KIGALI

COOLING EFFICIENCY PROGRAM

Global, regional, and country activities supported by the Kigali Cooling Efficiency Program

January 2018

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Contents

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List of acronyms used

A-5	Parties to the Montreal Protocol operating under its Article 5
AC	Air Conditioning
ADB	Asian Development Bank
DRM	Domestic Refrigeration Manufacturing
EE	Energy Efficiency
EEP	(National) Energy Efficiency (and Management) Plan
ExCom	Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol
FI	Financial institution
GHG	Greenhouse Gas(es)
GWP	Global Warming Potential
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HPMP	HCFCs Phase-Out Management Plan
K-CEP	Kigali Cooling Efficiency Programme
MEPS	Minimum Energy Performance Standard
MLF	Multilateral Fund for the Implementation of the Montreal Protocol
MP	Montreal Protocol
NCEEC	National Centre for Energy Efficiency and Conservation
NDCs	Nationally Determined Contributions
NEEAP	National Energy Efficiency Action Plan
NEO	National Energy Officer
NREEEP	National Renewable Energy and Energy Efficiency Policy
NOO	National Ozone Officer
NOU	National Ozone Unit
ODA	Official Development Assistance
ODS	Ozone Depleting Substances
RAC	Refrigeration and Air Conditioning
SMEs	Small and medium-sized enterprises
SON	Standards Organization of Nigeria
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
ODA	Overseas Development Assistance

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Introduction

The Kigali Cooling Efficiency Program is a philanthropic initiative launched in April 2017 with the aim of increasing the energy efficiency of cooling in support of efforts to phase down F-gases. Cooling is essential to health, prosperity, and the environment, underpinning many of the Sustainable Development Goals. Yet currently most cooling is energy intensive and highly polluting. Demand for cooling is booming, so there is an urgent need to not only cut pollution from existing cooling but to ensure future cooling needs are met sustainably.

K-CEP is already supporting a wide range of projects to meet this need for improving cooling efficiency. This document consolidates summaries of each project K-CEP has approved for support to date. These summaries are organised at global, regional, and country levels. The projects include activities to:

- Strengthen efficiency by building capacity;
- Improve policies, standards and labelling;
- Develop cooling plans;
- Unlock manufacturing capacity for efficient equipment;
- Improve monitoring and analysis of cooling efforts; and
- Better understand access to cooling.

This summary provides a snapshot in time of the work that K-CEP is funding. It focuses in particular on improving the efficiency of air conditioning and refrigeration and enabling district cooling. This portfolio of activity is being delivered across developing countries in Africa, the Middle East, Asia, Latin America and the Caribbean alongside various efforts at a global level to improve efficient clean cooling awareness and action.

K-CEP plans to fund more projects to improve cooling efficiency which will be included in an updated version of this publication. K-CEP has also launched a new support window in 2018 on financing cooling efficiency. We will be making further announcements about this financing window shortly.

We hope that you find these profiles useful and welcome feedback on them. We also encourage you to join us on this important journey to rapidly transform cooling efficiency internationally. Our contact details are below. We look forward to collaborating with you to deliver a world in which environmentally friendly, energy efficient cooling is accessible to all.

www.k-cep.org, Twitter @kigali_cooling, Email: k-cep@climateworks.org

Global and regional projects

Global project: Cooling for All
Global Panel on Access to Cooling

Objective
Convene a global panel of experts to endorse an authoritative report that identifies the opportunities, barriers, and steps needed to accelerate access to sustainable cooling solutions.

Background
Demand for cooling is expected to boom as the world warms, household incomes rise, and urbanisation progresses. The lack of access to clean cooling solutions has serious implications for human development including health risks, food security, medical supply chains, and productivity.

Cooling to date has not captured the political imagination. An estimated one billion people currently lack access to cooling and only 0.04% of total ODA funding goes towards cooling solutions. Existing cooling devices are often inefficient, unaffordable for the poor and the energy demand for cooling risks further exacerbating climate change. The HFC phase-out enacted by the Kigali Amendment to the MP offers opportunities to leverage new technologies and approaches which could transform cooling efficiency. There are also a range of solutions that do not require the use of electrical power.

The economic and social costs of poor access to cooling are not well understood or communicated. This leads to risks that countries will lock into expensive, dirty cooling pathways.

Drivers of Change
This project sits at the intersection of three internationally agreed goals: the UNFCCC Paris Agreement, the Sustainable Development Goals (SDGs), in particular SDG7 on clean and affordable energy and SDG13 on climate action, and the MPs Kigali Amendment.

Understanding how cooling becomes embedded as a goal in this landscape and the clean energy transition is critical, especially as heat strain could cancel out part of gains made elsewhere towards the SDGs. Distributed energy models are emerging which hold promise for enabling pathways to access to sustainable cooling.

Key questions include: How many people are at highest risk? What does the critical path for cooling look like for the poorest countries and people? What are the key barriers to progress? What needs to happen to bring sustainable access to cooling to these people and places? Which stakeholders need to be around the table to resolve these barriers? What resources and tools do countries need to act?

Scope of Work
This project has three key components:

1. Evidence gathering and analysis: the global panel will gather evidence, data and proposals to help address key questions for access to cooling. In particular, this will cover:

- Defining access to cooling and developing a baseline assessment of how many people lack access to cooling;
- The rationale for developing sustainable access to cooling pathways and their potential impacts;
- What access to cooling pathways could look like, including a high-level framework for their design, governance and implementation;

- An overview of existing and emerging cooling technologies and key areas for research and development to unlock the proposed access to cooling pathways;
- Existing or potential market needs and models;
- Barriers to the adoption of access to cooling solutions;
- Relevant global or regional initiatives and supporting mechanisms to leverage;
- Mechanisms to catalyse a "race to the top" among solution providers (e.g. incentive prizes); and
- Case studies of success in similar fields.

2. Report writing and awareness raising: Write and refine report based on evidence gathered and feedback. Develop communications strategy to raise awareness and influence decision-makers.

3. **Resource and fund mobilisation:** Explore with key funders and supporters of action on the Kigali Amendment how to mobilise resources for access to cooling that can leverage additional commercial and development finance.

Implementing partners

SE4ALL is the implementing agency for this project and will support the global panel. The global panel is co-chaired by Rwanda and the Marshall Islands. Panel members include government, academia, civil society, business, and finance community members.

Activity

- Evidence based, authoritative report for publication on access to cooling.
- Communication and awareness raising activities on access to cooling leveraging the panel's report insights and recommendations.

Impact

The expected impact of this project is a significant improvement in awareness of access to cooling issues from the high profile report and associated communications activity. This aims to catalyse meaningful progress towards mobilisation of resources and funds needed to support the implementation of priority access to cooling recommendations identified during the project. The report itself will help to improve the understanding and quantification of the potential impact of improved access to cooling.

Nationally-Determined Contribution

This project aligns with various NDCs internationally. For example, the Global Alliance for Buildings and Construction notes 212 $MtCO_2$ of emissions related to space cooling equipment for buildings is covered by country NDCs.

Link with Montreal Protocol

This project builds on the MPs interest in 'not-in-kind' technologies and aims to catalyze opportunities to go beyond AC, refrigeration and heat pumps to support other solutions which could transform cooling efficiency and increase access to cooling.

Timeframe

12 months from 2017 to mid-2018.

Global project:
Corporate and policy measures to incentivise efficient cooling

ENVIRONMENTAL INVESTIGATION AGENCY

Objectives

The two main objectives of this project are to: (i) work with global corporate leaders to advance energy-efficient cooling, and (ii) help embed energy efficient cooling within Montreal Protocol (MP) plans, processes and funding.

Background

The Consumer Goods Forum (CGF) is a global industry network which brings together consumer goods retailers and manufacturers to drive positive change, including greater efficiency.

In October 2017, the CGF agreed a new Refrigeration Resolution, which commits its members to install new equipment that utilises only natural or ultra-low global warming potential (GWP) refrigerants, effective immediately, in all commercial and industrial refrigeration equipment along the food and beverage supply chain. Two key elements in this Refrigeration Resolution are the need to improve energy efficiency and overcome remaining barriers to the adoption of low GWP technologies particularly in developing countries.

There is also a need to embed energy efficiency in the MP. This includes within existing planning and reporting processes under the HCFC phase-out and incorporate it in funding guidelines and other processes under the Kigali Amendment.

Drivers of Change

Large supermarket companies have thousands of stores in developing countries and most have so far only made some progress in moving away from HFCs in their national-based stores. This project will influence and support multinational CGF members as they implement their Refrigeration Resolution. It will help them develop action plans, including energy efficiency targets, provide market insights, and raise awareness to help these companies to adopt efficient cooling equipment.

The project will also help provide insights, advocacy and raise awareness to enable MP stakeholders to embed energy efficiency practically in their work.

Scope of Work

This project comprises four main activities across the projects two main focus areas:

1. Corporate market research and analysis: Analysis and technical report on energy efficiency and the cost of HFC-free commercial refrigeration; Research on the state of play and options for CGF members to make energy efficiency commitments; Development of policy recommendations for CGF members including on commitments, action plans, and monitoring and reporting methodologies for verifying energy efficiency progress on the Refrigeration Resolution.

2. Communications, awareness raising and advocacy: Engagement with CGF Secretariat and wider sustainability steering group on energy efficiency implementation; Launch a campaign to engage multinational CGF supermarkets; Campaign to raise awareness of energy efficiency opportunities in commercial refrigeration among policy makers and industry; Workshops/events to build policy-industry cooperation on energy efficiency.

3. MP research and analysis: Analysis of Stage II HCFC Phase-out Management Plans (HPMPs) to ensure energy efficiency is maintained or enhanced; Analysis of remaining fast-start projects and the MP Technology and Economic Assessment Panel (TEAP) energy efficiency

report in the context of expected 2018 outcomes.

4. MP awareness raising and advocacy: Attend relevant MLF meetings to advise on workable ways to include energy efficiency measures and ensure it is being adequately addressed; Disseminate new technology and market updates from corporate campaign; Advocate for embedding energy efficiency in MP processes.

Implementing partners

This project is being led by EIA which is a not-for-profit company with teams based in the UK and USA. EIA has more than two decades of experience working to reduce the impact of ozone depleting and climate warming gases within the MP.

EIA is working in partnership with shecco, which is a market accelerator for climate friendly technologies, especially HFC-free natural refrigerants.

EIA and shecco have strong working relationships with the CGF which is a potential delivery partner. This may include leveraging on-the-ground projects with CGF members in targeted developing countries. Examples of leading businesses that CGF works with include AEON, Walmart, Carrefour, Tesco, Metro, AHT, and Ahold Delhaize.

EIA and shecco work closely in partnerships with civil society, governments, and ambitious industry stakeholders.

Activity

- Technical report on energy efficiency in HFC-free supermarket refrigeration;
- Internal scoping report determining potential CGF commitment and targets;
- Policy report outlining potential CGF energy efficiency commitments and targets;
- Launch of campaign to influence corporate leaders;
- Progress reports on corporate engagement;
- Technical and advocacy reports on funding guidelines to the Executive Committee (ExCom) meeting in June 2018
- Policy papers on energy efficiency at OEWG 40 (July 2018) and Meeting of the Parties 30 to the MP.

Impact

Measuring and quantifying the direct mitigation impact of these corporate and policy measures to incentivise efficient cooling will require additional analysis during the project. Experience with similar initiatives suggests significant mitigation and energy cost saving benefits. For example, in Europe innovative CO2 technologies for cooling in supermarkets have seen 10-20% efficiency gains over new HFC-based systems and 18-24 month payback periods from energy savings and lower refrigerant costs. CGF members operate at scale across multiple countries and benefits so the projected benefits from them adopting efficient cooling measures is expected to be high. The project will also help to incorporate energy efficient considerations into the MP and Multilateral Fund.

Nationally-Determined Contributions

This project aligns closely with the energy efficiency objectives present in most NDC plans.

Link with Montreal Protocol

This project links directly with the MP by working with its standing committees, working groups, and meetings to embed energy efficiency considerations into its work. By working with the CGF this project will also help to link up existing corporate commitments on refrigerants with corporate efforts on cooling efficiency.

Timeframe

27 months from October 2017 to December 2019.

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Global project:
Kigali Progress Tracker

International Energy Agency

Objectives
This project aims to track cooling efficiency progress against BAU and support the prioritisation of cooling efficiency.

Background
The International Energy Agency (IEA) tracks, analyses and manages global energy data and statistics. The Kigali Progress Tracker will collect new data on cooling efficiency and integrate it into a technology and policy database which will generate insights into cooling emissions, markets and policies. The tracker is part of the IEA's new *Global Exchange*.

Drivers of Change
Better historical data on cooling efficiency is needed to understand variations and track progress by country, technology and policy. Producing a BAU outlook will provide a baseline for the expected increase in energy consumption, refrigerant use, global warming and ozone depleting potential. Against this baseline data and outlook, the IEA can then project various scenarios to explore the impact of changes (e.g. refrigerant replacement, temperature changes, changes in cooling equipment efficiency etc). This improved data and analytics will help to better allocate funding, design improved policies, and identify appropriate technology opportunities.

K-CEP partners will provide data into the tracker and data will be disseminated for use in partner databases, models, analysis, publications, and capacity building work. IEA will explore business models to ensure longevity of the tracker beyond this project.

Scope of Work
The tracker will have information by year, policy, and product type including the efficiency, size, refrigerant, sales, and product registration. There are three key components:

- **Database development and maintenance**: using bottom up and top down data and a stock accounting framework to track technology and policy data at local, national and regional scales.
- **Data collection:** direct reporting from partners and countries, indirect industry reporting, and new research.
- **Data dissemination:** high level summary report for partners and policy makers and detailed, easy to use data for key partners for their own databases and models.

Implementing partners
IEA will deliver this work in collaboration with K-CEP partners, industry and policy-makers.

Activity
- Technology and policy database
- High level summary report
- Detailed, useable data for key partners

Impact
Tracking impact is central to this project and will enable K-CEP to measure its impact. Further details and updates on this will be released during the project.

Nationally-Determined Contribution
This project aligns closely with the EE objectives in most NDC plans. For example, 212 $MtCO_2$ of emissions related to space cooling equipment for buildings is covered by country NDCs (GABC Global Status Report 2017).

Link with Montreal Protocol
The Kigali Progress Tracker will provide a joined up view of policy and market progress on cooling efficiency with efforts to reduce the GWP of cooling and will improve the availability of cooling data for the benefit of NOOs and EE policy makers.

Timeframe
2017 to 2020.

Contact
Cooling@iea.org

Global project:
Saving energy and phasing down HFCs

Objective

The objective of this project is to collaborate with key countries and thought-leaders to (1) help the institutions of the MP develop guidelines and criteria to support increases in the EE of products undergoing HFC and HCFC conversions, and (2) support ambitious standards, labels, programs, and testing procedures and plans in countries working to improve EE.

Background

Building on decades of experience working within the MP framework and extensive engagement in EE standards design, NRDC will develop new research, analysis, and recommendations on EE for key MP decision-makers and thought-leaders. Paired with NRDC's advocacy for stringent standards on AC energy use, the aim is to support the transition towards more energy efficient ACs and other cooling products in key markets around the world.

Drivers of Change

There is an opportunity to build in EE considerations into the formal processes of the MP and better integrate the MP's chemical work with other international FIs working to promote appliance EE. As parties call for more information, NRDC and its partners hope to provide evidence supporting strong EE ambition, applicable to:

a) Efficiency considerations in adoption of HFC funding guidelines by ExCom

b) Technology and Economic Assessment Panel's (TEAP) assessment of EE-related issues

c) Opportunities for implementing agencies and NOUs to integrate EE improvements into HPMPs, possibly with support from MLF or other international financial institutions.

HFC and EE regulations with multiple ambition levels available depending on specific country circumstances will be developed to help individual countries push for the most ambitious action possible. The intention is to engage nationally in standards development processes to contribute most effectively to ambitious MEPS, labels, and/or HFC regulations supported by K-CEP.

NRDC will develop a strategy and specifications for a testing program that can verify the accuracy of EE for AC products. The testing program will be designed monitor performance data for current and new AC models and assess whether they meet the energy use and, possibly, refrigerant specifications as labelled. The focus will be on verifying the characteristics of ACs exported from high-volume exporting countries such as those in Asia and Latin America.

Scope of Work

• **MP and energy efficiency**: This task will include working closely with the MP's committees, working groups, and meetings, to promote the inclusion of EE in funding guidelines, support EE-related enabling activities, raise awareness, and systematize incorporation of EE improvements into HPMPs and HFC phasedown management plans.

• **Standards and labelling advocacy**: This task will entail developing model EE and HFC regulations that can be used by countries looking to quickly adopt measures, and for calibrating advocacy for regulations in specific countries. NRDC will promote the importance of ambition in standards and labelling measures.

• **Standards and labelling advocacy**: This task will entail determining the scope of the testing plan, including equipment type and capacity,

market positioning of tested products, refrigerant type and the nature of its use, and countries of product origin included. NRDC will survey existing testing activity and capabilities and convene relevant technical experts and organizations to devise a peer-reviewed testing plan. NRDC will also pursue a pilot implementation of this program and will publicly announce and describe the results.

Implementing partners

NRDC is the main implementing agency for this project.

NRDC will fund a to-be-determined laboratory to carry out the physical testing required to complete the pilot phase of the testing program.

The Inter-American Association for Environmental Defense (AIDA) will work across Latin America to solicit views on incorporating EE into the activities of the MP, promote EE legislation, and convene stakeholders.

NRDC plans to partner with United for Efficiency to support the multi-stakeholder approval and implementation of proposed regulatory models.

Activity

- Two reports on new EE research, analysis, and policy recommendations.
- Three side events at the MP meetings to present findings.
- Model EE and HFC regulations for adoption by interested countries.
- 5-10 country analyses of proposed regulations to provide recommendations on how to modify proposed standards to ensure the best environmental outcomes.
- Participation in up to three workshops on how to implement ambitious standards and labelling in targeted countries.
- Plan for a testing program outlined in a short issue brief.
- Pilot of a market monitoring program on exported AC products to demonstrate the viability and impact of new testing program including public report of any discrepancies observed.

Impact

Measuring the direct impact of a global framework for systematizing EE improvements will require additional analysis based on a narrower range of potential policy options that have yet to emerge. Based on U4E's country-specific assessments of EE potential in the countries and regions in which NRDC plans to work, NRDC estimates that our advocacy, together with the in-country work of other K-CEP grantees, will mitigate on the order 10Mt of CO_2 between 2020 and 2030 by the establishment of ambitious MEPS for cooling and refrigeration equipment in Latin America and of order 100Mt of CO_2 in Asia.

Nationally-Determined Contribution

This project aligns closely with the EE objectives present in most NDC plans.

Link with Montreal Protocol

This project links directly with the MP by working with its standing committees, working groups, and meetings to embed EE considerations into its work and support parties as they try and link EE and the F-gas transition.

Timeframe

36 months from 2017 to 2020.

