UN environment programme

CTCN
UN Climate Technology Centre & Network

10 YEARS 2014 – 2024

# TECHNOLOGY SOLUTIONS & INNOVATION FOR CLIMATE ACTION

## 10TH ANNIVERSARY REPORT

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# 2014–2024 SNAPSHOT

**500+**
requests for technical assistance received

**370+**
technical assistance projects implemented

**1.5**
billion of anticipated funding leveraged**

** Calculated considering a yearly operational budget of USD 10 million.

**110+**
developing countries benefiting from CTCN technical assistance, of which 38% are Least Developed Countries (LDCs) and 16% are Small Island Developing States (SIDS)

**4,600+**
trained individuals


**3–4**
capacity building initiatives per month on average

**200+**
million anticipated beneficiaries

**10–15**
million - expected tonnes of $CO_2$eq reduced per year*

* Average annual GHC emission potential based on the full implementation of the technology solutions proposed.

**840+**
Network members

# LETTER FROM THE DIRECTOR

Dear CTCN community and friends,

As we mark the 10th anniversary of the Climate Technology Centre and Network (CTCN), it is with a profound sense of gratitude and pride that I present to you CTCN's 10th Anniversary Report, a testament to our collective achievements and the transformative impact we have made both on the global stage and at the community level.

I joined CTCN at its inception, and I have seen it grow from an idea on paper to a concrete global asset for climate action. Its technical assistance and knowledge transfer has reached 113 countries, impacted the lives of over 200 million people, and managed more than USD 100 million.

I have witnessed how technology can save the lives of people from floods and droughts, secure food on the table, and empower communities.

The case for investing in climate technology has never been more compelling, and this report provides even stronger supporting evidence.

From pioneering new financing mechanisms to leveraging cutting-edge technologies, from forging strategic partnerships to driving systemic change, this report encapsulates the spirit of collaboration and innovation that defines our community, highlighting the remarkable progress we have achieved. The dramatic increase of technical assistance requests and how they are now more integrated in long-term national strategic visions is a testimony of this paradigm shift.

We have solid data, a proven business model and a growing portfolio of technologies, and the agility to meet developing countries where they are, alongside the support and collaboration of world-leading organizations. The call is on the international community, donor countries, philanthropic organizations and the private sector to mobilize resources to meet the climate technology needs of developing countries and exceed expectations in delivering system-transformative solutions.



CTCN is at the right time and the right place to plant the seed of radical system transformation, through climate technology for decarbonization and community resilience.

This report paints a realistic portrait of how **changing the systems that change the climate** works. The triggers, the accelerating actions, the obstacles, the pace, the breadth of action, it looks at all the compounding elements strengthening national systems of innovation and the adoption of climate technology.

Most importantly, this report takes readers through a journey of system transformation. From how CTCN strengthened national systems through technology roadmaps and policy changes in Africa, or designed a new sustainable business model for the herders' community in Mongolia, to how Sudan and Eswatini are using drone technology to map the soil and devise adaptation strategies. It shows the results of new forms of partnerships and how CTCN is engaging with Business & industry to design new roadmaps in the cement sector, and its early success in the Republic of the Congo, and how a circular economy is setting new climate ambitions in Costa Rica. It delves into the ecosystem changes needed to bring e-mobility to the Asia-Pacific region and attract the investment needed to bring the first e-buses to Indonesia and Papua New Guinea.

The report capitalizes on synergies and on how, through a multi-country GCF project, seven African countries were able to leapfrog to energy efficient mechanisms, and how CTCN introduced a pay-as-you-irrigate model in Mozambique or a new solar powered water pumping system in Liberia, relieving communities from the pressure of food insecurity. Yes, climate technology is saving lives.

The report also shows how CTCN is addressing inequalities and vulnerabilities, or more concretely, securing school buildings and infrastructure in Saint Lucia and Antigua and Barbuda so that children can go to school despite the impacts of climate change.

As we reflect on the past decade and look to the future, **it is clear that our work is far from finished**.

In the past 10 years climate technology has made quantum leap, and digitalization is spearheading new solutions leveraging big data, machine learning and AI, to mention but a few of the tools on the CTCN radar. Yet, despite technology being more accessible and comparatively cheaper than ever before, the resources needed to make this technology available to developing countries struggle to catch up.

Until we reconcile these two speeds, and bring knowledge and technology where it is most needed, we will not be able to make the systemic changes required to not exceed the 1.5°C limit. This report makes the strongest case for investing more and faster in climate technology to provide CTCN with the resources needed to respond to all requests for technical assistance – not just 60 per cent – and to take the most promising solutions to the next level through strategic partnerships and financing.

I am proud of all that we have accomplished together. Over the past decade, a network of partners, businesses and donor governments[1] have supported CTCN through strategic financial, in-kind and pro-bono contributions. These partners have demonstrated unwavering commitment and dedication to advancing climate action through technology transfer, capacity-building and collaboration.

As we cross the 10-year mark together, there is an important message that CTCN wants to convey, echoing the words of UNEP's Executive Director: we can still limit global warming to 1.5°C, but this requires unprecedented system transformations. Although Gap Reports inform us that we are moving in the wrong direction, **we have the technology to make the dramatic U-turn needed to get us to net-zero by 2050.**

The window of opportunity is narrowing at a dramatic pace. I urge the international community to follow through on the global commitments and join forces to bridge the existing resource gap. With additional resources, CTCN can multiply the return on investment of climate technologies and design with the communities most in need innovative solutions for climate action and sustainable development.

Thank you once again, together we can and we will make a difference.

**Rajiv Garg**
**CTCN Interim Director**

1 https://www.ctc-n.org/about-ctcn/donors

> At the heart of the EU's priorities lies a strong commitment to innovation and climate resilience. The work that CTCN is doing with the support of the EU, is strengthening the resilience of vulnerable communities struggling with extreme weather events, providing them with technology solutions and the knowledge and capacity to forge their own path towards a sustainable future. Through the work of CTCN, the EU is investing in a prosperous future for everyone.
>
> ***Kurt Vandenberghe***
> ***Director General for the European Commission's Directorate-General for Climate Action***

# THE JOURNEY SO FAR

Since the establishment of the Technology Mechanism in 2010 (Decision 1/CP.16) and the official launch of CTCN as the implementation arm of the Technology Mechanism at COP19 in November 2013 (Decision 25/CP.19), CTCN has steadily enhanced its technical assistance/service portfolios and has responded to an increasing number of requests from developing countries for climate technology development and transfer. This evolution has been guided by COP decisions and mandates.

CTCN's first Programme of Work (2014–2018) provided a roadmap for its start-up phase and the establishment of its global network of technology companies and institutions for providing technical assistance, capacity building and knowledge sharing tailored to developing countries' needs.

In 2015, following the formulation of Nationally Determined Contributions (NDC) by countries in 2015, much of CTCN's technical assistance directly supported the realization of these national commitments and the overarching goals of the Paris Agreement. Within the first five years of operation, CTCN grew its network to 500 members and 160 national climate technology focal points, completing over 70 technical assistance interventions.

Building on insights gained during its initial phase, CTCN transitioned to a geographic approach for service delivery, diversifying its offerings to include multi-country assistance, fast-track support, pro-bono support and assistance with the Green Climate Fund Readiness and Preparatory Support Programme, and in collaboration with the Adaptation Fund and the Global Environment Facility. CTCN also focused on creating enabling environments for climate technology development and deployment by designing university programmes and publications, drafting technology guides, training on specific technologies and sectors, and advising on national capacity building programmes and institutions.

Once the business model of CTCN was consolidated, the second Programme of Work (2019-2022) aligned the CTCN's services with the Paris Agreement's Technology Framework (Decision 15/CMA.1), emphasizing innovation, implementation, capacity-building, collaboration and support. Activities during this phase aimed to provide faster and more targeted assistance to reflect the urgency of the transformational changes required, along with integrating gender considerations, deepening engagement with an expanded network, strengthening linkages among NDEs and other national climate focal points, and increasing collaboration with stakeholders to mobilize additional resources.

By the end of its second programme, CTCN had served 108 developing countries, facilitating access to over 390 mitigation and adaptation technologies in support of NDC implementation and Paris Agreement commitments.

At COP27 in November 2022, the Technology Executive Committee (TEC) and CTCN jointly launched their first ever Joint Work Programme for the Technology Mechanism (2023 –2027), signifying a paradigm shift towards enhanced cooperation. The CTCN's third Programme of Work (2023-2027) under this joint approach focuses on accelerating transformative climate technology development and transfer. While CTCN remains 'demand-driven', responsive to requests from National Designated Entities (NDEs) from developing countries, this new approach builds upon the parties' call for a more programmatic approach and seeks to enhance transformational impact and scale across its core areas. These are structured around two key enablers of systemic change (national systems of innovation and digitalization) and five system transformation areas (water-energy-food nexus, buildings and infrastructure, sustainable mobility, energy systems, and business and industry).

# CTCN timeline and milestones

**1992 to 2001**
Commitments established guiding Parties to the Convention for transfer of technology to developing countries. At **COP1** (1995) and **COP4** (1998), inventories were made, needs outlined and private sector investment identified.

**2001 to 2012**
An Expert Group on Technology Transfer was established (**COP7**, 2001) and a Financial Mechanism requested to support technology framework implementation. At **COP13** and **COP14** (2007, 2008) an action plan focused on long-term cooperation and technology transfer.

**COP16** (2010) a Technology Mechanism consisting of a Technology Executive Committee (TEC) and CTCN were created. Terms of reference were established in 2011 at **COP17** and in 2012 (**COP18**), UN Environment and consortium partners were selected as CTCN host.

**May**
1st CTCN Advisory Board Meeting.

**February**
1st request for CTCN technical assistance received (from Chile).

**March**
1st Network members join the Centre: REEEP, REN21 and WIPO.

**August**
1st regional request for technical assistance submitted (from Ghana, Kenya, Mauritius, Namibia).

**Deccember**
1st training for National Designated Entities (NDEs) held in Thailand.

**COP21**
CTCN operational launch announced.

**April**
1st CTCN Regional Forum held (in Thailand).

**September**
1st consultations for Least Developed Countries under the Incubator programme occur.

**COP21**
Technology Framework established.

**December**
100th Network member welcomed.

**April**
100th technical assistance request received (from Lao PDR).

**COP22**
welcomes increased engagement of GCF and CTCN.

**May**
1st CTCN proposal to GCF Readiness Programme approved.

**June**
Decision to allocate minimum 1% of technical assistance budget to gender is made.

**August**
First pro-bono technical assistance (provided by NEDO-Japan to Thailand).

**July**
CTCN completes its first 50 technical assistance cases.

**September**
CTCN Gender Policy and Action Plan drafted.

**October**
400th member joins the Network.

**COP23**
Hosting agreement of CTCN by UNEP is renewed.

CTCN requested to support integration of gender considerations in Technology Needs Assessments.

First year of operationalization of the Technology Framework.

Launch of CTCN first Youth Climate Innovation Labs.

Launch of the AFCIA programme.

CTCN operationalized its regional approach, to be more responsive to developing countries' climate technology needs.

**COP26**
Second Independent Review of the effective Implementation of CTCN.

Renewal of the MoU between the COP and UNEP for the hosting of CTCN.

**21 July 2022**
Launch of CTCN Partnership and Liaison Office in Songdo, established in partnership with the Korean Ministry of Science and ICT and Incheon Metropolitan city.

**COP27**
High-level launch of the first joint work programme of the Technology Mechanism for 2023-2027.

**COP27** (SBI 57) – First periodic assessment of the effectiveness and adequacy of support provided to the Technology Mechanism in supporting the implementation of the Paris Agreement on matters relating to technology development and transfer.

**January**
Start of the third work programme of CTCN for the period 2023 – 2027.

Conclusion of the first Global Stocktake of the Paris Agreement.

Launch of the EU climate security programme.

**December**
CTCN reaches more than 840 members.

500 requests for technical assistance received.

110 developing countries served.

200 million anticipated beneficiaries.

The impact of technical assistance includes an anticipated 10–15 million tonnes of $CO_2$-equivalent per year in greenhouse gas emissions reduced or avoided.

1992–2001 2001–2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

# A UNIQUE VALUE PROPOSITION

**CTCN is the only body implementing climate technology that has an official mandate from UNFCCC and the Paris Agreement.** CTCN supports developing countries, at their request, to develop and deploy technologies to meet their climate change and sustainable development goals.

**CTCN follows a demand-driven process.** National Designated Entities (NDEs) are technology representatives selected by each country's government.[2] They serve as national entities for the development and transfer of technologies, to coordinate requests from local communities, civil society, the private sector and public institutions to ensure alignment with Nationally Determined Contributions (NDCs) and national climate change priorities.

**CTCN delivers tailored technology assistance.** Experts from CTCN provide one-to-one support to NDEs to identify and implement appropriate environmentally sound technologies that suit national circumstances. All technical assistance is adapted to local conditions, and is socially and environmentally sound, gender responsive and accessible to all.

**CTCN creates economic opportunities.** CTCN plays a pivotal role in unlocking new pathways for economic growth and supports investments in and the adoption of green technologies that bolster entrepreneurship and green jobs. By facilitating access to finance and scalability of climate technologies, reducing carbon emissions, and enhancing resilience, CTCN enables businesses and industries to thrive sustainably. This shift towards climate resilience safeguards the environment and fosters long-term economic stability and prosperity.

**CTCN provides technical assistance across the full technology cycle and for the complete spectrum of mitigation and adaptation technologies.** CTCN delivers capacity building and knowledge sharing across technology priorities, from needs assessment and innovation to identifying financing sources for upscaling. CTCN also strengthens the underlying institutional structures, which enables technology through the deployment of guidance such as policies and regulatory frameworks, and the creation of national markets.

**CTCN is committed to gender mainstreaming and the inclusion of youth and Indigenous people in its work.** CTCN co-hosts the global Gender-Just Climate Solutions capacity building programme, operates Youth Climate Innovation Labs, and hosts the Technology Mechanism Gender and Climate Technology Expert Roster.

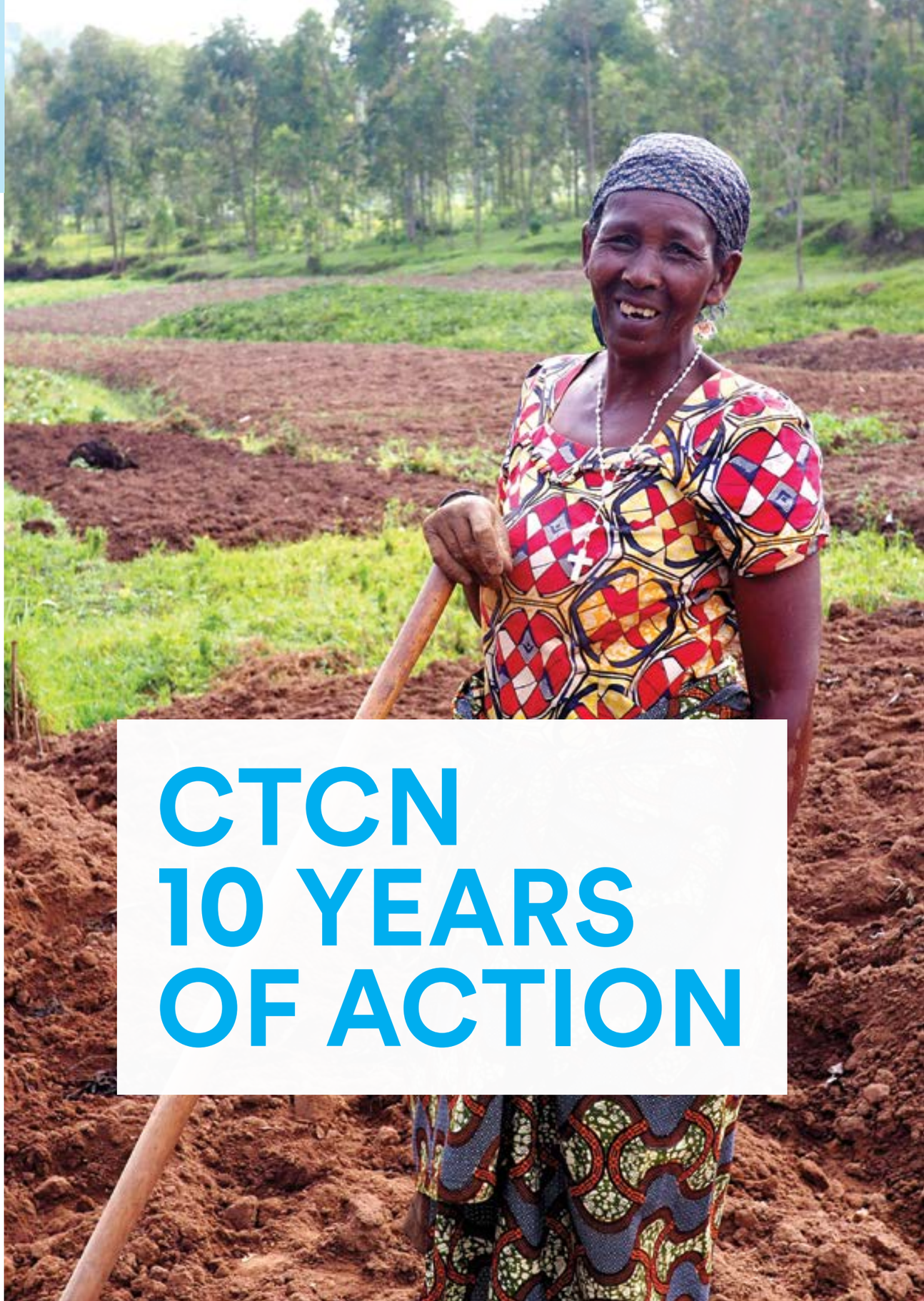
**CTCN is technology agnostic.** It is led by integrity, transparency and neutrality.[3] It assists developing countries to develop their own capacity to work towards a sustainable future and supports them to choose the technology that best fits their needs and ambitions.

**CTCN works with a global network** of NDEs, over 800 Network Members, climate technology leading partners and stakeholders. The Centre **holds a unique convening capacity** that can influence and shape sustainable and innovative climate action including through North-South and South-South collaboration and knowledge sharing.

2 NDEs are technology representatives selected by each country's government representing 164 parties to the UNFCCC https://www.ctc-n.org/about-ctcn/national-designated-entities/national-designated-entities-by-country

3 The UN Global Compact Values & Behaviours Model https://unglobalcompact.org/about/the-un-global-compact-way





# CREATING PATHWAYS FOR NATIONAL STRATEGIES

CTCN works with and connects developing countries to international organizations, national governments and relevant stakeholders, including international finance and the private sector, to create pathways for national strategies, aggregate green regional markets, and de-risk both private and public investments.

Concerted and continued efforts applied to this multifaceted approach can create the regulatory and market ecosystem needed for system transformative climate action.

CTCN plays a crucial role in:

- Catalysing and sustaining climate technologies and innovation.
- Accompanying countries through the different stages of system transformation.
- Attracting resources and investors.
- Maximizing the social, environmental and economic returns on investments.







## Uganda: Igniting a journey to geothermal energy development

### 2014

The Geothermal Resources Department is established to accelerate the development of geothermal technology.

CTCN responds to a request for technical assistance to help formulate the Geothermal Energy Policy and Legal and Regulatory Framework.

### 2016

CTCN delivers a draft policy and draft legislation on geothermal energy.

### 2018

The Mining and Mineral Policy integrates content from both the draft policy and draft legislation.

### 2019

The Ministry of Energy and Mineral Development undertakes a Regulatory Impact Assessment of the draft policy and draft legislation.

### 2019–2021

Uganda, Djibouti, Ethiopia, Kenya, Rwanda and Tanzania request CTCN technical assistance to conduct feasibility analyses and to identify the most suitable direct-use applications and technologies in low- to medium-temperature geothermal systems.

### 2022

The Electricity Act and the Mining and Minerals Act integrate content from the both the draft policy and draft legislation.

The Government of Uganda, in collaboration with ASKA Infrastructure Development, signs a memorandum of understanding to develop a geothermal power project in Katwe – Kikorongo, Kasese District.

### 2023

The Uganda Energy Policy 2023 integrates content from CTCN draft policy and draft legislation.

At COP28, the Ministry of Energy and Mineral Development unveils an ambitious 'Uganda Energy Transition Plan'[4] aiming for reliable electricity to the entire country by 2030.

Geothermal energy can offer a clean, reliable and affordable source of power that can support sustainable development and reduce emissions, helping countries meet their Nationally Determined Contributions (NDCs). In Uganda, these resources are estimated at 450 Mwe[5] and could become an alternative baseload power source that could mitigate the country's dependency on the hydropower capacity from the Nile River flowing out of Lake Victoria, which is threatened by increased rainfall variability due to climate change.

In 2016, the Government of Uganda reached out to CTCN for technical assistance in formulating a Geothermal Energy Policy and Legal and Regulatory Framework with the intent of attracting private investments.

### What we did

Through its network member Carbon Counts, CTCN delivered geothermal-specific drafts for policy and legislation. These drafts provided the necessary definitions and clarity for the development of geothermal energy and guidance for the industry in Uganda, and became the basis for a series of policies and legislations.

CTCN technical assistance took a holistic approach, highlighting criticalities specific to geothermal power development, and addressing:

- The high capital cost of geothermal energy, which has a very long lead time and needs significant government or donor support to prove its viability over the course of many years before it is realistic for the private sector to lead tangible energy investments.
- The need for geothermal power plants to be connected to the grid and used for baseload generation. Currently geothermal power is used as intermittent backup to hydropower, Uganda's main source of power generation.

4 https://iea.blob.core.windows.net/assets/00e4c677-4009-4d56-9a6b-accf14ca8456/UgandaEnergyTransitionPlan.pdf

5 McNitt, 1982. Uganda's Vision 2040 has an aim of installing 1500 MW of geothermal power capacity.

**Figure 1 CTCN support for geothermal technology in Uganda: From roadmap to implementation**


- The need to address from the onset the environmental risks of geothermal energy, including GHG emissions and the discharge of toxic minerals into local waterways.
- The needs of smaller scale low enthalpy (<150°C) binary-cycle power plants for geothermal energy development in Uganda are very different from the needs of East African geothermal resources.

By articulating the system components and strategic direction for the development of geothermal energy, CTCN technical assistance laid the foundation for Uganda to move systematically towards the Draft National Energy Policy. This policy provides strategies for geothermal energy and promotes investment in the sustainable commercial development of geothermal resources.

