



Buildings & Infrastructure *for resilient communities*

**STRENGTHENING RESILIENCE THROUGH
INCREASED ENERGY EFFICIENCY AND EMISSIONS
REDUCTION USING NEW BUILDING STANDARDS,
BUSINESS MODELS, NATURE-BASED SOLUTIONS
AND DIGITAL TECHNOLOGIES**

CTCN works with developing countries to accelerate, develop and transfer technologies for low carbon, climate resilient development.

Why building and infrastructure impact communities' resilience

The building and construction sector accounts for almost one-third of total final energy. The end-use sector direct CO₂ emissions is 15 per cent, and its share of emissions rises to around 30 per cent if indirect emissions from the electricity and heat used within the buildings are included.

The sector has been moving at two speeds. On the one hand, energy needs have steadily been on the rise, driven by the growing energy access in developing countries and by the increasing demand for air conditioning and energy-consuming appliances.¹ On the other hand, energy efficiency and emissions reduction have progressed at a much slower pace,

with two-thirds of countries still lacking mandatory building energy standards. This is important, as most new construction is slated to occur in those countries without or with low energy standards.²

Climate technology and innovation, including newly-built design, retrofitting and the redesign of existing infrastructure combined with nature-based solutions and grey infrastructure,³ has a key role in strengthening communities' resilience while helping boost energy efficiency and emissions reduction within the building and construction sector. Smart solutions can ensure buildings and infrastructure are adapted for climate change and greater resilience and safety of the people using them.

CTCN case studies, pilot projects, RD&D, and concept notes can be leveraged/are pivotal to attract investments and funds. CTCN collaborates with The Green Climate Fund, The Global Environmental Facility, The Adaptation Fund Climate Innovation Accelerator, and several regional and national development banks, supporting systems transformation in over 30 countries.

But such adaptations are expensive. In low- and middle-income countries, designs for more resilient assets in the power, water and sanitation, and transport sectors would cost between US\$11 billion and US\$65 billion a year by 2030 – an incremental cost of around 3 per cent compared with overall investment needs.

To minimize these costs in resilient buildings as well as save lives and protect development investments, early and targeted investment is crucial. **Estimates show that the net benefit of investing in resilient infrastructure in low- and middle-income countries would amount to US\$4.2 trillion, which is a US\$4 benefit for each US\$1 invested.**⁴

CTCN solutions for communities and energy-efficient buildings and infrastructure

Working with National Designated Entities (NDEs),⁵ CTCN provides customized technical support, capacity-building and knowledge-sharing activities in response to countries' requests for assistance in addressing resilience challenges linked to the ongoing and transitional risks to infrastructure caused by the impact of climate change, including:

- ▶ Developing green buildings' standards and new energy-efficiency business models;
- ▶ Developing early warning systems for flood and droughts;

- ▶ Implementing nature-based solutions and ecosystem-based approaches;
- ▶ Innovative application of adaptation technologies such as sensor based automated irrigation, use of drones for crop monitoring and planning; and
- ▶ Forest fire preventive monitoring and abatement.

Led by a demand-driven process working with NDEs, CTCN also supports national decision-making, sectoral technology roadmaps, market assessments and feasibility studies to create an enabling environment for climate technology development and transfer.

Thailand develops energy-efficiency benchmarks for the building sector



Thailand needs to reduce emissions to meet national targets for the building sector. The National Energy Efficiency Plan (2015–2036) and Nationally Determined Contribution (NDC) Roadmap mandate the **reduction of 113 million tonnes of GHG emissions by 2030**



through renewable energy and energy efficiency. While the national building energy code from 2009 set minimum energy standards for new buildings, the lack of knowledge and guidance on cost-efficient technologies made it hard to enforce such standards.

To address these issues, CTCN and its Consortium Partners, the National Renewable Energy Laboratory and The Energy and Resources Institute, prepared a Green Climate Fund Readiness proposal.

The International Institute for Energy Conservation led the development of energy consumption benchmarks for selected building types and a techno-financial assessment of energy-efficient building technologies upon approval of the concept note.

Through the technical assistance provided by CTCN, Thailand was able to:

- ▶ Determine potential of commercial buildings included under the Building Energy Code (BEC) in meeting the NDC target.
- ▶ Develop a more rigorous mechanism for enforcing BEC in selected buildings.
- ▶ Determine upfront financial investment required for both energy efficiency and integrating renewable energy with buildings.

As a result, Thailand **can avoid 20 million tons CO₂e of GHG emissions by the 2030 timeframe, as defined in the Thailand NDC.**

How CTCN is enabling the building sector clean transition

By facilitating and strengthening the flow of know-how experience, and solutions for the building and construction sector clean transition, CTCN has delivered tangible progress towards achieving net-zero goals, while supporting the identification and the development of relevant national business and industry policies, strategies and plans.

This two-pronged approach – **converging innovative solutions and policy development** – has proven successful in several countries, including Burundi (helping with flood and drought damage prevention) and Kyrgyzstan (formalizing Building codes), and led to the delivery of:



77 technical assistance projects delivered totalling US\$15 million



62 developing countries received CTCN's technical assistance, and 3 multi-country technical assistance projects



50 projects on National Systems of Innovation and 27 projects included Digitalization



Thousands of stakeholders took part in a range of capacity-building activities, including:

- ▶ GHG inventory preparation training (Sri Lanka)
- ▶ Six-day training courses on GIS and photogrammetry and unmanned aerial vehicle (UAV) standard operation procedures
- ▶ UAV pre-mission planning for disaster management (Eswatini)
- ▶ A workshop on drought forecasting tools for water supply system resilience (Saint Kitts and Nevis).

In parallel, each technical assistance and intervention works to strengthen national systems of innovation⁶ (NSI) and digitalization⁷ as proven technology enablers.