Global project:
Global leadership, advocacy & communication for efficient, clean cooling

Objectives

This high-level advocacy and political communication campaign aims to strengthen the scientific case for cooling efficiency action, engage political leadership, and help mobilise the private sector.

Background

The Kigali Amendment has created general awareness about the advantages of combining the phase-down of HFCs with efforts to improve the EE of cooling products. A strong scientific evidence base is now needed to accelerate cooling efficiency action.

197 countries adopted the Kigali Amendment to the MP in October 2016. Political leadership is needed to ensure the Kigali Amendment is ratified and awareness of the benefits of promoting cooling efficiency are raised.

There is also an opportunity to engage the private sector and mobilise their endorsement for policy reforms and market transformation programs that would help support the deployment of efficient cooling products.

Drivers of Change

International political and public debate is often informed by new scientific studies. A globally accepted scientific assessment of the climate and economic benefits of the Kigali Amendment will help build momentum for its ratification and an evidence base that accelerates the adoption of energy-efficient and climate-friendly cooling options internationally.

UN Environment can play a key role in engaging political leadership on cooling efficiency. UN Environment's Executive Director will personally press ministers and other political leaders about the Kigali Amendment and benefits of ratification.

The Ozone Secretariat can also steer the formal process of ratification as part of its normal responsibilities. UN Environment can also raise awareness of the benefits to countries of adopting policies that promote cooling efficiency.

Mobilising private sector manufacturers, governments, and civil society organisations to endorse model policies and market transformation programs, and increase consistency across markets, are also key drivers of change. These have the potential to lower compliance costs for manufacturers and prices for consumers. Model policy templates could also be promoted or required by leading international organisations. For example, these templates would be required for future U4E cooling projects.

Scope of Work

There are three key components:

1. **Strengthen scientific case for action**: Prepare global scientific assessment report and policy brief on projected impact of Kigali Amendment, efficient cooling options, and other key issues. This is expected to inform the 2018 Conference/Meeting of the Parties to the UNFCCC and MP. It will be supported by award-winning scientists and build on experience with UN Environment's *Emissions Gap Report*.
2. **Engage political leadership:** Executive Director of UN Environment will work with UN partners and relevant initiatives (e.g. Climate and Clean Air Coalition) to inform political leaders and senior officials of the benefits of Kigali Amendment ratification.

UN Environment will develop an outreach and advocacy strategy to build support for the Kigali Amendment including key events (e.g. G20, African Ministerial Conference on the Environment, meetings of the Global Environment Facility and Green Climate Fund). UN Environment will also prepare briefings and liaise with the broader K-CEP community to share success stories.

3. **Engage the private sector:** UN Environment will convene leading stakeholders to develop and deliver model policy templates that developing and emerging economies can use in transforming the cooling sector. These will cover common elements (e.g. standard test procedures, product information requirements, definitions etc) and content tailored to country/regional needs (e.g. differentiated performance requirements with tiers for each climatic zone). This component will help policy makers to understand what is needed and help to simplify and accelerate the policy making process for cooling efficiency. Outreach to key private sector, government, and civil society stakeholders will help to generate support for these policy and program measures. Basic capacity building information would be provided to governments to facilitate their use of these templates during the regional training of NOOs conducted on UN Environment's separate twinning and training K-CEP project.

Implementing partners

UN Environment will lead the delivery of this work in collaboration with government, industry and policy-maker partners.

UN Environment plans to work with Lawrence Berkley National Laboratory and NRDC on drafting the model policy templates for mandatory minimum energy performance standards for room ACs.

Activity

- Global scientific assessment report, policy brief and outreach activities.
- Develop strategy, schedule of key events and briefing material for engaging political leadership.
- Report on feedback from sample stakeholders on impacts of political leadership engagement and follow up advocacy needs.
- Draft and update model policy templates based on feedback, secure stakeholder endorsement, and conduct high profile announcements.
- Capacity building support to at least three countries to help tailor policy templates for national use.

Impact

Measuring the direct impact of a global leadership, advocacy and communication program will require additional analysis during this and other projects (e.g. Kigali Progress Tracker). The impacts from strengthening the scientific case for cooling efficiency action, engaging political leadership, and helping mobilise the private sector are expected to be significant.

Nationally-Determined Contribution

This project aligns closely with the EE objectives in most NDC plans. The global scientific assessment report and brief will include details and analysis on the ambitions in NDCs under the Paris Agreement on cooling efficiency.

Link with Montreal Protocol

This project will promote ratification of the Kigali Amendment through the global scientific assessment work and engaging political leadership.

Timeframe

2017 to 2020.

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Global project:
Twinning of national ozone officers and energy policymakers

UN environment
United Nations Environment Programme

Objective

Build the capacity of NOOs and national energy policymakers (NEPs) for linking EE with MP objectives in support of the Kigali Amendment.

Background

The rapid uptake of refrigeration and air conditioning products in developing countries requires close coordination at the national and regional levels.

UN Environment's OzonAction's Compliance Assistance Programme (CAP) manages nine regional networks of NOOs covering 147 developing countries that cover a broad spectrum in terms of size, population, and consumption and production of ozone depleting substances, from Niue to China. This includes 48 countries classified by the UN as Least Developed Countries and 38 countries classified as Small Island Developing States. CAP has widened its scope and outreach to forge new partnerships essential to support countries in their technology choices for HCFC phase-out and HFC phase down. The challenge is to support countries in developing plans for assessing, monitoring and sustaining the HCFC reductions, while having due consideration for technology choices, energy-efficient alternatives and sustaining the critical skilled workforce.

The regional networks are an existing, cost-effective, and appropriate platform to build capacity. The Networks are a core mechanism of the MP MLF family of institutions.

Drivers of Change

The capacity of NOOs needs to be strengthened so they can adjust their national MP compliance programmes to respond to the Kigali Amendment and incorporate EE considerations in the cooling capacity of the RAC sector.

The proposed project will use the well-established infrastructure of the regional network meetings to identify and engage one national energy policymaker (NEP) per country to participate, and promote the concept of "twinning" with the NOO from the same country to exchange experiences, develop skills, and share knowledge and ideas on energy efficient refrigerant transition. This will enable individual governments to integrate EE more rapidly into the ongoing MP process. It is expected that this interaction will catalyze a relationship that results in better cooperation at the national level between these two stakeholder groups.

Scope of Work

- **Preparation for twinning NOOs and NEPs**: Identify appropriate NEP contacts from each of the 147 countries, conduct a basic gap analysis to understand the most critical areas to cover, and develop appropriate training materials.

- **Conduct twinning / capacity building**: Through hosting an additional two-day segment at each of the regional network meetings.

- **Update country savings assessments and country policy assessments**: Using updated data provided by NOOs and NEPs.

- **Provide financial and technical support for national pilot programmes**: Targeting ten countries each in 2018 and 2019.

Implementing partners

UN Environment is the implementing agency for this project.

Activity

- Identification of NEP contacts.
- Capacity building training materials.
- 10 training workshops attached to the regional network events.
- Support to 20 pilot programs.

Impact

This project will enable individual governments to integrate EE more rapidly into the on-going MP process. It is expected that this interaction will catalyze a relationship that results in better cooperation at the national level between the MP and EE stakeholder groups.

Nationally-Determined Contribution

This project aligns closely with the EE objectives present in most NDC plans.

Link with Montreal Protocol

This project will make use of existing MP engagement forums to make an explicit link between MP activity and EE concerns.

Timeframe

30 months from 2017 to 2020.

Website

http://web.unep.org/ozonaction/partnership/k-cep.

Regional project:
Energy-efficient and climate-friendly cooling in the Caribbean

Objective

The objective of this project is to transition markets for RACs in the tourism sector in the Caribbean toward energy-efficient and climate-friendly products that save consumers and businesses money on utility bills, reduce electricity waste, enable greater comfort and productivity for building occupants, advance economic development priorities for governments, and mitigate pollution and GHG impacts on the planet.

Background

UN Environment seeks to build upon the wealth of related activities in the region to support the development of financial mechanisms and policies for energy-efficient and climate friendly cooling products in select Caribbean countries – the Bahamas, Barbados, the Dominican Republic, Jamaica, and St Lucia. The project will involve collaboration with on-going initiatives while contributing new resources and expertise to complement existing efforts.

Drivers of Change

In order to make the market transition to energy efficient and climate-friendly RACs, Caribbean countries need technical support, capacity building, high-profile recognition of the value of energy efficient and climate-friendly products, and some convening capacity to assist:

- Corporate tourism stakeholders with new financial mechanisms that will be tailored to help with purchasing energy-efficient and climate-friendly products for their facilities; and
- Energy and environment officials with developing and implementing national cooling strategies and model policies.

Scope of Work

There are five key components:

- **Stakeholder input** gathered in the tourism industry regarding barriers to investments in energy efficient and climate-friendly cooling in hotels. Convene stakeholders to share the findings and secure initial commitments to develop a financial mechanism tailored to address key barriers.
- **Financial mechanism** developed and a location for a pilot selected (at least two countries) based on the interest of hotels and the input of governments. A launch event to be hosted.
- **National strategy** drafted, in collaboration with government, for transitioning to energy-efficient and climate-friendly cooling products. Official endorsement for the strategy sought once it has been vetted with appropriate officials. Strategy finalized and promotion assisted.
- **MEPS and product labels for each country**. Consult officials, manufacturers, consumer groups, retailers, etc. to ensure various views are considered.
- **Training and expert advice** provided to facilitate the governments' adoption and initial implementation of MEPS and supporting policies and programmes.

Implementing partners

UN Environment is the lead implementing agency for this project via the UN offices in Kingston and Panama City. Lawrence Berkeley National Laboratory will act as technical advisor on MEPS and cooling strategies and the Basel Agency for Sustainable Energy (BASE) will act as technical advisor for financial mechanisms. National governments will be key

partners in each country and a range of other regional organisations are possible collaborators.

Activity

- Analysis of barriers.
- Financial mechanism pilot in at least two countries.
- Launch event.
- National strategy for market transition to energy efficient and climate-friendly products in each country.
- Develop model MEPS and product labels for each country.
- Deliver training and expert advice to government in each country.

Impact

This project aims to save consumers and businesses money on utility bills, reduce electricity wasted, enable greater comfort and productivity for building occupants, advance economic development priorities for the government, mitigate pollution and reduce GHG emissions. The Kigali Progress Tracker project will help to quantify some of these impacts during the project.

Nationally-Determined Contribution

Most of the countries covered by this project have EE elements in their NDCs that are relevant to this project's objectives. The Bahamas' NDC has the development of energy efficient building codes incorporating efficient cooling systems. Barbados' NDC incorporates a public sector EE program with a 22% electricity consumption reduction target relative to BAU by 2029 and EE measures in homes. Jamaica lists EE and conservation, including leadership by the public sector, as part of its National Energy Policy 2009-2030. Energy efficient appliances supported by National Energy Efficiency Labelling Standards – covering ACs – are part of Saint Lucia's NDC.

Link with Montreal Protocol

The national cooling strategies for each Caribbean country can serve to inform future HPMPs.

Timeframe

27 months from 2017 to 2019.

Regional project:
ECOWAS Regional Compliance Program

UN environment
United Nations Environment Programme

Objectives

This project aims to lay the foundation for a regional cooling efficiency compliance network in the Economic Community of West African States (ECOWAS). This will help compliance agencies share test results and market intelligence on non-compliant or sub-standard cooling products and safeguard the benefits of cooling efficiency activities in the region.

Background

Most ECOWAS member states don't currently have policies, standards, and programs (PSPs) for cooling efficiency. Those member states that do have PSPs haven't yet harmonised them so testing cooling products for the region is often expensive and inefficient.

An assessment by CLASP in ECOWAS in 2013 found a significant opportunity to align compliance efforts and improve collaboration among member states on appliance energy standards and labels. The high level of product imports in the ECOWAS region means that there is also the potential to adopt low cost compliance methods focusing on port of entry verification.

This project builds on ongoing efforts in the region – for example, the ECOWAS Energy Efficiency Policy which aims to implement measures that will save up to 2GW of power generation capacity by 2020 and the general ECOWAS mandate to promote the establishment of a common market.

Drivers of Change

National compliance programs can be significantly strengthened through regional collaboration and coordination, especially where standards are aligned and products are sold across borders. Regional collaboration results in increased efficiencies when testing products, and authorities can work together to identify non-compliant products, target their market surveillance activities, and strategically allocate their resources. Data collected at a regional level can feed back into national PSPs to improve their operation. Even in countries with no PSP framework, there is the potential to limit inefficient cooling products entering the market.

Harmonising standards, labels, and testing is under discussion in the ECOWAS region. There is also the potential to implement best practice early on in member states which don't yet have a cooling efficiency PSP framework.

Effective regional compliance will require compliance training, improved product information, and improved testing facilities.

Scope of Work

There are three key components:

1. **Compliance training**: Train compliance officers and policymakers to help them understand the need and mechanisms for compliance and successful regional collaboration including product database user training. The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) will be crucial to engaging policymakers from the 15 ECOWAS member states.
2. **Regional product database:** Develop a regional product database and online information sharing platform to enable enforcement at customs. This will integrate legislative requirements, databases and standards of ECOWAS trade partners to enable inefficient cooling products to be

restricted cost effectively without expensive market surveillance activities.

3. **Gap assessment and feasibility study:** Assess product testing capability in the region and identify gaps and opportunities to increase product testing capacity. This will include assumptions on how to make a viable business case for private or government investment in cooling product testing infrastructure. It will also consider the cost of laboratory implementation, operation, maintenance, and income.

Implementing partners

CLASP will lead the delivery of this work in collaboration with government, industry and policymaker partners.

CLASP will leverage partners working on regional compliance coordination and implementation including UN Environment, ECREEE, and the United States Agency for International Development (and their contractors).

Activity

- Draft ECOWAS compliance program strategy and work plan;
- Establishment of regional network and two rounds of compliance training (these will be scheduled on the side of regional events in order to maximise participation e.g. ECOWAS Sustainable Energy Week, ECOWAS Sustainable Energy Forum);
- Regional product database framework concept and development;
- Gap assessment templates (including inventory of equipment and services, staff and technical capacity);
- Fact finding mission to laboratories;
- Draft for a business case template; and
- Completed gaps assessment and feasibility study.

Impact

This project expects to accelerate the regional harmonisation of AC testing and performance standards, train 20 staff on compliance best practice, and implement 1 regional database. It also aims to increase rates of compliance with standards and labels, enhance monitoring, verification and evaluation capabilities in the region, increase regional collaboration between ECOWAS member states, help prioritise compliance resources, and safeguard expected savings from cooling efficiency PSPs.

Nationally-Determined Contribution

This project aligns with the EE objectives in many NDC plans in the region.

Link with Montreal Protocol

This project presents an opportunity to link up existing work on compliance and data collection for the MP with existing and new work on cooling efficiency in the ECOWAS region.

Timeframe

2017 to 2020.

Country projects

Argentina

Assessment of potential improvements and technology-system optimization to maximize the energy efficiency of refrigeration products during the HFC phase-down in the domestic refrigerators' manufacturing sector

Objective

This project aims to embed efficient clean cooling into the refrigeration manufacturing sector in Argentina with a focus on self-contained domestic refrigeration units.

Background

The domestic and commercial refrigeration sectors in Argentina are mainly served by local manufacturers. Exports are negligible and imports of domestic refrigerators and freezers are estimated to account for approximately 10% of the units sold on the market. Total production of domestic refrigerators and freezers is c.1.1 – 1.2 million per year and has been increasing mainly due to the substitution of imports and availability of credit for consumers.

There are six medium sized enterprises and some very small manufacturers producing domestic and commercial refrigerators in Argentina. Three of the six medium-sized enterprises are included in both this project and a complementary MP project – Briket S.A., Talleres Metalurgicos Bambi and Mabe-Kronen Int. SRL. These three companies use different manufacturing processes and layouts and produce a different mix of products.

The MLF proposal focuses on refrigerant phase-down and does not include an in-depth evaluation of the energy efficiency improvements for different sizes of manufacturers. It also does not include support on the economics and policies needed to promote EE products in Argentina.

While medium sized manufacturers in Argentina have standardised processes and well established production lines, the production processes of smaller manufacturers are more artisanal which has limited the efficiency improvements they have been able to make.

This project focuses on the domestic refrigeration sector as this sector represents a barrier to higher energy efficiency standards across all sectors, some of which are already able to reach higher standards and are applying minimum standards.

Drivers of Change

Under Argentina's National Energy and Climate Change Action Plan, energy efficiency is a crosscutting issue that is considered in several mitigation initiatives including the implementation of minimum standards of energy efficiency in home appliances.

Scope of Work

There are four key components:

1. **Research and development support**: evaluating potential in domestic industries for improving the EE of equipment produced by the selected companies and product redesign, prototype development and testing.
2. **Strategy development and training**: developing a roadmap guideline for assessing approaches to improve EE in manufacturing refrigeration products and organising national training and helping coordinate with policymakers to promote

EE in the refrigeration manufacturing sector.

3. **Barriers and business models:** market research on barriers, national mechanisms to promote locally produced EE appliances, and developing a financial model for improving the EE of appliances in production lines.
4. **MEPS and labelling:** assessing barriers and needs to help smaller manufacturers raise the EE of their products and support to negotiate the entry into force of higher energy efficiency classes and labels.

Implementing partners

UNIDO is the implementing agency for this project. UNIDO will collaborate with the National Ozone Office in Argentina (ORPROZ) which will also be responsible for planning, coordinating and executing the project.

The project aims to support cooperative work between the Ministries of Environment, Production and Energy, as well as supporting partners from research institutes and certified labs on EE testing of appliances, industry associations, retailers and other organizations involved in the market alongside the focus on domestic refrigeration manufacturers.

Activity

- Report on potential EE improvements and technology optimization of products (selected companies) and results of products evaluated/tested.
- Roadmap for the manufacturing sector on EE improvements in new products.
- Report on barriers identified and financial/business models proposed.
- Workshop training for EE experts and local authorities.
- Report on existing EE standards, barriers and gaps for smaller manufacturers.
- National workshop with the refrigeration manufacturing sector.
- Final report on key results from assessments, events/meetings and a list of materials developed and disseminated.

Impact

This project aims to shift the domestic refrigeration market to greener and more energy efficient products by improving the efficiency of locally produced refrigeration equipment and identifying ways to incentivise ownership of efficient, clean cooling equipment. By identifying technology improvements and financing models, it will integrate EE into the HFC phase-down in a cost effective way. It will also build capacity to help further develop EE standards and labels in the domestic refrigeration sector.

This support also aims to develop stronger and more effective coordination between MP and EE activity in Argentina.

Nationally-Determined Contribution

This project will help Argentina to deliver its NDC aims. Argentina's NDC includes an unconditional target of a 15% reduction in GHG emissions by 2030 and a conditional target of a 30% reduction in GHG emissions by 2030 depending on the commitments made by other countries. By improving the efficiency of domestic refrigerators, Argentina can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and help meet its NDC targets under the Paris Agreement.