> The support of CTCN has helped Uganda to overcome the fundamental challenge of inadequate legal, regulatory and institutional frameworks in the renewable energy space. The outcome of the assistance underpins the basis on which the government will provide incentives to promote the local production and use of renewable energy solutions while lowering risks involved in these capital-intensive investments.
>
> ***Dr. Maxwell Otim Onapa***
> ***Uganda National Council for Science and Technology***





## Impact

CTCN's foundational work led to the 2019–2021 multi-country[6] technical assistance request for in-depth feasibility analyses to identify the most suitable direct-use applications and technologies in low- to medium-temperature geothermal systems.

The analyses led to the:

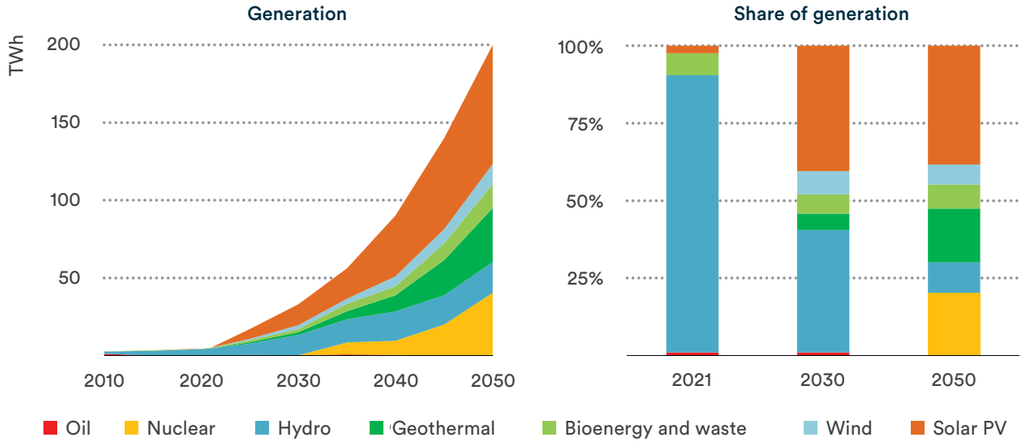
- Identification and classification of geothermal sites.
- Definition of the economic and market viability of the direct use of geothermal technologies in different economic segments, such as in agri-food value chains (for example in vegetable/grain drying, fish drying and tea processing), including the delivery of capacity building and a comprehensive financial model to assess specific technology applications.

In 2022, the Government of Uganda, in collaboration with ASKA Infrastructure Development, signed a memorandum of understanding to develop a geothermal power project in Katwe – Kikorongo, Kasese District.

At COP28 in 2023, Uganda released its new Energy Policy, which integrates the policy and legislation drafted through CTCN technical assistance. Uganda's Ministry of Energy and Mineral Development also introduced the ambitious Energy Transition Plan,[7] with the goal of providing reliable electricity, to the country's entire population of 45 million people by 2030.

Uganda intends to increase the amount of renewable energy capacity by at least **1,100** MW by **2030**, with priority technologies including hydro, solar, biomass and geothermal.

**Figure 2 Electricity generation and share of generation for various energy sources, Uganda, actual and forecast to 2050**




Source: https://iea.blob.core.windows.net/assets/00e4c677-4009-4d56-9a6b-accf14ca8456/UgandaEnergyTransitionPlan.pdf

6 Djibouti, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda.

7 https://iea.blob.core.windows.net/assets/00e4c677-4009-4d56-9a6b-accf14ca8456/UgandaEnergyTransitionPlan.pdf

# Costa Rica: Accelerating transition to a circular economy

**2018**

Development of the National Decarbonization Plan 2018–2050, with a specific focus on circular economy.

**2019**

Development of the National Sustainable Consumption and Production Plan.

Request for CTCN technical assistance to support municipalities and other decentralized administrations to incorporate circular economy approaches in their budgetary planning.

**2020**

NDCs include the circular economy.

**2021**

CTCN publishes a step-by-step guide for municipalities to implement a circular economy approach in planning and budgeting.

**2022**

Request for CTCN technical assistance for the development of the National Circular Economy Strategy, starting with the establishment of the Intersectoral Technical Committee on Circular Economy.

**2023**

Publication of the National Circular Economy Strategy.

**For Costa Rica, the transition to a circular economy has the potential to reincorporate 85 per cent of the waste generated back into the economy.** Therefore, the country embarked on a series of strategic actions to create a regulatory framework. These actions included the request for CTCN technical assistance in 2019.

## What we did

CTCN technical assistance helped Costa Rica identify economic, environmental and social development barriers hindering progress towards a circular economy model.

Through its network partner, OCA Global, CTCN delivered a portfolio of integrated services bolstering the implementation of a circular economy in Costa Rica, including:

- Mapping of existing stakeholders and initiatives for a circular economy and planning of socialization and validation workshops.
- Development of the first National Circular Economy Strategy and indicators.
- Update, dissemination and training for the use of the step-by-step guide for key stakeholders to pilot the strategy in three municipalities.

> Today, we have two outstanding international instruments: the National Circular Economy Strategy of Costa Rica and the Step-by-step Guide to Facilitate the Transition to a Circular Economy for Local Governments. These instruments have become pillars to propel Costa Rica towards the circular economy, and the collaboration with CTCN has made this possible.
>
> ***Cynthia Córdoba***
> ***Coordinator of Environmental Economy***





## Impact

In 2023, building on the work of CTCN, Costa Rica published its National Circular Economy Strategy. The strategy aims to optimize the use of resources and create more and better employment opportunities, while generating environmental sustainability and potential for innovation.

The strategy offers an approach that decreases pollution and increases health benefits and addresses:

- **Sustainable tourism** as a major asset and higher value-added economy.
- **Circular industry, trade and services** focusing on the development of new businesses and models that cater to the needs of consumption-conscious users.
- **Cooperation of the infrastructure and construction, and agricultural sectors** to reduce socio-environmental impacts, improve efficiency in water use, reincorporate waste into productive processes in the form of biomass, and increase competitiveness in the local market and access to international green markets.

Both the Circular Economy Fiscal Policy and Law proposals are under public consultation. A project is in design to generate an index of circularity potential at the local government and municipality level.

In the National Circular Economy Strategy, the country aims to become a leader in the circular economy, innovation and sustainability for Latin America by 2050.[8]

8 https://minae.go.cr/organizacion/vicegestionestrategica/SEPLASA/Documentos/Estrategia%20National%20Economia%20Circular.pdf

# Nepal: Developing a National Agroforestry Policy

**2013**

Nepal's Technical Needs Assessment (TNA) identifies agroforestry practices as a priority for mitigating vulnerabilities.

**2015**

National consultations result in the Kathmandu Declaration on Agroforestry by the Ministry of Agricultural Development (MOAD) and Ministry of Forestry and Soil Conservation (MOFSC).

**2016**

Development of Intended Nationally Determined Contributions (INDC).

Request for CTCN technical assistance for the development of the draft of the National Agroforestry Policy.

**2018**

CTCN submits the draft National Agroforestry Policy to the Government of Nepal to take it forward through the approval process.

**2019**

National Agroforestry Policy is enacted.

National Climate Change Policy is enacted.

> Innovation in responding to climate change has many faces. CTCN support helped Nepal to sharpen the new national agroforestry policy and turn it into an essential tool for sustainable climate action.
>
> ***Mr. Bishnu Hari Devkota***
> ***Senior Agriculture Extension Officer, Ministry of Agriculture and Livestock Development***

Nepal faces numerous vulnerabilities that are worsened by climate change, including increased risk of water-induced disasters and hydro-meteorological extreme events such as droughts, storms, floods, landslides, debris flow, soil erosion, avalanches and glacier lake outburst floods (GLOFs). These all have economic, social and environmental impacts.

In 2015, Nepal began focusing on agroforestry practices to bolster climate resilience and to reduce GHG emissions, particularly through carbon sequestration. In 2016, to the Ministry of Agricultural Development (MOAD) requested CTCN technical assistance to develop the National Agroforestry Policy, to address barriers and establish the mechanisms to promote appropriate technologies and best practices for agroforestry in the country.

## What we did

CTCN technical assistance delivered:

- An analysis of existing policies and laws affecting agroforestry in Nepal and a comparative analysis of agroforestry policy development across the region.
- A series of knowledge sharing initiatives on a wide range of agroforestry technologies and practices.
- Support in coordinating engagement and consultation processes, which involved over 500 stakeholders, throughout the development of the draft National Agroforestry Policy.
- Strengthened role of the Inter-Ministerial Coordination Committee (IMCC) in charge of overseeing policy development.
- Completed the draft of the National Agroforestry Policy.





## Impact

As a result, agroforestry in Nepal is now recognized as an approach that harmonizes agricultural, environmental and socioeconomic goals. This has a positive impact on food security, rural livelihoods and environmental sustainability, while also contributing to mitigating climate change and decreasing GHG emissions.

**Expected amount of emission avoided**

**0.5** **million MT** of carbon fixation/year after 5 years of implementation of agroforestry policy

**20** **million MT** after 40 years policy implementation

CTCN technical assistance impacts also included:

- Increased awareness and knowledge of over 230 organizations to own and drive national mitigation planning processes.
- Improved capacity of policymakers, researchers and end users to implement and sustain the National Agroforestry Policy.

The promotion of agroforestry practices is expected to help approximately 2 million small holders already involved in agroforestry, strengthening their resilience to climate change and extreme events.

Mr. Tilak Jang, General Secretary, Federation of Private Forest Owners' Association at one of the national consultations.

Handing over the final Nepali and English draft of the National Agroforestry Policy to IMCC.

# Papua New Guinea: E-mobility market analysis, policy and roadmap

**2021**

Papua New Guinea's Climate Change and Development Authority (CCDA) requests CTCN technical assistance to develop a national policy to deploy and scale up e-mobility and support sustainable infrastructure.

**2023**

CTCN delivers a draft a National Electric vehicle (EV) Policy, a feasibility study on selected interventions, and a Green Climate Fund (GCF) concept note.

**2024**

The Department of Transport implements two large-scale projects: one to create a Sustainable Urban Mobility Plan (SUMP), funded by the Asian Development Bank (ADB), and another one to introduce e-buses, in partnership with a Swiss e-mobility company.

> The introduction of e-mobility aligns with the National Transport Strategy and the Enhanced Nationally Determined Contribution.
>
> ***Jason Paniu***
> ***Acting MRV Manager, Climate Change and Development Authority***

To prevent the increase of GHG emissions, expand and promote the use of public transportation and non-motorized transport, and fulfil its commitments in its Nationally Determined Contributions (NDCs), the Government of Papua New Guinea reached out to CTCN to investigate electric mobility solutions powered by domestic renewable energy sources targeting a reduction of 22 per cent in emissions by 2035.

### Expected emissions avoided

Baseline emissions are considered under the business-as-usual scenario, which assumes an electrification rate of 0 per cent and shows how GHG emissions would develop from 2024 to 2035 and to 2050 if the number of vehicles increases yet e-mobility is not adopted:

2035 **19,034,606** $tCO_2$

2050 **48,162,188** $tCO_2$

Papua New Guinea's economic growth depends on the expansion and improvement of its state transport network. By 2030, the number of vehicles is estimated to increase from 155,000 to over 600,000, which could result in a similar increase in transportation fuel demand, which is fossil fuel-based, leading to an increase in GHG emissions from 1.6-2.4 to 3.3-4.5 Mt $CO_2e$ by 2030.





## What we did

CTCN supported Papua New Guinea to:

- Assess the potential for e-mobility, including risks and barriers to e-mobility investments policy and finance instruments.
- Draft a National EV Policy, based on an evaluation of:
  - Transport mode shares, travel behaviours and infrastructure
  - Technology options
  - Local manufacturer and service centre markets
  - Environmental impacts
  - Technical, social, economic and policy barriers.
- Undertake feasibility studies on selected interventions and develop a GCF concept note.
- Develop a National Electric Mobility Implementation Roadmap.
- Organized awareness-raising and capacity building events

## Impact

- The Ministry of Transport, through the Department of Transport and Implementation, will endorse the EV policy.
- The Global Green Growth Institute assisted in developing a GCF readiness proposal for the preparation of an e-mobility policy.
- The Department of Transport implements two large-scale projects: one to create a Sustainable Urban Mobility Plan, funded by the Asian Development Bank (ADB), and another one to introduce e-buses, in partnership with a Swiss e-mobility company.


# ACCELERATING DEVELOPMENT AND TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGIES

We can still limit warming to 1.5°C but this requires unprecedented system transformations.

IPCC 6th report

The innovation and technology needed to accelerate progress towards net-zero carbon emissions and increase climate resilience are already available, yet access and adoption of such solutions is slow in most developing countries, particularly in the least developed ones. In its distinctive role within the global climate action landscape, CTCN is working to bridge this gap.

CTCN has a proven track record of delivering innovation and technology in developing countries following a business model that converges policy, knowledge and technology transfer; technology proof of concepts; and implementation, while leveraging innovative and inclusive partnerships.

**Bangladesh**
Saline water purification and low-cost durable housing

**Kenya**
Green technologies for sustainable water service delivery

**Algeria**
Photovoltaic Certification Laboratory

**Republic of the Congo**
Decarbonizing hard-to-abate sectors

**Mauritius**
Renewable energy through circular economy

**Kyrgyzstan**
Advancing energy efficiency through building codes and sustainable technologies

**Indonesia**
Driving sustainable mobility in Jakarta

**Panama**
Fast-tracking sustainable mobility in Panama City

# Bangladesh: Saline water purification for households and low-cost durable housing

### 2010

The Government of Bangladesh establishes the Bangladesh Climate Change Trust Fund (BCCTF), the first national climate fund established by a Least Developed Country.

### 2011–2013

An NGO called Practical Action, with support from the Asian Development Bank (ADB), implements the “Community-based adaptation in vulnerable coastal areas of Bangladesh” project to integrate climate change adaptation and disaster risk reduction in community-level programming.

### 2012

In 2012, The Government of Bangladesh allocates almost USD 400 million to the BCCTF.

### 2014–2020

ADB implements the “Coastal Towns Environmental Infrastructure Project” in eight coastal towns to provide climate-resilient municipal infrastructure, coupled with strengthening capacity and governance.

### 2018–2019

CTCN supports the Bangladesh Department of Environment to identify and prioritize technologies for climate-resilient housing and low-cost purification of saline water, increase capacity of stakeholders in technology transfer and operation, and develop project concepts to scale-up and attract investment.

### 2020–2024

Building on the results of the technical assistance, Glory&Tech further scales up installing water purification systems in more than 50 villages.

In Bangladesh, 27 per cent of the population - more than 40 million people - are threatened by climate risks such as floods and cyclones, and water and soil salinization. In addition, inadequate housing exacerbate the impacts of climate-change induced disasters, impacting health and livelihoods, and hindering the country’s economic and social development.

To tackle these challenges, the Government of Bangladesh and the Palli Karma-Sahayak Foundation (PKSF) requested technical assistance from CTCN to introduce:

- Household-level desalination technologies, and
- Low-cost climate-resilient housing options.

## What we did

CTCN implementing partners, together with PKSF, reviewed, analysed and made recommendations on existing affordable climate-resilient housing solutions and household-level desalinization technologies based on the most promising technologies.

CTCN trained community members and stakeholders to increase the adoption of the proposed technology solutions.

CTCN designed a project concept to scale-up and attract investment for implementing technologies, along with the identification of possible sites for the implementation of future projects.





## Impact

The pilot project implementation resulted in improved health and safety in vulnerable communities in the coastal districts of Satkhira and Bagerhat, while strengthening the capacity of the local stakeholders to sustain the project.

In 2020, building on the results of the technical assistance, Glory&Tech, one of the partners in the consortium, developed a Clean Development Mechanism (CDM) project and installed water purification systems at the village level in over 50 villages as of March 2024.

The project is ongoing, and many private companies are showing interest in investing, and further scaling up.

Dr. Rezaul Karim, Vice Chairman, Vice Chairman, Bangladesh Unnayan Parishad (BUP), delivers his opening remarks at the Inception Workshop.


Mr. Changsun Hang, Team Leader, presenting the project overview.

# Kenya: Green technologies for sustainable water service delivery

**2004**

The Government of Kenya establishes the Water Services Trust Fund (WSTF) to finance the provision of water services in underserved areas.

**2005**

WSTF becomes operational.

**2008**

Water resource investment starts.

**2015**

A new Water Bill is developed to align the sector to the 2010 Constitution.

Kenya requests CTCN support to develop an extensive green water technology research strategy based on existing and potential low-cost green water technologies to be adopted within WSTF programmes.

**2015–2016**

UNEP-DTU (now UNEP-CCC), in partnership with the CTCN, develops a public private partnership business model on the deployment of green water technologies.

**2016**

CTCN develops a GCF concept note.

## What we did

Unsustainable traditional agricultural practices, over-exploitation of water resources, a rapidly growing economy, population growth and climate change put Kenya's limited resources under severe stress. Under these circumstances green growth, natural resource management and environmental sustainability have become vital for sustaining growth and jobs, and maintaining community resilience.

The Government of Kenya reached out to CTCN to accompany the WSTF programmes and develop a WSTF Green Technology Strategy, which incorporates aspects of renewable energy, and includes the development of climate-proof green technologies for water services, sanitation and water resources through public-private partnership mechanisms.

## Impact

Building on this strategy, UNEP-DTU, in partnership with the CTCN, developed a public-private partnership business model on the deployment of green water technologies.

In addition, CTCN developed a GCF concept note proposal for the programme *Enhanced Access to Financing for Green Water and Sanitation Technologies in Kenya*.

**Expected emissions avoided**

**51,180** tonnes/year, assuming **3,000** solar pumps are installed





# Algeria: Photovoltaic certification laboratory

**2016**

CTCN provides technical assistance to establish a laboratory in Algeria to test and control the quality of photovoltaic (PV) solar panels in accordance with the International Electrotechnical Commission (IEC) 61215 standard.

**2018**

Experts of the Centre de Développement des Énergies Renouvelables (CDER) are invited to be trained in calibration and inter-comparison at the National Renewable Energy Laboratory (NREL) Outdoor Test Facility in Colorado, USA.

**2021**

Algeria invests €3 million to set up three laboratories within CDER: the Photovoltaic Solar Module Test Laboratory, Circulating Solar Collector and Water Heater Test Laboratory and the Pyranometer Calibration Laboratory.

**2024**

The three solar energy quality control laboratories of CDER are in the process of being accredited by the Algerian Accreditation Agency.

Algeria's renewable energy development programme prioritizes photovoltaic (PV) solar energy, aiming to install over 15,000 MWp by 2035. However, the programme is challenged by the potential proliferation of substandard solar equipment in the market, posing risks to the overall quality of the installations.

## What we did

In response to these concerns, the Centre de Développement des Énergies Renouvelables (CDER), supported by technical expertise from CTCN and its network member the National Renewable Energy Laboratory (NREL), initiated the establishment of a solar panel certification laboratory. This facility is designed to test solar panels according to international standards. Its purpose is to regulate and validate the quality of solar PV equipment available and utilized in the Algerian market, thereby safeguarding investments and ensuring the reliability of the equipment deployed.

Extensive training was provided to ensure testing was carried out in accordance with the International Electrotechnical Commission (IEC) 61215 standard.

Since the laboratory was established, a number of services have been provided on the basis of these tests, including the testing of solar panels and the diagnosis of the 1.7 MWp solar power plant at Oran International Airport.

Currently, a knowledge gap remains regarding the certification of battery quality. Securing financing for the necessary equipment to establish three laboratories and obtain their accreditation is essential for addressing this gap.

## Impact

Since the end of the Technical Assistance, the Centre de Développement des Énergies Renouvelables (CDER) has undertaken considerable investment with a view to establishing a certification laboratory and integrated infrastructure dedicated to the quality control of photovoltaic equipment and systems for the Algerian and regional markets.

To realize the long-term vision and ambition of setting up of the photovoltaic test technology platform encompassing solar panels, inverters and batteries, a substantial investment of around €3 million has been committed to the development of a dedicated site and the acquisition of test equipment for solar panels and inverters.

While the legal structure for this laboratory was formally established by interministerial decree, a robust and effective regulatory framework will be needed to support its implementation.

# Republic of the Congo: Decarbonizing hard-to-abate sectors

### 2021–2022

Following the request of the Republic of the Congo for technical assistance, CTCN delivers a thorough audit of cement plants and develops a $CO_2$ emissions methodology to evaluate and monitor the climate impact of the national cement industry.

### 2023–2024

Building on CTCN technical assistance, the Republic of the Congo is in the process of adopting the updated cement standard, EN-197-5, as part of decarbonization recommendations.

### 2024

The Congolese Government initiates the development of a decarbonization roadmap for the cement sector based on the transparent emissions data available now.

Globally, the cement industry is one of the main GHG emitters, accounting for 5 per cent to 8 per cent of total man-made $CO_2$ emissions. In the Republic of the Congo, cement production has surged in the past decade to meet the growing demand of the domestic market, supporting urbanization efforts. However, this upsurge has also resulted in a simultaneous increase in $CO_2$ emissions.

Data on the cement production industry is needed to accurately calculate GHG emissions. This calculation can be used identify potential GHG emissions reduction levers.

## What we did

CTCN, with support from its network member Cementis, conducted an energy and thermal audit, and established methodologies for calculating more detailed GHG emissions in line with Tier 2 and Tier 3 methods of IPCC guidelines.

**Expected emissions avoided**

**122,000–166,000** T $CO_2$e

## Impact

This technical assistance ignited the process of updating the internationally recognized EN-197-5 standard, facilitating the generation of greener cement (LC3). This standard calls for only 50 per cent clinker, which, in cement, accounts for most of its carbon emissions, in comparison to the current standard of 65 per cent.

The Congolese Agency for Standardization and Quality (ACONOQ) Technical Committee already approved the draft amendment of the new standard. The amendment is due for adoption depending on a positive result of the public consultation process later in 2024.

