revolution) concept. It is argued that the circular economy can perhaps be best described through its characteristics. This is the approach adopted by the OECD (McCarthy et al., 2018) which identified the following key features of a circular economy as: increased product repair and remanufacture; increased material recycling; more robust long-lived products through design; increased product re-use and repair; increased material productivity; improved asset utilization; and modified consumer behavior. The intended effects of these features are listed as: decreased demand for new goods (and virgin materials); substitution of secondary raw materials in production; expanded secondary sector; more durable and repairable products; and expanded sharing and service economies (McCarthy et al., 2018, Figure 1:15).

Relevance

The action was very relevant, given the growing interest in better understanding and fostering progress in Circular Economy concepts in the four countries covered under the regional TA project. The TA request timing of November 2018 appears to have been relevant with respect to other CE initiatives under way at that time.

Coherence

UNIDO has relevant expertise in the Circular Economy area, so UNIDO was a logical contracting partner for the TA. The TA is coherent with the work of key civil society groups active in the 4 countries (e.g., Ellen MacArthur Foundation, Exchange4Change Brazil, ASDF-CEFA), partner government ministries (e.g., MCTI in Brazil), local government agencies, government research funding agencies (e.g., Fundep in Brazil) and business groups. The Brazil kick-off workshop in September 2019 had a wide cast of relevant participants, so the TA in Brazil appears to have been coherent at that time. There is some evidence that the framework proposed future circular economy platform in Brazil, which appears to be the main output of the TA project in Brazil, had a useful key government agency (MCTI) ownership. CTCN reports that in Mexico the GEF funded TA has apparently led to another TA to provide inputs into the CE law.

The CTCN TA in Uruguay is reported to only have involved the Ministry for the Environment, and to have lacked ownership from other key Ministries, the private sector and other donors.

Effectiveness

The project appears to have produced most of its designated deliverables.

Project activities in Brazil appear to have been broadly based and to have been useful to MCTI and Exchange4Change Brazil. The key output for the TA in Brazil is a very high-level project outline for a future circular economy platform which appears to have suitable necessary individual government agency (MCTI), ownership. Hence, as a high-level capacity building and enabling mechanism the TA in Brazil appears to have had useful effectiveness.

It was reported by CTCN that in the case of Mexico, this TA led to another TA to provide inputs to the CE law in the country.

Feedback from the UNIDO Representative for Uruguay, Chile, Argentina and Paraguay, was that the project was not effectively linked to UNIDO and other donor-led regional CE initiatives. It was further reported that the report for Uruguay had ownership from only one department in the Ministry of Environment, the report was not used widely by actors, and the Ministry of Environment did not share it widely. Overall, the roadmap for Uruguay was seen to be not useful. The regional approach of the project was reported to not have led to any exchange or synergies among countries, and that it would have been better to have national projects with broader ownership.

However, an example of positive effectiveness is that the CTCN launched a preparatory meeting in Lima, Peru in March 2020 for a Regional Coalition on Circular Economy for Latin America and the Caribbean that was based on the 4-country project supported regional TA. The CTCN follow up efforts are a positive sign of post project end sustainability of the project supported regional TA.

The TA project's unique value in the fast-moving CE area with many players is not clear. There is also a lack of reference to the TA in some separate key reports that were produced with UNIDO involvement.

Efficiency

From the production of expected reports and a perusal of the reports in English for Brazil, the TA appears to have been efficiently implemented.

Sustainability

The Circular Economy is a topic that is being pursued in China and Europe at a policy and practical level, along with a growing interest in other regions such as Latin America. There appears to be sufficient government, civil society and business interest for the wider circular economy concept to be sustainable.

However, the sustainability of the TA projects key outputs of roadmaps produced for each of the four countries is likely to be low except in Brazil.

Progress to impact

Inception workshops were held and nearly all scheduled reports were produced.