Link with Montreal Protocol

Argentina has ratified the MP and is currently in the process of ratifying the Kigali Amendment. K-CEP support complements a separate MLF project to demonstrate replacing HFC-134a with isobutane (R-600a)/propane (R-290)-based refrigerant in the manufacturing of domestic and commercial refrigeration equipment in Argentina. This MLF project focuses on supporting the same three domestic manufacturing companies as K-CEP in this project.

Timeframe

24 months from 2018 to 2020.

KIGALI
COOLING EFFICIENCY PROGRAM

Bangladesh

Efficient Domestic Refrigeration

National Efficiency Cooling Plan

Objective

There are two K-CEP funded projects in Bangladesh.

Project 1: Efficient domestic refrigeration

Maximise the EE of domestic refrigeration products manufactured in Bangladesh as the country moves to using low GWP refrigerants.

Project 2: National efficiency cooling plan

Fill the gap in EE expertise needed to assist Bangladesh to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

For over 15 years, the DRM sector in Bangladesh has been one of the largest users of HFC-134a refrigerant in the country. HFC-134a has a GWP of 1,300.[1] Bangladesh now plans to phase-out this refrigerant and substitute it with lower GWP alternatives – either R-600a or HFO blends.

Both R600a (isobutene) and HFO blends are considered state of the art refrigerants. Appliances using R600a have started to be produced in Bangladesh since 2014. However, this production is currently in small quantities and using imported compressors. Current manufacturing processes in Bangladesh still lack important optimisation elements that could deliver higher efficiency appliances that use low GWP refrigerants. These elements include higher coefficient of performance compressors, brushless DC fan motors, better air and refrigerant flow inside the appliance, and electronics control systems.

There is one main DRM in Bangladesh – Walton Hi Tech Industries Ltd (Walton).

Drivers of Change

Project 1

Walton wants to produce more efficient domestic refrigerators that use low GWP refrigerants. However, it faces barriers including a lack of in-house knowledge/capacity on how to incorporate EE designs into the refrigerators they manufacture.

Walton is currently deciding on different designs and appliance sizes. K-CEP support will help Walton to improve its equipment design, use efficient components, and optimise the energy consumption of its products. This will enable Walton and Bangladesh to meet their aims to manufacture EE equipment that uses low GWP refrigerants and optimise the conversion of Walton's DRM plant (using the MLF and Walton funding).

There is also a lack of energy consumption data for different profiles of refrigerators that would help as an input to establishing higher EE standards in Bangladesh. Results of the EE optimisation work on this project will be used by the Government of Bangladesh as feedback to further develop MEPSs for the sector.

[1] UNFCCC, 100 year time horizon, http://unfccc.int/ghg_data/items/3825.php

Project 2

There are major synergies between EE and the phase-out of ODSs but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EEPs will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

Project 1: There are two key components:

- **Energy efficient design and manufacture advice**: Technical advice and capacity building to Walton to help improve its equipment design, use efficient components, and optimise product energy consumption.
- **Awareness raising and capacity building**: Awareness campaign to promote EE in the domestic refrigeration sector and support further development of MEPS for the sector.

Project 2: There are four key components:

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

Project 1: UNDP is the implementing agency for this project. They will coordinate with their partners the Department of Environment of Bangladesh and the national refrigeration manufacturer Walton to execute this project.

Project 2: The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP unit or its country office will guide and quality assure the project implementation.

Activity

Project 1

- Technical and capacity building advice to Walton;
- Summary report(s) on key information and insights generated by the project (including for the support of further MEPS development and results that may help other countries replicate this industrial conversion);
- Awareness raising campaign.

Project 2

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

It is expected that K-CEP funding, combined with MLF and Walton funding, will directly promote the phase-out of 282 metric tons of CO2 equivalent in the Walton plant.

The project also expects to help improve the design of compressors and other electric components that will deliver indirect CO2 equivalent emissions reductions. These will be calculated during the project implementation

once the new design and efficiency improvements are known.

More broadly, the project aims to shift the domestic refrigeration market to greener and more energy efficient products, build capacity to help further develop EE standards, and raise public awareness of EE in the domestic refrigeration sector.

This support also aims to develop stronger and more effective coordination between MP and EE activity in Bangladesh.

Nationally-Determined Contribution

This project will help Bangladesh to integrate its HPMP with its EE-related NDC plans.

Bangladesh's NDC includes a target of a 20% reduction in energy intensity (per GDP) by 2030 compared to 2013 levels. It includes EE policies for the household sector with a focus on improved cookstoves. It also includes an EE labelling programme to promote high efficiency products in the market. By improving the efficiency of domestic refrigerators, Bangladesh can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and help meet its NDC targets under the Paris Agreement.

Link with Montreal Protocol

Bangladesh has ratified the MP and all its amendments except for the Kigali Amendment which it is currently in the process of ratifying. K-CEP support complements a separate proposal to the MLF which is expected to fund the conversion of Walton's plant to phase-out approximately 179 metric tons of HFC-134a. The Department of Environment of Bangladesh also hosts the NO of Bangladesh and K-CEP funding will use the NOU structure. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

24 months from 2017 to 2019.

Brazil

National Energy Efficiency Strategy for the Air Conditioning Sector and Capacity Building to Strengthen Energy Efficient Standards and Labelling

Objective

This project aims to establish state of the art EES&L in the AC sector in Brazil and encourage the transition to low GWP refrigerants, in order to improve cooling efficiency and ultimately reduce GHG emissions.

Background

In Brazil, the majority of the population, totalling 206 million people, live in climates with high ambient temperatures for a large portion of the year. Approximately 40% of the population had an installed AC unit in 2014, with growth in the number of home ACs projected to increase by 85% by 2024.

AC is currently one of the most significant components of domestic electricity consumption in Brazil and there is low market penetration of low GWP AC units. The majority of ACs contain high GWP refrigerants HCFC-22 and HFC-410A, leading to high GHG emissions.

The law in Brazil requires domestic manufacturing of equipment at 80% of total cost. Brazil is a large manufacturing country and could have a role in fostering implementation of standards more widely across Latin America in the future.

Drivers of change

Brazil has a large AC manufacturing / assembly industry, totalling 2-3 million units per year, yet the market penetration of energy efficient ACs using low GWP refrigerants remains low. There are a number of country-level barriers that have been identified, relating to policy and regulation, institutional and technical capacity, domestic law, the lack of inverter technology compressors manufactured in Brazil, consumer awareness and market / financial mechanisms.

Brazil already has a national policy framework for energy in place, including MEPS, which have been implemented for several years. However, MEPS for the AC sector in Brazil are currently very low. The MEPS have not been updated since 2011, failing to keep pace with available technologies – however, an update is imminent. The adoption and enforcement of regulated MEPS for ACs is still in the development stage for large AC systems, and needs to be strengthened for room ACs. The current labelling system for AC units in Brazil is also poor. Appliances with superior EE have been sent to INMETRO, the national metrology institution (which also has responsibility for monitoring and evaluation of compliance), for testing and labelling. However, appliances are often not commercialised due to the fact that they tend to entail significantly higher costs, resulting in a lack of demand for the products.

Brazil's HPMP does not consider EE improvements and there is no integration of EE in the AC sector in the Brazilian national strategy and NDC. Changes in regulation, such as the development of EES&L policies and stricter MEPS, alongside more competitive prices, economic incentives, bulk procurement projects and consumer education could transform the market in Brazil.

This K-CEP project will support the transformation of the market and integration with MP actions, and leverage additional funding to increase cooling efficiency in Brazil's AC sector.

Scope of Work

- **Development of EE management plan for AC sector**.
- **Revision of MEPS & labelling policies and programmes for the AC sector.** This will

culminate in supporting a local partner to develop and implement a communications and awareness campaign around energy efficient cooling products.

- **Development of project proposal to finance a compressor manufacturing line** capable of producing high efficiency and alternative refrigerant invertor technology.
- **Leveraging finance for implementation support**.
- Through other initiatives, such as public and private partnerships and green procurement, a programme to replace inefficient AC units is envisaged with commercial banks in Brazil.
- **Market transformation activities** (e.g. buyers club / bulk procurement, etc).

Implementing partners

The Instituto Clima e Sociedada (iCS) is the implementing agency for all components of this project. The Energy Research Office (EPE), the governmental agency responsible for energy planning in Brazil will be the coordinating partner institution. Contributing partners include Lawrence Berkeley National Laboratory, INMETRO, PROCEL, University of Santa Catarina, IGSD, and International Energy Initiative Brasil.

Activity

- EE Management Plan for AC sector.
- Revised MEPS and labelling policies for the AC sector including effective EES&Ls.
- Communications and awareness campaign around energy efficient cooling products.
- Project proposal to finance a compressor manufacturing line capable of producing high efficiency and alternative refrigerant invertor technology.
- Data about AC market and state of the art technology prepared.

Impact

A baseline, impacts and direct and indirect GHG impact will be identified during implementation, and measured in collaboration with LBNL. A study by LBNL shows that globally, a 30% improvement of EE in mini-split residential AC units, together with the use of a low GWP refrigerant, could avoid the need to build in Brazil between 31 to 72 500MW peak power plants by 2030, and 92 to 216 500 MW peak power plants by 2050. Other impacts are expected to include:

- Movement of the market towards greener and more efficient products.
- Capacity built in key governmental bodies, to analyse, produce and implement EE policies.
- Provision of better information for the public, and increased awareness of EE savings in the AC sector.

The project results will be shared and contribute to strengthening the market for EE products and harmonising the EE standard for ACs in different countries in Latin America.

Nationally-Determined Contribution

Brazil's NDC commitment includes EE with a target to achieve 10% efficiency gains in the power sector by 2030.

Link with Montreal Protocol

This project will be implemented in coordination with the Ten Year NEEAP, the HPMP, and the future HFC-Phase-Down Management Plan. Any new labelling could be joint labelling for EE and GWP with financial mechanisms and procurement settings incorporated to incentivise both higher efficiency and lower GWP.

Timeframe

2017-2020.

KIGALI
COOLING EFFICIENCY PROGRAM

Chile

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Chile to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

A democracy since 1990, Chile has seen some of the fastest economic growth in the Latin American region since the turn of the millennium. From 1997 to 2012 Chile averaged over 1 percent per year of GDP growth, largely driven by the rise in exports as the world's largest producer of copper. This has enabled it to drive down poverty, with the proportion of the population living on less than USD 4 per day down from 26% to 8% from 2000 to 2015.

Chile is an importer of conventional energy sources. Fossil fuels dominate total energy generation with a 59% share. In 2014 Chile implemented a carbon tax, reflecting its ambition to reduce greenhouse gas emissions by 20% from 2007 levels by 2020.

To achieve this reduction in emissions, the Chilean Government is targeting an improvement in EE of 12% over the same period. Supportive initiatives under the 2010-2020 NEEAP include the labelling of consumer goods such as RAC units, as well as a replacement programme for the latter.

Drivers of change

There are major synergies between EE and the phase-out of ODSs but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- Building capacity of the NOU primarily focused on EE through training and guidance delivered by UNDP.
- Coordination between NOU and EE bodies established with long-term opportunities assessed.
- Drafting a long-term roadmap with priority actions identified.
- Raising awareness with key stakeholders.

Implementing partners

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on energy efficiency and the F-gas agenda.

- A ‘soft plan’ or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Chile.

Nationally-Determined Contribution

This project will help Chile to integrate its HPMPs with its EE-related NDC plans.

Chile’s NDCs include a target to reduce energy consumption by 20% by 2025.

Link with Montreal Protocol

Chile has ratified the MP and all its amendments including the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months from 2018-2019.

KIGALI
COOLING EFFICIENCY PROGRAM

China

Maximising GHG Emissions Reduction through Significant Energy Efficiency Improvement in Residential and Commercial Air-Conditioning in China

ENERGY FOUNDATION
能源基金会

Objectives

The goal of this project is to maximise the mitigation potential in residential and commercial air-conditioning (AC) in China primarily through the (1) development of energy-efficiency standards and labels and complementary market transformation programs. This project also aims to (2) assist in strengthening institutional capacity through integrating energy efficiency into MP implementation processes and (3) impact the global market transition through south-south collaboration.

Background

China's domestic market accounts for 40% of global AC sales. China produces over 130 million room ACs (70% of the global market). More than half of these ACs are produced by two Chinese manufacturers. China currently accounts for 85% of the global production capacity of unitary ACs and 90% of the global supply of rotary compressors. Cooling efficiency developments in China therefore have global implications.

China has a standards and labelling program but the coverage and the stringency of the program needs to be enhanced to capture the mitigation potential. The development and enhancement of Chinese standards and label requirements has been hindered by lack of limited government funding, robust economic analysis, and growing pushback from industry stakeholders.

Drivers of Change

China's HFC emissions grew at 35% annually between 2000 and 2013, much faster than CO2 emissions. They are projected to almost triple by 2050 and reach 100 MtCO2e if no control policies are put in place. This growth is driven mainly by: (i) replacement of HCFCs required by the MP; and (ii) China's rising supply of home appliances and vehicles, together with urbanisation and economic growth. An additional 300 million people are expected to move to cities in China by 2030 so improving the cooling efficiency of new buildings matters.

China has a two-fold policy framework for cooling efficiency: implementing the MP, led by the Ministry of Environmental Protection (MEP), and implementing the Paris Agreement, led by the National Development and Reform Commission (NDRC).

China has replaced ozone depleting substance refrigerants earlier than MP requirements and has the chance to leapfrog over the conventional HCFC replacement approaches with the Kigali Amendment. Due to climate and air quality concerns, China is motivated to cap and reduce coal consumption. Improving residential and commercial air conditioning efficiency contributes to this goal since 65% of China's electricity still comes from coal-fired power plants. China has also developed a top-runner program for home appliances and provided subsidies to improve the market share of efficient products.

China faces challenges phasing out HFCs including due to the high cost of alternatives, growing cooling demand, insufficiently stringent codes and standards, high incremental cost of energy efficient buildings, and a lack awareness of integrating HFC mitigation and efficiency improvements.

Scope of Work

The policies and standards work mainly focuses on upgrading existing minimum energy performance standards (MEPS) for Variable Refrigerant Flow (VRF) ACs in the commercial sector[2] and the market transition of residential and commercial AC to deliver efficient, climate-friendly cooling across the AC market.

The support mainly focuses on providing technical assistance to EE policy makers in China, particularly from NDRC, MEP, and Standardization Administration of China.

The key activities are:

- Market assessment and analysis on VRF product sales, efficiency, and affordability in and outside China;
- Techno-economic analysis of national level impacts of clean cooling solutions, efficient cooling policies, and MP implementation;
- Developing national and city level cooling efficiency policy frameworks;
- Establishing a Technical Steering Committee for cooling efficiency to review policy development and progress;
- Developing a National Cooling Efficiency Strategy and Roadmap and integrating EE in the Five-Year plan;
- Conducting Supply chain analysis for efficient VRF components including testing selected models from outside China;
- Strengthening and accelerating the development and enforcement of MEPS and labelling schemes for commercial AC in China;
- Upgrading testing standards for the revision of MEPS and developing a train-the-trainer program to improve testing capacity for MEPS enforcement;
- Improving MEPS and labelling compliance of cooling products and strengthening monitoring, verification, and enforcement;
- Evaluating the market and climate mitigation impact of cooling efficiency and HFC phase-down transition.

The support on market transformation programs focuses on increasing the market share of high efficiency ACs through developing procurement policies and subnational implementation programs in Chinese cities that are expected to peak emissions earlier. Key activities include:

- Procurement program and policy roadmap for promoting efficient cooling products.
- Sub-national pilot programs to enhance local capacity to improving cooling efficiency.
- Joint manufacturer and retailer programs for promoting efficient ACs.

The support on strengthening for capacity and south-south collaboration includes:

- Enhancing the energy efficiency capacities of the NOU and its partners in China
- South-south Cooperation to improve MEPs.
- Build capacities on “eco-design” of energy-saving products.
- Improve energy efficient capacities in the ICR servicing sector.

Implementing partners

Energy Foundation China is the lead coordination agency for K-CEP in China and will lead the implementation of this work in collaboration with partners including the following: Foreign Economic and Cooperation Office (FECO) of the MEP, China National Institute of Standardization, National Center for Climate Change Strategy and International Cooperation, China Household Electrical Appliance Association, China Refrigeration and Air-conditioners Association, Peking University, Hefei General Machinery and Electric Products Inspection Institute,

[2] MEPS enhancement for RAC is supported by CIFF directly through IGSD.

Lawrence Berkeley National Laboratory (LBNL), and Rocky Mountain Institute. The program has been designed with guidance from policy makers from the National Development Reform Commission of China and Ministry of Environmental Protection. UNDP will be leading the work with China's NOU housed by FECO.

Activity

Key policies and standards deliverables include:

- VRF market data and reports;
- Techno-economic analysis of national level impacts, policies, and MP implementation;
- Best practice guide for efficient cooling solutions in Chinese and global markets;
- Technical Steering Committee established and operationalised;
- National Cooling Efficiency Strategy and Roadmap recognised by NDRC and relevant government agencies;
- Report on cooling efficiency improvement pathway for VRF ACs;
- Report on international policy designs for standards and labelling programs;
- Recommendations for new and strengthened efficiency standards for VRF;
- MEPS for VRF approved and enforced;
- Training manual for standards and labelling of commercial cooling products;
- Pilots launched on Green Product labelling and certification of ACs and policy recommendations for integrating energy label, environment criteria, and pilot summary;
- Testing standards and procedures for VRF ACs developed/revised;
- Training manual for new/revised MEPS and testing standards;
- Methodological and policy recommendations on implementing national and local verification, monitoring, and enforcement;
- Training manual for monitoring and enforcing MEPS implementation;
- 100 staff trained at national and local levels for program monitoring and evaluation;
- Report on market and climate mitigation impact of cooling efficiency and HFC phase-down transition.

Key market transformation deliverables include:

- Report and policy recommendations on incorporating efficiency requirements into existing manufacturer subsidies for low GWP ACs;
- Policy recommendations submitted to national government and selected local governments/cities on improving energy efficient procurement policies in China;
- Procurement programs at central government launched;
- Sub-national policy roadmap developed for promoting cooling efficiency;
- Sub-national procurement program at selected early peaking cities launched;
- Joint rebate program for efficient ACs;
- Toolkit on EE and low GWP products developed for retailers in their marketing and outreach activities;
- 100 staff from retailers and manufacturers trained on government EE procurement policies
- Campaign strategies and selection and evaluation criteria developed for efficient cooling awards program
- Annual prize winner announced for the awards program (retailers, technology innovation and manufacturers).

Key deliverables on strengthening for efficiency and south-south collaboration include:

- 35 staff members of the NOU capacitated.
- At least one (1) coordination meeting held per country between public and private stakeholders.
- At least one (1) MEPS drafted for each general ICR sector (four in total) for consideration of Sri Lanka and Bangladesh officials.

- Experience shared with Sri Lanka and Bangladesh on application of MEPS.
- At least two (2) training workshops on EE and eco-design held for SMEs.
- Training Module on EE for SMEs prepared.
- Technicians trained.