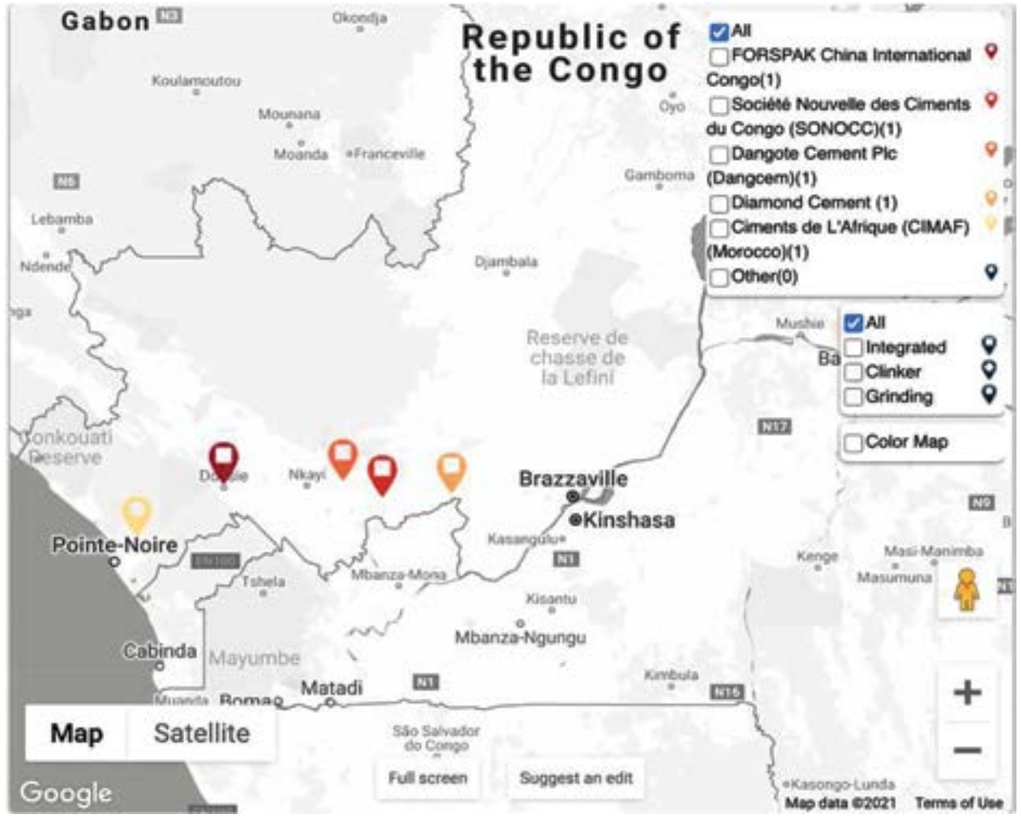
The cement sector $CO_2$ emissions data, gathered with CTCN technical assistance, allowed the Republic of the Congo to initiate the development of a decarbonization roadmap in 2024 in coordination with the cement and concrete production industries. Both of the follow-on projects are being undertaken by Cementis in partnership with the Global Cement and Concrete Association (GCCA) and CTCN, and are sponsored by the École Polytechnique Fédérale de Lausanne (EPFL).





> The updated standard that is currently proposed for adoption, and the decarbonization roadmap that is under development can be traced back to the important support we have received from CTCN. The accurate GHG emissions data and audit guidelines will help us to monitor the GHG emissions coming from that [the cement] sector, and also informed the revision of our Nationally Determined Contributions.
>
> ***Claude François Itsouhou***
> ***Head of the Greenhouse Gas Inventories Expert Group of the Industrial Processes and Product Use (IPPU) sector***

**Cement industry in Republic of the Congo**



# Mauritius: Biogas plant to generate renewable energy

### 2022

Following a request from Mauritius for technical assistance, CTCN delivers a technical and economic feasibility study to use organic waste for biogas production. The underlying implementation plan for a biogas plant is transformed into a draft proposal for a public-private-partnership.

### 2023–2024

National authorities prepare implementation and financing arrangements for the public-private-partnership.

### 2025–onwards

Planned construction of the biogas plant.


Final workshop to present project results, Port Louis, Mauritius, 2022.

Solid waste generation in Mauritius, as in other small island development states (SIDS), is a major issue due to land scarcity. Mauritius had set-up a solid waste management system using a single sanitary landfill located at Mare Chicose. However, this approach was no longer sustainable and clashes with the country ambition to reach 70 per cent diversion of solid waste from landfill by 2030. Therefore, alternative waste management technologies need to be studied and implemented in the short to medium term.

Coupled with the increase in solid waste generation, Mauritius also faces a heavy dependence on fossil fuels to meet its energy requirements. In 2019, fossil fuels accounted for a staggering 87 per cent of the island's total primary energy requirements, a vulnerability compounded by volatile oil prices.

To address both waste management and oil dependency, the Ministry of Environment, Solid Waste Management and Climate Change (SWMD) asked CTCN to conduct a technical and economic feasibility study for the construction and operation of a biogas plant.

> The CTCN support has laid the foundation for circular economy and renewable energy in Mauritius. Once operational, the biogas plant will fundamentally change our approach to organic waste management and enable a reliable supply of clean energy to more than 20,000 individuals.
>
> ***Ganesh Dookee***
> ***Deputy Director of the Solid Waste Management Division***





## What we did

An evaluation of Mauritius' organic waste availability and anaerobic digestion/methane and energy production potential was conducted by CTCN's consortium partner Council for Scientific and Industrial Research (CSIR) South Africa, in collaboration with the University of Mauritius. **The study concluded that the total of 30,000 tonnes of organic waste generated each year could be used to generate about 47,271 kWh of energy per day**. A total of 20,000 persons could benefit from electricity generated by the biogas plant.

Building on this baseline analysis, CTCN partners:

- Identified the optimal design and site for the biogas plant.
- Developed an underlying cost and revenue analysis.
- Generated a business model.

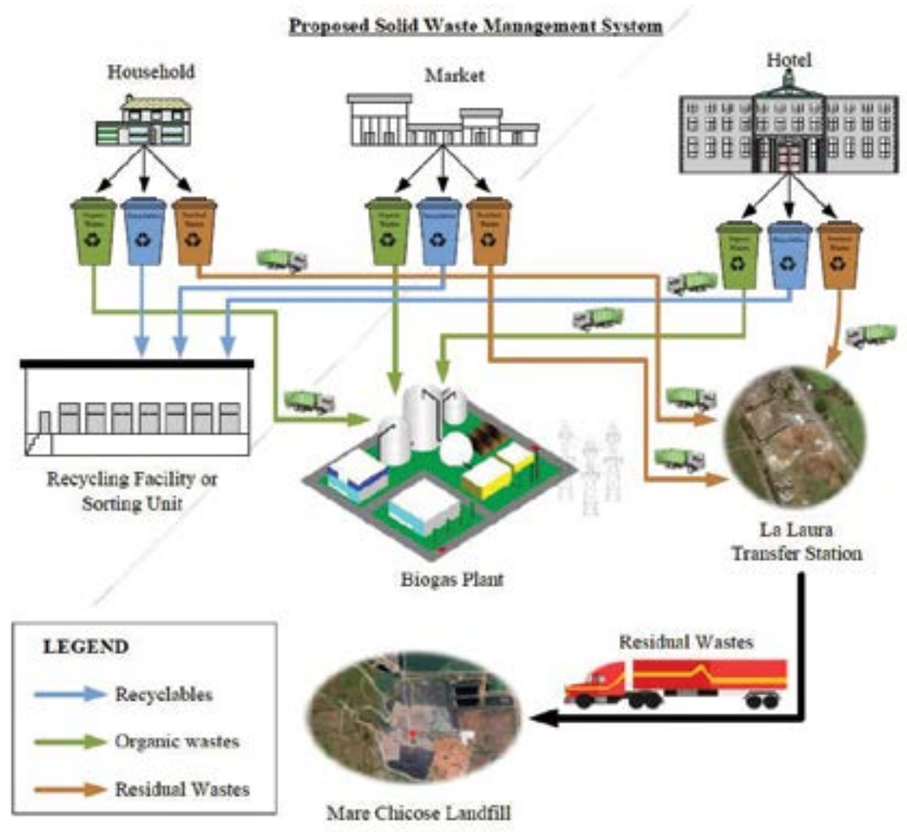
Building on these resources, a draft proposal for a public-private-partnership to set up a biogas plant was developed. Considering upfront and operational costs, and different revenue scenarios, the construction and operation of the biogas plant could have a net present value of roughly USD 15 million over a period of 20 years.

## Impact

After completion of the technical assistance, the SWMD reached an agreement with the Central Electricity Board (CEB) for the joint preparation of a project that will be implemented on a public-private-partnership basis for a term of 20 years.

An additional consultancy through the Transformation of the Waste Sector towards a Waste-Energy Nexus in the Southern Indian Ocean Regions (TWENex), with financial support from the European Union, will finalize the RFP documents by the end of 2024.

**Schematic Design of the Biogas Plant, Output 5, CSIR and University of Mauritius, 2022**




Source: CTCN Technical Assistance, Output 5 on Schematic Design of the Biogas Plant, CSIR and University of Mauritius, 2022.

# Kyrgyzstan: Advancing energy efficiency through building codes and sustainable technologies

**2014–2017**

In Kyrgyzstan, a Medium-Term Tariff Policy is adopted to increase electricity and heating tariffs for non-residential users, including the public sector. This provides a strong incentive for public buildings to adopt energy efficiency measures.

**2020**

Kyrgyzstan develops a National Adaptation Plan, which includes a roadmap for Implementation of Energy Efficiency in Public Buildings.

Kyrgyzstan submits a request to CTCN to develop their policy guidelines on building codes for enhancing energy efficiency and the identification of viable technologies for public buildings.

**2022**

CTCN delivers a roadmap for Implementation of Energy Efficiency in Public Buildings and Works.

Authorities facilitate the practical implementation of the revised building codes.

Most public buildings in Kyrgyzstan were built 35–75 years ago and have not undergone renovations since. This has resulted in buildings and infrastructure now being in very poor condition, operating severely under-heated even with excessive normative energy consumption, reaching often over 300 kWh/M2.

## What we did

CTCN assisted Kyrgyzstan in developing new building codes that focus on critical regulatory provisions for advanced energy efficiency, revising the existing national building codes for public buildings and structures. Specifics include three national building codes for new and existing public and residential buildings, with revised parameters to improve the energy efficiency of boiler installations and heating, ventilation, and air conditioning (HVAC) systems, as well building envelops of multicompartment residential buildings.

CTCN delivered recommendations on key energy performance indicators and energy efficient technology solutions, and developed policy guidelines for new energy efficiency standards by type of building.

New building codes are expected to improve building energy performance by 40 per cent to

**60 per cent**

compared to current regulations.

Anticipated reduction is

**1.5 million $tCO_2$** per year by 2025.





# Indonesia: Driving sustainable mobility in Jakarta

**2019**

The Ministry of Environment and Forestry, requests technical assistance to support transitioning to e-mobility in Jakarta.

**2020-2021**

CTCN holds consultations with key stakeholders and delivers policy recommendations to transition to e-mobility.

**2022**

Jakarta adopts the policy recommendations and successfully procures its first 30 e-buses.

**2022–2030**

Transjakarta has a target to electrify 50 per cent of its bus fleet by 2030.

> In 2021, CTCN has assisted the Government of Jakarta in preparing policy support that will be needed to accelerate e-bus deployment in Jakarta. This project is important for the local government as a guideline to implement the e-bus as stated in their long-term strategy.
>
> ***Laksmi Dhewanthi***
> ***Director-General of Climate Change***
> ***Indonesia Ministry of Environment and Forestry***

Transportation significantly contributes to GHG emissions in Indonesia. For example, in 2005, Jakarta alone emitted 35 million tonnes of $CO_2e$, compared to the 2.1 billion tonnes of $CO_2e$ produced throughout Indonesia. The city's emissions are projected to increase to 113.94 million tonnes of $CO_2e$ by 2030 (Jakarta Environmental Agency, 2005), with the transport sector contributing about 25 per cent of these emissions.

To mitigate this risk, Indonesia requested CTCN technical assistance to develop and deploy electric-mobility (e-mobility) within Transjakarta, South-East Asia longest rapid transit bus system.

## What we did

CTCN worked with both public and private Indonesian stakeholders in energy and transportation, and delivered:

- Policy recommendations and an operational plan for the deployment of e-mobility and related infrastructure.
- A charging strategy and implementation road map that assesses grid capacity and requirements in Jakarta and integrates renewable energy supply to mobility operations, including solar roofing for Transjakarta buses, stations and depots.
- An e-bus investment plan and business model to electrify Transjakarta fleets.
- An assessment of grid and renewable energy adoption.

## Impact

Transjakarta is using the electrification road map and investment plan developed by CTCN to deploy 1,635 e-buses (50 per cent of Jakarta's bus fleet) by 2030.

Around USD 1.4 million in investment opportunities has been identified to support Jakarta's charging facilities and grid infrastructure, with the potential to integrate solar roofing on buses and Mass Rapid Transit (MRT) stations.

**Expected amount of emission avoided**

Anticipated metric tonnes of $CO_2e$ reduced or avoided as a result of CTCN technical assistance totals

**100,892** $tCO_2e$.


Stakeholder workshop


Discussion of Gender Policy Mainstreaming by Ministry of Women Empowerment and Child Protection.





# Panama: Fast-tracking sustainable mobility and low carbon emissions in Panama City

**2020**

CTCN delivers a comparative analysis between electric buses, natural gas and Euro VI buses for Panama City.

**2022**

Based on the analysis, Law 295 on Electric Mobility "encourages electric mobility in ground transportation".

The Tourism Authority, in conjunction with MiBus and IDB technical cooperation, develops a public bidding process for the purchase of five electric buses.

**2023**

Panama issues new official considerations on e-mobility and sustainable building standards.

The National Secretariat of Energy, the Ministry of Environment, and the Inter-American Development Bank (IDB) apply for GCF funds for the EMOBILITY programme.

**2024**

The National Secretariat of Energy, the Ministry of Environment, and the Corporación Andina de Fomento (CAF) will apply for GCF funds for the EMOTION programme.

The bidding process for 45 electric buses will be carried out based on IDB technical assistance to MiBus.

> "Renewable energy will grow by an additional 37 per cent by 2030 in Panama due to the implementation of the electric mobility goals, this being one of the most relevant drivers to promote the creation of direct and indirect jobs associated with new infrastructure."
>
> ***Rosilena Lindo***
> ***National Secretary of Energy***

Panama's Energy Transition Agenda prioritizes e-mobility to reduce both non-renewable energy dependence and the carbon footprint of the transportation sector – the largest consumer of fossil fuels.

The National Secretariat of Energy sought CTCN technical assistance to accelerate the transition to sustainable mobility and low carbon emissions in Panama City.


## What we did

CTCN delivered:

- A comparative analysis between electric buses, natural gas and Euro VI buses for Panama City, encompassing technical, environmental, and financial evaluations.
- An analysis of charging strategies.
- An assessment of barriers to the adoption of a sustainable transport plan.
- Capacity-building for local stakeholders.

These analyses led to the recommendation to migrate to electric mobility for public transportation in Panama City.

## Impact

MiBus, Panama City's public transport operator, undertook a series of additional studies with partners including the World Bank, CAF and IDB, leading to the planned acquisition of 53 electric buses.

CTCN groundwork was also pivotal to informing policy and decision-makers. It also set in motion a series of complementary regulations and decisions to create an enabling environment for the transition to sustainable mobility and low carbon emissions.

The National Secretariat of Energy and the Ministry of Environment, With the support of IDB and CAF, and building on the work by CTCN, joined two GCF proposals: one for the EMOBILITY programme involving nine countries in Latin America and the Caribbean, and one for the EMOTION programme together with Paraguay and Uruguay.


# PILOTING NEXT-GENERATION TECHNOLOGY FOR CLIMATE ACTION

CTCN has developed a portfolio of climate innovation solutions spanning various technologies and sectors, piloting solutions for system transformation, and responding to the diverse needs and assets of developing countries.

Driven by the requests of developing countries and leveraging the knowledge and expertise of over 840 CTCN network members and a global community of partners, this portfolio has seen the proliferation of ingenuous solutions that have already shown tangible impacts in strengthening resilience and saving lives, and hold immense promise in scaling up.

**Burundi**
**Slamdam**

**Mali**
**Malicrop mobile app: Agrometeorological information**

**Grenada**
**Remote sensing and GIS for water supply management**

**Saint Kitts and Nevis**
**Drought-risk modelling**

**Thailand**
**Strengthening Bangkok's early warning system**





## Burundi and Pakistan: Using Slamdam from flood prevention and water availability during drought

**2021**
CTCN receives a request for technical assistance to support Burundi during floods through the Adaptation Fund Climate Innovation Accelerator.

**2022**
CTCN pilots the Slamdam technology in Burundi.

**2022–2023**
A concept note to scale up the project is developed and submitted to the Adaptation Fund.

**2023**
CTCN receives a request for technical assistance from the Government of Pakistan to develop water harvesting technologies.

Burundi is one of the 20 countries in the world most vulnerable and least prepared for climate change. The country does not have the capacity or means to invest in infrastructure improvements for flood prevention, such as concrete dams, nor can it respond adequately to flood emergencies by constructing bridges in flooded areas.

For this reason, more innovative solutions are needed. Slamdam is an easily deployable water-filled flood barrier that can be used to prevent damage from flooding and to store water to ensure water availability in times of drought.

ADAPTATION FUND
Climate Innovation Accelerator

## What we did

CTCN selected and implemented a low-cost, climate resilient, re-usable, easy replicable, scalable and mobile technology called Slamdam, which is an inflatable ribbon of rubber designed to be filled with water during floods. It works as a barrier to protect from flooding, but also acts as storage for water during droughts.

In Burundi, Slamdam's effectiveness was evident in times of drought in Mpanda Commune in Bubanza, which has a population of 25,000 people.

> The project has been very well received by the local population and the cost of installation was very cheap.
>
> ***Gerard Bucumi***
> ***Local community member***

## Impact

After its pilot success, a concept note for scaling the project up was submitted to the Adaptation Fund. In addition, the result of Burundi's Slamdam was demonstrated and attracted attention at COP27. This led to Pakistan submitting a request for CTCN technical assistance for developing water harvesting technologies.





# Mali: Mobile app and agrometeorological information

**2012**

Mali's Technology Needs Assessment (TNA) and Technology Action Plan (TAP) prioritize the use of agrometeorological information for decision making in agriculture.

**2015**

In its NCDs, Mali further prioritizes the use of agrometeorological data to increase resilience in the agricultural sector.

**2021**

Mali requests CTCN technical assistance to define, select, develop and pilot an agrometeorological information system.

**2022**

CTCN presents a new agrometeorological information system to provide accurate weather information to farmers leading to data-informed decision making, improved yields and reduced losses.

Reliable and accessible weather forecasts are crucial in countries like Mali, where farming employs about 75 per cent of the population and is responsible for 50 per cent of the gross domestic product. However, many farmers still do not have access to accurate weather information, in part due to the lack of high-speed internet service.

## What we did

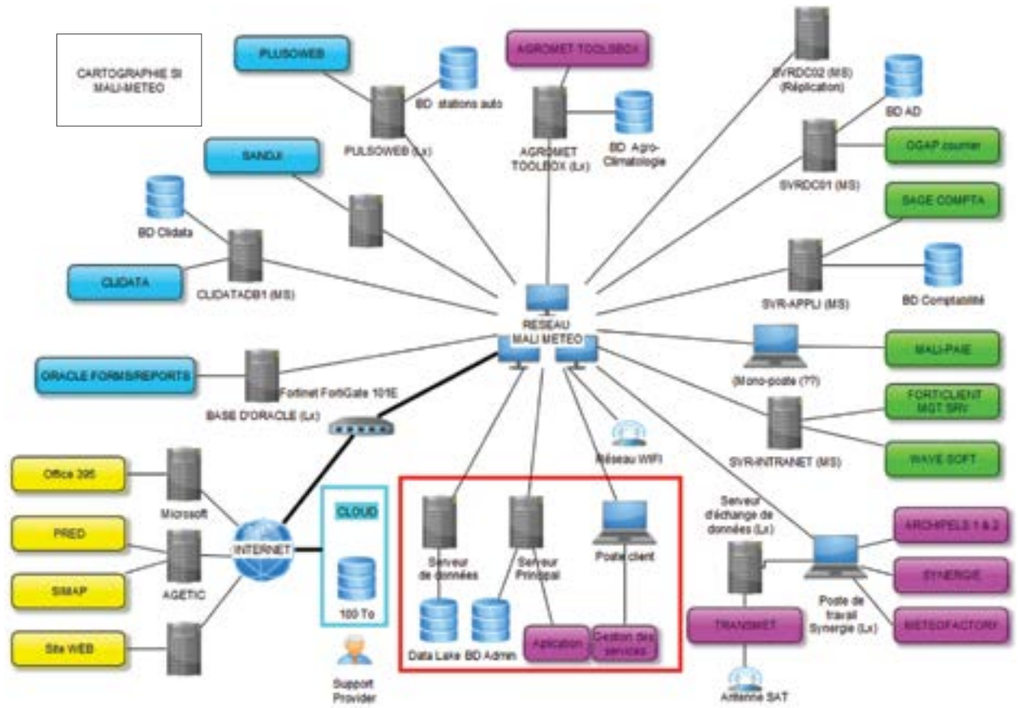
CTCN partnered with WeatherForce to build MaliCrop, a mobile app that can analyse 10 years' worth of data, which significantly increases the accuracy of weather forecasts. But this is no ordinary forecast; along with predictions for temperature, humidity and precipitation, broadcasters discuss historic rainfall patterns and the risk of the spread of a millet-wasting disease known as mildew.

ADAPTATION FUND
Climate Innovation Accelerator

> This data [helps] farmers, many of whom are women, plan and make informed decisions on how to manage their crops.
>
> ***Pascal Venzac***
> ***Co-Founder of WeatherForce***

## Impact

The forecast is read from the mobile app and broadcast through a local radio station in French and several local languages. It regularly reaches over 110,000 people and has become a lifeline for farmers in drought-prone Mali.




Mali crop : App work flow Copyright WeatherForce





# Grenada: Remote sensing and GIS for water supply management

### 2017

Grenada request support from the CTCN to establish a GIS-based monitoring and control system for water loss reduction and leakage detection.

### 2018–2019

CTCN supports the development of GIS systems, workflows and provision of GIS training to the National Water and Sewerage Authority (NAWASA) staff, alongside the development of enhanced systems for monitoring and metering water.

### 2020

Grenada improves the management of water resources across the country.

### 2021–2024

Work continues through the GCF FP059 projects (G-CREWS) supporting the country-wide delivery of enhanced water infrastructure.

Grenada is projected to experience a decline in rainfall, with estimates indicating it may decrease to 25-30 per cent of current levels by the end of the century. At the same time, water demand is forecasted to rise, intensifying pressure on the island's available water resources.