The roadmaps produced for each of the four countries by the project were the main outputs and were essentially stocktaking exercises. The real level of ownership by key stakeholders in the roadmaps is unclear outside of Brazil, and hence the progress towards impact of the project is hard to evaluate vis-à-vis the multiple other initiatives being undertaken in the other countries in question in the circular economy area.

The impact of the key roadmap report in Uruguay, due to the poor quality and due to the ownership with only one department in the Ministry of Environment, is reported to be likely to be “close to zero”.

The pilot project roadmap in Brazil, with its apparent strong MCTI ownership, looks likely to have had a catalytic effect in MCTI’s ongoing Circular Economy initiatives, as well wider circular economy capacity building impacts.

The work in Mexico has apparently led to follow-on TA work in the area of CE Law development.

Relevant project deliverables:

The CTCN Website has links to all project deliverables documents for the 4 countries, see: <https://www.ctc-n.org/technical-assistance/projects/assessment-current-status-circular-economy-developing-roadmap>

D 6.2 Diretrizes para a elaboração de um Roteiro Nacional de Economia Circular no Brasil

D 6.1 Descrição do projeto piloto - Brasil

D6.2 Guidelines for the formulation of a National Roadmap towards the Circular Economy - Brazil

D6.2 Orientaciones para la elaboración de una Hoja de Ruta Nacional hacia la Economía Circular - Uruguay

D6.2 Orientaciones para la elaboración de una Hoja de Ruta Nacional hacia la Economía Circular - Chile

D6.1 Descripción de Proyecto Piloto en la Cadena de Valor Láctea - Uruguay

D6.1 Descripción de Proyecto Piloto en la Cadena de Valor de la Carne Vacuna - Uruguay

D6.1 Pilot project description - Brazil

D6.2 Orientaciones para la elaboración de una Hoja de Ruta Nacional hacia la Economía Circular - México

D6.1 Descripción de Proyecto Piloto - México

D6.4 Reporte del taller de difusión regional del proyecto: Evaluación de la situación actual de la Economía Circular para el desarrollo de una Hoja de Ruta para Brasil, Chile, México y Uruguay

D.4 Recopilación de experiencias internacionales

D3.2&3.3 Análisis de fortalezas, oportunidades, debilidades y barreras para la adopción de una hoja de ruta de Economía Circular en Chile

D3.1 Análisis de los beneficios percibidos de la Economía Circular en Chile

D2.4 Reporte de Evaluación - Chile

D2.1 Reporte de la Reunión de Lanzamiento en Chile

D3.2&3.3 Analysis of strengths, opportunities, weaknesses and barriers for the adoption of a Circular Economy roadmap in Brazil

D3.1 Analysis of the perceived benefits of the Circular Economy in Brazil

D2.4 Evaluation Report - Brazil (ENG)

D2.1 Kick-off meeting report - Brazil (ENG)

D3.2&3.3 Análisis de fortalezas, oportunidades, debilidades y barreras para la adopción de una hoja de ruta de Economía Circular en Uruguay

D3.1 Análisis de los beneficios percibidos de la Economía Circular en Uruguay

D2.4 Reporte de Evaluación - Uruguay

D2.1 Reporte de la Reunión de Lanzamiento en Uruguay

D3.2&3.3 Análisis de fortalezas, oportunidades, debilidades y barreras para la adopción de una hoja de ruta de Economía Circular en México

D3.1 Análisis de los beneficios percibidos de la Economía Circular en México

D2.4 Reporte de Evaluación - México

D2.1 Reporte de la Reunión de Lanzamiento en México

D5.1 Diagnóstico general: nivel de desarrollo de la Industria 4.0 en Brasil, Chile, México y Uruguay

PT 5.2 Diagnóstico do benefício potencial da aplicação da Indústria 4.0 a modelos de economia circular no Brasil, Chile, México e Uruguai

ENG_D5.2_Analysis of the potential benefits to the circular economy models in Brazil, Chile, Mexico and Uruguay from application of Industry 4.0

Study of the circular economy for roadmap development - Response plan (EN + ES versions)