Impact

The estimated cumulative reduction potential in China is 16.9 GtCO2e over 2020 - 2030 and 52.1 GtCO2e over 2020 – 2050. Within these overall numbers, raising EE in residential mini-split ACs has the largest mitigation potential in China, followed by VRF, water- and air- cooled chillers, and unitary ACs in the commercial sector. There is a large spill-over effect outside China as China exports similar volumes of residential ACs as it sells domestically. LBNL research released in 2015 showed that combining efficiency improvements with alternative refrigerants for room ACs could double the impact of either policy in isolation and help the world avoid emissions equivalent to up to 98 GtCO2 by 2050.

Nationally-Determined Contribution

China's NDC set goals to peak energy related CO_2 emissions by 2030 and committed to reduce overall HFC emissions by planning to develop policy to control non-CO_2 GHG emissions.

Link with Montreal Protocol

China has committed to freeze and phase-out HFC emissions from 2024. This project supports China's two pronged policy approach for delivering cooling efficiency and integrates cooling efficiency with HFC phasedown through a range of activities and deliverables, such as how the cooling strategy aligns with the HPMP, and taking a joined up (high efficiency, low GWP) approach to labelling, financial incentives, training and policy enforcement.

Timeframe

2018 to 2020.

KIGALI
COOLING EFFICIENCY PROGRAM

Colombia

Improving Energy Efficiency in the Supermarkets Sub-Sector in Colombia

Objective

This project aims to promote the long-term adoption of technological measures to improve the EE and reduce the climate impact of refrigeration systems within Colombia's supermarket sector.

Background

There are more than 1,300 food retail stores in Colombia and the sector is growing rapidly within the country. Both thermal and electrical demand for energy is projected to grow under a business as usual (BAU) scenario, with the food and beverage sector currently responsible for the consumption of approximately 500 MWh of electricity per year.

The supermarket sector in Colombia encompasses supermarkets, grocery stores, refrigerated warehouses and retail stores. Most supermarket cooling equipment is assembled within the country using a combination of domestically produced and imported parts. The sector is typically characterised by high leakage rates of high GWP refrigerants, with the majority of refrigeration systems designed to use HCFC-22 or high GWP HFCs. Projections suggest that under a BAU scenario, Colombian refrigeration equipment is likely to continue to use HFC refrigerants in the short-medium term, but international trends are starting to show a promising use of low GWP refrigerants.

Drivers of change

This project will provide support to improve the energy efficiency of electrical parts of AC equipment in supermarkets and align local interventions to build capacity for greater EE in the sector. It also aims to increase the penetration of low GWP refrigerant alternatives. This may require changes to codes and standards for the cooling systems and technologies used in supermarkets.

This project will build from, and complement, the activities being implemented under Stage 2 of the HPMP, particularly those focused on the RAC sector related to improvement of national capacities and training technicians, replacing refrigerants and controlling refrigerants.

This project will also include demonstration projects using lower GWP refrigerants, as opposed to working with existing systems. This is expected to result in important lessons learned related to the improvement of EE practices in supermarkets and the development of a national cooling strategy for the supermarket sector.

A number of barriers have been identified which K-CEP support will help to overcome including:

- Lack of knowledge / capacity of Colombian commercial refrigeration manufacturing producers to develop equipment parts that meet higher EE targets.
- Lack of energy consumption data for different profiles of equipment that can serve as inputs to establish higher EE standards.
- Poor existing installed capacity and poor EE strategies in food-retail stores allied to very high leakage rates that increase the waste of energy.
- Lack of proper training and best practices that can ally EE interventions to the regular leakage control training promoted by the HPMP.
- Need to develop tools and practices on improved systems efficiency and monitoring to achieve early detection of

potential problems of existing installed capacity in stores.
- High financial costs in the transformation of existing systems and no financial incentives for the implementation of low-environmental and EE alternatives in cooling systems in supermarkets.
- Lack of competitive scenario to deploy alternatives with low energy and environmental impact in the national market.
- Regulatory framework lacks technical references to develop and enforce standards and norms that could establish proper indicators for EE for food-retail cooling systems.

K-CEP activities will provide the incremental support necessary to optimise the energy consumption of supermarket cooling products that will lead to associated CO_2-equivalent reductions.

Scope of Work

- **Provision of technical assistance** to manufacturers, suppliers, maintainers and operators of supermarket cooling equipment to improve EE. The different requirements for each type of supermarket will be established along with the expected product efficiency gains. Technical assistance may include providing training, bespoke advice or guidance materials.
- **Demonstration projects** that will improve the EE of electric / electronic parts (compressors, ventilators, controls, thermostats, etc.) of refrigeration equipment and physical pieces (doors, curtains, lamps) of displays and refrigerated isles in supermarkets through retrofit / revamp practices. These will also be undertaken using low GWP refrigerants.
- **Development of a cooling strategy** for the supermarket sector.

Implementing partners

The project will be implemented by UNDP.

Activity

- A draft National Supermarket Clean Cooling Strategy for the supermarket sector including a calculation of the greenhouse gas (GHG) reductions potential should the strategy be implemented.
- Two clean cooling demonstration projects for supermarkets.
- Recommendations for including new cooling policies and programs in Colombia's NDC.
- Dissemination of learnings and recommendations through engagement at MP related meetings, OEWG and or similar meetings.

Impact

- Increased capacity to further develop EE standards and programs in the supermarket sector.
- Identification and quantification of EE and lower GWP opportunities in the supermarket sector.
- New supermarket strategy and demonstrations to inform future NDCs.

Nationally-Determined Contribution

Colombia has an unconditional target to reduce GHG emissions by 20% by 2030 and a conditional target to reduce greenhouse gas emissions by 30% by 2031. Colombia has included cooling in its NDC.

Link to Montreal Protocol

Colombia has been a Party to the MP since 1992 and has phased out the consumption of Chlorofluorocarbons (CFCs), halons and Carbon tetrachloride (CTC). Since 2011 it has been implementing its HPMP. This project will help supermarkets in Colombia, and by extension to help the Government, to integrate cooling efficiency into their efforts to comply with the Kigali Amendment.

Timeframe

18 months duration.

KIGALI
COOLING EFFICIENCY PROGRAM

Cook Islands

Supporting Policy and Financing mechanisms for Energy-Efficient and Climate Friendly-Cooling in the Pacific

IIEC
International Institute for Energy Conservation

Objective

The objective of this program is to provide technical support to energy officials, financial institutions (FIs), and the tourism sector to build understanding of the benefits of cooling efficiency and to help identify funding options for investing in high-efficiency, climate-friendly AC. This will support the development and implementation of MEPS and labelling for climate-friendly ACs under the Pacific Appliance Labelling and Standards (PALS) project and build EE capacity within the NOU.

Background

In recent history, energy needs on the Cook Islands have been met by diesel-generated electricity. Exposure to price shocks have implications on its economy, potentially reducing the competitiveness and stability of its vital tourism industry, and its economic growth. Outer island systems has suffered from irregular fuel supply. Electricity tariff remains relatively high and volatile. However, electricity demand is relatively stable and the population is declining due to emigration.

Recognizing this, the government has proposed a 100% renewables future by 2020 and increased efficiency both in electricity supply and use.

With an estimated population of only 17,500 people, the market growth opportunity for cooling devices is small.

Based on a 2011 census, the majority of household electrical appliances – including AC units, refrigerators and freezers – did not have any energy rating and the majority of those that possessed energy labels had energy rating level 3. Most of the electrical appliances originated from Australia and New Zealand, but were often manufactured in China, Japan, and Italy.

ADB has been closely involved with supporting demand-side EE in the Pacific region since 2009. Phase 2 of the ADB EE programme (which also covers four other Pacific countries) includes providing support to replace old inefficient fridge/freezers with high efficient fridge/freezers. This alone is estimated to provide approximately 83,280 kWh/year in electricity savings.

Drivers of Change

There is high penetration of low efficiency window and split-type ACs primarily in commercial buildings (including hotels) and some households in the Pacific. Promoting the sales of high efficiency and climate-friendly inverter-type ACs would result in reducing energy consumption in AC by around 15% to 20% on average.

The proposed project will provide technical assistance in the design and implementation of appropriate financing mechanisms to facilitate the market transformation to high-efficiency and climate-friendly inverter-type ACs in the commercial sector with focus on the hotel sector.

Appropriate financing mechanisms will be developed in collaboration with FIs and the electric utility to support AC suppliers and commercial customers for adoption of high-efficiency and climate-friendly ACs.

Scope of Work

- Assessment of ACs in the current market and stakeholder consultation.
- Development of financial mechanisms to accelerate market adoption and large-scale implementation.
- Technical and financial evaluation of the pilot phase.
- Coordination with the PALS program to promote MEPS and labelling for ACs.
- This work will be expanded or replicated in the region.

Implementing partners

The International Institute for Energy Conservation (IIEC) is the implementing partner for this project.

Activity

- AC market assessment.
- Stakeholder consultation workshops and meetings.
- EE financing assessment.
- Design and pilot of financial mechanisms.
- Identification of funding sources.
- Local approval of financial mechanism.
- Technical and financial impact evaluation.

Impact

The strong projected demand for ACs in the tourism sector will be directed towards higher-efficiency AC products.

Nationally-Determined Contribution

EE does not receive any focus in the Cook Islands' NDC as the focus is on moving the electricity system to 100% renewables.

Link with Montreal Protocol

The Cook Islands has ratified the MP and all its amendments except for the Kigali Amendment. This project will develop financial mechanisms for improved energy efficiency and has an opportunity to simultaneously incentivize lower GWP solutions, so as to accelerate progress in compliance with the Kigali Amendment.

Timeframe

24 months from 2018 to 2019.

Costa Rica

Developing a National District Cooling Strategy in Costa Rica to Improve Energy Efficiency and Reduce Greenhouse Gas Emissions

Objective

This project aims to develop a National Cooling Strategy for the AC sector to promote District Cooling (DC) in Costa Rica. The project will assess the AC sector and evaluate sites where the potential introduction of DC systems can be effectively implemented.

Background

Costa Rica is a tropical country where AC systems are extensively used. Commercial buildings are responsible for 25% of electricity consumption and residential households are responsible for almost 40% of electricity consumption. The national electricity utility in Costa Rica, Compañía Nacional de Fuerza y Luz (CNFL), launched a Guide in 2004 to promote the smarter use of electricity in commercial buildings. However, continuous growth of the installed AC base (particularly split types) is expected to increase the energy demand for the AC sector. An AC sector action plan that addresses current energy consumption and expected energy growth is urgently needed.

Drivers of Change

DC systems are based on the central production of cold water, from natural sources such as seas, lakes and groundwater, which is distributed to customers in a closed loop pipe network that covers several buildings and/or larger areas. The use of DC systems results in efficiencies up to 10 times greater than typical AC systems, and a large reduction or elimination of the use of HFC/HCFC refrigerants.

Costa Rica uses “split system” or “multi-split system” ACs for major buildings. These typically use HCFCs and HCFs, have high refrigerant leakage rates, and reduce the ability to control temperature and energy consumption. This reduces cooling efficiency and increases GHG emissions.

A technical team from UNDP has undertaken an initial assessment of eight potential sites in Costa Rica which have sufficient demand and the potential to use DC systems. The introduction of DC systems at these sites, which currently hold an installed capacity of approximately 6,500kg of charged HCFCs /HFCs, offers the potential to eliminate the use of large refrigerant charges and increase the efficiency of equipment.

There are a number of barriers to introducing DC systems in Costa Rica, however, which this project aims to address:

- **Lack of “in house” knowledge/capacities** within the NOUs; Energy Efficiency Bodies and other private and public sector stakeholders with regard to the MP, EE and the potential benefits of DC systems.
- **Lack of an energy/cooling policy framework** to connect EE interventions in the AC sector with MP interventions.
- **Lack of management tools** tailored to local needs in Costa Rica which can support NOUs and energy focal points to increase the results of the HPMP. Management tools on how to manage HFC-based equipment in line with the Kigali Agreement phase-down schedule and the adoption of DC systems are also lacking.

K-CEP support will enable the provision of tools and knowledge to public and private sector stakeholders to enable them to better understand the AC sub-sector in Costa Rica. It will also increase the capacity of stakeholders to use higher efficiency technologies and reduce the use of halogenated refrigerants.

Scope of Work

- Gather technical and institutional information and design a National Cooling Strategy for the AC sector, promoting DC.
- Deliver two complete Business Studies for the most prominent sites where DC systems can be installed in the short to medium term, identifying potential sources of funding.
- Promote a nationwide awareness strategy to put into practice the AC Cooling National Strategy.

Implementing partners

The project will be implemented by UNDP in partnership with District Energy Venture (DEVCCO). Co-finance (in kind contributions) by the participant country is expected.

Activity

- **Draft National Cooling Strategy on DC for the AC sector** including a calculation of the GHG reduction potential should the strategy be implemented.
- **100 people sensitised** in Costa Rica.
- **At least 2 Business Case Studies** containing potential investment opportunities for DC.
- **Dissemination of learnings and recommendations** through engagement at MP related meetings, OEWG and other similar meetings.

Impact

The development of a National Cooling Strategy for the AC sector will help to provide a long term roadmap for managing the growth of AC systems in Costa Rica and transition to more efficient DC systems. This will help to reduce the use of HFCs and raise awareness among stakeholders in the AC sector about efficient cooling options particularly DC. Identifying prominent sites for DC to be implemented in Costa Rica is also expected to accelerate the implementation of DC systems.

Nationally-Determined Contribution

Costa Rica has an NDC target to reduce GHG emissions by 44% of the Business-As-Usual (BAU) scenario, and by 25% compared to 2012 emissions. To achieve this target, Costa Rica would have to reduce emissions by 170,500 tons annually until 2030.

Links to Montreal Protocol

Costa Rica has ratified the MP and all its amendments, except for the Kigali Amendment that is currently in the process of being ratified. Costa Rica played a constructive role in the negotiations of the Kigali Amendment. The introduction of DC systems would also be considered as an early stage action in the implementation of the Kigali Agreement in Costa Rica.

Timeframe

24 months duration.

Cuba

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Cuba to implement MP projects and management plans taking into consideration EE aspects and opportunities relating RAC.

Background

Since the Communist revolution in 1959, Cuba has been governed as a one-party state. The historically abrasive relationship with the U.S. has recently begin to thaw with diplomatic ties reinstated from 2015. Although the American embargo of the island continues until today, the energy sector is a key sector for future foreign investment.

Electricity in Cuba is predominantly generated from locally-sourced oil and natural gas, with renewable energy, which is mostly biomass, representing the remaining 4% of total generation. Cuba aims to increase the renewable energy in its electricity mix to 24% by 2030, through support for onshore wind, solar PV and more biomass (primarily sugar cane).

Cuba has a strong track record for promoting energy efficiency. For instance, the government distributed over 9 million compact fluorescent light bulbs for free, becoming the first country to phase out incandescent bulbs. In addition, two million refrigerators and 182,000 ACs were replaced by efficient alternatives within two years. The electricity tariff is geared towards promoting energy conservation, with steep step-changes in price as usage increases.

Drivers of change

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately

private and public stakeholders working on EE and the F-gas agenda.

- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Cuba.

Nationally-Determined Contribution

This project will help Cuba to integrate its HPMP with its EE-related NDC plans.

EE features strongly in Cuba's NDC, which includes strengthening activity in the state sector and the promotion of EE measures and policies to the wider population.

Link with Montreal Protocol

Cuba has ratified the MP and all its amendments except for the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months from 2017-19.

Ecuador

Assessment of Incremental Capital and Operating Costs for Improved Energy Efficiency in Domestic, Commercial, and Retail Refrigeration

Objective

The objective of this project is to assess the potential incremental capital and operating costs for improved energy efficiency in domestic and commercial refrigeration.

Background

Ecuador is undergoing an immense change in its energy sector. Historically dependent on its petroleum reserves for export earnings (more than half of these coming from oil) and reliant on the use of fossil fuels for electricity, it is now moving towards self-sufficiency in renewable energy – notably hydroelectric.

In the past, reliance on fossil fuels was not always an issue. When oil prices were high, it paved the way for GDP growth and external financing, encouraging social spending and reducing poverty. During that time, the government invested heavily in the energy sector – contributing to a high electrification rate (100% in urban areas and 92% in rural ones).

The fall in oil prices and the lack of a local currency have threatened the economic stability and energy security of the country. This has encouraged Ecuador to increase its presence in the renewable energy sector. It set a target of 90% of energy coming from hydroelectric sources for 2017, vowing to raise this percentage until 2025.

Ecuador is undergoing programmes to phase out HCFCs, with projections for it to reduce substances by 35% from the baseline by 2020.

Drivers of change

Better information is needed regarding the costs and benefits of installing more efficient refrigeration systems to help make the case for investment.

The project will examine potential options for energy savings in refrigeration systems, going beyond the refrigerating circuit to include e.g. LED lighting. The project will assess capital costs, if modifications are required in production areas, as well as operating costs.

Scope of Work

- **Examination of refrigeration systems**
- **Drafting of report on the incremental costs** of energy efficiency improvements.
- **Study on market barriers** for potential increase in sales prices for more energy efficient products.
- **Dissemination workshop.**

Implementing partners

UNIDO is the main implementing partner for this project. UNIDO will seek cooperation with CLASP to assist assessing the market for domestic and commercial refrigerators.

Activity

- An understanding of incremental capital and operating costs for improved energy efficiency in the domestic and commercial refrigeration sectors.
- An assessment of the impact on the production lines of more energy efficient programs for two manufacturers in the domestic and commercial refrigeration sectors.
- A study on market barriers for potential increase in sales prices for more energy efficient products.

- A methodology for collecting, analysing and calculating incremental costs.
- A workshop for dissemination of results.

Impact

Improved awareness of capital and operating cost of improved energy efficiency for the domestic and commercial refrigeration sector helping make the case for more energy efficient investment.

Nationally-Determined Contribution

In 2015, Ecuador submitted its INDC (Intended Nationally Determined Contribution) to the United Nations, pledging to reduce GHG emissions in the energy sector 37.5% and 45.8% below the business as usual scenario by 2025. Energy efficiency is not singled out as a mitigation strategy.

Link with Montreal Protocol

Ecuador has ratified the MP and all its amendments except for the Kigali Amendment. K-CEP support complements an on-going project for HCFC phase-out in Ecuador for the period up to year 2020. The project is financed by the MLF to the amount of US$515,000. There is also a planned conversion project from HFC-134a to R-600a (isobutane) at the ECASA and INDURAMA companies in Ecuador. This second project is planned to be submitted to the MLF in spring 2018.

Timeframe

18 months from 2018-2019.

Ghana

Enforcing Energy Efficiency in the Air Conditioning Servicing Sector in Ghana

Efficient Air-Conditioning Program in Ghana

National Efficiency Cooling Plan

Objective

There are three K-CEP funded projects in Ghana, each with their own objectives.

Project 1: Enforcing EE in the AC servicing sector.

This project will complement the ongoing HPMP in Ghana by extending its reach and influencing interventions that can improve EE in the AC servicing sector.