## What we did

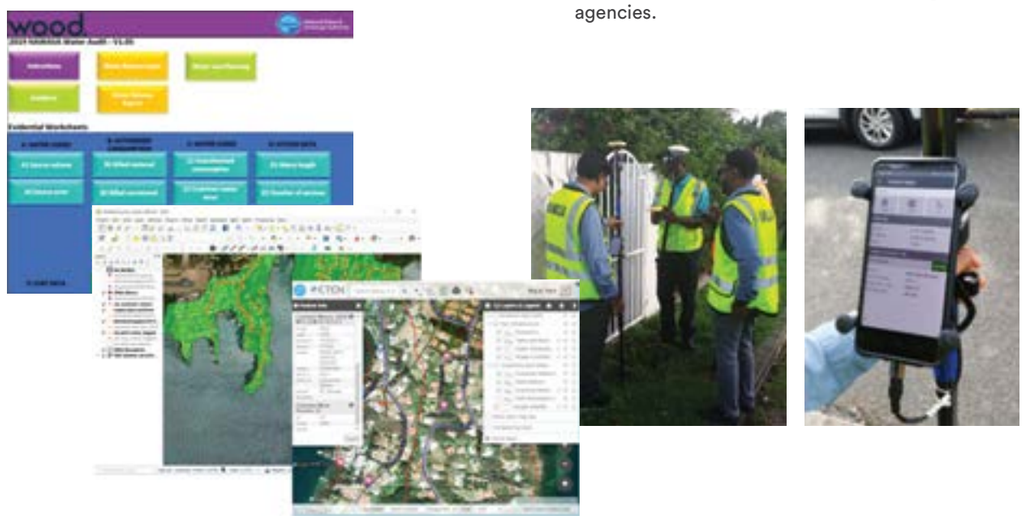
To relieve this pressure on available water, CTCN strengthened the capability of the National Water and Sewerage Authority (NAWASA) to monitor and address water loss and leakage through the application of the following technologies:

- Leakage management in piped systems
- Water accounting
- Geographical Information Systems (GIS) management.

## Impact

The application of these technologies led to the:

- Creation of a server-based GIS for NAWASA, including enhanced GIS infrastructure layers to undertake an effective assessment of non-revenue water in selected pilot areas.
- Provision of basic internet-based mapping viewer to visualize datasets.
- Implementation of a structured assessment method to better quantify the level of non-revenue water and reduce this level to below the current 22 per cent to 29 per cent.
- Development of a South-South knowledge sharing network between Caribbean water management agencies.



# Saint Kitts and Nevis: Drought-risk modelling

### 2021

Saint Kitts and Nevis requests support from the CTCN, through the UNEP/CTCN AFCIA programme, to identify the most vulnerable areas at risk of droughts and water variability, and to develop a drought-risk assessment.

### 2022

CTCN Implements a drought-risk model as a planning tool for climate change adaptation.

### 2023

The drought-risk model is now helping national officers to identify areas most susceptible to water supply variability and shortages, and take early action to manage these risks.

### 2024

Building on the drought forecasting system developed by CTCN, the Caribbean Public Health Agency (CARPHA) funds the development of a National Water Information System.

Saint Kitts and Nevis designs a national plan in

In Saint Kitts and Nevis, the recent push towards an agricultural and tourism-based economy has placed greater demands on already stressed water resources. Therefore, identifying areas and vulnerable groups most susceptible to water shortages is crucial to facilitate early action to manage risks and increase resilience. The country needed assistance to mitigate these risks and develop a long-term strategy to address climate change impacts.

## What we did

Saint Kitts and Nevis partnered with CTCN to incorporate drought risk modelling as a planning tool for climate change adaptation measures, looking at the entire water ecosystem, and combining and analysing several datasets and technologies that feed into a drought forecasting tool.

ADAPTATION FUND
Climate Innovation Accelerator
SMALL GRANTS. BIG IMPACT.
CTCN

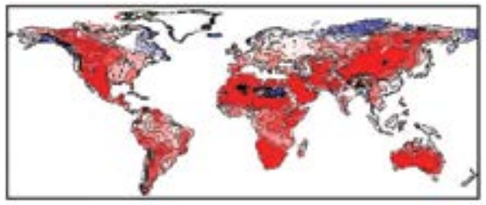




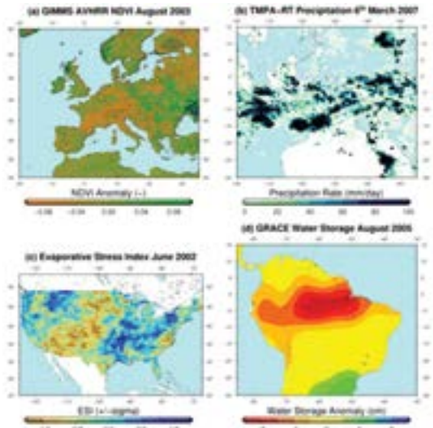
Together with a committed stakeholder working group, CTCN generated:

- **Hazard mapping solutions** to highlight areas affected by or vulnerable to drought.
- **Water resource assessment** to determine the status and trends in both water resources and water supply services, with a focus on availability and demand issues.
- **Open-source climate data and tools** that use freely available satellite data, hydrological models and seasonal weather forecasts.
- **Hydrological modelling** that simplifies real-world systems to help understand, predict and manage water resources.
- **Early warning system communication** to provide an integrated system of drought monitoring and forecasting that enables government stakeholders to take timely action to reduce drought risks.

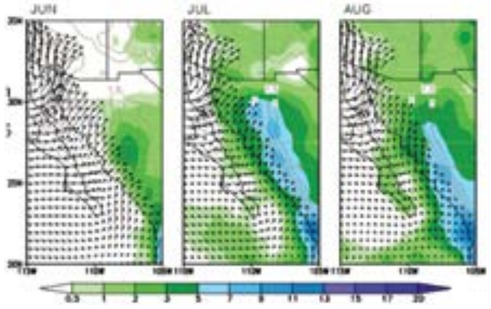
### Hydrological modelling



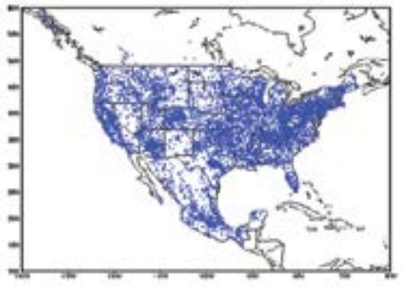
### Satellite remote sensing



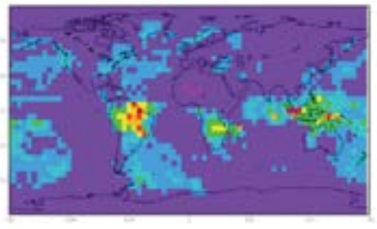
### Re-analysis




### Ground observation



### Regional/Global climate models and statistical prediction



# Thailand: Strengthening Bangkok's early warning system

**2015**

Thailand submits its Intended Nationally Determined Contribution (INDC) and approves the Climate Change Master Plan 2015-2050 defining priority sectors for adaptation and building climate adaptation in Thailand´s National Development Plan (including water management, and human settlements and security).

**2016–2017**

Development of the National Adaptation Plan (NAP).

**2016 (Jan)**

Bangkok Metropolitan Authority (BMA) submits a TA request for an urban flood early warning system.

**2017**

CTCN delivers the urban flood early warning system for the Sukhumvit catchment area in Bangkok.

**2018**

The National Committee on Climate Change Policy approves the National Adaptation Plan (NAP).

Bangkok is facing increased climate-related risks such as rising sea levels and increased frequency of extreme weather events. Additional challenges include groundwater pumping, dumping of solid waste into city canals and waterways, clogged drainage systems, and deforestation. These all contribute to urban flooding, which has devasting impacts on people and the economy.

## What we did

To mitigate the impacts of flooding, CTCN supported the Bangkok Metropolitan Administration (BMA) to develop targeted, city-specific and innovative approaches for:

- A strategic urban adaptation framework for managing climate risks.
- Strengthening of institutional capacity for adaptation and implementation of measures such as land-use planning and zoning.
- Designing of an early flood warning system to help reduce urban vulnerability.
- Sound urban and environmental planning and management.





The design of an urban flood early warning system for high-risk catchments in the Bangkok metropolitan area involved technology transfer, capacity building and a demonstration of advanced urban storm water management. This needed to be applied to the complex drainage network of Bangkok, which demanded the following actions:

- Refinement and updating of the hydraulic model along with building hydraulic drainage models for flood scenario analysis.
- Review of data and operational knowledge.
- Establishment of a cloud-based core data management system linked at various levels with Bangkok Metropolitan Authority's existing data logging and publishing systems.
- On the job training and advanced hydraulic and forecasting modelling courses for BMA staff to ensure technology uptake.

# INCREASING KNOWLEDGE AND CAPACITY IN DEVELOPING COUNTRIES

Education, training, awareness raising and capacity building are fundamental to achieving the objectives of the United Nations Framework Convention on Climate Change (UNFCCC), Paris Agreement and Kyoto Protocol, and empower individuals, organizations and societies to mitigate and adapt to climate change, while strengthening the resilience of future generations.

From its beginning, CTCN has invested systematically across all its areas of intervention to strengthen countries' capacity on climate technology, policy and action. This effort has bolstered the necessary structure to secure responsiveness, ownership and sustainability of climate solutions. Today, CTCN has an extensive portfolio of tailored capacity-building activities – from technical assistance to policy development and collaborative research. These activities respond to the needs and ambitions of developing countries, and facilitate transformation across five system transformation areas, in parallel strengthening national systems of innovation (NSI) and digitalization.

As a network and partnership-based organization, CTCN's capacity building activities are designed to engage multiple stakeholders, from local to global, including United Nations bodies such as UNFCCC along with its Technical Executive Committee (TEC), and UNEP, among others. This engagement facilitates the creation of enabling environments for NDEs in developing countries.

CTCN also relies on the capacity and expertise of its global network of technology members and partners to create capacity building activities in line with the latest science, technological developments and market trends.

# Ten years of capacity building: Snapshot

**Over the past 10 years, CTCN successfully supported**

**110** developing countries

**440+** capacity-building activities

## Capacity building activities by type

**181** Project activities as part of technical assistance implementation in developing countries

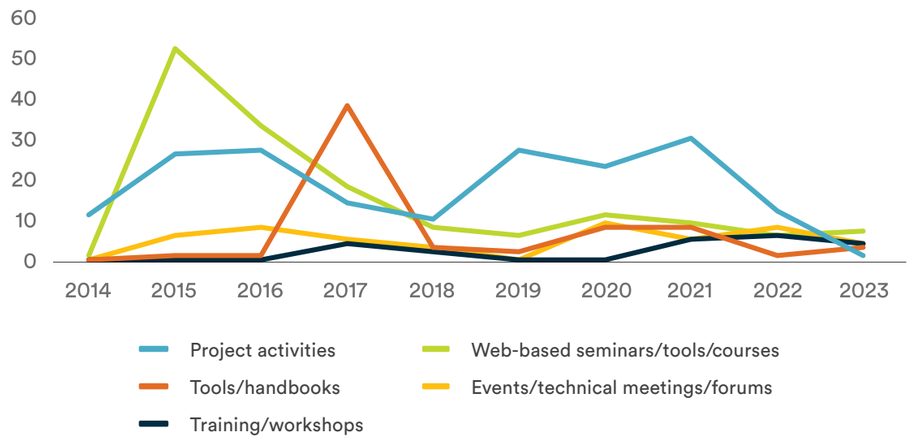
**151** Web-based seminars/tools/courses

**65** Tools/handbooks

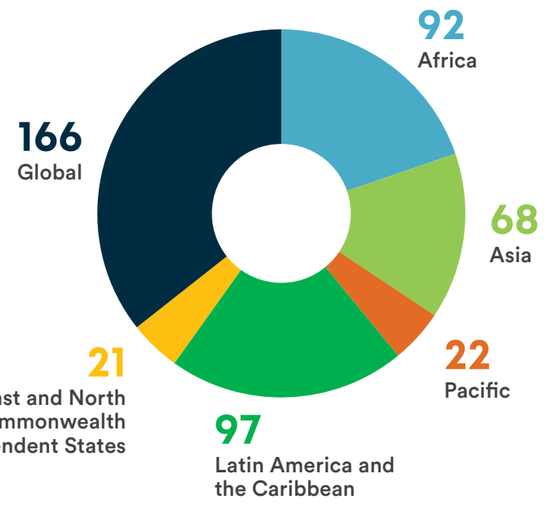
**48** Events/technical meetings/forums

**21** Training/workshops

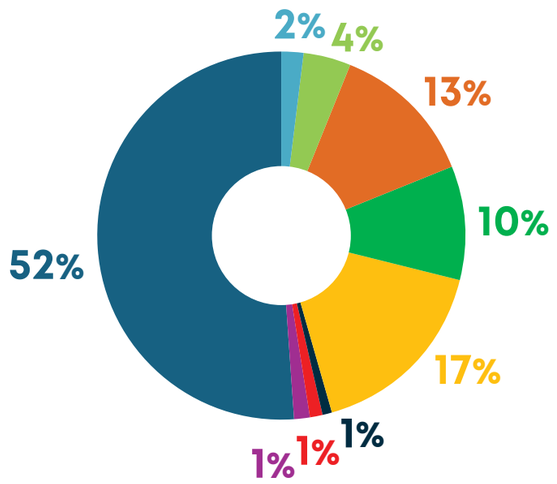
## Capacity building activities by year, 2014–2024




## Global vs. regional focus of capacity building activities




## Partners and collaborators




- External UN bodies
- Private sector
- Public sector (including NGOs)
- Academia
- Internal UN bodies: UNFCCC and UNEP
- Finance mechanisms GCF, GEF, AFCIA
- Youth community
- Women/gender community
- Consortia and joint partnerships

# Catalysing knowledge and amplifying capacity building

Capacity building is an integral part of the design and implementation of CTCN technical assistance. So far, 179 out of 294 technical assistance projects delivered have included capacity building components (technology transfer, peer-to-peer learning and stakeholders' engagement among others).

Between 2014-2019, CTCN supported five technical assistance projects that were exclusively dedicated to capacity building. These projects benefited four countries: Bhutan, Timor-Leste, Tunisia and the Dominican Republic, which requested technical assistance to develop capacity to innovate technology across various sectors.

In 2022, CTCN introduced a new capacity building strategy, kicking off with a series of eight new modules for capacity building, network engagement and collaborative RD&D programmes to ensure that CTCN systematically enhances innovation capacity and collaboration on climate technology transfer of developing countries.

These modules include a variety of methods and modalities including:

- Global capacity-building programmes to train NDEs with the latest climate technology knowledge and applications.
- Workshops on co-creating solutions with network members to showcase technology, and explore twinning arrangements for collaborative RD&D.
- Bridge-building workshops.
- Learning-visit exchanges.
- Technology talks.
- Structured dialogues with NDAs that are seeking partners.
- Workshop co-designed by NDEs for multi-country technical assistance ideation.

All the activities are inspired by country's ambitions and are based on the readiness of the NDEs to engage with different stakeholders to support the process of establishing a National Innovative System using digital climate technologies.

## Bhutan: Capacity building for improving urban transport for key municipalities

The transport sector in Bhutan accounts for 44 per cent of all energy-related GHG emissions, and for over 7 per cent of overall GHG emissions. Poor road quality and a difficult terrain, which hinders road expansion, challenge the development of sustainable mobility.

In 2016, Bhutan requested CTCN's support in the preparation of a Mobility Plan for an Intelligent Transport System (ITS) for Thimphu City. The plan included support for implementation along with the development of professional capacities on managing and operating ITS, and piloting an ITS project.

The capacity building targeting transport officials and managers included:

- Modules on public transport and traffic management theory, tools and applications.
- A learning exchange in Thailand on "Intelligent transport systems implementation in Thailand".
- How to develop sustainable models of transport and manage traffic through advanced technology in Bhutan.





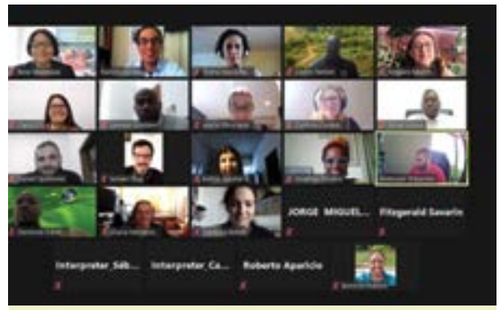
# Enabling informed climate action for National Designated Entities

NDEs have a leading role in generating requests for CTCN technical assistance projects, knowledge transfer and partnership opportunities. As a demand-driven network, CTCN organizes knowledge exchange and capacity building initiatives targeting NDEs to support them in decision making including:

- Annual NDE forums.
- Global thematic capacity building programmes.
- Structured dialogues with focal points.
- Broader discussions with the finance mechanisms.

Annual NDE forums gather NDEs from developing countries across regions and engage multiple stakeholders in the UNFCCC mechanism. Since 2015, CTCN has organized 32 regional NDE forums to facilitate the pre- and post-discussions on COP decisions and negotiations, and CTCN's annual operation outcomes. These forums provide a space for NDEs to share their concerns and plans strengthening the participation of NDEs in CTCN key service areas.

CTCN strengthened stakeholder engagement during the COVID-19 pandemic, leveraging online platforms to connect NDEs with other key stakeholders for national climate strategy development and coherence acceleration.



NDE Regional Forum for the Latin America and the Caribbean region, June 2021.

NDE Regional Forum, Uzbekistan, June 2018

# Thematic capacity building programmes for national designated entities

In the past 10 years, **over 4,637 people benefited from CTCN's capacity-building activities**.
Of these, over **1,200 NDE personnel participated in at least one of CTCN's capacity-building activities**.

## $SF_6$ Learning Programme: Phase-out of highly potent greenhouse gases

In 2023, CTCN in collaboration with NDE Germany organized a three-day $SF_6$ Learning Programme that was attended by about 40 participants, including stakeholders from NDEs, energy ministries or utilities from 11 developing countries across the world, as well as representatives from technology providers and financial institutions. The programme delved into the harmful climate impacts of $SF_6$, the importance of accurate $SF_6$ usage reporting and phase-out regulations and available $SF_6$-free technologies in the market.

To reduce the global-warming potential (GWP), switchgear manufacturers are building commercially viable $SF_6$-free electrical equipment. However, the level of awareness of $SF_6$ impacts and alternatives at a global level is very low. Countries are confronted with challenges related to the unavailability of accurate $SF_6$ baseline data, the absence of policies and regulations, limitations in adopting alternative technologies, and constraints in financing.

With a global warming potential of 24,300, sulfur hexafluoride ($SF_6$) is mostly used as an insulating gas in electrical equipment (such as switchgears and circuit breakers) for electrical transmission and distribution lines.







Site visit at the SF6-free switchgear startup Nuventura

Following the $SF_6$ Learning Programme and presentations on $SF_6$ at regional climate weeks, CTCN received many requests for support in the phase-out of $SF_6$.

A first technical assistance will be implemented in Kenya targeting the elimination of $SF_6$ from grid infrastructure through the development of a phase-out strategy and governance framework, capacity building and piloting $SF_6$-free technologies.

## Digital Innovation in Agriculture[9]

Digital agriculture technologies can support a smooth and effective transition, enabling the re-design of food systems for greater efficiency and sustainability.

CTCN invited 30 NDEs representatives and officers from Ministries of Agriculture worldwide to a three-day capacity building programme on Digital Technology Applications in the Agriculture Sector. The programme strengthened participants' capacity to:

- Use/leverage digital technologies for stronger and more sustainable agriculture and food systems.
- Co-design future CTCN technical assistance projects to address sector-specific aspects of the climate crisis.

This programme led to the ideation of more than 15 new technical assistance ideas and increased the knowledge of digital tools for innovation in the agriculture sector in developing countries.


Siheung, South Korea, December 2022

## Green Hydrogen[10]

Green hydrogen use for primary steelmaking is near-commercial, with countries such as Sweden, Australia and Germany spearheading the technology with the establishment of national economic and policy instruments for green hydrogen. However, in developing countries, the design and implementation of public policy instruments supporting green hydrogen for system transformation is lagging.

In 2023, CTCN delivered a capacity building programme on green hydrogen to strengthen developing countries capacity in Asia and the Pacific, Latin America and the Caribbean, and Africa.

This programme was tailored to the knowledge needs and ambitions of each region, and CTCN invited 105 NDEs to share theories and applications on hydrogen technologies for future RD&D collaboration, focusing on targeted areas including:

- Green Hydrogen Technology in Energy and Business & Industry Sectors: Africa.
- Green Hydrogen Technology in Energy and Sustainable Mobility Sectors: Asia and Pacific.
- Green Hydrogen Technology in Energy Systems and the Water-Food-Energy Nexus: Latin America and Caribbean.

As a result of the capacity building programme, CTCN is now supporting Maldives to explore the green hydrogen potential with an assessment for sustainable energy transition.[11]

9 https://www.ctc-n.org/news/ctcns-palo-now-hosting-3-day-capacity-building-programme-digital-technology-applications
10 https://www.ctc-n.org/news/latin-american-and-caribbean-representatives-unite-green-hydrogen-advancements
11 https://www.ctc-n.org/technical-assistance/projects/exploring-green-hydrogen-potential-maldives-assessment-sustainable





> This programme is highly applicable to Sri Lanka at this stage of renewable energy development. We have planned to increase our renewable energy share up to 70 per cent by 2030 and green hydrogen energy technology is an ideal renewable source of energy. Our Carbon Net Zero 2050 Road Map and Strategic Plan is under validation. The skills and knowledge we gained during the CTCN training will be very useful.
>
> ***Leel Randeni***
> ***Director of Climate Change Secretariat and NDE Sri Lanka***

Cotonou, Benin, October 2023

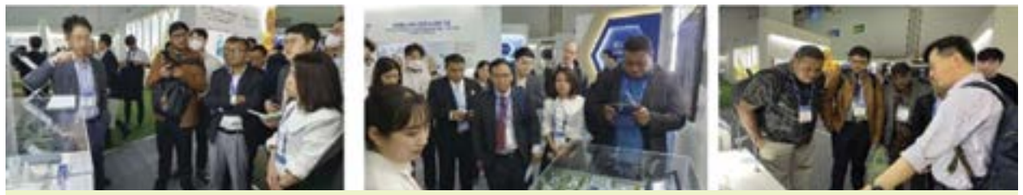
Vitacura, Santiago de Chile, October 2023

# Ramping up collaborative research, development and demonstration

CTCN serves as a Centre of Excellence on research, development and demonstration (RD&D) on climate technologies, liaising with universities, research institutes, private sector organizations, and other key stakeholders. CTCN promotes North-South, South-South and triangular collaboration on RD&D by actively fostering regional partnerships, for example with regional donors, the Asian Development Bank, and regional network members and consortium partners, including the Asian Institute of Technology (AIT) and Energy and Resources Institute (TERI).