Selected examples of CTCN buildings and infrastructure technical assistance including anticipated impact

Examples of the CTCN technical assistance	Countries	Impacts
Easily deployable water-filled flood barriers used to prevent damage from flooding and to store water vapor to ensure water availability in times of drought	Burundi	Pilot demo completed and adopted. The country is now scaling up the adoption of the technology at the national level by leveraging climate adaptation funds.
Development of policy guidelines on building codes for enhancing energy efficiency and identification of viable technologies for public buildings	Kyrgyzstan	Building codes s (heating, ventilation and air conditioning) for old buildings were revised and delivered, and are in the process of being adopted.
Strengthen the National Disaster Management Agency (NDMA) capacity's application of unmanned aerial vehicles (UAVs) and remote sensing technology for vulnerability assessments and response planning	Eswatini	<ul style="list-style-type: none">• Enhanced capacity of the use of modern technologies such as remote sensing and UAVs for better analysis of agricultural vulnerabilities.• Provision of a foundation course as the basis for more capacity building.
Improving resilience of the education system to climate change impacts in the Eastern Caribbean region	Antigua and Barbuda, Saint Lucia	A new hurricane-proof building design for public schools was submitted and approved by the Ministry, which will also serve as shelters during emergency response.
Rehabilitation and modernization of the district heating system in the City of Banja Luka	Bosnia and Herzegovina	A strategy to improve the district heating system was delivered and adopted by the local authorities, who in turn managed to secure a European Bank for Reconstruction and Development investment of EU€15 million in biomass boilers, network upgrades and other efficiency measures.
Modernization of the district heating system and improvements of energy efficiency of buildings in the City of Belgrade	Serbia	CTCN researched, developed and demonstrated a smart monitoring system for district heating in Serbia leveraging IoT and established a roadmap to connect with new renewable energy and scale it up.

“We are now moving towards a comprehensive plan for water management, integrating all available hydrological and meteorological data, monitoring consumption, and raising awareness on water storage.

Cheryl Jeffers, Ministry of Environment, Climate Action and Constituency Empowerment, Saint Kitts and Nevis

Next-generation buildings and infrastructure

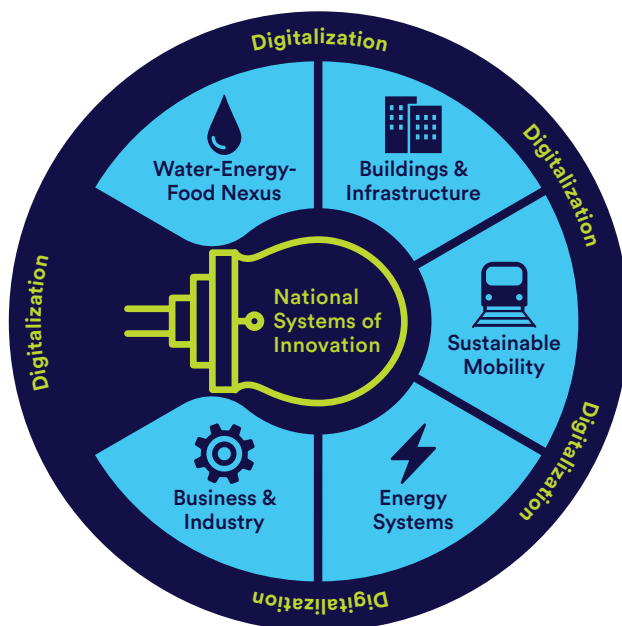
An increasing number of countries are seeking system-wide transformations and requesting support to enhance buildings and infrastructure to strengthen the resilience of communities affected by climate change impacts, including:

- ▶ Net-zero emission buildings, green infrastructure and green building materials
- ▶ Application of Internet of Things (IoT) for building management
- ▶ Use of remote sensing and UAVs for urban planning through nature-based solutions
- ▶ Longer lead times based on early warning systems for drought, floods etc.
- ▶ Integrated coastal zone management through nature-based solutions
- ▶ Real-time systems for monitoring and management of floods
- ▶ Climate resilient smart cities
- ▶ Integrated water management systems, smart water and waste-water networks
- ▶ Digital public goods, and community-based solutions and resource pricing

About 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.



1 World Energy Outlook 2021, IEA, 2021.

2 Global Alliance for Buildings and Construction. 2022. 2022 Global Status Report for Buildings and Construction.

3 The IPCC's 6th assessment report identifies retrofitting and the redesign of existing infrastructure combined with the new design as a way to capitalise on existing knowledge with regard to nature-based solutions and grey infrastructure. This can lead to inclusive adaptation processes. IPCC AR6 Chapter 6 Cities, settlements and key infrastructure.

4 Hallegatte, Stéphane, Jun Rentschler, and Julie Rozenberg. 2019. Lifelines: The Resilient Infrastructure Opportunity. Sustainable Infrastructure Series. Washington, DC:World Bank


5 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>

6 National Systems of Innovation (NSI): IPCC defines NSI as: "the set of institutions to create, store and transfer the knowledge, skills and artifacts which define technological opportunities" (Metcalfe, 1995). National systems of innovation reflect a complex mixture of institutions (e.g., financial; legal; scientific and technological; educational), public policies (regarding, e.g., taxation; export/import promotion; science, technology, and innovation), and business and social relationships.

7 Digitalization: Digital technologies impact positively and negatively on GHG emissions through: their own carbon footprint; technology application for mitigation; and induced larger social change. Whether the digital revolution will be an enabler or a barrier for decarbonisation will ultimately depend on the governance of both digital decarbonisation pathways and digitalization in general (medium evidence, high agreement). CTCN will use this approach that positive impacts of digitalization is realized for emission reductions and creation of resilience.

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Become a CTCN member,
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