Project 2: Efficient AC programme

This project will facilitate market transformation for efficient AC equipment, building on a similar successful rebate scheme for refrigerators to influence EE standards in Ghana.

Project 3: National efficiency cooling plan

This project aims to fill the gap in EE expertise needed to assist Ghana to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

The HPMP for Ghana has made steady progress in phasing out HCFCs. The HCFC consumption level for 2015 was 54% below the MP targets, with HCFCs solely used for servicing RAC equipment.

The AC of offices, indoor work spaces and residential homes has become a common feature of the modern Ghanaian lifestyle. As housing development is increasing, stationary AC has become a fast growing sector. According to a GIZ study, there were approximately 450,000 domestic refrigerators in Ghana in 2015, with expected sales growth projected at 7% per year until 2030.

The market is dominated by unitary ACs with single split systems being the most common. Multi-split systems and Variable Refrigerant Volume technology are present in modern complex office applications where customers have become aware of the EE benefits. The majority of ACs are charged with HFC-410A, although R-22 split units are popular due to their lower price.

Ghana is committed to cooling efficiency, and a founding member of the Climate and Clean Air Coalition (CCAC). However, in common with A-5 countries it faces significant barriers to the implementation of cooling efficiency projects, such as MEPS, labelling and market transformation.

Drivers of change

Project 1

This project aims to address the lack of enforcement of the regulation banning imports of second hand AC units in Ghana. It also aims to improve service practices and operational and maintenance procedures to reduce leakage rates and increase performance of equipment. It will provide support to increase the capacity of trained officers in relation to increasing the EE of AC units.

This project is complementary to the swap-out market transformation interventions of Project 2 by supporting the local market to absorb the technical aspects of handling and servicing

super-efficient equipment in order to maximise its EE long-term.

Project 2

This project will address key barriers of MEPS implementation and will use the model of the new EU Eco-design Directive which prescribes mandatory minimum energy performance levels and labelling levels for professional cabinets. This will be used alongside best practices to define policies and standards to be applied in the AC sector in Ghana in order to boost a wider "swap-out" programme.

It will address barriers to adoption of efficient ACs and enable market transformation interventions by driving consumer choices on the long-term savings that EE equipment can provide and enabling additional funding to be mobilized. Specifically, this project aims to address:

- The lack of financial incentive to promote a large-scale rebate / replacement / early retirement programme for inefficient ACs.
- Limited awareness of EE.

Project 3

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EEPs will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

Project 1:

- **Ensure legislation banning imports of second-hand AC units is fully integrated** in customs regulation.
- **Train customs offices** to enforce regulations and identify storage requirements for seized AC units.
- **Establish a certification mechanism** for imported AC units.
- Share experiences with ECOWAS countries.

Project 2:

- **Assess international product definitions**, test protocols, rating schemes, performance level definitions, certification procedures, etc.
- **Conduct technical analyses** and identify data sources for use as a baseline in development of standards and labelling policy for selected product categories.
- **Collect additional market data** and baseline usage and performance data for the selected product category to inform a decision on efficiency performance levels.
- **Enforce MEPS** for selected products based on market analysis and international benchmarking.
- Develop monitoring, validation and enforcement processes and train staff.

Project 3:

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination established between NOU and EE bodies** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

Project 1 and 2:

The implementing agency for both projects is UNDP, in partnership with the NOU at the Ghana Environment Protection Agency. For Project 2, cooperation with the Ghana Energy Commission, a pillar of the refrigeration rebate scheme's success, will be particularly crucial.

Project 3:

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation. The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

Project 1:

- Procedures to enforce the ban enacted.
- 25 officers trained.

Project 2:

- MEPS enforced. The swap-out programme will ensure that low efficiency appliances are replaced with AC units that are at least a level above the MEPS.
- Legislation banning imports of second-hand ACs integrated in customs regulation.
- Experience shared with ECOWAS countries.
- AC unit "swap out" programme / rebate scheme designed.

Project 3:

- NOOs' capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Project 1:

- Ban on import of used AC units enforced.
- Capacities built within Governmental entities and officers on EE.

Project 2:

- Assessment of national technical and financial conditions that could enable potential future implementation of AC unit "swap out" programme / rebate scheme.
- Total CO_2 equivalent impact reduction estimated.
- Identification of potential sources of co-funding for implementation.
- Dissemination of best practices initiated in other ECOWAS countries carried out.

Project 3:

Stronger and more effective coordination between the MP and EE activity in Ghana.

Nationally-Determined Contribution

These projects will help Ghana to integrate its HPMP with its EE-related NDC plans. Ghana's NDC includes an unconditional target to achieve 15% reduction in GHG emissions and a conditional target to achieve a 45% reduction. This includes an intention to abate fluorinated gases (HFC-22 and HFC-410) from stationary air conditioners.

Link with Montreal Protocol

Ghana has ratified the MP and all its amendments, except for the Kigali Amendment that is currently in the process of being ratified. Ghana has also played a constructive role in the negotiations that led to the approval of the Kigali Amendment. K-CEP support will help incorporate EE considerations into MP activity. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

Projects 1 and 3 run for 18 months and project 2 runs for 24 months.

Guatemala

Assessment of Incremental Capital and Operating Costs for Improved Energy Efficiency in Domestic, Commercial, and Retail Refrigeration

Objective

The objective of this project is to assess the potential incremental capital and operating costs for improved EE in commercial refrigeration.

Background

Nested between the North Pacific Ocean and the Caribbean, Guatemala is the biggest economy in Central America (PPP GDP: $139 billion). Guatemala has a relatively large agricultural sector (13.5% of the GDP and 3% of the labour force) as well as large foreign income inflows from expatriates that have migrated to the U.S.

Despite its large GDP for the area, Guatemala is marked by severe inequality, meaning that 20% of the population accounts for 51% of the country's overall consumption. Over half of the total population live below the poverty line, and nearly half of its indigenous population live in extreme poverty.

Although the energy mix is dominated by oil (43%), there is also a large proportion of electricity generated from hydroelectric and renewable sources.

About 10% of the population has no access to electricity; this is particularly notable in rural areas where the electrification rate is only 72% (vs. 85% in urban areas). The electric power consumption per person is quite low at 578 kWh/capita, with the Latin American average about 4 times higher.

The lower residential consumption is due in part to the low use of heating appliances due to mild weather, although the use of cooling in certain regions is rapidly increasing.

Guatemala is looking to decrease HCFCs 35% from the baseline by 2020.

Drivers of change

Better information is needed regarding the costs and benefits of installing more efficient refrigeration systems to help make the case for investment.

The project will examine potential options for energy savings in refrigeration systems, going beyond the refrigerating circuit to include e.g. LED lighting. The project will assess capital costs, if modifications are required in production areas, as well as operating costs.

Scope of Work

- **Examination of refrigeration systems**
- **Drafting of report on the incremental costs** of EE improvements.
- **Study on market barriers** for potential increase in sales prices for more energy efficient products.
- **Dissemination workshop.**

Implementing partners

UNIDO is the main implementing partner for this project. UNIDO will seek cooperation with CLASP to assist assessing the market for domestic and commercial refrigerators.

Activity

- An understanding of incremental capital and operating costs for improved EE in the commercial refrigeration sectors.
- An assessment of the impact on the production lines of more energy efficient programs for one manufacturer in the commercial refrigeration sector.

- A study on market barriers for potential increase in sales prices for more energy efficient products.
- A methodology for collecting, analysing and calculating incremental costs.
- A workshop for dissemination of results.

Impact

Improved awareness of capital and operating cost of improved EE for the commercial refrigeration sector helping make the case for more energy efficient investment.

Nationally-Determined Contribution

Guatemala's NDC makes a conditional commitment to reduce emissions below business-as-usual but does not single out EE as a mitigation pathway.

Link with Montreal Protocol

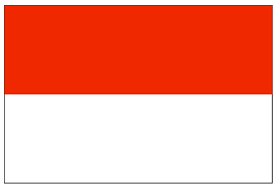
Guatemala has ratified the MP and all its amendments except for the Kigali Amendment. K-CEP support complements an on-going project for HCFC phase-out in Guatemala for the period up to 2020. This project is financed by the MLF in the amount of US$ 345,637.

Timeframe

18 months from 2017-2019.

Indonesia

Cooling Efficiency Award Category at Sustainable Business Awards, Indonesia 2018



global initiatives

Objective

The objective of this project is to integrate a cooling efficiency award category into the established Sustainable Business Awards, Indonesia 2018 and raise awareness of cooling efficiency in Indonesia.

Background

Indonesia is the world's third most populous democracy, the world's largest archipelagic state, and the world's largest Muslim-majority nation. It has a population of around 260 million people concentrated in particular on the islands of Java, Sumatra, Sulawesi and Kalimantan.

Indonesia is the largest economy in South East Asia. It faces challenges that include poverty, unemployment, infrastructure development, a complex regulatory environment, and unequal resource distribution among its regions.

The energy mix is dominated by fossil fuels (88% of total installed capacity) with the balance of the generating mix made up of hydroelectric plants (8%) and other renewables (3%). Indonesia is one of the top 20 electricity consuming nations in the world.

About 48 million people in Indonesia have no access to electricity; this is particularly notable in rural areas where the electrification rate is only 66% (vs. 94% in urban areas).

Potential energy efficiency savings in Indonesia are estimated to be between USD15 – 43 billion according to the IEA *Market Potential in Energy Efficiency in South East Asia.* However, the energy efficiency market is currently underdeveloped and faces a range of barriers.

Drivers of change

In 2007, the Government of Indonesia issued Law No. 30/2007 stating that national energy management must take energy conservation into account. Subsequent Presidential Regulations mandated a reduction in energy intensity by 1% annually from 2015 – 2025. Government support for EE has, however, declined recently.

International organisations including USAID, ADB, DANIDA, AFD and the Global Green Growth Institute have also been promoting EE in Indonesia in recent years.

Scope of Work

- **Award development and implementation:** integrating the award into the Sustainable Business Awards, Indonesia 2018 and defining the methodology for the award category.
- **Communications:** raising awareness of the new award category among key stakeholders in Indonesia.
- **Articles and videos:** editorial article and short video on efficient clean cooling including distribution/dissemination.
- **Roundtable discussion:** convening key stakeholders from business, government and the NGO community on efficient clean cooling on the day of the awards dinner.
- **Award venue space and logistics.**

Implementing partners

Global Initiatives is the main implementing partner for this project. Global Initiatives will cooperate with K-CEP to deliver the project activities.

Activity

- Questionnaire covering both supply side and demand side for the award category.
- Scoring and evaluation process to determine winners in the category.
- Invitations to roundtable discussions.

Impact

Improved awareness of efficient clean cooling opportunities and action in Indonesia will help make the case for more businesses to invest in EE and government to introduce more ambitious cooling efficiency regulations.

Nationally-Determined Contribution

This project will support Indonesia with its NDC aims. Indonesia's NDC includes an unconditional target of a 26% reduction in GHG emissions by 2030 and a conditional target of a 41% reduction in GHG emissions by 2030 depending on the commitments made by other countries. Indonesia does not identify EE as a specific mitigation pathway in its NDC.

Link with Montreal Protocol

Indonesia has ratified the MP and is currently in the process of ratifying the Kigali Amendment.

Timeframe

8 months in 2018.

Jordan

Assessment of Incremental Capital and Operating Costs for Improved Energy Efficiency in Domestic, Commercial, and Retail Refrigeration

Objective

The objective of this project is to assess the potential incremental capital and operating costs for improved EE retail (central supermarket installation) refrigeration.

Context/background

Jordan is among the highest in the world in terms of national dependency on foreign energy sources, with c.96% of the country's energy needs being met by imported oil and natural gas from neighbouring countries. This reliance exposes Jordan to problems of energy price volatility and supply disruption.

From 2001 to 2011, Jordan has experienced an average growth rate of primary energy demands of 3.9 % per year. The Government has taken other actions to enhance EE without compromising economic growth. The introduction of EES&L for home appliances is one such policy. The government is also slowly raising oil and electricity prices towards market levels, and has exempted certain energy efficient equipment from customs duty.

The household sector is the largest electricity consumer in Jordan, accounting for 41% of total electricity consumption. For Jordan's *National Energy Efficiency Strategy*, four appliances were selected for further analysis and consideration for energy labelling –ACs, freezers, domestic refrigerators and washing machines. Together, they contribute to 73% of total residential sector electricity consumption. Building energy codes have been introduced on a voluntary basis since 2009, and MEPS has been adopted for refrigerators, but not for ACs

Rationale

Better information is needed regarding the costs and benefits of installing more efficient refrigeration systems to help make the case for investment.

The project will examine potential options for energy savings in refrigeration systems, going beyond the technical solutions to CO_2 installations; it will also look at auxiliary energy consuming sources, such as – but not limited to – lighting, fans, etc. Further, options for utilization of waste heat from the CO_2 system for hot water production or heating will be investigated.

Scope of Work

- Examination of refrigeration systems
- Drafting of report on the incremental costs of EE improvements.
- Study on market barriers for potential increase in sales prices for more energy efficient products.
- Dissemination workshop.

Implementing partners

UNIDO is the main implementing partner for this project. UNIDO will seek cooperation with the Norwegian research organisation SINTEF to assist assessing the retail refrigeration sector.

Activity

- An understanding of incremental capital and operating costs for improved EE in the retail refrigeration sector.
- An assessment of the impact of more energy efficient programs for supermarket systems.

- A study on market barriers for potential increase in sales prices for more energy efficient products.
- A methodology for collecting, analysing and calculating incremental costs.
- A workshop for dissemination of results.

Impact

Improved awareness of capital and operating cost of improved EE for the retail refrigeration sector helping make the case for more energy efficient investment.

Nationally-Determined Contribution

This project is well aligned with Jordan's NDC objective to rationalise energy consumption in all sectors and improve their EE by raising awareness of the long-term benefits of EE.

Link with Montreal Protocol

Jordan has ratified the MP and all its amendments except for the Kigali Amendment. K-CEP support complements an on-going project in Jordan on replacing HCFC-22 by trans-critical CO_2 in a centralized supermarket installation. This project is financed by the Climate and Clean Air Coalition (CCAC) in the amount of US$ 550,000.

Timeframe

18 months from 2018-2019.

Kenya

Standards and Labelling Program for Air-Conditioners

Objective

Support the implementation of Kenya's standards and labelling program for ACs.

Background

While demand for cooling is currently low in Kenya, growth is projected for cooling, especially in the Nairobi and Mombasa markets. Kenya is projected to have 1.8m cumulative AC unit sales from 2020-2030. This will place additional load on the grid and require the construction of additional infrastructure. Kenya currently imports all ACs.

Kenya is facing an insufficient supply of electricity, which is hindering the country's economic growth and driving the move to increase efficiency and availability of alternative energy supplies. Approximately 45% of Kenya's population lack access to electricity, with much of the rest of the population experiencing black outs during times of electricity shortage.

Kenya is experiencing rising energy prices, with the average household paying an average of KSh3,400 ($32.9 USD) in March 2017, compared to KSh3,042 ($29.4 USD) in February 2013 for 200 kilowatt hours (kWh) of electricity.

In a drive to improve efficiency and reduce demand on the grid, Kenya is in the process of implementing its first MEPS for appliances, including refrigerators, ballasts, tubular fluorescent lights, motors, and room air conditioners.

Kenya's position as a leader in the East African Community and prominent role in developing East African Standards also presents an opportunity to harmonize regional standards, building on those in Kenya.

Drivers of Change

Projected growth for cooling in Kenya, and specifically the Nairobi and Mombasa markets, is anticipated to place additional load on the grid and require construction of costly infrastructure. By targeting EE policy and program development, Kenya hopes to reduce projected cooling demand, decrease requirements for additional power supply to meet growing demand, and contribute to achieving a 30% reduction in GHG emissions by 2030 to meet its NDC ambition.

Lack of a complete set of market and usage data is currently affecting S&L program design and implementation of ACs, and therefore a market assessment will be undertaken to provide accurate data for policy makers to review and revise MEPS and labels for ACs. Kenya is moving forward with implementing a MEPS and labelling program for ACs, but lacks the product testing laboratory infrastructure and personnel to conduct monitoring, verification and evaluation to ensure the integrity of the program. Key barriers will be addressed by strengthening institutional capacity and undertaking a market readiness assessment for a market transformation program to incentive uptake of efficient ACs.

Scope of Work

- **AC standards and labelling program design and implementation**: Data collection, energy savings analysis, policy analysis, support for the review of AC test methods, and revision of MEPS and labelling.

- **Monitoring, verification and enforcement to improve compliance**: Support the effectiveness of standards and labelling programs and ensure program integrity through a compliance framework.

Implementing partners

CLASP will coordinate activities with K-CEP partners including the IEA (on the K-CEP tracker), the Government of France as MP MLF lead, and with the Ministry of Environment and Natural Resources as host. CLASP also has staff on the ground to support implementation.

Activity

- Comprehensive market assessment report.
- MEPS policy options and impacts assessment report.
- Monitoring, Verification, and Evaluation (MV&E) strategy document and MV&E training.
- Policy and Measures (PAMS) training and a study tour for representatives from Kenya Bureau of Standards (KEBS), the Energy Regulatory Commission (ERC) and the Kenya Industrial Research and Development Institute (KIRDI).
- Assessment of public/private sector readiness for market transformation.

Impact

Up to 0.06 Mt CO_2 emissions saved in 2030 from implementing AC MEPS; compliance rates with MEPS and labelling requirements measured by 2020; significant reduction in power supply investment requirements; quantified savings for ratepayers.

Nationally-Determined Contribution

Kenya's NDC includes a target of a 30% reduction in GHG emissions over BAU by 2030. By reducing the projected cooling demand through policies and programs, Kenya can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and meet its NDC targets under the Paris Agreement.

Link with Montreal Protocol

This project can help align international policy efforts to comply with the Kigali Amendment to the MP and domestic policy efforts to improve MEPS.

Timeframe

2017-2020.

Lebanon

Improving Energy Efficiency and Avoiding HFCs

Developing Cooling Standards to Enable Retirement of Inefficient Equipment

National Efficiency Cooling Plan

Assessment of Incremental Capital and Operating Costs for Improved Energy Efficiency in Domestic, Commercial, and Retail Refrigeration

UNIDO

UNDP

clasp

Objectives

There are four K-CEP funded project activities in Lebanon each with their own objectives:

Project 1: Improving energy efficiency and avoiding HFCs

Development of an incremental training module on energy efficiency linked to, and supporting, Lebanon's on-going and future hydrochlorofluorocarbon (HCFC) Phase-Out Management Plan (HPMP) activities.

Project 2: Developing cooling standards to enable retirement of inefficient equipment

Assist the development of policies, standards and the appropriate regulatory framework to implement minimum energy performance standards and develop a roadmap for accelerating market transformation in the domestic refrigerator and air conditioning (RAC) sectors.

Project 3: National efficiency cooling plan

Fill the gap in energy efficiency expertise needed to assist Lebanon to implement MP projects and management plans taking into consideration energy efficiency aspects and opportunities relating to refrigeration and air conditioning.