In 2023, to strengthen countries' capacities on climate technologies for climate action, CTCN launched a collaborative RD&D activity encouraging NDEs to learn about CTCN members' technology solutions. This was followed by fostering twinning arrangements between NDEs and national technology experts for RD&D activities.

With the Bridge-building Workshop initiative, CTCN engaged NDEs to identify national counter-partners for technology transfers. For example, at the World Climate Industry Expo, 15 NDEs took the lead in matching collaborative RD&D opportunities between 8 government research institutes from the Republic of Korea and their national institutions. As of March 2024, five countries, Cambodia, Mongolia, Thailand, Viet Nam and Lao PDR, are preparing for collaborative RD&D activities with national climate technology experts that are also CTCN members.



Busan, South Korea, May 2023

## Linking Mechanisms for National Coherence

CTCN has been offering capacity-building opportunities across key service areas through bilateral and multilateral efforts. In collaboration with the Green Climate Fund (GCF), CTCN co-organized a Deep Dive Clinic at a GCF Regional Structured Dialogue.

Launched in 2023, this programme opened a platform for the discussion between focal points of CTCN and GCF to increase their national coherence on climate technology and action plans. This will continue in 2024, in close collaboration with the GCF Secretariat, to strengthen linkages and increase the overall climate action capacity of developing countries.

Songdo, South Korea, August 2023





## Network engagement event: Co-creating Climate Solutions[12]

Looking at new ways to converge network members expertise and climate technology needs, CTCN launched the Co-creating Climate Solutions (CCS) event aiming to:

- Strengthen ties among CTCN members.
- Provide key insights and support CTCN members seeking advice on implementing CTCN technical assistance.
- Exchange lessons learned about successful technology transfers.
- Showcase innovative climate solutions.

At the CCS four CTCN members volunteered to introduce their innovative solutions and were matched with experts to provide immediate feedback on the solutions' feasibility and impact potential.

As a result, CTCN members:

- Were better equipped with ideas on how to improve their technology solutions.
- Benefited from a high visibility opportunity.
- Forged new connections with other CTCN members, funders and technical experts.

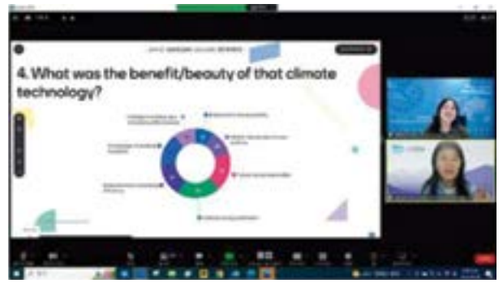

Co-creating Climate Solutions (CCS), Songdo, South Korea, July 2022

## Enhancing inclusivity and accessibility to climate technologies for all

To expand developing countries' access to climate technologies, CTCN provided a two-day workshop to:

- Introduce the Technology Mechanism of the Paris Agreement.
- Share innovative policy tools and social marketing techniques aimed at catalysing behavioural change.

The international workshop equipped over 300 participants with new insights and tools (i.e. Social Marketing for Behaviour Change, WIPO Green Database, TNA Database) to address climate challenges, and a certificate upon completion.





12 https://www.ctc-n.org/news/first-ctcn-networking-event-new-partnership-and-liaison-office-success

## Developing capacities on emerging digital technologies: Blockchain series

Emerging digital technologies, such as blockchain, artificial intelligence (AI), machine learning technology, the internet of things, cloud computing, and open data and digital platforms, have the potential to unlock and accelerate global climate action toward the Paris Agreement and reaching the SDGs. Applications in clean energy, climate finance, carbon markets and value chains are already yielding promising results.

During 2021–2022, CTCN together with its network member Blockchain and Climate Institute (BCI) delivered capacity building activities on Emerging Digital Technologies for Climate Policy Implementation with a focus on blockchain technology.

The capacity building kicked off with a deep-dive online course on blockchain technologies tailored to NDEs, which included information sharing sessions with case studies and experts from policy, academia, as well as learning assignments leading to an official certificate. The online course consisted of five modules:

1. The introduction to blockchain technology
2. Clean energy
3. Green finance
4. Carbon markets
5. Implementation considerations

A total of 74 participants worldwide actively engaged in the curriculum.

NDEs assessed the course as relevant and valuable in enabling them to evaluate different use cases for their national context, and as a result, several follow-up requests for technical assistance on blockchain technology for climate action were submitted to CTCN, including from Kenya and Thailand.

The initial module targeting NDEs was followed by a series of six public webinars, delivered between November 2021 and January 2022, and covering the following topics:

- Blockchain 101
- Clean energy
- Adaptation finance
- Mitigation finance
- Carbon markets
- Sustainable value chains

**Figure 3** CTCN Blockchain series, gender distribution

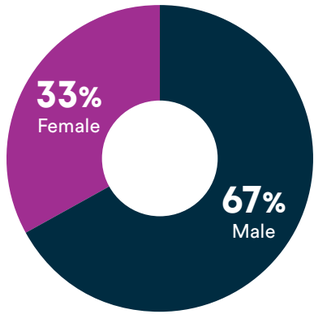
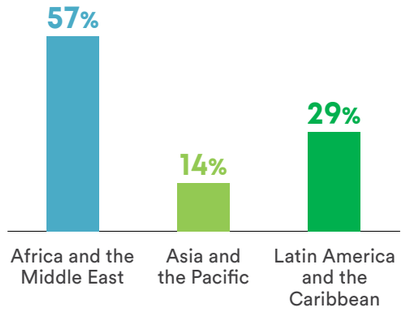



**Figure 4** CTCN Blockchain series, regional distribution




Experts from industry, the public sector and academia were involved in the delivery of these modules, which combined applications, business and research. The webinar series attracted more than 1,340 registrations and 388 attendees. It was included in the Paris Committee on Capacity-building Informal Coordination Group's e-resource on Capacity-building for Climate Technology Development, Deployment and Transfer.

Blockchain technologies for climate policy implementation series



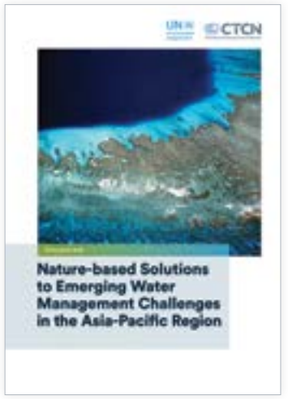


## Knowledge assets and resources

During its 10 years of operation, CTCN has produced a wealth of knowledge resources with over 200 products including publications, briefs and guidebooks, and more recently, webinars and videos, covering climate action and technologies for adaptation, mitigation and strengthening resilience.

### Green Technology Book


### Nature-based Solutions to Emerging Water Management Challenges in the Asia-Pacific Region




Since 2022, CTCN has been partnering with the World Intellectual Property Organization (WIPO) in the production of the yearly **Green Technology Book** to raise awareness about the breadth of technologies available.

### Harnessing Technology in the Circular Economy for Climate Action in Africa


### Green hydrogen technologies for systems transformation

# Capacity building moving forward

Technology plays and will continue to play a fundamental role in solutions for climate action. Developing countries need to have access to information about all types of technologies from emerging to consolidated ones to inform decision-making on climate technology innovation. **Moving forward, CTCN will keep scanning the climate technology horizon, and disseminate the latest information and opportunities.**

Digitalization, one of the system transformation enablers, is high on the agenda. CTCN will continue to provide capacity building in this fast-developing area.

In 2024, CTCN will launch the new edition of the Youth Climate Innovation Lab (see page 60) to equip youth and young entrepreneurs with the knowledge, tools and community needed to innovate.

In line with the initiative **Artificial Intelligence for Climate Action** (#AI4ClimateAction) launched at COP28, CTCN will continue to support NDEs capacity to understand the complexity and implications of AI, and seize the opportunities offered by AI in advancing digitalization and scaling up transformative climate solutions in developing countries.

With a specific focus on least developed countries (LDCs) and small island developing states (SIDS), CTCN and the Technology Executive Committee (TEC) will jointly:

a) Provide a space for policy discussions including UNFCCC national focal points and NDEs, awareness raising, and exchange of knowledge and experience among relevant stakeholders on developing and deploying climate solutions powered by AI.

b) Support capacity-building efforts in developing countries to leverage emerging digital technologies and devise locally led solutions harnessing AI.

c) Develop CTCN regional networks of entities supporting AI for climate action.

Taking a holistic approach, and involving policymakers, technology solution providers and stakeholders in developing countries, CTCN will deliver a capacity building programme on AI technologies to NDEs across three regions and assist in the formation of NDE-led regional networks supporting AI for climate action.

# LEAVING NO ONE BEHIND: TEN YEARS OF INCLUSION AND PARTICIPATION

CTCN ensures inclusion, relevance and participation in the transfer and development of knowledge and technology for climate action by engaging with a broad range of UNFCCC constituencies:

- Research and independent NGOs
- Environmental NGOs
- Business and industry NGOs
- Indigenous peoples' organizations
- Women and gender constituencies
- Youth constituencies

CTCN is guided by its Advisory Board comprised of 18 government representatives who are nominated by the UNFCCC Conference of the Parties, bringing equal representation of Parties included in Annex I to the Convention (Annex I Parties) and Parties not included in Annex I to the Convention (Non-Annex I Parties), ensuring equitable representation of United Nations regional groups. The positions of the Chair and Vice-Chair alternate annually between a representative of an Annex I Party and a representative of a Non-Annex I Party.

https://www.ctc-n.org/about-ctcn/advisory-board





## Research and academia

CTCN is engaging with academia and research institutes to leverage the wealth of data, analysis and best practices available; and inform climate policy, technology and knowledge transfer in developing countries.

### National Digitalization Readiness Index

In 2023, CTCN started the National Digitalization Readiness Index (NDRI), a joint research partnership with George Washington University and the National Institute of Green Technology. The project aims to evaluate the potential of each developing country to transform its system in five identified areas by applying digital tools.

With this index, CTCN is strengthening the engagement of NDEs in technical assistance project ideation, and the implementation of digitalization as an enabler of system transformation. After pilot testing the Index, energy system transformation will be the first area where NDRI will be implemented.

### Tool for NDC and technology needs assessment analysis

To stimulate the uptake of technologies, CTCN analyses climate plans submitted by countries to the UNFCCC to understand trends in climate technology priorities and track climate technology network needs. To do this, CTCN collaborated with its member the University of Michigan, to undertake the following:

- Conduct an in-depth analyses of technology needs identified in updated NDC submissions.
- Define an alternative method of collecting, viewing and interacting with the evolving landscape of climate technology prioritizations and needs of countries.

The project analysed NDCs and technology needs assessments for Non-Annex I countries, and parsed the climate specific needs. These were then fed into a web-based tool to create interactive visualizations, including how climate technology prioritizations connect at a regional scale, as well as gaps between taxonomy and priorities.

**The KOICA-INU Master's Degree Program Capacity Building for Response to Climate Change**[13] sets a perfect example of CTCN's effort to connect academia and front-line climate action. This course combines theory as well as hands-on experience with field visits, and equips students with knowledge and skills to promote and contribute to sustainable development in their respective countries. CTCN promotes participation in this programme to their junior officers.


Songdo, South Korea, January 2023

13 https://www.ctc-n.org/KOICA-INUs-Climate-Training-Program-fosters-endogenous-capacity-of-developing-countries

## Environmental NGOs

CTCN collaborates extensively with environmental NGOs. These organizations play a crucial role in awareness raising and advocacy for sustainable practices, including research, innovation, capacity building and environmental monitoring.

CTCN also collaborates with its network member the Blockchain and Climate Institute (BCI), a think tank providing expertise in the deployment of emerging technologies for climate and sustainability action. In 2021–2022, a joint capacity building programme was delivered to NDEs and the wider public on the potential of blockchain technology for climate mitigation and adaptation (see page 50).

To provide technical assistance in countries targeting solar cooking technologies, CTCN collaborates with Solar Cooker International (SCI). In Mali, the collaboration is supporting a project on women's empowerment, and another project in the Central African Republic focuses on youth.

In Nigeria, CTCN collaborates with Green Sustainable Habitat, to respond to the request from Kubau, a community in Kaduna State, to pilot a small-scale hydroponics system as an innovative solution to address challenges stemming from climate change and food insecurity in the region.

Universities and NGOs are encouraged to become CTCN members to take part in the implementation of technical assistance programmes such as the community-led Climate Change and Security programme funded by the European Commission.

## Business and industry NGOs

Business and Industry NGOs are a crucial building block for decarbonization and climate resilience, and in recent years, have worked with CTCN to provide platforms and opportunities among private sector organizations. CTCN and business and industry NGOs together have developed new strategic partnerships with leading companies as well as with philanthropic organizations, which has strengthened CTCN's portfolio of low-carbon and cost-competitive technology alternatives.

For example, CTCN's unique position in working with business and industry NGOs as well as with the global network of NDEs provides an ideal mechanism for public-private sector engagement that is required for cement sector decarbonization.

CTCN has been working with the Global Cement and Concrete Association (GCCA) to lead the decarbonization of the cement sector and establish guiding resources for the industry, including the 2050 Net Zero Roadmap. This can have a far-reaching impact as GCCA has an extensive network of cement producers representing 80 per cent of the world cement capacity outside of China.

CTCN and GCCA have already partnered on several projects to decarbonize the cement industry through transparent emissions monitoring and audits, the development of national decarbonization roadmaps, and the promotion of low-carbon cement standards and technologies, such as in a project in the Republic of the Congo (page 18).

## Indigenous peoples' knowledge

The UNFCCC technology provisions state that "technologies must meet needs and priorities of specific local communities", adding on this, the IPCC definition of technology transfer is that it "encompasses the broad set of processes that cover the flows of knowledge, experience and equipment for mitigating and adapting to climate change amongst different stakeholders". In line with these definitions, CTCN technical assistance engages with local communities to ensure that Indigenous people are involved in consultation and decision-making processes, that their needs are addressed and that their knowledge is embedded in climate actions.

The recently launched CTCN–TEC Gender and Climate Technology Expert Roster embraces Indigenous peoples' knowledge by encouraging professionals, grassroots experts and Indigenous individuals with ancestral knowledge to join the roster, thereby, opening new opportunities for exchanging diverse knowledge and practices.





## Chartering new territories: Ten years of gender just climate action

**2013**

Decision 25/CP.19: Modalities and procedures of CTCN and its Advisory Board noting "[…] the need to achieve gender balance in accordance with Decision 36/CP.7 and Decision 23/CP18."

**2017**

UNEP Policy and Strategy for Gender Equality and the Environment 2014-2017 states that its initiatives "will allocate not less than 1 per cent of programme and operations funds to gender mainstreaming actions and, where appropriate, at least 1 per cent of project funds."

CTCN partners with the Women and Gender Constituency on the Gender Just Climate Solutions Award.

**2018**

Publication of CTCN Gender Considerations in a Snapshot.

**2019**

CTCN Advisory Board endorses the first Gender Policy and Action Plan.

**2023**

CTCN Advisory Board endorses the updated Gender Policy.

CTCN and TEC launch the Gender and Climate Technology Expert Roster.

CTCN starts allocating a minimum of 5 per cent of its funds to gender mainstreaming activities, in line with UNEP's Gender Policy.

This programme, which aims to spotlight, bolster and amplify grassroots' climate actions prioritizing gender equality and women's rights, has received over 1,000 applications, with more than 400 of these in the technical category. These applications span diverse regions and themes, ranging from building capacity and providing solar energy training to women in Pacific Island states, to developing alternative protein sources in climate-affected mountains of Guatemala, and implementing stormwater storage and management systems in India. The awards serve as exemplary models of climate-resilient and transformative development, and are complemented by a robust mentoring programme to strengthen the capacity of recipients to further refine and expand their initiatives while fostering knowledge exchange and collaboration within the broader climate action community.


Gender equality and gender mainstreaming are increasingly recognized as mission-critical for the effective implementation of the Paris Agreement.

The endorsement of the CTCN Gender Policy and Action Plan in 2019, and its revision in 2023, provide a framework for fostering a gender-responsive approach across all activities, including technical assistance, capacity-building, network engagement, knowledge sharing and communications.

Since 2017, CTCN has maintained a longstanding partnership with the Women and Gender Constituency, collaborating on the Gender Just Climate Solutions Programme.

In 2023, CTCN and TEC introduced the **Technology Mechanism Gender and Climate Technology Expert Roster**. This free global database lists professionals, grassroots experts, and Indigenous individuals with ancestral knowledge, all recognized as experts in gender equality and climate technology, and available for engaging in research, events and projects.

# Economic Community of West African States: Mainstreaming gender for climate resilient energy systems

While the 15 Economic Community of West African States (ECOWAS) countries have a modest per capita GHG emissions profile, they are highly vulnerable to climate change impacts. Changing rainfall patterns in the ECOWAS countries' largely rain-fed agricultural system, which is the main source of employment, are threatening livelihoods and food supplies.

Women are most impacted by climate change, and – while women have a key role in adaptation to climate change – they are underrepresented in climate change decision making and in clean energy entrepreneurial businesses.

**Countries benefiting from the ECOWAS CTCN technical assistance**

Benin, Burkina Faso, Cote d' Ivoire, the Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

CTCN support to ECOWAS **redefined women's involvement in climate change adaptation policy development and planning, and created the opportunity to enhance women-led clean energy entrepreneurial activities enhancing**:

- Capacity building on gender mainstreaming in energy projects, products and services.
- Gender and climate change knowledge management, awareness and advocacy.
- Gender responsive clean energy investment promotion and business development.

CTCN trained 27 Gender Focal Unit (GFU) representatives who attended the training-of-trainer sessions for selected replicator organizations. These sessions served as a stepping stone toward developing national capacities at both the GFU levels and at the civil society training-of-trainers level. Additional training support was subsequently received from other donors, including Spain and USAID.

The training was complemented by a gender-responsive clean energy investment call for proposals, targeting businesses seeking investment of up to USD 50 million, which received over 50 submissions.

Following the business coaching provided by the Private Finance and Advisory Network (PFAN), hosted by UNIDO, 13 projects were developed, and four women entrepreneurs pitched their proposals directly to investors at the 2018 PFAN Global Climate and Clean Energy Investment Forum. Two women entrepreneur projects received subsequent funding for:

- A biogas project in **Sierra Leone** received a USD 155,000 grant towards developing a total of 7 MWe (megawatts of electric capacity) of Waste to Energy 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 impact of the three units is expected to be GHG reductions of 450 tonnes $CO_2$eq/year, with GHG reductions of 45,000 tonnes/year $CO_2$eq being expected when all 7MWe of biogas units are installed.

  The Sierra Leone Waste to Energy plant project led to support from the PFAN advisor, and a USD 26 million loan is under active due diligence consideration. A containerized pilot project funded by the German government is working successfully at a Freetown hospital. This pilot project uses organic food waste, and sells heat and power to the hospital and also sells the organic fertilizer WTE residue. Systems that use the heat to produce cooling for cool stores is under development.
- In **Nigeria**, a 2 MWe lease-to-own solar powered business was aimed at 1,000 SMEs to replace fuel generators and received USD 100,000, of which 50 per cent was grant and 50 per cent debt funding from non-project sources. The full GHG mitigation impact of the targeted two MWp solar units is expected to be GHG reductions of 4,000 tonnes $CO_2$eq/year, with 150 SMEs using solar power provided by the relevant company.





# Uganda: Defining the vulnerability index and national indicators for measuring resilience

Climate change continues to threaten Uganda's development and economic growth aspirations with severe negative impact across all sectors. This includes climate-induced yield losses for key export earnings, such as coffee, cotton and tea, in the agriculture sector; disruptions in the energy, mineral development and infrastructure (buildings and transport) sectors; and impacts on the population's health and quality of life.

CTCN in collaboration with UNEP-CCC assisted the Government of Uganda to design a national climate vulnerability index and national level indicators to monitor climate action under NDC implementation.

This enhances enables practitioners and decision-makers to identify the most vulnerable areas, sectors and social groups, and develop targeted interventions to mitigate risks.

To operationalize the national vulnerability assessment, an interactive risk management map was designed to track adaptation efforts and resilience to four types of hazards in selected sectors. The prototype of the digital map was successfully tested in 2022, and a follow-up project was implemented in 2023 to verify the proposed national vulnerability indicators initially developed.

# Saint Lucia and Antigua and Barbuda: Improving resilience to climate change impact for school buildings and infrastructure

Studies suggest[14] that each year 175 million children worldwide are likely to be affected by natural hazards and disasters. This is particularly true for children in the Caribbean, where countries are exposed to a variety of natural hazards, magnified by the effects of climate change, including more frequent and severe extreme weather events, hurricanes, floods, landslides, droughts and fires.

In response to these climate-related risks and the importance of education to the future of children and youth, the Governments of Saint Lucia and Antigua and Barbuda asked for CTCN technical support for:

- Undertaking a rapid climate-change vulnerability assessment of 12 school buildings in Saint Lucia and 16 in Antigua and Barbuda.
- Designing school resilience improvement packages, with options for upgrading, retrofitting or replacing school buildings.
- Assessing of potential environmental and social-risk impacts of the interventions being considered.
- Designing options for improvement of critical infrastructure within the education system.
- Identifying ways to replicate the solutions and approaches throughout the region.

CTCN assessments and innovative solutions to strengthen school building resilience has benefitted staff, students and the overall ability of education systems to provide continuous education, which fulfils children's right to education.

14 Atle Dyregrov et all (2018). Online https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6095022/

# Next-generation change-makers

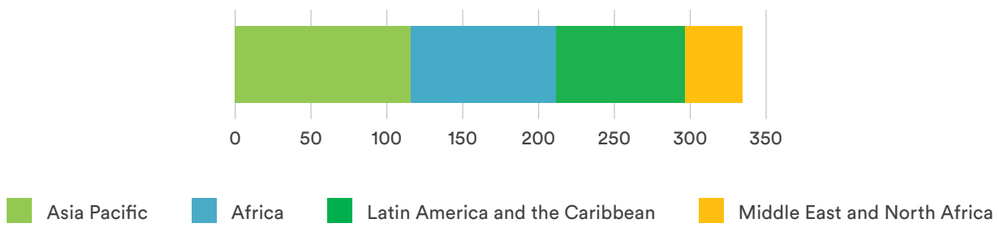
From its beginning, CTCN has actively involved youth in its technology and innovation initiatives, aiming to provide knowledge, technology services and a platform for networking and mutual learning. This effort includes providing technical support that benefits youth in developing countries and crafting specialized training programmes such as the Youth Climate Innovation Lab and Academy.