Study of the circular economy for roadmap development – Request (EN for all 4 countries + signed ES version for each of the 4 countries)

20200303 CTCN Regional Coalition on CE for LAC - 1st Tech Preparatory Meeting

Circular Economy 20210806 D1.3 Closure Report RTA Circular Economy BR-CL-MX-UY_by Factor & ASDF - ENG- FINAL

Other relevant reports (Not related to the CTCN TA)

- Project reference in Factor website: <https://www.wearefactor.com/en/evaluation-and-development-of-a-roadmap-for-the-integration-of-the-circular-economy-in-the-country/project/64>
- 20151021 The Ellen MacArthur Foundation launches CE100 Brazil
- Circular economy - getting the best out of Latin America | UNIDO - 24 Nov 2017
- Circular Economy - What, Why, How and Where - Ekins et al - UCL -2019
- 20200415 Webinar/ Circular Capacity Building in Brazil | European Circular Economy Stakeholder Platform
- 20200915 The Circular Economy in Latin America and the Caribbean – by Chatham House and UNIDO - with UNIDO Montevideo arranging the Dec 2019 workshop and field trips that the report was based on
- Brazil - The Circular Economy Platform of the Americas - Hosted by ASDF
- Brazil 20200415 Webinar/ Circular Capacity Building in Brazil | European Circular Economy Stakeholder Platform

- Brazil 20201027 First transaction on Circular Action Hub, the 1st circular economy marketplace - PREVENT Waste Alliance
- Brazil 20201124 Report on EU-LAC Foundation Webinar on Circular Economy in the Covid-19 Era
- Brazil 202010118 Introducing the first circular economy hub in Latin America – RPRA
- Brazil 20210221 Ways to Expand the Circular Economy in Brazil/ from Small to Big Businesses – Fundep
- Brazil 20210617 First circular economy hub in Latin America - RECYCLING magazine
- 20210915 Solid foundations for a circular economy model in Brazil - article in E4CB HUB News

Additional information/documents not gathered

- Evaluation forms that were to be gathered by CTCN from the four NDEs.
- Final report
- Compilation of International Experiences (The TA's Deliverable #4) in English
- Organization of a final workshop to present the results of the work of the TA in the requesting countries (D6.3) - in English if available
- TA Budget
- TA end date

Relevant Organizations

- Factor (main implementer): **Iker Larrea Ereño** ilarrea@iamfactor.com
- NDE Chile: **Ximena Ruz**
- NDE Brasil : '**Daniel Lage Chang**' daniel.chang@mctic.gov.br
- NDE México: '**Juana Itzchel Nieto Ruiz**' itzchel.nieto@inecc.gob.mx
- NDE Uruguay: **Carla Zilli** (carla.zilli@ambiente.gub.uy) was involved most of the time and specially during the last part of the TA.
- Representative and director of UNIDO regional office for Argentina, Chile, Uruguay and Paraguay: **Manuel Albaladejo** office.uruguay@unido.org – “He is promoting the circular economy in the region through technical cooperation projects, development of roadmaps, regional forums and research” (as per Chatham House-UNIDO Sept 2020 report - a report that did not mention the CTCN TA project. Mr. Albaladejo provided useful feedback to the evaluation team on the CTCN regional circular economy project's regional and Uruguay aspects.
- Exchange4Change Brazil **Beatriz Luz** beatriz@e4cb.com.br who is the founder and who referenced the TA project in an EU-LAC Webinar in Nov 2020 and said “With the support of UNIDO, E4CB started the development of a road map on the circular economy in Brazil, Chile, Mexico and Uruguay” and in September 2021 reported that the project had provided solid foundations for a circular economy model in Brazil in an article in E4CB HUB News.

Annex 5: Project - Terms of Reference

The complete evaluation Terms of Reference could be accessed at the below link:

https://www.unido.org/sites/default/files/files/2020-11/TOR_GFGLO-140307_CTCN_201120_final2.pdf