Project 4: Incremental costs for energy efficiency in refrigeration

The objective of this project is to assess the potential incremental capital and operating costs for improved energy efficiency in domestic and commercial refrigeration.

Background

Lebanon is a small Mediterranean country in the Middle East with land area of roughly 10,000 square kilometers and a population of about 6.2 million, swelled by more than one million by a recent influx of Syrian refugees. About 88% of the population is urban. The economy is dominated by services with banking and tourism being notable sectors.

Power generation in Lebanon comes from thermal and hydraulic generation domestically and from international imports from Syria, Egypt, and more recently heavy-fuel-powered power ships off the coast. Regional difficulties since 2011 have made international imports volatile and subject to disruption.

These challenges with supply, coupled with minimal new investment, face growing demand. Electrification is 100% and existing demand is added to by the influx of Syrian refugees meaning that Lebanon has regular power blackouts.

Prices from the nationally-owned power utility Electricité du Liban have been frozen for consumers since the 1990s. As costs have steadily increased since this time, government subsidies have ballooned to over USD 2 billion

per year and represented over 14% of the national government's budget in 2013.

The predominant HCFC used in Lebanon is HCFC-22. HCFC consumption in Lebanon increased from 413 metric tons in 2008 to 924 metric tons in 2014, indicating an average annual growth rate of about 15%. The main reason for this growth has been economic development, especially prior to 2011, and the resulting increase in demand for consumer, commercial and industrial products that use HCFCs.

The HPMP for Lebanon is being implemented by the National Ozone Unit with the UNDP and has made steady progress towards achieving the reduction of HCFC consumption from its freeze level of 76.5 Ozone Depleting Potential (ODP) tons to 60.44 ODP tons by the year 2017.

The Ozone Depleting Substances Alternatives Survey (2017) shows that residential, commercial, and mobile air conditioning (AC) equipment are assembled in Lebanon, and there is HFC consumption in this sector apart from HCFCs.

Drivers of Change

Project 1

K-CEP support will build from the experiences and baseline interventions promoted by the MP Multilateral Fund (MLF) by expanding the training activities and improving the national capacities of servicing technicians on energy efficiency approaches.

Project 2

Lebanon is experiencing increasing demand for household refrigerators and residential AC systems. The government is implementing a strategy to replace/avoid high global warming potential (GWP) refrigerants-based equipment. Simultaneously there is an opportunity to develop a comprehensive rebate/replacement/early retirement strategy for inefficient RAC equipment including a roadmap and identified sources of finance for equipment replacement.

Project 3

There are major synergies between energy efficiency and the phase-out of ozone-depleting substances but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of energy efficiency principles within the National Ozone Unit (NOU) and relevant energy efficiency bodies, and build the capacity and knowledge of National Ozone Officers regarding energy efficiency issues and synergies with the MP. The link between MP and energy efficiency plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Project 4

Better information is needed regarding the costs and benefits of installing more efficient refrigeration systems to help make the case for investment.

The project will examine potential options for energy savings in refrigeration systems, going beyond the refrigerating circuit to include e.g. LED lighting. The project will assess capital costs, if modifications are required in production areas, as well as operating costs.

Scope of Work

Project 1

- **Energy efficiency incremental training** primarily focused on energy efficiency analysis and comparisons from the F-Gas baseline online metering tools applied in a demonstration mode to optimize equipment performance and minimize hardware failures.
- **Updates/developments to/of equipment servicing syllabus and training manuals** for educational institutions and established servicing centers.

Project 2

- Feasibility study that will identify market readiness for alternative technology types, supporting partners/stakeholders, and financing options that will allow the introduction of a (pilot) equipment replacement scheme in the domestic sector.
- Development of standards and labelling policy for selected product categories to support future implementation of a large-scale rebate/ replacement program.

Project 3

- **Building capacity of the NOU** primarily focused on energy efficiency through training and guidance delivered by UNDP.
- **Coordination between NOU and energy efficiency bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Project 4

- **Examination of refrigeration systems**
- **Drafting of report on the incremental costs** of energy efficiency improvements.
- **Study on market barriers** for potential increase in sales prices for more energy efficient products.
- **Dissemination workshop.**

Implementing partners

Project 1

The NOU will implement projects activities in the field, collect and organize information generated by the project, and coordinate activities with stakeholders.

The UNDP Country Office in Lebanon will quality assure the project implementation and the project's results.

Project 2

As with Project 1.

Project 3

As with Projects 1 and 2.

Project 4

UNIDO is the main implementing partner for this project. UNIDO will seek cooperation with CLASP to assist assessing the market for domestic and commercial refrigerators.

Activity

Project 1

- Training of five teachers on energy efficiency interventions (train the trainers) for further replication and training of technicians under the HPMP.
- Incorporation of energy efficiency principles into the F-gas syllabus's educational system draft.
- Completion of at least two demonstration projects on energy efficiency applied to natural refrigerant alternatives.

Project 2

- International product definitions, test protocols, rating schemes, performance level definitions, and certification procedures assessed.
- Technical analyses, data sources for use as a baseline in development of standards and labelling policy for the selected product categories completed.
- Support effectively delivered to the government in order to prepare the required standardization mechanisms.

Project 3

- National Ozone Officers' capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on energy efficiency and the F-gas agenda.
- A 'soft plan' or roadmap on cooling energy efficiency is prepared and published.
- Event held to share roadmap.

Project 4

- An understanding of incremental capital and operating costs for improved energy

efficiency in the domestic refrigeration sector.
- An assessment of the impact on the production lines of more energy efficient programs for one manufacturer the domestic refrigeration sector.
- A study on market barriers for potential increase in sales prices for more energy efficient products.
- A methodology for collecting, analysing and calculating incremental costs.
- A workshop for dissemination of results.

Impact

Project 1

- Energy efficiency principles, activities and interventions are incorporated in the draft syllabuses educational system.
- Knowledge on application of energy efficiency principles and interventions is applied in the HPMP.

Project 2

- Decision makers are better informed on efficiency performance levels enabling more effective enforcement of MEPs and a rebate programmes aimed at the most efficient equipment available.
- At least one MEPS for selected products drafted on the basis of market analysis and international benchmarking.

Project 3

Stronger and more effective coordination between MP and energy efficiency activity in Lebanon.

Project 4

Improved awareness of capital and operating cost of improved energy efficiency for the domestic refrigeration sector helping make the case for more energy efficient investment.

Nationally-Determined Contribution

Lebanon's NDC includes an unconditional target to reduce power demand by 3% through energy-efficiency measures in 2030 compared to demand under the Business-As-Usual scenario. This increases further to 10% should further international support be forthcoming. Both energy and industrial processes are included in the sectoral coverage of these targets.

Link with Montreal Protocol

Lebanon has ratified the Montreal Protocol and all its amendments except for the Kigali Amendment which it is currently in the process of ratifying.

Project 1

The project will be implemented in coordination with the NOU and will assist Lebanon in developing policies, standards and the appropriate regulatory framework and to integrate energy efficiency interventions to the current HPMP.

Project 2

The project will be implemented in coordination with the NOU and is a complement to Project 1.

Project 3

Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs

Project 4

K-CEP support complements a planned conversion project from HFC-134a to R-600a (isobutane) at Lematic Industries, Lebanon. The project is planned to be submitted to the Multilateral Fund (MLF) in spring 2018.

Timeframe

From 2017-2019.

Malaysia

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Malaysia to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to refrigeration and air conditioning.

Background

Malaysia is an upper middle-income East Asian country of 31 million people. Though income inequality in Malaysia remains high relative to other East Asian countries it is gradually declining.

82.1% of total installed electricity generation capacity comes from fossil fuels, natural gas, oil and coal are the main fuel sources for power.

The Government of Malaysia enacted the Electricity Supply Act in 1990 to promote the efficient use of electricity, and enacted the Energy Commission Act in 2001, later amended in 2010. This Act had provisions for establishing the Energy Commission with powers to regulate the energy supply activities in Malaysia, and to enforce the energy supply laws. Malaysia has had Electricity Regulations since 1994 which were later amended in 2013 and incorporated MEPS.

Rising living standards, higher incomes, and increased urbanisation are driving a high growth rate in energy demand. Malaysia's hot and humid climate encourages the use of cooling year round. According to the International Energy Agency (IEA), cooling equipment and appliances accounted for around half of electricity demand in buildings in 2013, and this will grow to 57% by 2040.

Malaysia has a large AC manufacturing sector, much of this feeds local demand. The room air conditioners market achieved sales of over 826,000 units in 2013, and the average sales growth in the past 5 years is 4-5% per year. 20% of AC units in Malaysia are manufactured domestically and 45% of the units are imported, most of these coming from China.

With the support of UNEP and ICA, the Malaysian Government is developing national policy roadmaps as part of the ASEAN-SHINE Project to improve EE in the AC sectors.

Drivers of change

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EEPs will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Malaysia.

Nationally-Determined Contribution

This project will help Malaysia to integrate its HPMP with its EE-related NDC plans.

Malaysia intends to reduce its GHG emissions intensity of GDP by 45% by 2030 relative to the emissions intensity of GDP in 2005. By reducing the projected cooling demand through policies and programs, Malaysia can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and meet its NDC targets under the Paris Agreement.

Link with Montreal Protocol

Malaysia has ratified the MP and all its amendments except for the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months from 2017-2019.

Mexico

Pilot Project for the Substitution of Old Domestic / Commercial Refrigeration Appliances to New, Redesigned Energy Efficiency Products

Promoting Efficiency and Alternative Refrigerant Leapfrogging (PEARL)

Boosting Energy Efficiency During HFC Phase-Out in the DRM Sector in Mexico and Promotion of Installation of New Efficient Technologies

Objective

There are three K-CEP funded project activities in Mexico each with their own objectives:

Project 1: Pilot project for the substitution of old domestic/commercial refrigeration appliances to new, redesigned energy efficient products

This project will target the introduction of sustainable solutions for the replacement of inefficient appliances**.**

Project 2: Promoting Efficiency and Alternate Refrigerant Leapfrogging (PEARL)

This project will seek to promote the introduction of more efficient equipment into Mexico in conjunction with the phase-down to lower GWP refrigerants.

Project 3: Boosting EE during HFC phase-out in the DRM sector in Mexico and promotion of installation of new efficient technologies.

The proposed project will allow MABE to undertake incremental applied research and design and parts optimization to achieve around 25% EE improvements for final products, following the HFC-134a refrigerant conversion to HFC-600a (baseline project to be funded by the MP MLF).

Background

Mexico is a large North American country with land area of nearly two million square kilometers and a population of about 125 million. About 80% of the population is urban-dwelling. The economy has a large manufacturing sector (over 30% of GDP) that has grown strongly since the establishment of the North America Free Trade Agreement (NAFTA) in 1994. Mexico is also an oil producer.

About 26% of power generation in Mexico comes from renewable sources with the rest from fossil fuels and a small (2%) nuclear share. Population and economic growth is placing pressure on the capacity of power generation to meet demand. Mexico has accordingly defined EE as a priority in its National Energy Strategy. Cooling efficiency will be a key component of this as the population continues to urbanise.

For over 20 years, the DRM sector in Mexico has been one of the largest users of HFC-134a refrigerant in the country. The domestic refrigeration sector has traditionally been a net exporter of appliances as Mexico exports around 60% of its total domestic refrigerator production mainly to the U.S. and the Latin America region.

Drivers of change

Project 1

The conversion and the redesign of appliances alone is not enough to deliver efficiency savings results. The promotion of an early retirement program of refrigerators on a large scale, substituting old appliances with new efficient refrigerators will make a real impact on energy consumption. This program needs a

well-organized collection and safe disposal system for inefficient appliances to ensure they are removed from circulation.

Project 2

Four key factors support a strong move toward aggressive mini-split AC standards in Mexico in the near term. First, a revision of this standard is already on the schedule in 2018, which provides the platform and process for increasing the level of EE for this product. Second, the leadership at the National Commission for the Efficient Use of Energy (CONUEE) is deeply committed to working to ensure increased EE improvements. Third, Mexico's Energy Transition Law and its NDC commitments reinforce ambition in EE. Finally, synchronization of EE improvement with refrigerant transition may offer cost reduction opportunities to manufacturers.

Project 3

This project will build on the baseline MP MLF project and provide the incremental support to MABE to improve equipment design - and its parts – in order to optimize the energy consumption of these products, allowing the industrial reconversion (that shall use MLF and MABE`s funding) to take place in an optimized manner to achieve higher EE targets for the whole refrigerator.

Scope of Work

Project 1

- National survey and data analysis.
- Awareness raising event and stakeholder workshop and selection of a pilot center(s).
- Financial modality for the replacement scheme designed.
- Implementation of a scrappage program in the pilot center(s).
- Organization of regional dissemination programs.
- Commencement of larger scale replacement program through government support.

Project 2

- **MEPS revision for mini-split ACs**: AC market and cost-benefit analysis, manufacturer impact analysis. Data collection and analysis of availability, source and uptake rates of fixed-speed mini-split ACs. Assessment of feasibility of MEPS target. Publish draft and final Norma Oficial Mexicana (NOM).
- **Non-Regulatory Programs**: Disseminate non-regulatory program options menu in workshop forum. Distribute technical specifications to stakeholders. Submit pilot project proposal to implementing institution.
- **Support for Program Implementation, Monitoring, and Enforcement**: Submit market baseline measurement I to NOM working group. Submit enforcement monitoring plan to CONUEE. Submit market baseline measurement II to NOM working group.
- **MEPS for Commercial Buildings AC**: Develop commercial buildings AC MEPS market analysis and scheduling – Preliminary analysis to determine feasibility and impact of setting a new MEPS for Commercial Unitary AC. Submit cost-benefit analysis and manufacturer impacts analysis to NOM working group. Release draft and final AC NOM for commercial AC.

Project 3

- **Technical advice on the redesign of** compressors and parts.
- **Awareness campaign on the** use of efficient domestic appliance implemented.

Implementing partners

Project 1: UNIDO is the implementing partner.

Project 2: Lawrence Berkeley National Laboratory is the implementing partner for this project.

Project 3: UNDP is the main implementing partner for this project. MABE s.a. de c.v. (Mexico) will be a partner executing agency.

Activity

Project 1

- Reporting on key results, including increased market penetration of efficient appliances, funding leveraged, and other relevant information.
- Final report including lessons learnt.

Project 2

- AC market analysis.
- AC cost-benefit analysis and manufacturer impacts analysis.
- Draft and final NOMs for ACs.
- Non-regulatory program options workshop.
- Technical specifications for AC efficiency.
- Pilot project proposal.
- Enforcement monitoring plan.

Project 3

- Redesign of appliances, compressors and parts redesigned.
- Efficiency of appliances improved by 25%.
- An awareness campaign on the use of efficient domestic appliances.

Impact

Project 1

Substitution of about 8,000 old domestic and commercial self-contained refrigerators with new efficient ones (rated above the MEPS for Mexican refrigerators).

Project 2

Market-weighted efficiency for fixed-speed mini-split ACs is estimated at 2.85 EE Ratio (EER) — 11% below the Chinese minimum standard for fixed speed mini-split AC of 3.2 EER. Increasing the EE of mini-split ACs in Mexico could save ~120 million tons of CO_2 between 2020 and 2030.

Project 3

257 metric tons of CO_2-eq emissions directly reduced/eliminated (as result of baseline project).

Nationally-Determined Contribution

Mexico's NDC includes an unconditional target for reducing its greenhouse gas emissions by 25% relative to BAU by 2030. However, this target does not single out EE (or any other specific action) as a mitigation pathway.

Link with Montreal Protocol

Mexico has ratified the MP and all its amendments except for the Kigali Amendment which it is currently in the process of ratifying.

Project 1

There has been some experience in the replacement of old and inefficient appliances in the residential sector in Mexico as part of changing the refrigerants used. Altogether over 1.8 million units of inefficient domestic refrigerators, and to a lesser extent AC units, were replaced. The new phase-out prompted by the Kigali Amendment gives the opportunity to also bring in more efficient appliances.

Project 2

The timing of the upcoming efficiency standard for mini-split ACs is an opportunity to link this efficiency improvement with the transition to low-GWP refrigerants and to disseminate the technical aspects of the efficiency transition to the NOU and implementing agency through Mexican partners close to the MP process.

Project 3

This project proposal is directly linked to the HFC-134a conversion project, being prepared by UNDP, and expected to be submitted for the 80th ExCom Meeting consideration. The mentioned conversion project will promote the investment activities at the MABE plant in Mexico that will reconvert the DRM production lines from the HFC-134a to the HC-600a as refrigerant.

Timeframe

30 months from 2017-2019.

Morocco

Assessment of Incremental Capital and Operating Costs for Improved Energy Efficiency in Domestic, Commercial, and Retail Refrigeration

Objective

The objective of this project is to assess the potential incremental capital and operating costs for improved EE in domestic refrigeration.

Background

In recent years, the Moroccan energy market has been growing at a rapid pace and increasingly opening up to domestic and foreign private investment. It has transformed from a country that was previously almost entirely reliant on imported fossil fuels for energy, to a country that is positioned to become a major energy producer as it recognizes and enacts upon its massive potential for wind and solar generation. Host of COP22, and home to the world's largest concentrated solar power plant, Morocco is already on track to exceed its renewables target of 2020. However, it is also making significant progress in EE.

In 2010, the National Renewable Energy and Energy Efficiency Development Agency was created (later renamed the **Moroccan Energy Efficiency Agency**, giving up its purview on renewable energy to the Moroccan Agency for Sustainable Energy). The **National Energy Efficiency Strategy** establishes an ambitious goal of achieving efficiency improvement of 20% by 2030 compared to BAU, and includes specific action plans for several sectors, including buildings, industry and public lighting. **Act 47-09** in 2011 introduces energy performance ratings for buildings, equipment and certain appliances.

In the period 2000–13, c.1.4m units of ACs were installed in Morocco, and 50% of its households is projected to be equipped with AC by 2030. Currently, the market is supplied mostly by imports of finished products and predominantly by Chinese factories. Future demand, especially centralized AC could be augmented by growth in the tourism sector.

Drivers of change

Better information is needed regarding the costs and benefits of installing more efficient refrigeration systems to help make the case for investment.

The project will examine potential options for energy savings in refrigeration systems, going beyond the refrigerating circuit to include e.g. LED lighting. The project will assess capital costs, if modifications are required in production areas, as well as operating costs.

Scope of Work

- **Examination of refrigeration systems**
- **Drafting of report on the incremental costs** of EE improvements.
- **Study on market barriers** for potential increase in sales prices for more energy efficient products.
- **Dissemination workshop.**

Implementing partners

UNIDO is the main implementing partner for this project. UNIDO will seek cooperation with CLASP to assist assessing the market for domestic and commercial refrigerators.

Activity

- An understanding of incremental capital and operating costs for improved EE in the domestic refrigeration sectors.