CTCN has strengthened ties with UNFCCC youth constituency YOUNGO, fostering collaboration through knowledge exchange opportunities and showcasing youth innovators' work. Through these endeavours, CTCN promotes youth engagement in climate action and intergenerational cooperation for transformative climate technology solutions.

## The Youth Climate Innovation Programme

**The Youth Climate Innovation Labs** is a fast-paced three-day online innovation event with over 330 participants from 72 different countries. During this event, teams ideated climate technology solutions through the application of design thinking methods. In the process, the teams were supported by over 100 climate technology experts from private sector companies (including Roland Berger and Deloitte) and start-ups (including Cowtech and Nadeera), academia (including the University of Michigan and Nigeria Maritime University Okerenkoko), NGOs (including Geek Girls LaTam and Jeunes Volontaires pour l'Environnement), international organizations (including UNIDO and the UN One Planet Network) and financial institutions (including the African Development Bank and Asian Development Bank). The Youth Climate Innovation Labs concluded with a pitch of each team in front of an international jury of experts which selected the best climate technology ideas.


**Figure 5** Number of participants in the Climate Innovation Lab, by region








Between 2020 and 2022, CTCN delivered the first edition of the Youth Climate Innovation (YCI) Labs and Academies in four regions: Africa, Asia Pacific, Latin America and the Caribbean, and the Middle East and North Africa to provide young people with training and tools for developing solutions to climate change challenges.

### Youth Climate Innovation Programme in **Africa**: Agronovate

A team of young innovators from South Africa and Nigeria created **Agronovate**. The start-up designed and built a smart solar-powered storage space for fruits and vegetables that was able to provide refrigeration for a period of 16 hours with little power consumption.

This solution tackles the cold chain problems in the agricultural sector experienced by many farmers in the Africa. Farmers in Nigeria lose 52 per cent of their harvest annually before it gets to market, leading to food insecurity ad rising food prices, as well as low income for farmers.

To date, Agronovate has developed a prototype and successfully tested it with farming cooperatives in Nigeria.

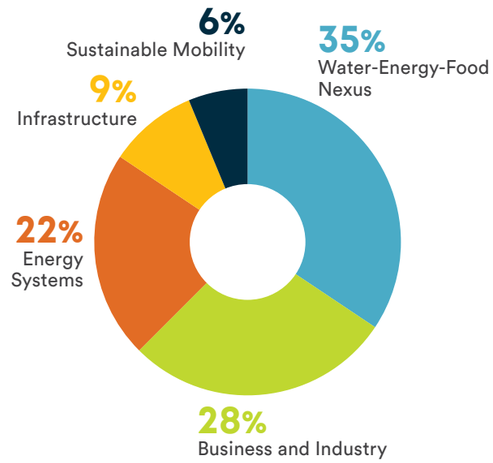
### Youth Climate Innovation Programme in **Asia-Pacific**: Nirwallna

Team Nirwallna worked on a digital system to facilitate the design and planning of green walls, which are viable solutions to urban heat islands but tend to be very expensive and are, at times, ineffective. Nirwallna's developed the concept for a sensor-based analysis tool that is intended to provide performance evaluations to optimize green wall planning. After the YCI programme, the project received a follow-on grant from a private-sector innovation competition to further develop the analysis tool.

### Youth Climate Innovation Programme in the **Middle East and North Africa**: Bio Treasure

The Yemen-based team of **Bio Treasure** developed a small-scale waste to energy system that converts bio waste efficiently into a clean and sustainable source of energy. As a side product, it produces high-quality organic fertilizers. With this mobile and easy-to-install biogas system, the team overcame the challenge of economic viability of other small-scale waste to energy systems. Currently, Bio Treasure has raised USD 50,000 and is serving a growing user community.

**Figure 6** Distribution of Youth Climate Innovation Academy teams, by sector




A recent survey among YCI Academy participants showed that 20 teams are still in operation, and several of them have successfully raised funds (through investors or grants) and have grown their companies and consumer base.

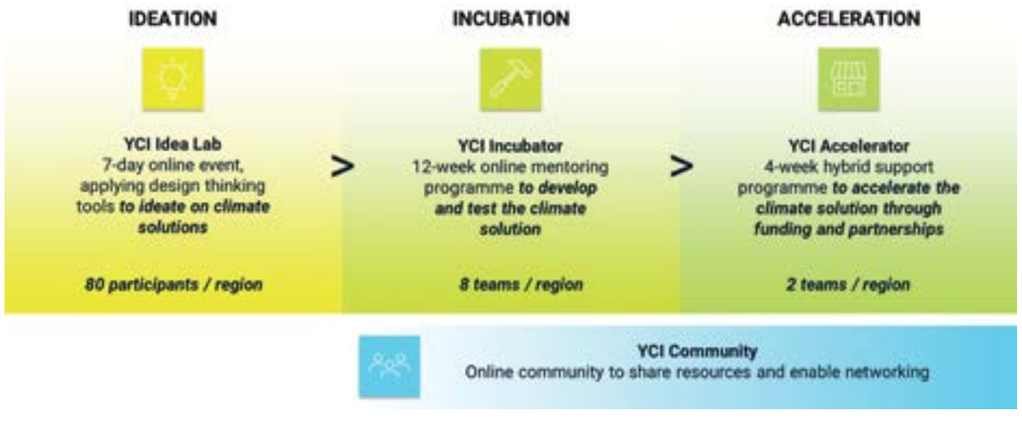
> The Youth Climate Innovation Academy helped us to work with other young innovators and entrepreneurs to validate our climate solution. The programme exposed us to key entrepreneurial principles that have helped us build a climate venture that's now solving energy access problems for SMEs and households in off-grid areas in Nigeria, and we are looking to scale to make a bigger impact.
>
> One of the most important lessons I have learned is how innovation and entrepreneurship can play a key role in addressing climate change. My team and I continue to witness positive changes in people's lives in the places we serve.
>
> ***Nonso Asuoha***
> ***Co-founder and CEO, Afrinet PowerTech Ltd, participant in the first edition of the YCI Programme, Africa***

In 2024, building on the success and lessons learned in the first edition, the CTCN will launch a second edition of the YCI Programme, supporting ideation, incubation and acceleration of teams and their ideas.

The second edition will feature:

- Improved selection process for the YCI Idea Lab for more inclusiveness and effectiveness.
- Extended YCI Incubator with different tracks based on the development stage, region and sectoral focus.
- New YCI Accelerator support programme to help high-potential teams to fundraise and establish partnerships.
- More engaged YCI Community to create and circulate ideas and resources.

**Figure 7 CTCN Youth Climate Innovation Programme 2024–2025**








## Timor-Leste: Harnessing youth engagement with solar energy

With a vision to harness the potential of solar energy, Timor-Leste sought the expertise of CTCN to develop an educational programme to boost local young people's capacity and knowledge in installing and maintaining solar PV systems, and ultimately, bring reliable and renewable energy technologies and electricity to a hundred thousand people in remote villages and municipalities.

In a five-day training-of-trainers course, CTCN engaged with about 20 young people to build their knowledge and capacities in installing and maintaining solar PVs. The trainers – energy specialists from training centres, utility companies and students – in turn became a source of knowledge and know-how for their communities and villages, creating a far-reaching spread in business and livelihoods.

> By equipping us [the younger generation] with the knowledge and expertise in solar energy technology, we know we can actively participate in the country's energy transition and play a crucial role in shaping a more prosperous and environmentally-friendly nation.
>
> ***Aurora de Fatima Lelo***
> ***Solar-PV training participant***

# SYNERGIZING EFFORTS: MOBILIZING RESOURCES AND STRATEGIC PARTNERSHIPS

Donor countries, international organizations, development banks and the private sector have been investing in the CTCN business model and operations to fund system-transformative climate action in developing countries. CTCN has been increasing the impact of these investments by attracting further resources and partnerships that enable the scaling up of innovative climate solutions by moving from the ideation of solutions to piloting their implementation at national and regional levels.

## The CTCN Partnership and Liaison Office

In 2022, CTCN with the support of the Republic of Korea, launched the Partnership and Liaison Office (PALO) in Songdo, Incheon. PALO quickly established itself as a major asset for CTCN and its global community, catalysing and amplifying knowledge and capacity building, as well as mobilizing vital partnerships. Key roles and activities include:

- Designing and implementing global capacity-building programmes for NDEs.
- Serving as a Centre of Excellence on RD&D on climate technologies, and liaising with universities, research institutes, private sector organizations, and key RD&D stakeholders.
- Promoting a North-South, South-South and triangular collaboration on climate technology RD&D by actively fostering regional partnerships, including with regional donors, the Asian Development Bank, and regional Network members and consortium partners.

**Climate change and security**
**Innovative community-based climate technologies strengthen communities at risk of conflict**

**Pro-bono contributions**
**Bridging gaps and creating opportunities for mutual growth**

**Serbia**
**From pro-bono to research, development and demonstration**

**Mongolia**
**Feasibility study of combined heat and power supply using green hydrogen**

**Mongolia**
**Designing sustainable business models for climate-resilient farming**

# Climate change and security: Innovative community-based climate technologies strengthen communities at risks of conflict

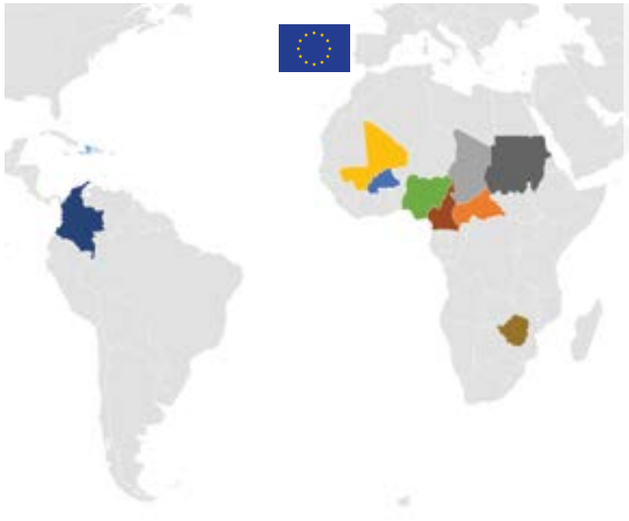
According to UNEP, by 2050, over 143 million people in sub-Saharan Africa, South Asia and Latin America will have become internal migrants. A major cause of that will be various climatic impacts, with people leaving less viable areas with high water scarcity and low crop productivity, as well as areas affected by rising sea levels and storm surges.

Women, youth and marginalized groups – representing 80 per cent of those displaced by climate change – face increased vulnerability from environmental stresses that lead to intensified competition for scarce natural resources, and potentially lead to instability and conflict.

In 2022, the European Union entrusted CTCN with the €3 million programme *Climate Technology for Communities at Risk of Climate-Induced Conflicts*. This programme is part of the Neighbourhood, Development and International Cooperation Instrument – Global Europe, Thematic Programme on Peace, Stability and Conflict Prevention 2021–2027, and the aim is to develop innovative conflict-sensitive, field-focused, cost-effective climate technology solutions.

Working with NDEs, CTCN identified 10 conflict-prone countries that are ready to integrate peacebuilding with climate resilience and adaptation, and leverage community-based endogenous know-how with innovation technology.

**Climate Change and Security: Innovative Community-based Climate Technology for Communities at Risks of Conflicts Due to Climate Impact**



**Burkina Faso:** Reinforcement of the implementation of actions to mitigate and adapt to climate change by developing solar energy systems for off-grid agro-industrial facilities through the establishment of a Community Solar Platform.

**Central African Republic:** Production of affordable solar cookers for the commune of Bangui which is at risk of deforestation.

**Chad:** Rehabilitation of wells in the commune of Liwa using solar-powered pumps

**Mali:** Piloting the sustainable management of wood resources through the promotion of solar cookers and solar energy for the operation of electric cookers in a context of climate change.

**Haiti:** Organic waste management project using inflatable tanks and targeting women and young people

**Nigeria:** Piloting a small-scale hydroponics system in Kaduna State.

**Colombia:** Strategies for the conservation and restoration of mangrove areas of the Cuerval Community Council,

**Cameroon:** Local climate resilience through synecoculture, a high-yield agricultural technique.

**Sudan:** Improving the country's capacity to effectively implement and sustain water harvesting technologies, through technology transfer, capacity building, and research collaboration.

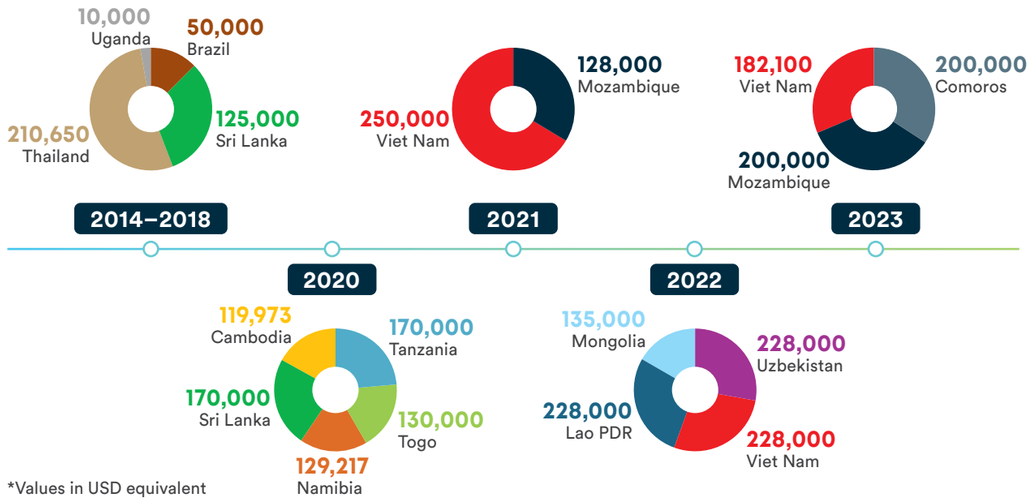
**Zimbabwe:** Development of Renewable Energy Solutions for Sustainable Forestry Conservation

From solar power in Burkina Faso to organic waste management in Haiti, innovative community-based climate technologies are strengthening communities at risks of conflicts





# Pro-bono contributions: Bridging gaps and creating opportunities for mutual growth




*Values in USD equivalent

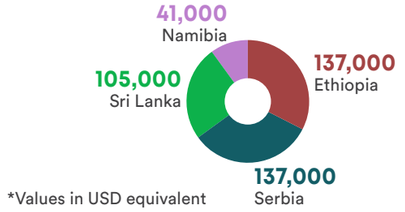
Since 2017, several countries, including the Republic of Korea, Japan, Germany, Belgium and the United States, have provided pro-bono support to CTCN. In particular, the Republic of Korea has taken an active role in planning and implementing pro-bono technical assistance projects, chartering a new path in the way donor countries and the private sector can support CTCN pilots and scale up system transformative climate technologies in developing countries. This has jump started a virtuous circle of attracting further technology, funding and financial opportunities.

Pro-bono support has played a significant role in enabling CTCN network members to enhance their voluntary efforts in the development and transfer of technology, and developing countries have benefited from the extended support and access to climate technologies.

Pro-bono support is now regarded as a strategic investment by donor countries and network members. It helps to

- Bridge the scalability gap, building on the outcomes and impact of CTCN initial /pilot technical assistance, as in the pro-bono assistance from the Republic of Korea to Serbia; and
- Test new technologies, as in the case of Japan and its assistance in Mongolia.

**Republic of Korea pro-bono contributions 2018-2019**




*Values in USD equivalent

> CTCN provides an innovative platform to match technology demand and technology suppliers for climate action. Based on the list of technical assistance (TA) requests submitted to the CTCN resources, Korea NDE attempted to contribute to the work of the CTCN by undertaking pro-bono TA activities with its own financial resources and climate technologies.
>
> ***Yoonji Hwang***
>
> ***Deputy Director, Climate Change R&D Team, Ministry of Science and ICT, NDE of the Republic of Korea***

# Serbia: From pro-bono to research, development and demonstration

**2016**

CTCN responds to a request for technical assistance from Serbia for the modernization of the district heating system and improvements in the energy efficiency of buildings in Belgrade.

**2019**

CTCN delivers a proposal for Incorporating Innovative Renewable and Waste Heat Technologies in Belgrade's District Heating System, including, with support from pro-bono services from the Republic of Korea, a plan for leveraging the internet of things ( IoT) to transform the system to be energy efficient and low-carbon.

**2021-2023**

The Republic of Korea, building on the initial technical assistance in Serbia, delivers a smart monitoring system for district heating and designs a plan to connect with new renewable energy.

**2023**

A district heating smart monitoring system, based on IoT, is introduced and demonstrated, with the support of the Republic of Korea.

Following CTCN technical assistance with pro-bono support from the Republic of Korea in Belgrade, a district heating smart monitoring system was introduced and demonstrated in April 2023.

## What we did

Collaboration between CTCN and Republic of Korea pro-bono technical assistance led to developing a district heating monitoring system that is a cloud based. The Home Energy Management System, based on the Internet of Things (IoT), can provide real-time energy usage and analysis through web interfaces and applications. It collects energy consumption data, IoT sensor information and environmental data utilizing machine-learning-based AI technology to detect abnormalities.

## Impact

This new system led to a monthly reduction of approximately 9 per cent in winter heating energy consumption of households, resulting in an annual reduction of around 1 per cent in carbon dioxide emissions.

If implemented nationwide, the new technology solution could potentially reduce Serbia's annual carbon dioxide emissions by about 420,000 tonnes.





# Mongolia: Feasibility study of combined heat and power supply using green hydrogen

**2019**

Mongolia develops its first Nationally Determined Commitments (NDCs).

**2022**

The Ministry of Environment and Tourism requests technical assistance for a feasibility study of a combined heat and power supply using green hydrogen.

**2022**

The Ministry of Environment of Japan, the country's NDE, and CTCN prepare and endorse the Response Plan for the feasibility study, to be conducted with pro bono support from the Government of Japan.

**2024**

The feasibility study of a combined heat and power supply using green hydrogen is completed.

Although Mongolia is characterized by abundant renewable solar and wind energy resources, more than 70 per cent of the electricity is still provided by coal-fired power generation, and more than 90 per cent of heating is provided by coal combustion. This results in high GHG emissions, with Mongolia's per capita GHG emissions totalling in 2018 6.67 t-C02/year, higher than the global average of 4.42 t-C02/year. This also results in increasedhealth risks associated with high levels of air pollution. In 2023, annual average of PM2.5 concentration in Mongolia was 4.5 times above the World Health Organization (WHO) annual air quality guideline values, with daily averages in the capital Ulaanbaatar reaching in the coldest days of the year over 25 times the level WHO considers as safe.

## What we did

Working with Mongolian national stakeholders and CTCN, the Japan Overseas Environmental Cooperation Center (OECC), with the pro bono support from the Government of Japan, conducted a feasibility assessment to understand the basic technical requirements for realizing green hydrogen projects using existing renewable energy sources for production, storage and transportation of green hydrogen to be used for heat and power supply.

This feasibility study indicates that green hydrogen can be a viable mitigation option for Mongolia, paving the way for the introduction of an alternative energy system that:

- is domestically produced,
- does not emit $CO_2$ and air pollutants,
- improves power grid stability, and
- provides additional power/heat source options for off-grid sites and in cities.

## Impact

After testing new technology solutions, Japanese-made polymer-electrolyte-membrane (PEM) electrolysers and hydrogen energy supply systems are being installed as an alternative to coal-fired energy sources, contributing to reducing GHG and air pollution in Mongolia.

# Mongolia: Designing sustainable business models for climate-resilient livestock farming

**2021**

Mongolia requests CTCN technical assistance, through the UNEP/CTCN AFCIA programme, to design solutions and sustainable business models for climate-resilient livestock farming.

**2022**

Findings from CTCN technical assistance, supports the development of a Concept Paper for Enhancing Community Climate Options for Adaptation and Resilience (ECCO-FARM) in Mongolia, submitted to Global Affairs Canada (GAC) to help secure climate finance.

**2023**

The GAC–ECCO-FARM full proposal is submitted with complete CTCN technical assistance results as background information.

CTCN delivers a feasibility study and business model for climate-resilient farming.

**2024**

The ECCO-FARM proposal is signed by GAC Deputy Minister, securing approximately USD 7.5 million for further climate action response to build resiliency of livestock farming.

To respond to the downward spiral of ecosystem degradation and increasing livestock headcounts, which threaten the livelihoods of nomadic livestock herders and food security, the Government of Mongolia asks CTCN for technical assistance.

## What we did

The Government of Mongolia and CTCN worked with national and local communities to identify:

- Mitigation solutions, including grassland management, soil carbon and carbon stock measurement, monitoring and verification, and improvement of agri-food processes.
- Adaptation solutions, such as terrestrial ecosystem management and biodiversity management systems to increase crop resilience and productivity, and livestock management.

The technical assistance also supported a feasibility assessment for a meat processing plant, including the financial, economic and legal guidance for sustainable production to support herding businesses and communities, and small- and medium-sized farms.

The solutions were successfully piloted in the Bayantümen Soum herding community, paving the way to possible scale up among other Mongolian herding communities.

A comprehensive gender assessment was conducted to leverage women's roles in mitigating and adapting to climate risks, protecting natural resources, and safeguarding livelihoods. The assessment included the potential impact on women's employment and income, and resilience to climate disasters.

## Impact

A total of 113,000 $tCO_2e$ are expected to be reduced annually in the Bayantümen Soum if the identified measures are taken. These measures include restructuring cattle herds and sheep flocks, and preventing further increases in the populations of other livestock types. This can increase the resilience of a total of 11,017 people, including 2,840 residents of Bayantümen Soum, and benefit the almost 300 trained members of the community and local institutions. In addition, If the meat processing plant is built, it will benefit 4,000 consumers.





> Climate action and sustainable development do not happen in vacuum. It is a continuum, where small changes trigger system changes and pilot investments trigger larger-scale investments. With the right and timely financial support, the impact of innovation can expand from communities to regions, delivering exponential return on investments.
>
> Global Affairs Canada is glad to pick up the baton from CTCN and its network partner and build on the pilot work in Bayantümen Soum to strengthen the resilience of herding communities through the Enhancing Community Climate Options for Adaptation and Resilience in Mongolia (ECCO-FARM) project."
>
> *Global Affairs Canada (GAC)*

# LEVERAGING FINANCE FOR SCALING UP INNOVATIVE CLIMATE SOLUTIONS: MOVING FROM IDEATION TO PILOTING

> Climate technology is crucial for accelerating the design and implementation of solutions for climate adaptation and enhancing resilience. For the past 10 years, CTCN has been empowering communities with technology and capacity fit for purpose and ability to ignite system transformations.
>
> ***Kazem Kashefi***
> ***UNFCCC Adaptation Committee member, Iran***

Climate finance is a key enabler for addressing climate change, promoting sustainable development and building resilience to the impacts of a changing climate. According to the latest assessment report by the Intergovernmental Panel on Climate Change (IPCC), **if we are to limit global warming to 2°C or below. current financial flows for climate change mitigation need to increase between three and six times to meet average annual needs between 2020 and 2030** (IPCC AR6 WGIII Chapter 15).