- An assessment of the impact on the production lines of more energy efficient programs for one manufacturer in the domestic refrigeration sector.
- A study on market barriers for potential increase in sales prices for more energy efficient products.
- A methodology for collecting, analysing and calculating incremental costs.
- A workshop for dissemination of results.

Impact

Improved awareness of capital and operating cost of improved EE for the domestic refrigeration sector helping make the case for more energy efficient investment.

Nationally-Determined Contribution

Morocco's NDC includes targets for energy savings in both the residential and services sectors.

Link with Montreal Protocol

Morocco has ratified the MP and all its amendments except for/including the Kigali Amendment. K-CEP support complements a planned conversion project from HFC-134a to R-600a (isobutane) at Manar, Morocco. The project is planned to be submitted to the MLF in spring 2018.

Timeframe

18 months from 2017-2019.

Nigeria

Integrating Energy Efficiency into the Room Air-Conditioners Servicing Sector

Transforming the Market of Inefficient Room Air Conditioning Equipment

National Efficiency Cooling Plan

Objective

There are three K-CEP funded projects in Nigeria, each with their own objectives:

Project 1: Integrating EE into the Room AC servicing sector

This project aims to support the integration of EE into the room AC sector. It will support the Government of Nigeria to incorporate EEPs into their official HCFC and HFC management plans. This project will complement the ongoing HPMPs by extending its reach on EE.

Project 2: Transforming the market of inefficient RAC equipment

This project will support the Government of Nigeria to increase the market penetration of efficient technology. It will reinforce the existing MEPS frameworks and address key barriers to implementation. The project will apply current MEPS and labelling project frameworks for the domestic refrigeration sub-sector.

Project 3: National efficiency cooling plan

This project aims to fill the gap in EE expertise needed to assist Nigeria to implement MP projects and management plans, taking into consideration EE aspects and opportunities relating to RAC.

Background

The Nigerian National Renewable Energy and Energy Efficiency Policy (NREEEP) identified the potential for energy savings in the Nigerian economy to be large, particularly in the three main energy demand sectors: household, industry and transportation. It found that in the household sector there is considerable energy loss due to inefficient household appliances, in particular for lighting and refrigeration.

Nigeria is in the process of implementing a HPMP. Stage 1 of the HPMP has already been implemented and aimed to reduce HCFC consumption in Nigeria to a sustained level of 90% of the baseline. Nigeria is currently preparing Stage 2 of its HPMP that will address the room AC sector in order to deliver the further reduction schedule under the MP. A stakeholder workshop in October 2016 identified a need for:

- Policies that favour ozone-friendly alternatives and Hydrocarbons (HCs).
- Training and certification of technicians on safe handling of HCs.
- Encouragement of financial institutions to complement current efforts in the implementation of the HPMP.
- More demonstration projects on ozone friendly alternatives and their increased availability.
- A replacement programme to exchange HCFCS with ozone-friendly products at an affordable rate.

The Government of Nigeria has set out a number of policies and strategies to promote EE, and the NREEEP mandated that, within 12 months of its publication, Nigeria would have established a NEEAP.

Drivers of change

Project 1:

This project aims to address the need for improved service practices through training, enhanced curricula and new codes of practice.

This will drive improved operational and maintenance procedures and consequently reduce leakage and improve performance.

It will integrate servicing sector activities promoted and funded under the HPMP into a higher level by promoting energy conservation and EE practices.

Project 2:

This project aims to address the lack of financial incentives to promote a large-scale rebate / replacement / early retirement programme for inefficient room AC equipment, and the low awareness of EE.

K-CEP funds will reinforce the MEPS framework to address the barriers on adoption of highly efficient domestic refrigeration units, and will serve as a basis to enable a market transformation intervention by driving consumer's choices on the long-term savings that energy efficient equipment can provide.

Project 3:

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

Project 1:

- **Implement demonstration interventions** to promote increased EE while adopting HCs, HFOs, CO_2 and Ammonia, with fully optimised systems equipped with energy metering and performance monitoring equipment before and after the project interventions focusing on at least one AC installation and one supermarket.
- **Publish results of case studies and technical information** on EE interventions undertaken in selected room AC applications.
- **Develop RAC training syllabi** to include EE, performance monitoring and benchmarking.

Project 2:

- **Scoping:** Undertake an initial survey in order to better outline the links or overlap between the existing EE plan and the cooling plan. This will define the terms of use for the second tranche of project funding for the rebate programme.
- **Enable an environment that encourages the phase-in of highly efficient domestic refrigerators:** This includes assessment of international definitions, test protocols, etc., the conduction of technical analysis, collection of market data, enforcement of MEPS, development of monitoring, validation and enforcement processes, and the training of staff.

Project 3:

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

UNDP is the implementing agency and will work closely with the NOU to implement the project activities in the field to collect and organize information generated by the project, coordinate activities with stakeholders, and carry out awareness-raising for the project's implementation. The UNDP via its MP Unit or

its country offices will guide and quality assure the project implementation.

Activity

Project 1:

- Room AC installations with full energy metering and performance demonstrated;
- Revised industry training syllabi including energy-efficient design and operation of room AC systems;
- Trained 100 servicing personnel on best practices to reduce energy consumption of serviced equipment, leading to eventual energy use reduction.

Project 2:

- National conditions enabled that will allow that a domestic refrigerator "Swap out" programme is developed, reducing an estimated amount of 11mt of CO_2-eq direct emissions. The swap-out programme will ensure poor-efficiency appliances are replaced by new appliances which exceed the level of the MEPS.
- Import of used domestic refrigerators banned (or a scheduled ban prepared).

Project 3:

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Project 1:

- EE interventions in selected room AC applications expanded at servicing companies and technician levels.
- Capacity built in formal training institutions with incremental interventions on EE applied in the servicing of room AC equipment.

Project 2:

- National domestic refrigerator "swap out" programme enabled to reduce an estimated amount of 11Mt of CO_2-eq direct emissions launched.
- Ban on selected second-hand room AC equipment which establishes the ground to improved overall sector EE.

Project 3:

- Stronger and more effective coordination between MP and EE activity in Nigeria.

Nationally-Determined Contribution

These projects will help Nigeria to integrate its HPMPs with its EE-related NDC plans. Nigeria's NDC has a target to reduce GHG emissions by 45% by 2030 against a BAU baseline. Its NDC also includes target to improve EE by 2% per year and refers to considering standards for imported equipment, in particular in the field of RAC where there is a risk of dumping HCFC and HFC installations that are being phased out in OEDC countries.

Link with Montreal Protocol

Nigeria has ratified the MP and all its amendments, except for the Kigali Amendment that is currently in the process of being ratified. K-CEP support will help incorporate EE considerations into MP activity. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs

Timeframe

Project 1 and 2 have a 24 month duration. Project 3 has an 18 month duration.

Palau

Supporting Policy and Financing Mechanisms for Energy-Efficient and Climate Friendly-Cooling in the Pacific

Objective

The objective of this program is to provide technical support to energy officials, financial institutions (FIs), and the tourism sector to build understanding of the benefits of cooling efficiency and to help identify funding options for investing in high-efficiency, climate-friendly AC. This will support the development and implementation of MEPS and labelling for climate-friendly ACs under the Pacific Appliance Labelling and Standards (PALS) project and build EE capacity within the NOU.

Background

Palau's economy is dominated by tourism, fishing, and subsistence agriculture. Much of the workforce is employed by the government, which relies on financial assistance from the U.S., paid for unrestricted strategic access to its land and waterways. The per capita income of the country is roughly double that of the Philippines.

The electrification rate of Palau is relatively high at around 95%. Between 2005 and 2030, demand for electricity in the Pacific is expected to grow 7% annual, ahead of expected electricity generation increases of 6.4% per year. Refined petroleum fuels are expected to continue to dominate the energy mix, and countries like Palau are likely to remain dependent on such expensive imported fossil fuels for some time, and thus vulnerable to global oil price fluctuations directly impacting the cost of electricity. Power generation on the island is quite reliable, with few outages.

Electricity tariffs in Palau are expensive, averaging around 22 US cents/Kwh. Energy costs can represent around 40 – 50% of the overall operating costs in hotels, with AC as the major contributor to commercial sector electricity consumption.

Palau initiated EE efforts to reduce governmental energy use through its Energy Conservation Strategy in 2007. A year later, it adopted a 15-point Energy Efficiency Action Plan (EEAP).

In 2016, the cooling sector was responsible for 0.0117 Mt CO_2 eq of emissions. Low efficiency AC units tend to have a high penetration, mostly in commercial buildings that include hotels. Adoption of higher efficiency units would result in significant reducing energy consumption.

Drivers of Change

There is high penetration of low efficiency window and split-type ACs primarily in commercial buildings (including hotels) and some households in the Pacific. Promoting the sales of high efficiency and climate-friendly inverter-type ACs would result in reducing energy consumption in AC by around 15% to 20% on average.

The proposed project will provide technical assistance in the design and implementation of appropriate financing mechanisms to facilitate the market transformation to high-efficiency and climate-friendly inverter-type ACs in the commercial sector with focus on the hotel sector.

Appropriate financing mechanisms will be developed in collaboration with FIs and electric utilities to support AC suppliers and commercial customers for adoption of high-efficiency and climate-friendly ACs.

Scope of Work

- Assessment of ACs in the current market and stakeholder consultation.
- Development of financial mechanisms to accelerate market adoption and large scale implementation.
- Technical and financial evaluation of the pilot phase.
- Coordination with the PALS program to promote MEPS and labelling for ACs.
- This work will be expanded or replicated in the region.

Implementing partners

The International Institute for Energy Conservation (IIEC) is the implementing partner for this project.

Activity

- AC market assessment.
- Stakeholder consultation workshops and meetings.
- EE financing assessment.
- Design and pilot of financial mechanisms.
- Identification of funding sources.
- Local approval of financial mechanism.
- Technical and financial impact evaluation.

Impact

The strong projected demand for ACs in the tourism sector will be directed towards higher-efficiency AC products.

Nationally-Determined Contribution

Palau's NDC includes several specific EE actions relevant to the cooling sector, including: Increasing its energy retrofit program, adopting the Energy Star appliance standard, implementing an energy labelling scheme, and expanding its Cool Roof Program.

Link with Montreal Protocol

Palau has ratified the MP and all its amendments including the Kigali Amendment. This project will develop financial mechanisms for improved energy efficiency and has an opportunity to simultaneously incentivize lower GWP solutions, so as to accelerate progress in compliance with the Kigali Amendment.

Timeframe

24 months from 2018 to 2019.

Panama

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Panama to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

A democracy since 1989, Panama's economy has been growing rapidly in recent times – 38% over the last five years. It is dominated by a services sector underpinned by the Panama Canal that acts as the major maritime thoroughfare from the Atlantic to the Pacific Oceans.

Hydroelectricity accounted for over half of the energy generated in the country in 2016. Panama has no fossil fuel reserves but relies on imports for 32% of energy generation. Wind and solar power cover 6%.

Energy demand has increased rapidly recently: national consumption of petrol and its derivatives increased at an average annual rate of 11.7% between 2010 and 2014; electricity consumption increased at an average annual rate of 5.8% over the same period.

EE is a central pillar of Panama's National Energy Plan 2015 – 2050. The government has had success with light bulb replacement in the past and implements efficiency standards for consumer appliances including RACs, with certain products receiving up to 50% import duty tax exemption.

Drivers of change

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and

environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.

- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Panama.

Nationally-Determined Contribution

This project will help Panama to integrate its HPMP with its EE-related NDC plans.

EE is mentioned as part of the government's strategy in Panama's NDC.

Link with Montreal Protocol

Panama has ratified the MP and all its amendments except for the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months from 2017-2019.

Philippines

Supporting Market Transformation to Higher Energy-Efficient, Lower GWP Refrigerant Room Air Conditioning Through Manufacturing Readiness

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Objective

The overall objective is to support country readiness for longer-term transformation of the market towards lower GWP, higher EE RAC products, by:

- Creating an enabling environment for the supply and demand of high EE RAC with lower GWP refrigerants
- Strengthening the local RAC industry by improving its technical capacity, thereby increasing the confidence of government regulatory bodies to raise MEPS
- Catalyze a cost-efficient market shift to more efficient ACs.

Background

According to World Bank estimates, the Philippines had the second fastest growing economy in the ASEAN region behind Laos at 6.9%. The economy has averaged growth of 6.1% annually from 2011 to 2016. Challenges to achieving more inclusive growth, however remain.

Current electrification rates are at 88%, but the government has stressed it is targeting 100% electrification by 2022. Currently the Philippines relies heavily on coal and diesel for energy production. 67.5% of total installed capacity (2016 est.) comes from fossil fuels. Large geothermal resources are being developed, but for now, the Philippines is a net importer of energy.

The Philippines has one of the highest electricity prices in Southeast Asia, on par with Singapore due to a lack of government subsidies. Adding to the costs for households, extreme weather events such as tropical cyclones increase energy prices - the country has on average 20 typhoons per year. Households opt for the most convenient energy sources to power cooling appliances.

The growth in the sales of ACs has risen around 3-6% per year in the 2010s. In 2016, the sales of ACs in the Philippines reached over more than 800,000 units. In the past 5 years, there has been little change in the efficiency of the AC units available on the market. Room AC penetration in the Philippines is still relatively low at around 20%. This is expected to grow rapidly however, similar to other countries in the region. 70% of units are imported from China, Malaysia, Taiwan, and Japan.

Drivers of Change

The cooling and food cold chain industries are of strategic importance to the Philippines countries as its economy depends heavily on agriculture, food processing, and tourism.

The success of EE programs and activities such as MEPS and labeling schemes is thus far largely attributed to the ability of governments to secure industry buy-in. However, the incremental gains in energy improvement become smaller and smaller for the same amount of investment costs in mechanical design when dealing with one technology.

Local companies are interested in the electronic control (inverter) technology driven by bottom-line benefits but also policy and market pressures to improve energy performance. Although now no longer unsurmountable, barriers for local manufacturers to adopt the technology persist

including cost and the lack of know-how to match electronic and electrical components.

Scope of Work

- **Strategy support activities** including market assessment, regional workshop, and preparation of cooling plans.
- **Technical support to Room AC manufacturers**.
- **Policy support** through field assessments of inverter room ACs and review of MEPS/labelling schemes.

Implementing partners

The World Bank is the main implementing partner for this project but will partner with CLASP for the regional workshops.

Activity

- Room air conditioning market assessment and policy/regulatory framework analysis.
- Regional workshops.
- Options to accelerate EE improvements for room AC identified.
- Key stakeholders from the government and the room AC industry trained.
- Reports of field tests on energy performance assessment of inverter room ACs.
- Plans prepared for the revision of MEPS/ energy rating labelling schemes for room AC.
- Energy efficient cooling management plan.
- Government's agreement to implement the targets contained in plans.

Impact

Cumulative electricity savings of 13,655 GWh and cumulative CO_2 emissions savings of 9.15 $MtCO_2$ from 2020-2027.

Nationally-Determined Contribution

The Philippines NDC has a conditional GHG emissions target of 70% below BAU level by 2013. By reducing the projected cooling demand through policies and programs, Kenya can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and meet its nationally determined NDC targets under the Paris Agreement.

Link with Montreal Protocol

The Philippines has ratified the MP and all its amendments except for the Kigali Amendment. Upgrades to more energy efficient room AC equipment will be linked to introducing new replacement refrigerant (lower GWP HFCs).

Timeframe

24 months from 2018 to 2019.

Rwanda

Energy-Efficient and Climate-Friendly Cooling

UN environment
United Nations Environment Programme

Objective

Transition the market for RAC in Rwanda toward energy-efficient and climate-friendly products that save consumers and businesses money on utility bills, reduce electricity waste, enable greater comfort and productivity for building occupants, advance economic development priorities for governments, and mitigate pollution and GHG impacts on the planet.

Background

The number of refrigerators in Rwanda is expected to increase from approximately 100,000 in 2015 to over one million in 2030, which will lead to a significant increase in Rwanda's GHG emissions. Room ACs are similarly expected to grow, from 12,000 to over 180,000 by 2030.

Drivers of Change

Given the projected growth in the number of RACs in Rwanda, there is a need to transition the national market for RACs towards energy efficient and climate-friendly products.

Scope of Work

- **Market assessment:** of residential and commercial RACs.
- **National strategy**: Drafted for transitioning to energy-efficient and climate-friendly cooling products.
- **MEPS**: drafted MEPS on residential RACs for adoption by national government.
- **Labelling scheme** recommended for cooling products based on assessment of local needs, infrastructure, and international best practices.
- **National product registration system** piloted to help officials monitor the market for cooling products and inform future policies.
- **Financial mechanism** piloted to help buyers overcome cost and perceived risk barriers to purchasing energy-efficient and climate-friendly cooling products.
- **Capacity building** for officials and practitioners on verifying product performance and enforcing MEPS and labelling requirements.
- **Awareness campaign** with a focus on engaging Rwandan stakeholders and globally promoting the country's cooling activities.

Implementing partners

- UN Environment leads the project, managed by EE and OzonAction experts in Paris and Nairobi.
- Rwandan Energy, Ozone and other officials will offer strategic guidance, feedback on draft content, help convene meetings and champion the project with key stakeholders from the private sector and civil society.
- Lawrence Berkeley National Laboratory (LBNL) will act as technical advisor on cooling strategy and policies.
- Basel Agency for Sustainable Energy (BASE) will serve as a technical advisor for the financial mechanism.
- There may be additional potential collaborators: East African Centre for Renewable Energy and Energy Efficiency (EACREEE), African Development Bank, and / or others.

Activity

- Drafted national strategy for transitioning to energy-efficient and climate-friendly cooling products. Official endorsement will be sought.

- Drafted MEPS for Rwanda on residential RACs for adoption by national government.
- National product registration system piloted for cooling products.
- Financial mechanism developed to help buyers overcome barriers.
- Awareness campaign implemented.

Impact

This project aims to save consumers and businesses money on utility bills, reduce electricity wasted, enable greater comfort and productivity for building occupants, advance economic development priorities for the government, mitigate pollution and reduce GHG emissions. The Kigali Progress Tracker project will help to quantify some of these impacts during the project.

Nationally-Determined Contribution

EE measures in Rwanda's NDC focus on the promotion of more efficient lighting.

Link with Montreal Protocol

Rwanda has ratified the MP and all its amendments including the Kigali Amendment.

Timeframe

2018-2019.

South Africa

Technical Assistance on Air Conditioner Energy Efficiency Opportunities in South Africa

Objective

Build local capacity in EE program development and contribute to a market assessment of AC appliances in South Africa.

Background

South Africa is a middle income emerging economy with well-developed financial, communications and legal sectors and a stock exchange that is Africa's largest and among the top 20 in the world.

Economic growth has decelerated in recent years (estimated 0.7% in 2017) and unemployment, poverty, and inequality are among the highest in the world. Electricity access rates are high (85%) but electricity supplies are variable. Around 87% of total electricity generating capacity comes from fossil fuel with the balance made up of nuclear (4%), hydroelectric plants (1.4%) and other renewables (7%).