Following recent UNFCCC and Paris Agreement decisions and the guidance of Parties, CTCN has proactively sought to enhance cooperation with the Financial Mechanism, including with the Adaptation Fund, the Green Climate Fund (GCF), and the Global Environment Facility. This cooperation will boost the return on the initial investments made by CTCN, and help replicate and scale up successful pilots and demonstrated technology.

**Climate finance is especially important to amplify the impact of the work implemented by CTCN and to establish the enabling environments needed for climate technology uptake.**

Larger funding is required to:

- Scale up the identified and piloted technologies and resilient infrastructures.
- Enforce regulations and standards for environmentally sound technologies.
- Ensure continued knowledge transfer and skills development on climate adaptation and mitigation technologies.

CTCN supports countries in accessing funding through various financing mechanisms, including:

- Preparation and/or successful implementation of 30 GCF readiness projects that total USD 10.7 million.
- Two GEF projects that total about USD 2.5 million.
- Establishment of a strong relationship with the Adaptation Fund Climate Innovation Accelerator (AFCIA).

As part of the delivery of technical assistance and a best practice, CTCN develops concept notes for the scale-up of funding for submission, for example, to GCF or the Adaptation Fund.

**Adaptation Fund Climate Innovation Accelerator**

**Green Climate Fund**

**Southern Africa Community**
**Leapfrogging to energy efficient mechanisms**

**Paraguay**
**Pathways for, technology needs assessment, action plan and systems transformation**

**Tonga**
**Master plan for energy efficiency**

**The Global Environment Facility**

**Sri Lanka**
**Designing and building climate smart cities**

**Lao People's Democratic Republic**
**Building on the City Climate Vulnerability Assessment**

**Solomon Islands**
**Feasibility study for low emission land transport secures electric buses**

**Bosnia and Herzegovina**
**Sustainable green district heating system in Banja Luka**



# Adaptation Fund Climate Innovation Accelerator

The CTCCN is working with the Adaptation Fund to scale up innovative technologies for adaptation as well as take up new opportunities for engaging with the Fund's readiness grant funding and support for Direct Access Entities (DAEs).

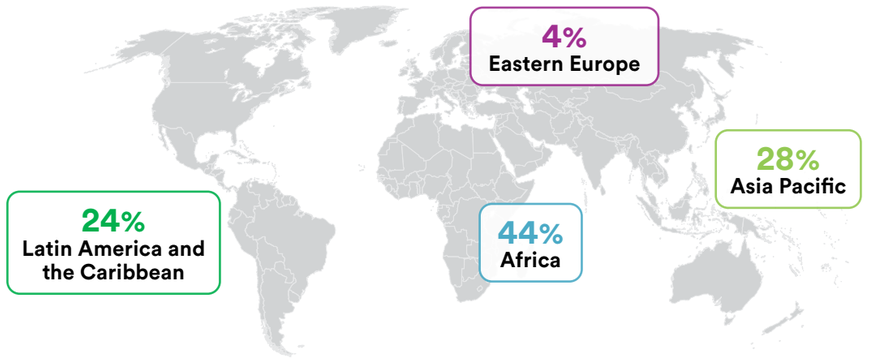
Since 2020, CTCN has been implementing projects under the Adaptation Fund Climate Innovation Accelerator (AFCIA) to foster innovation in adaptation in developing countries.

The first edition of the AFCIA had a USD 10 million small-grant aggregator programme implemented by the United Nations Development Programme (UNDP) and UNEP in conjunction with CTCN. It targeted a broad range of potential recipients, including governments, NGOs, community groups, entrepreneurs and young innovators to encourage and accelerate innovations, and new adaptation practices, tools and technologies. In addition, AFCIA and CTCN worked to generate evidence of effective, efficient adaptation practices, products and technologies and assess potential scaling up of successful prototypes.

Under the AFCIA programme, CTCN implemented 25 projects and developed 2 concept notes for scaling up successful initiatives.

- Fifteen adaptation technology innovations, including a flood early warning system in Mali; a radio internet system in Nigeria; the use of mobile phone technologies as a solution to comprehensively collect and digitize water, weather and climate observations in Malawi; an early warning system for forest fires in Georgia; and a blueprint for action for the uptake of rainwater harvesting system in Pakistan.
- Ten Technical Assistances to enable environments for technology innovations, such as early warning systems, solar-powered irrigation systems, blockchain and flood barriers, to a broad range of audiences and stakeholders from governmental entities, to youth and gender associations, vulnerable people, academia, centres of research and NGOs.

### AFCIA Geographical distribution




### Status of AFCIA programme in April 2024

**16%** Under bidding process

**60%** Under implementation

**24%** Closed

# Green Climate Fund

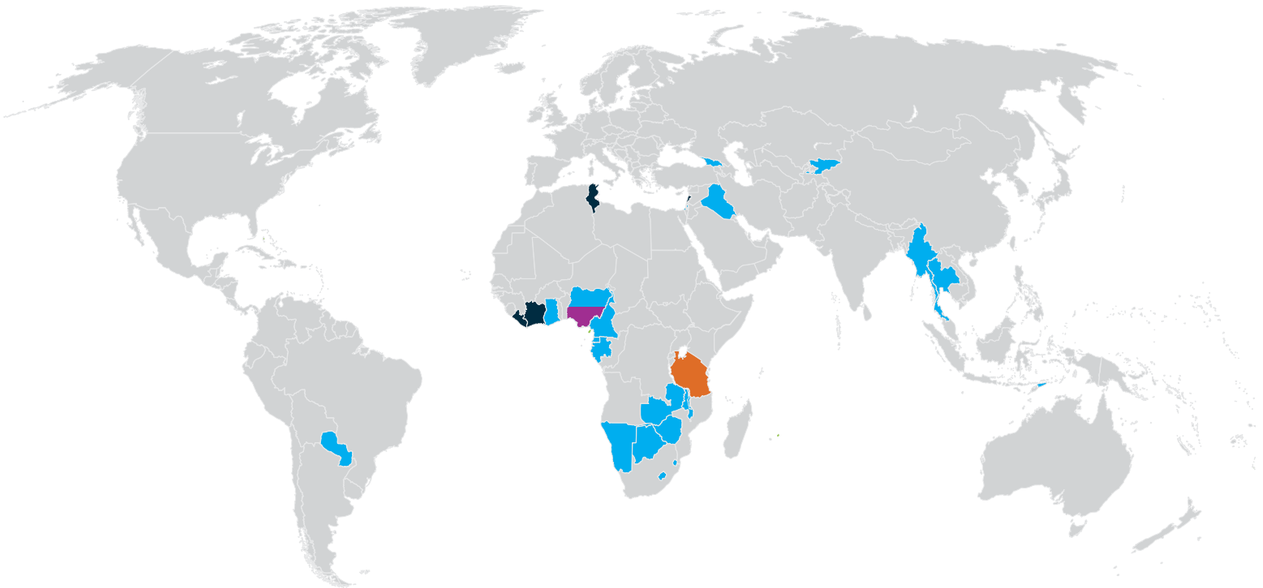
CTCN has been strengthening linkages with the Green Climate Fund (GCF) and is to date the largest provider of the GCF readiness programme services to developing countries, with over 30 countries supported. In addition, CTCN envisages stronger cooperation in supporting parties to access the GCF Project Preparation Facility.

In 2023, to strengthen national coherence in climate action, GCF and CTCN opened a platform for the discussion between their respective focal points to increase Parties' national coherence on climate technology, capacity building and action plans.

This collaboration increased coordination with the Technology Executive Committee (TEC) through the new joint work programme. CTCN is poised to play an even stronger role in supporting climate ambition, and the successful implementation of nationally determined contributions (NCDs) and goals of the Paris Agreement.

For a full list of GCF-CTCN projects scan the QR code

### Status of GCF-CTCN projects



**Completed**
Bahamas, Botswana, Cameroon, Democratic, Equatorial Guinea, Eswatini, Gabon, Georgia, Ghana, Iraq, Kyrgyz Republic, Lesotho, Malawi, Mauritius, Myanmar, Namibia , Nigeria, Palestine, Paraguay, Thailand, Timor-Leste, Tonga, Zambia, Zimbabwe

**Under Implementation**
Côte d'Ivoire, Lebanon, Liberia, Tunisia

**Under Approval**
Nigeria

**Cancelled**
Tanzania

GCF Grant amount by regions (USD approved)
Grand Total: **10,725,957**






# Southern African Development Community: Leapfrogging to energy efficient mechanisms

**2017–2018**
CTCN multi-country technical assistance for the development of energy efficiency country profiles for the Southern African Development Community (SADC) to identify appliances/ equipment with a high energy efficiency potential.

**2019–2020**
Preparation of GCF Readiness proposals for energy efficient refrigerators and distribution transformers.

**2021–2022**
Implementation of GCF Readiness projects in 8 SADC countries.

**2023–2027**
Operationalization of the developed National Policy Roadmaps.

**2024**
Adoption of the regional SADC standard for energy efficient refrigerators.

Southern African Development Community (SADC) countries benefiting from the CTCN technical assistance: Botswana, Eswatini, Lesotho, Malawi, Namibia, Zambia and Zimbabwe.

Electricity infrastructure is expanding, and households are increasingly using electric appliances, placing the reliability of energy supply high on agendas of countries in the Southern African Development Community (SADC).

Low efficiency electrical appliances and equipment result in huge losses, impacting national budgets and hampering a country's electrification potential. The lack of information, awareness and dedicated policies for energy efficient products and appliances, including the lack of minimum energy performance standards (MEPS), prevents countries from moving toward a sustainable market transformation with higher efficiency products.

## What we did

A preparatory regional assessment was conducted from 2018–2019 that identified domestic refrigerators and distribution transformers as appliances and equipment with a high energy consumption reduction potential. For this, CTCN supported seven GCF readiness projects worth USD 2.4 million in the SADC region (Botswana, Eswatini, Lesotho, Malawi, Namibia, Zambia and Zimbabwe) to develop national frameworks for leapfrogging to energy efficient refrigerators and distribution transformers through regulatory and financing mechanisms.

The GCF support in readiness projects for seven countries was implemented simultaneously at the national level with strong regional coordination.

CTCN, through its network members, developed MEPS and labelling schemes, as well as financing mechanisms, to facilitate the transition to energy efficiency, aiming to reduce the strain on electricity grids, increase disposable income for households by reducing electricity bills, and potentially reduce GHG emissions.

## Impact

**The readiness projects resulted in actionable national policy roadmaps with the foundation to successfully transition to energy efficient refrigerators and distribution transformers, ultimately leading to a significant reduction of electricity consumption and thus, of GHG emissions.**

Since the completion of the projects, several countries progressed to the implementation of their roadmaps and the adoption of MEPS. To date, Botswana, Eswatini and Zimbabwe have adopted the MEPS for refrigerators and distribution transformers.

> The technical assistance has put a lot of effort on stakeholder coordination and capacity building, which created consensus and confidence amongst key stakeholders to adopt Minimum Energy Performance Standards. The National Policy Roadmaps now act as guiding documents to build a conducive environment for households and utilities to adopt energy efficient refrigerators and distribution transformers.
>
> ***Simasiku Titus Mukwaso***
> ***Principal Energy Engineer at the Botswana Ministry of Minerals and Energy***

Up to **2040**, Expected amount of emissions avoided: **10,962,000** $tCO_2e$

Delivery of the "Total Cost of Ownership" Workshop to the Botswana Power Corporation (BPC) – Gaborone, Botswana, 2022.





# Paraguay: Pathways for technology needs assessment, action plan and system transformation

**2011**
Climate Change Policy is in place.

**2016**
Paraguay National Adaptation Plan developed.

**2017**
National Mitigation Plan established.

**2020**
Third biennial annual report published.

**2021**
Updates for second NDC.

**2022**
Paraguay requests technical support from CTCN to develop its Technology Needs Assessment and Technology Action Plan to guide implementation.

**2023**
Technology Needs Assessment, Technology Action Plan and concept notes to leverage finance are published.

Paraguay lacked specialized knowledge and skills for innovating and implementing climate technologies. The country was also hindered by inadequate infrastructure services for appropriate technologies, a lack of research and development of green technologies, and inadequate incentives and enabling environments for technology transfer.

## What we did

To align with national priorities established in their NDC, Paraguay requested CTCN technical assistance to conduct a technology needs assessment and deliver a technology action plan to guide implementation. This contributed to strengthening the private sector capacity and enabled the country's participation in climate technology adoption. In addition, two GCF concept notes were developed for leveraging finance for climate technology deployment.

## Impact

One of the GCF concept notes addressed an integrated water management system, worth USD 4 million, that has the potential to:

- Reverse ecosystem degradation in prioritized river-basins and strengthen resilience of the ecosystems to climate change, through anticipatory actions for droughts, floods and other climate risks.
- Strengthen local livelihoods with more equally distributed water resources to provide steady income to the local communities.
- Increase access to safe drinking water in both urban and rural areas, with about 4,987,500 people (almost 75 per cent of the population) benefiting from the integrated water resource management programme.

# Tonga: Master plan for energy efficiency

**2015**
Tonga requests CTCN technical assistance.

**2017**
Tonga is awarded a GCF Readiness Grant.

**2018**
CTCN delivers the draft of the Tonga Energy Efficiency Master Plan (TEEMP) 2020–2030.

**2019**
Tonga requests CTCN Fast Technical Assistance of USD 15,000 to finalize TEEMP 2020–2030.

**2020**
Tonga launches TEEMP: 2020–2030, along with the National Certificate on Sustainable Energy (NCSE) Level 1 and Level 2, and the Second Nationally Determined Contributions (NDC).

As most Small Island Developing States (SIDS) in the Pacific, Tonga is almost entirely dependent on imported fossil fuel for its energy needs. Any increase in the cost of oil or fuel supply disruption severely impacts Tonga's economy and development, and the livelihoods of its communities.

## What we did

Tonga's government reached out to CTCN for the development of the Tonga Energy Efficiency Master Plan (TEEMP) 2020–2030. TEEMP has achievable energy efficiency and greenhouse gas targets that ensure the transition to an energy efficient future for Tonga, including reducing energy use in the transport and building sectors by more than 50 per cent by 2030.

The development of TEEMP, made possible through a GCF Readiness Grant, was led by the Tonga Department of Energy, MEIDECC[15] and was further revised following public consultations, through follow-up CTCN fast technical assistance in 2020, with the support of Ministry of Environment, Japan.

## Impact

Support provided by CTCN enabled Tonga to access a solid analysis of technology options to reduce energy intensity in key sectors, setting feasible but ambitious policy guidance and plans to reduce its imports of fossil fuels. This made energy more accessible and affordable for its population, and set an example for other SIDS in the Pacific.

In December 2020, the TEEMP was adopted and launched by the Government of Tonga, and is now guiding implementation of energy efficient investments in key sectors, such as transport and construction.

The implementation of the Tonga Energy Efficiency Master Plan (TEEMP) is expected to lead to GHG emission reductions of about 100,000 $tCO_2e$ by 2030, almost 50 per cent of the baseline GHG in 2020, along with increased access to more affordable energy and less dependency on fossil fuel imports.

> TEEMP [the Tonga Energy Efficiency Master Plan] is another chapter in Tonga's sustainable energy journey. Its implementation will bring greater benefits to the people of Tonga in reducing the high cost of fuel, making electricity affordable and complementing our efforts on mitigating climate change.
>
> ***Hon. Poasi Tei***
> ***Minister for Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications, signing ceremony and launch of TEEMP, 4 December 2020.***

15 Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications.





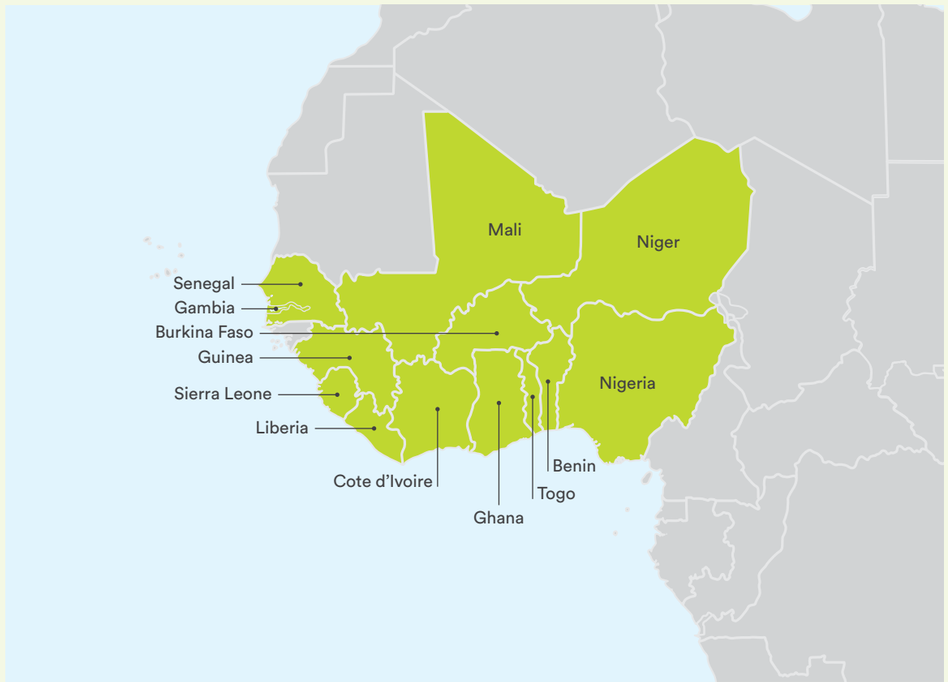
# The Global Environment Facility

CTCN engages with the Global Environment Facility (GEF) and its regional centres in supporting developing countries on technology-related needs and activities for enhanced climate action. CTCN is also exploring more opportunities for accessing the GEF 8 funding cycle.

As part of the GEF Challenge Program for Adaptation Innovation, CTCN is currently executing the project Piloting Innovative Financing for Climate Adaptation Technologies in Medium-sized Cities in Antigua and Barbuda, Mozambique and Lao PDR. This project supports selected cities in adopting a systematic approach to prioritizing infrastructure needs, identifying key investment projects, matching with private financiers, and leveraging the CTCN network for climate change technology data.

Piloting innovative financing for climate adaptation technologies in medium-sized cities | GEF (thegef.org)

Another GEF and CTCN project was Mainstreaming Gender for a Climate Resilient Energy System for the Economic Community of West African States (ECOWAS). This project has a budget of USD 1.8 million, and reached Benin, Burkina Faso, Cote d' Ivoire, the Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo (see map below).




Countries reached by the GEF/CTCN project Mainstreaming Gender for a Climate Resilient Energy System

Promoting Accelerated Transfer and Scaled up Deployment of Mitigation Technologies through the Climate Technology Centre & Network (CTCN) | GEF (thegef.org)

# Sri Lanka: Designing and building climate smart cities

### 2018

CTCN receives two technical assistance requests from Sri Lanka on establishing a Climate Smart City (CCS) of Kurunegala. In parallel, the Climate Change Secretariate of Sri Lanka joined the World Bank's Partnership for Market Readiness (PRM).[16]

### 2018–2019

The Republic of Korea provides pro-bono support for a series of adaptation-related activities.

At the same time, the World Bank PRMs Partnership Assembly endorses Sri Lanka's USD 3 million grant proposal for mitigation actions.

### 2020

CTCN provides additional assistance on mitigation-related activities on carbon capture and storage.

The Government of Sri Lanka obtains a USD 1.2 million bank executed grant from the World Bank PRM Trust Fund to establish a carbon emission trade framework for scaling up economic benefits.

### 2023

The government submits a proposal for the GEF8 Integrated Sustainable Cities programme for Kotte Wetland City with UNEP that is under revision.

Cities consume 78 per cent of the world's energy and contribute to 60 per cent of global greenhouse gas emission (UN Habitat, 2019). With rapid urbanization, often fuelled by unregulated rural-urban migration and demographic challenges, city populations and infrastructure become increasingly vulnerable to climate-induced risks, such as rising sea-level, extreme weather events, drought, floods and landslides.

Climate Smart City planning and governance become crucial in addressing the impacts of climate change by identifying and anticipating risks, providing adaptation measures and strengthening resilience.

## What we did

In 2018, CTCN responded to the request of Sri Lanka's Ministry of Environment to design a 'Climate Smart City' for Kurunegala, identified as one of the cities in Sri Lanka with the highest risk to drought.

Starting from an analysis of the current situation in the city of Kurunegala, CTCN produced:

- Climate change risk assessment guidelines.
- Capacity gap analysis report.
- Climate change adaptation action plan and manual.
- Policy recommendations to expand and renew urban infrastructure through a smart and net-zero approach.

In addition, a series of climate technology recommendations responded to:

- Water scarcity and heat stress with solutions such as the use of a gravity-driven membrane (GDM) to filter water or rain water harvesting to reduce air pollution;
- Energy and transport challenges with the promotion of alternative road connections, e-buses, solar streetlights and conversion to energy efficient lighting and buildings; and
- Waste management issues with the strengthening of the waste -energy nexus.

## Impact

Building on CTCN's recommendations, UNDP Sri Lanka further demonstrated two mitigation technologies:

- Domestic solar PV with battery energy storage.
- A pilot biogas project in the Kurunegala Green Zone area.

The wealth of tools and knowledge developed by CTCN created momentum for the Sri Lanka's Ministry of Environment to obtain an additional USD 1.2 million from the World Bank's PRM Trust Fund to develop and execute carbon pricing guidelines.

16 Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications.





# Lao People's Democratic Republic: Building on the City Climate Vulnerability Assessment

### 2017–2018

The CTCN technical assistance for a City Climate Vulnerability Assessment and Identification of Ecosystem-based Adaptation Interventions in Lao PDR is completed.

Through fast-paced technical assistance, CTCN delivers the design of ecosystem-based solutions for building urban resilience.

### 2020–2022

The Power to Gas Masterplan is developed with support from CTCN technical assistance.

### 2024

GEF Challenge Programme is expected to start implementation.

## What we did

Since 2017, CTCN has supported Lao PDR with a series of technical initiatives to develop urban ecosystem-based adaptation interventions. These have attracted interest and funds to move projects from design to implementation, and from pilots to scalability.

As first steps to build a solid foundation, CTCN assessed and identified ecosystem-based adaptation interventions at the city level that focused on the vulnerability of people and ecosystems, and provided technical options for adaptation in urban areas. These options included increasing technical skills and knowledge, and improving equipment, which contributed to design a GCF project proposal on ecosystem-based adaptation in six cities. The proposal leveraged USD 11.5 million, which combined a GCF grant and in-kind funds from the Government of Lao PDR.

The identification of ecosystem-based adaptation interventions in the six cities was followed by an economic and engineering analysis. This analysis contributed to the revision and re-submission of the GCF funding proposal building resilience of urban populations with ecosystem-based solutions in Lao PDR which was able to:

- Estimate the economic impacts for the six proposed interventions.
- Design interventions for flood remediation and residual flood risks.
- Analyse the potential pollution remediation issues.

## Impact

The GCF ecosystem-based adaptation in Lao PDR generated a paradigm shift through mainstreaming integrated flood management strategies into urban planning frameworks and implementing urban ecosystem-based adaptation. It also strengthened institutional capacity for urban flood risk management and established integrated climate resilient flood management strategies and urban ecosystem-based adaptation guidelines, leading to:

- 800 ha of Paksan wetland restored.
- 700 ha of urban streams rehabilitated and sustainably managed.
- 18,000 m2 of permeable paving solutions installed.

CTCN, in collaboration with GEF, continued building on the initial success with an additional technical request to pilot innovative financing for climate adaptation technologies in medium-sized cities.

Kaysone Phomvihane City (or Savannakhet), one of the six cities originally targeted, has been selected as one of the three pilot cities of the CTCN multi-country technical assistance funded by the GEF Challenge Programme.

For this pilot, CTCN is working to:

- Map and prioritize high potential climate resilience projects and financing solutions.
- Identify financial tools and mechanisms for financing adaptation technologies in medium-sized cities.
- Build relationships between municipalities, the private sector, financial markets and infrastructure funds.
- Present the adaptation technology financing plan to selected members of the financial community.

The technical assistance in Kaysone Phomvihane City also serves as a demonstration of climate change adaptation financing solutions for medium-size cities with potential opportunities to scale up in other medium-size cities in Lao PDR and regionally.

Alongside the continued support to Lao PDR's adaptation efforts, CTCN technical assistance has also helped Lao PDR to move towards its GHG emission reduction targets, with the development of the Power to Gas Masterplan completed in 2022.

# Solomon Islands: Feasibility study for low-emission land transport secures electric buses

### 2020

The Solomon Islands Department of Climate Change requests technical assistance for a feasibility study for low-carbon transport.

### 2022

CTCN delivers the feasibility study with options for implementing an electric vehicle project in the Solomon Islands and submits a GCF concept note.

### 2023

The first-ever fleet of electric buses was introduced in the Solomon Islands.

The Commonwealth Climate Finance Access Hub (CCFAH) provides technical support for this project, and the country approves USD 2 million in funding from the Global Environment Facility's (GEF) 8 STAR allocation to support the implementation of e-mobility.

The Solomon Islands' transport sector plays a pivotal role in the country's economy. However, the country's dependence on imported fossil fuels has led to a continuous rise of total GHG emission ($CO_2$ equivalent) at the rate of 74,302 tonnes of $CO_2e$ per year between 1994 and 2010, with road transport alone accounting for 176.9 Gg $CO_2eq$ of GHG emissions.

In addition, Solomon Islands' power production is expensive and unpredictable, and the grid is underpowered. There is an over-reliance on low-capacity passenger vehicles and informal public transport services, insufficient traffic management, and inadequate non-motorized transport facilities that have caused severe traffic congestion.

## What we did

CTCN responded to the Solomon Islands' request for technical assistance to develop a feasibility study on low-emission land transport and delivered:

- An electro-mobility policy, planning and market framework to upgrade the transport sector into a modern and sustainable system.
- An evaluation of Solomon Islands' infrastructure, market readiness and tools to support the adoption of electric vehicles.
- A roadmap, an action plan and business case for the deployment of electric vehicles and associated charging infrastructure.
- A concept note for obtaining finance for Solomon Islands' electric vehicles.
- Stakeholder capacity building to promote the creation and execution of Solomon Islands' electro-mobility roadmap, and support for the infrastructure for charging stations.
- A cohesive electric mobility policy, planning and market framework for transforming Solomon Islands' transport sector.

> We thank the CTCN for funding this great initiative in support of achieving our country's ambitious NDC goal towards, ie. reduction of its GHG emission by 2030. Though it looks comparatively small compared to other initiatives, a thousand-mile journey starts with the first step. For that, I'm certain that this is a first step in the right direction towards adoption of clean energy for this country.
>
> ***Dr Michael Ha'apio***
> ***Commonwealth Climate Finance Advisor to Solomon Islands Government***





## Impact

The Ministry of Energy and Power Development leveraged the outputs of CTCN technical assistance and was able to secure technical support from the Commonwealth Climate Finance Access Hub (CCFAH). The country has received USD 2 million of funding from the Global Environment Facility's 8 STAR allocation to support the implementation of e-mobility.

In 2023, the first-ever fleet of electric buses was introduced in the Solomon Islands.

**Expected emissions avoided**

The cumulative $CO_2$ reductions for the period:

2022–2035 **166,422** $tCO_2$

**Figure 8 Total cost of ownership analysis for new vehicles, USD/Km), Solomon Islands, 2022**


**Figure 9 A Roadmap for affordable electric vehicles**

| EV Segments | Two Wheeler | Three Wheeler | Four Wheeler - Personal | Four Wheeler - Taxi | Bus – Mini | Bus - Standard | Truck (Light duty) | Truck (Medium-heavy duty) |
|---|---|---|---|---|---|---|---|---|
| % TCO advantage over ICEVs* | -27% | 8% | 59% | 10% | 167% | 241% | 189% | 253% |
| % higher cost over ICEVs without incentives | -17% | 3% | 65% | 53% | 191% | 588% | 10% | 389% |
| % of Subsidy on battery | 0% | 10% | 100% | 100% | 100% | 100% | 30% | 100% |
| % GST reduced | 0% | 0% | 84% | 96% | 100% | 100% | 0% | 100% |
| % Customs reduced | 0% | 0% | 0% | 0% | 100% | 100% | 0% | 100% |
| % higher cost over ICEVs with/after incentives | -17% | -3% | 0% | 0% | 49% | 269% | 0% | 178% |
| Reduced GST (%) (Incentive) | No | No | Yes | Yes | Exemption | Exemption | No | Exemption |
| | 19.0% | 19.0% | 3.0% | 0.7% | 0.0% | 0.0% | 19.0% | 0.0% |
| Reduced Custom Duty (%) | No | No | No | No | Exemption | Exemption | No | Exemption |
| | 10.0% | 10.0% | 10.0% | 10.0% | 0.0% | 0.0% | 15.0% | 0.0% |
| Proposed Subsidy on Batteries as % of total EV cost | 0% | 6% | 25% | 25% | 30% | 27% | 11% | 22% |
| Proposed Subsidy (USD/unit) | 0 | 138 | 9200 | 8856 | 15180 | 42780 | 2762 | 31050 |

29-07-2022 Prepared by pManifold | Consortium with UNEP CCC 17

# Bosnia and Herzegovina: Sustainable green district heating system in Banja Luka

**2016**

Bosnia and Herzegovina requests CTCN technical assistance for the rehabilitation and modernization of the district heating system in the city of Banja Luka.

**2017**

CTCN delivers a Feasibility Study for Banja Luka District Heating Project.

The European Bank for Reconstruction and Development (EBRD) approves a loan of EUR 8.347 million to Banja Luka to finance the city's equity stake in the newly created district heating company Eko Toplane.

**2018**

New biomass heating plant for Banja Luka starts operation using locally sourced wood biomass.

Established in the early 1970s, the district heating system in Banja Luka used to run on costly heavy fuel oil, delivering unreliable service and experiencing significant energy loss during transmission and end-use, while producing high amounts of GHG emissions and causing the city to incur unsustainable debt.

## What we did

CTCN developed an operational and investment strategy as well as a District Heating Project Feasibility Study to improve the district heating system sustainability. The study and strategy addressed:

- Construction of new sustainable biomass boilers to generate heat with sustainable biomass wood waste – which is cheap, renewable and locally sourced.
- Rehabilitation and replacement of key components in the distribution network to cut heat and water losses and reduce electricity consumption.
- Switch to consumption-based metering and billing for improved quality of service and transparency.

Leveraging CTCN technical assistance amounting to USD 90.000, the city of Banja Luka gained a strategy for significantly upgrading its district heating as well as gained financing to implement the proposed changes. The proposed CTCN strategy and feasibility plan attracted interest from the European Bank for Reconstruction and Development (EBRD), which provided an unsecured loan to the city of EUR 8.347 million. This was used to finance the city's equity stake in a newly created district heating company called Eko Toplane, which was a total project cost of EUR 18,568,000.

Operating since 2018, the new biomass heating plant for Banja Luka uses locally sourced wood biomass that saves the municipality over 5 million euros per year for the purchase of fuel oil. It also reduces $CO_2$ emissions by 90 per cent or 45,000 tonnes annually. The new heating plant complies with EU safety and sustainability standards and ensures continuous high quality service provision.

# TEN LESSONS IN DRIVING INNOVATION FOR CLIMATE ACTION

**1** **Never underestimate the exponential power of partnerships and networks.**

CTCN's experience underscores the significance of collaboration among diverse stakeholders, including governments, finance mechanisms, private sector entities, research institutions, and civil society, in advancing climate technology transfer and deployment.

**2** **There is no "one size fits all"**

Tailored technical assistance provides tailored research, analyses and solutions to developing countries based on their specific needs and capacities which has proven to be effective in supporting the adoption of climate-friendly technologies.

**3** **Capacity building is key.**

Continued capacity building and learning exchanges are crucial to sustain technology uptake and ensure that communities can independently manage and maintain climate-resilient infrastructure and solutions.

**4** **Address barriers to technology transfer.**

CTCN's work has highlighted the importance of addressing barriers, such as policy and regulatory constraints, lack of financing, and knowledge gaps, to facilitate the transfer and adoption of climate technologies.

**5** **Encourage innovation and adaptation.**

Innovation and adaptation in technology development and deployment is essential for meeting evolving climate challenges and maximizing the effectiveness of solutions in different contexts.

**6** **Prioritize knowledge sharing and cooperation.**

Facilitating knowledge sharing and promoting South-South and North-South cooperation have proven valuable in accelerating technology transfer processes and fostering mutual learning among countries facing similar climate-related challenges.

**7** **It is not a sprint.**

System transformation relies on a series of slow continuous advancements aligned to political will and supported by adequate resources. Long-term engagement and sustained support are necessary to ensure successful implementation, uptake and scaling-up of climate technology, especially in regions vulnerable to climate change impacts.

**8** **Integrate indigenous and endogenous knowledge.**

Recognizing and integrating indigenous knowledge and traditional practices and developing endogenous knowledge into technology development and deployment enhances the relevance, acceptance and sustainability of climate solutions.

**9** **Engage the private sector.**

Engaging the private sector as partners and stakeholders is critical for mobilizing additional resources, leveraging innovation, and scaling up the deployment of climate technologies.

**10** **If you can't measure it...**

Robust monitoring, evaluation and learning mechanisms are essential for assessing the impact of climate technology interventions, identifying lessons learned and continuously improving approaches to technology transfer and deployment.

These simple-but-not-easy lessons reflect CTCN's experience. They can be applied from the global to local, and serve as valuable insights for enhancing efforts to address climate change through technology cooperation and innovation.

# LOOKING AHEAD: THE FUTURE OF SYSTEMS' TRANSFORMATION

As we take stock of the work done over the past 10 years, this report offers an opportunity to reflect on what lies ahead for CTCN to accelerate the implementation of climate technology transfer and to deliver on both the joint work programme of the Technology Mechanism and its own Programme of Work.

## Unlocking resources and maximizing partnerships

CTCN will deliver on its mandate and meet parties' expectations through its thriving team of experts paired with financial, in-kind resources and partnerships. Increased resources will be vital to close the gap between the pace at which climate technology is developing and the limited access that developing countries have to these technologies.

To this end, CTCN will be investing more effort in strengthening resources and partnership mobilization following its new resource mobilization strategy. CTCN will explore innovative modalities for working together with new donors and partners, and looking at pro-bono and in-kind contributions as well as pioneering new financing mechanisms.

The Partnership and Liaison Office (PALO) will play a key role in driving strategic partnerships for system transformation. Building on the impact of the most promising climate technologies, PALO will encourage and facilitate the development of RD&D projects by connecting donor countries and developing countries.

CTCN members and partners will become increasingly crucial to its success. CTCN will develop a portfolio of partnerships and opportunities and further develop its matchmaking role, creating a marketplace where climate technology demand and offer can exchange knowledge and services, and where successful piloted solutions can find resources for scaling up.

CTCN will continue strengthening linkages with the Financial Mechanism not only to support technical assistance implementation, but also to engage NDEs and NDAs at the national level to reinforce a programmatic approach to climate technology in developing countries.

With the successful conclusion of AFCIA I, CTCN is already engaging with the Adaptation Fund to finalize AFCIA II and possibly other forms of collaboration. CTCN will also work on creating synergies with new bodies such as the Santiago Network for Loss and Damage and the new Loss and Damage Fund.

CTCN will continue to strengthen collaboration with COP, TEC and UNFCCC constituencies, looking at opportunities for raising awareness on the impact of its work, as well as new engagement and knowledge sharing opportunities.

## Next generation climate technology and AI for climate action

Thanks to a network of over 840 members, of which 55 per cent are from the private sector and 15 per cent from academia including government-affiliated research centres and universities, CTCN will continue keeping abreast with the latest technologies and innovations for climate action.

CTCN together with TEC is already exploring the different applications enabled by big data, machine learning and AI, looking at both the opportunities and the risks that any innovation entails.

For example, the TEC CTCN joint #AI4ClimateAction Initiative is already testing potential AI applications to respond to the impacts of climate change, including looking at applications that can:

- Support the transition from fossil fuels to renewable energy, playing a crucial role in enhanced smart grids, and efficient electricity power generation, transmission and distribution.
- Benefit the most vulnerable communities, particularly in the least developed countries and small island developing states, by paving the way for more effective disaster risk reduction and multi-hazard early warning systems.
- Bolster the resilience of farmers and agricultural communities by improving access to data on weather patterns and enhancing irrigation and planting systems.

CTCN will continue to provide a space for policy discussions, awareness raising, and exchange of knowledge and experience among relevant stakeholders on developing and deploying AI climate solutions and regional networks of institutions supporting AI for climate action.

## Powering innovation

As we move closer to the 2030 milestone for the Sustainable Development Goals (SDGs), countries will accelerate the demand for green renewable energy systems to replace fossil fuels and reduce emissions. To respond to this evolution, CTCN will continue to raise awareness and build capacity in developing countries by sharing knowledge on alternative power sources, policy, infrastructure and investments needed, as well as the associated opportunities and risks.

CTCN is exploring emerging technologies and solutions to continue to support countries in developing decarbonization pathways (long-term emission-reduction plans), including:

- Use of digitalization and AI for energy system management.
- Demand-side management and demand response, and energy storage applications.
- Grid optimization and smart grid operation including decentralized power systems.
- Decarbonizing or greening the grid and hard-to-abate sectors.
- Strengthening of National Systems of Innovation to create market mechanisms for energy supply.
- Use of non-conventional renewable energy systems, such as green hydrogen, ocean thermal energy, offshore wind, geothermal energy, energy islands, etc.

## National systems of innovation

CTCN will continue to strengthen national systems of innovation as the vital engine powering climate technology development and sustainability, embarking in new forms of resource mobilization and partnerships to:

- Strengthen countries' capabilities to drive and enable climate technology innovation.
- Support countries in incentivizing innovation through policy, institutional and regulatory development.
- Provide opportunities to lower emissions, create social and environmental co-benefits, and achieve related SDGs.
- Facilitate the development and transition to a circular economy, whereby national systems of innovation can stimulate economic growth and contribute to a more resilient environment.

In addition, CTCN will continue scanning the horizon for new technologies in transformative areas, including:

- Net-zero emission buildings, green infrastructure and green building materials.
- Application of the Internet of Things (IoT) for building management.
- Use of remote sensing for urban planning through nature-based solutions.
- Real-time systems for monitoring and management of floods.
- Integrated water management systems, smart water and waste-water networks.
- Digital public goods and community- based solutions and resource pricing.
- Use of digitalization and AI for smart monitoring systems for traffic management.
- Bi-directional charging, and optimization of EV charging infrastructure in countries, specifically in small island developing states.
- Using digital technologies for agri-food technology development and strengthening the water-energy-food nexus.
- Sensor deployment to aid food and crop resilience.






## Knowledge-exchange, capacity building and inclusion

Continuous and systemic capacity building is the only solution to future proof CTCN investments in climate technologies in developing countries. CTCN will continue expand its capacity-building portfolio, assessing emerging needs and involving network members and partners in the development and delivery of capacity building initiatives. There will be a special focus on NDEs needs and how capacity building can contribute to the development of national systems of innovation.

In 2024, CTCN will launch the second edition of the YCI Programme, further supporting ideation, incubation, acceleration and expansion of innovative technologies for climate action. This will offer an extended YCI Incubator, a new YCI Accelerator programme, and a stronger YCI Community to support next-generation climate innovators.

> The ability to reduce inequalities and vulnerabilities and develop inclusiveness will be the ultimate litmus test for climate technology.

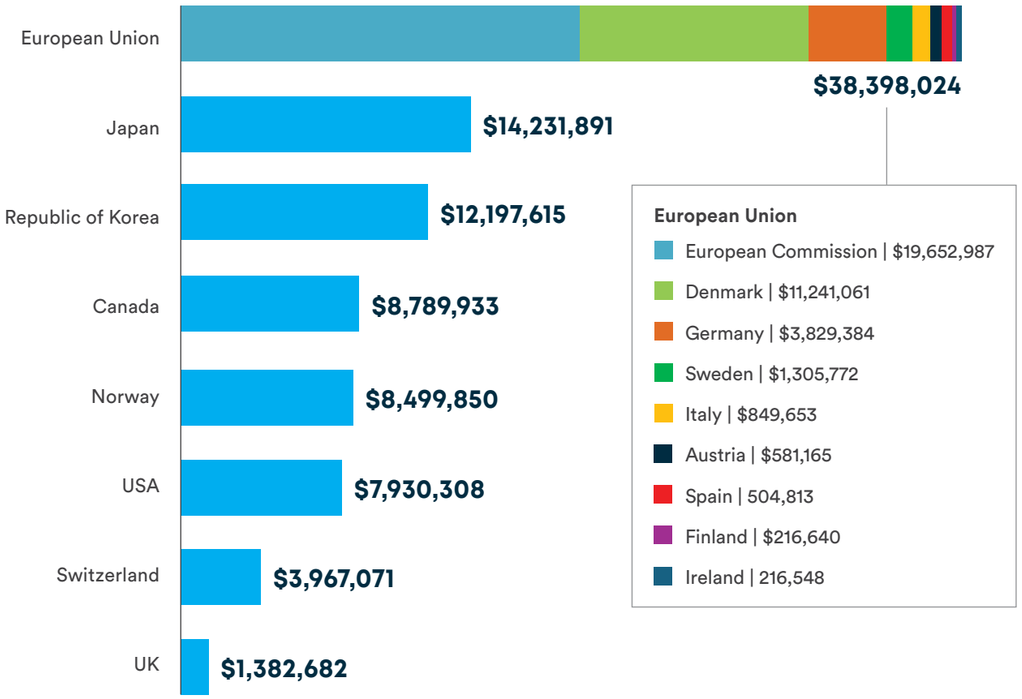
The demand driven approach, will continue to ensure CTCN responds to the needs and ambitions of developing countries, designing climate solutions that leave no one behind. CTCN will continue strengthening the recently launched CTCN–TEC Gender and Climate Technology Expert Roster, which also embraces Indigenous peoples' knowledge by encouraging professionals, grassroots experts and indigenous people with ancestral knowledge. It will also continue creating strong stakeholders' committees for the implementation of technical assistance to better understand the impact of climate change in people's lives, leverage indigenous and endogenous capabilities, and ensure community ownership of the climate technology solutions implemented.

> A future proof CTCN is able to catalyse trust and resources to respond to countries' requests with the best technology available while working in a responsive and agile manner. Stronger involvement of donors, the private sector and philanthropic organizations will not only be essential for raising more resources and enabling more climate technology solutions to be delivered where they are most needed, but also for scaling impacts from community to national level, and beyond.
>
> This report offers an amazing opportunity for me and the entire community working on different fronts of climate action to decide what comes next, because it is the decisions that we are taking now that will influence the story we will be telling in 10 years.
>
> ***Rajiv Garg***
> ***CTCN Interim Director***

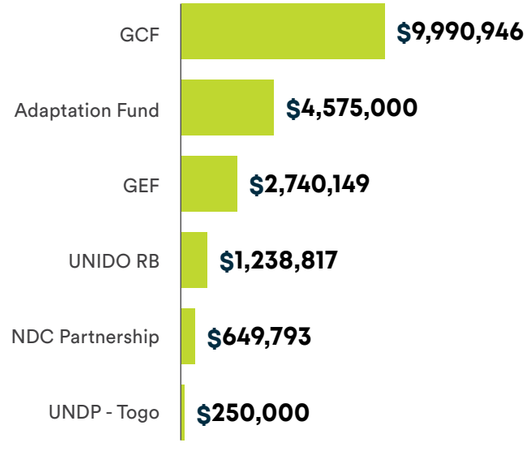
# FINANCIAL HIGHLIGHTS

Thanks to Parties' contributions and other financial mechanisms, CTCN secured a total of USD 115 million, which supported more than 370 technical assistance projects in more than 110 countries globally.

### Parties' contributions to CTCN since 2014




### From other mechanisms






# ABOUT CTCN

### The Climate Technology Centre and Network (CTCN)

The Climate Technology Centre and Network (the implementation arm of UNFCCC's Climate Change Technology Mechanism, mandated under the Paris Agreement) provides accelerated development and transfer of environmentally sound technologies for low carbon and climate resilient development at the request of developing countries. CTCN provides a portfolio of technology solutions, capacity building and advice on policy, legal and regulatory frameworks tailored to the needs of individual countries by harnessing the expertise of a global network of technology companies and institutions. CTCN is hosted by the UN Environment Programme and is headquartered in Copenhagen, Denmark.

UN environment programme

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