The South African government, through the Department of Energy (DoE) in collaboration with the Department of Trade and Industry (DTI) and the UNDP, is implementing a market transformation project in South Africa, with support from the Global Environment Facility. The aim is to remove inefficient appliances from the South African market and encourage the adoption of efficient measures and interventions – for example MEPS, appliance labelling, and incentive programs.

The project steering committee is exploring options to improve the AC market in South Africa. It will commission a market assessment for local consultants to deliver. Local capacity is limited as the country only implemented its first standards and labelling program in 2015.

Drivers of Change

Market studies will help to identify appropriate efficiency levels and gain stakeholder buy-in for standard setting. The proposed study will identify market trends and international norms, particularly for South Africa's major trade partners.

Lawrence Berkeley National Laboratory (LBNL) is experienced in this area and will help build local capacity for this study. A second study phase may be needed to demonstrate cost effectiveness to consumers.

Scope of Work

LBNL will assist local consultants in two areas:

- **Assess AC market conditions:** this will look at product categories, trade, usage patterns, fixed-speed versus variable speed appliances, baseline market share, typical costs, stock of AC installed, used AC market, refrigerant types, and policies and objectives for phasing out CFCs.
- **International experience on EE AC program implementation:** LBNL will compare South Africa's current MEPS with South Africa's main trade partners and explain international trends including Seasonal EE Ratings for better accounting of part load savings.

Implementing partners

LBNL will collaborate with UNDP, the DoE, and DTI.

Activity

- Input on local consultants' scope of work.
- A slide-deck on international best practice for DoE and UNDP (Webinar).

Impact

The project aims to remove inefficient appliances from the South African market and

encourage adoption of efficient technologies to reduce power consumption and GHG emissions.

Nationally-Determined Contribution

South Africa's NDC aims to reduce GHG emissions against BAU by 14% by 2030. Energy efficient equipment has been identified as a technology area that could help South Africa further reduce its emissions.

Link with Montreal Protocol

South Africa has ratified the MP and is currently in the process of ratifying the Kigali Amendment. This project can help align international policy efforts to comply with the Kigali Amendment to the MP and domestic policy efforts to improve minimum energy performance standards.

Timeframe

6 months in 2018.

Sri Lanka

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Sri Lanka to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

A lower middle-income country, Sri Lanka has experienced robust growth since the end of its civil war in 2009, growing on average at around 6% annually. Although there have been some recent changes at a ministerial level, the government remains relatively stable. Currently, the government is attempting to sustain growth and promote macroeconomic stability under an IMF programme.

The economy has been transitioning away from a largely agrarian-focused economy to one oriented more towards manufacturing and services. The government is pursuing aggressive medium-term reforms, increasing public and private investments, particularly in infrastructure, and improving competitiveness.

Electrification rates for the country were at 98% in 2016, with only a few remote areas still off the grid. The ADB is supporting the government's pursuit of 100% electrification.

The country is also pursuing an aggressive goal of reaching 60% renewables by 2020, an increase of 20% on current levels. However, with energy demand increasing (it is expected to increase by 36% between 2015 and 2020), the reliance on fossil fuels to meet this demand is also rising. Electricity prices for Sri Lankans are relatively low (around US$0.03/kWh).

One of the key contributors for the economic growth in Sri Lanka is the tourism sector. The Central Bank of Sri Lanka, estimated that tourism and travel contributed 10.6% to the overall GDP in 2015, which in turn is also the major contributor of GHG emissions. Cooling in hotels often accounts for more than 50% of electricity consumption, and the Green Cooling Initiative estimates the RAC sector accounts for approximately 4.79 $MtCO_2eq$ (2014), or 15%, of national GHG emissions.

Drivers of change

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Sri Lanka.

Nationally-Determined Contribution

This project will help Sri Lanka to integrate its HPMP with its EE-related NDC plans.

Sri Lanka's NDC sets a reduction in GHG emissions target against the BAU case of 7% unconditionally and 16% conditionally by 2030. By reducing the projected cooling demand through policies and programs, Sri Lanka can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and meet NDC targets under the Paris Agreement.

Link with Montreal Protocol

Sri Lanka has ratified the MP and all its amendments except for the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months from 2017-2019.

Thailand

Supporting Market Transformation to Higher Energy-Efficient, Lower GWP Refrigerant Room Air Conditioning Through Manufacturing Readiness

THE WORLD BANK
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Objective

The overall objective is to support country readiness for longer-term transformation of the market towards lower GWP, high EE room AC products, by:

- Creating an enabling environment for the supply and demand of high energy efficient room AC with lower GWP refrigerants
- Strengthening the local room AC industry by improving its technical capacity, thereby increasing the confidence of government regulatory bodies to raise MEPS
- Catalyze a cost-efficient market shift to more efficient ACs.

Background

Thailand has sustained strong growth over the last few decades, moving from a low income to an upper middle income country during this time. Growth has slowed in recent years due in part to political instability in the country, and is projected to reach 3.6% in 2018.

Thailand's continued economic growth has seen significant increases in energy demand. The country is heavily reliant on imports of fossil fuels to meet its energy needs, and coupled with energy price volatility, this is a significant concern for energy security. There have been increased efforts to diversify the energy mix and maximise domestic energy resources, especially renewables.

The buildings sector is one of the largest sources of energy demand in Thailand, and of this, demand, much of this is for cooling. The IEA projects the growth in demand for energy in the buildings sector of 75% from 2016 to 2036. It is expected that almost all of this demand for cooling will be met by traditional ACs, which, though there have been increases in their efficiency, much needs to be done in terms of improving technologies and approaches.

Thailand is the second largest producer of room ACs in the ASEAN region. 17 million units are produced annually, with 10% sold domestically. The level of penetration of these units is around 60-70% and as incomes rise, this rate is also expected to grow.

In the room AC market, MEPS, energy efficiency resource standards (EERS), and energy management systems in buildings and industry have been set.

Drivers of Change

The cooling and food cold chain industries are of strategic importance to Thailand countries as its economy depends heavily on agriculture, food processing, and tourism.

The success of EE programs and activities such as MEPS and labelling schemes is thus far largely attributed to the ability of governments to secure industry buy-in. However, the incremental gains in energy improvement become smaller and smaller for the same amount of investment costs in mechanical design when dealing with one technology.

Local companies are interested in the electronic control (inverter) technology driven by bottom-line benefits but also policy and market pressures to improve energy performance. Although now no longer unsurmountable, barriers for local manufacturers to adopt the technology persist

including cost and the lack of know-how to match electronic and electrical components.

Scope of Work

- **Strategy support activities** including market assessment, regional workshop, and preparation of cooling plans.
- **Technical support to room AC manufacturers**.
- **Policy support** through field assessments of inverter room ACs and review of MEPS/labelling schemes.

Implementing partners

The World Bank is the main implementing partner for this project but will partner with CLASP for the regional workshops.

Activity

- Room AC market assessment and policy/regulatory framework analysis.
- Regional workshops.
- Options to accelerate EE improvements for room AC identified.
- Key stakeholders from the government and the room AC industry trained.
- Reports of field tests on energy performance assessment of inverter room ACs.
- Plans prepared for the revision of MEPS/ energy rating labelling schemes for room AC.
- Energy efficient cooling management plan.
- Government's agreement to implement the targets contained in plans.

Impact

Cumulative electricity savings of 29,970 GWh and cumulative CO_2 emissions savings of 17.67 $MtCO_2$ from 2020-2027.

Nationally-Determined Contribution

Thailand's Climate Change Master Plan and NDC aims to reduce GHG emissions by 20-25% from projected BAU levels by 2030. By reducing the projected cooling demand through policies and programs, Thailand can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and meet its NDC targets under the Paris Agreement.

Link with Montreal Protocol

Thailand has ratified the MP and all its amendments except for the Kigali Amendment. Upgrades to more energy efficient room AC equipment will be linked to introducing new replacement refrigerant (lower GWP HFCs).

Timeframe

24 months from 2018 to 2019.

Trinidad and Tobago

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Trinidad and Tobago to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

Trinidad and Tobago is the most prosperous country in the Caribbean – and the third richest, by per capita GDP, to the U.S. and Canada across all the Americas. The most significant factor is its oil and natural gas industry, which dominates its economy and accounts for 83% of exports.

These fossil fuels account for the vast majority of the energy generation mix, with renewable energy deployment currently negligible. While only contributing to 0.1% of global CO_2 emissions, Trinidad and Tobago ranks second in the world for per capita emissions. The government has set a target of 10% of electricity to be sourced from renewables by 2030.

The country has some of the lowest electricity rates across the Caribbean – c. $0.04/kWh as compared to the regional average of $0.33/kWh. This represents a significant barrier to implementing EE measures. However, there are significant opportunities to replace inefficient cooling systems and appliances with an ageing stock dominating the consumer market. This is an increasingly pressing issue given the number of AC units in households tripled in the decade 2000 to 2010.

Drivers of change

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

The NOU Unit will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Trinidad and Tobago.

Nationally-Determined Contribution

This project will help Trinidad and Tobago to integrate its HPMP with its EE-related NDC plans.

Trinidad and Tobago's unconditional NDC commitment focuses on the public transport sector and there is not an explicit reference to EE.

Link with Montreal Protocol

Trinidad and Tobago has ratified the MP and all its amendments including the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months from 2017-2019.

Tunisia

Assessment of Incremental Capital and Operating Costs for Improved Energy Efficiency in Domestic, Commercial, and Retail Refrigeration

Objective

The objective of this project is to assess the potential incremental capital and operating costs for improved EE in retail (central supermarket installation) refrigeration.

Background

A small North African nation bordering the Mediterranean Sea, Tunisia relies almost entirely on fossil fuels to meet its domestic energy needs. Despite being a small natural gas and oil producer, it has had to begin importing most of its energy needs since the early 2000s as energy demand has outstripped domestic production.

The National Agency for Energy Conservation (ANME) is designated as the lead agency for formulating and implementing EE policies and interventions.

As of 2010, households accounts for 25% of total energy consumption. The government has introduced minimum EE specifications for residential buildings (2009) and mandatory energy audits for large energy-consuming facilities. Additionally, MEPS and mandatory labelling schemes have been introduced for certain household appliances, including ACs, refrigerators, and freezers.

The AC market is growing rapidly, but without significant improvements in energy performance. In the period 2000–13, c.1.7m AC units were installed in Tunisia. Although standards exist and performance of new units regulated, utilized units can deteriorate quickly and less-efficient products from neighbouring countries have been sold illegally – a trend that is also driven by weakening of border controls since 2011 and high taxes introduced on AC

units in the regulated market. Forecasts predict c.92% of households in Tunisia to be equipped with air conditioners by 2030.

Drivers of change

Better information is needed regarding the costs and benefits of installing more efficient refrigeration systems to help make the case for investment.

The project will examine potential options for energy savings in refrigeration systems, going beyond the technical solutions to CO_2 installations; it will also look at auxiliary energy consuming sources, such as – but not limited to – lighting, fans, etc. Further, options for utilization of waste heat from the CO_2 system for hot water production or heating will be investigated.

Scope of Work

- **Examination of refrigeration systems**
- **Drafting of report on the incremental costs** of EE improvements.
- **Study on market barriers** for potential increase in sales prices for more energy efficient products.
- **Dissemination workshop.**

Implementing partners

UNIDO is the main implementing partner for this project. UNIDO will seek cooperation with the Norwegian research organisation SINTEF to assist assessing the retail refrigeration sector.

Activity

- An understanding of incremental capital and operating costs for improved EE in the retail refrigeration sectors.
- An assessment of the impact of more energy efficient programs for one supermarket system.
- A study on market barriers for potential increase in sales prices for more energy efficient products.
- A methodology for collecting, analysing and calculating incremental costs.
- A workshop for dissemination of results.

Impact

Improved awareness of capital and operating cost of improved EE for the retail refrigeration sector helping make the case for more energy efficient investment.

Nationally-Determined Contribution

EE in the building sector features in Tunisia's NDC.

Link with Montreal Protocol

Tunisia has ratified the MP and all its amendments except for the Kigali Amendment. K-CEP support complements an on-going project in Tunisia on replacing HCFC-22 by transcritical CO_2 in a centralized supermarket installation. This project is financed by the MLF in the amount of US$ 425,000.

Timeframe

18 months from 2017-2019.

Uganda

Assessment of Incremental Capital and Operating Costs for Improved Energy Efficiency in Domestic, Commercial, and Retail Refrigeration

Objective

The objective of this project is to assess the potential incremental capital and operating costs for improved EE in domestic refrigeration.

Background

Since its independence in 1962, Uganda has transformed itself to a country of relative stability. However, the country's infrastructure – including energy – continue to lags behind many of its neighbours and is a binding constraint on development.

Electricity access remains low, at around 14%. Due to Uganda's reliance on hydropower, erratic rainfall and droughts have affected the electricity supply in recent years and led to load shedding. Electricity blackouts and brownouts also highlighted a fragile power system.

Uganda currently has 850 MW of installed electricity generation capacity, of which approximately 645 MW is hydro and 101.5 MW thermal. It has a peak power demand of around 500MW. The government has targeted constructing an additional 2,500MW in 2018 to meet the increasing demand. Given these constraints, EE policy and measures hold great promise in helping Uganda cope with the fast growing demand for electrical energy.

Several EE efforts since the early 2000s have achieved varying levels of success in Uganda. Additionally, the 2016 draft of the **Energy Efficiency and Conservation Bill provides** the legal, institutional, and regulatory framework for enforcing the national EE policy, include a specific regulation on providing MEPS for equipment such as RACs.

Drivers of change

Better information is needed regarding the costs and benefits of installing more efficient refrigeration systems to help make the case for investment.

The project will examine potential options for energy savings in refrigeration systems, going beyond the refrigerating circuit to include e.g. LED lighting. The project will assess capital costs, if modifications are required in production areas, as well as operating costs.

Scope of Work

- **Examination of refrigeration systems**
- **Drafting of report on the incremental costs** of EE improvements.
- **Study on market barriers** for potential increase in sales prices for more energy efficient products.
- **Dissemination workshop.**

Implementing partners

UNIDO is the main implementing partner for this project. UNIDO will seek cooperation with CLASP to assist assessing the market for domestic and commercial refrigerators.

Activity

- An understanding of incremental capital and operating costs for improved EE in the domestic refrigeration sectors.
- An assessment of the impact on the production lines of more energy efficient programs for one manufacturer in the domestic refrigeration sectors.
- A study on market barriers for potential increase in sales prices for more energy efficient products.
- A methodology for collecting, analysing and calculating incremental costs.

- A workshop for dissemination of results.

Impact

Improved awareness of capital and operating cost of improved EE for the domestic and commercial refrigeration sector helping make the case for more energy efficient investment.

Nationally-Determined Contribution

EE does feature in Uganda's NDC but the focus is on the EE of public buildings such as hospitals and schools and the EE of cooking stoves.

Link with Montreal Protocol

Uganda has ratified the MP and all its amendments except for the Kigali Amendment. K-CEP support complements an on-going project implementing an integrated plan for reducing HCFCs consumption in all sectors, initially emphasising the RAC sector, as well as promoting and adopting ozone-friendly, climate-friendly, and energy efficient technologies in Uganda. This project is financed by the MLF in the amount of US$ 80,000.

Timeframe

2017-2018.

Uruguay

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Uruguay to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

Uruguay has been under civilian rule since 1985 and has developed a contemporary reputation for liberal stance on social issues such as drug, abortion and same-sex marriage legislation. Its economy averaged annual growth of 8% from 2004 until the global financial crisis in 2009. Whilst it did not go into recession, its growth rate has slowed in recent years due to economic difficulties in its neighbours and biggest trading partners, Argentina and Brazil.

At the turn of the millennium, Uruguay was heavily dependent on hydropower. But following a series of dry years, from 1997 to 2007 hydroelectricity fell more than 90% to 50% of total generation. This led to a large increase in fossil fuel imports to provide a third of electricity generation. Fears for energy security contributed to the development of a very favourable policy environment for renewables, which led to an explosion in deployment – particularly for wind power, which increased from virtually 0% in 2007 to 30% by 2015. Along with additions of solar and biomass, Uruguay now gets 95% of its electricity from renewables.

The 2009 Energy Efficiency Law set a national energy savings goal and created financial mechanisms to improve uptake. The latest Energy Efficiency National Plan sets targets by sector to realise an overall 5% reduction across the economy from 2015 to 2024, as well as implementing a mandatory labelling scheme for appliances including RAC.

Drivers of change

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.
- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Uruguay.

Nationally-Determined Contribution

This project will help Uruguay to integrate its HPMP with its EE-related NDC plans.

EE measures are not singled out by Uruguay in its NDC but they will be crucial in meeting its emissions intensity reduction goals.

Link with Montreal Protocol

Uruguay has ratified the MP and all its amendments except for the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months from 2017-2019.

Venezuela

National Efficiency Cooling Plan

Objective

The objective of the project is to fill the gap in EE expertise needed to assist Venezuela to implement MP projects and management plans taking into consideration EE aspects and opportunities relating to RAC.

Background

Located on the northern coast of South America, Venezuela has the world's largest oil reserves. It has always promoted this industry making its economy highly dependent on oil revenues. This offered some economic stability and social reform in the past, but since 2014 falling oil prices have contributed to Venezuela's current economic, social and political crisis.

53% of electricity is generated from fossil fuels. The remaining 47% of electricity comes from hydroelectric plants. This brought the country to an electricity crisis in recent years when droughts provoked a decline in the electricity generated by the dams.

Venezuela has failed to meet soaring demand for electricity since the 2000s, and has been subject to regular blackouts and rationing since 2009. A series of social measures by the late president Hugo Chavez contributed to the rise in demand. He froze electricity prices in 2002 and nationalised the electric grid in 2007, subsidising consumption and pushing the population to buy new appliances such ACs.

The social reforms saw a push for equality resulting in the electrification of most urban and rural areas (99.8% and 98.6% respectively). The country's rate of per capita use was 3,240 kWh/capita in 2013, 4% higher than the world average and 53% higher than the Latin American average at the time.

Drivers of change

There are major synergies between EE and the phase-out of ODS but to date these two areas have been dealt with separately, in terms of funding, implementation and departmental responsibility.

Financial support will strengthen existing national institutional mechanisms, support the mainstreaming of EE principles within the NOU and relevant EE bodies, and build the capacity and knowledge of NOOs regarding EE issues and synergies with the MP. The link between MP and EE plans will be more widely appreciated and steps will be taken to coordinate activities in a more structured manner.

Scope of Work

- **Building capacity of the NOU** primarily focused on EE through training and guidance delivered by UNDP.
- **Coordination between NOU and EE bodies established** with long-term opportunities assessed.
- **Drafting a long-term roadmap** with priority actions identified.
- **Raising awareness with key stakeholders**.

Implementing partners

The NOU will implement projects activities in the field, with assistance from UNDP, collect and organize information generated by the project, and coordinate activities with stakeholders, carrying out any necessary awareness-raising for the project's implementation.

The UNDP via its MP Unit or its country offices will guide and quality assure the project implementation.

Activity

- NOOs capacity enhanced.

- Coordination meetings held between NOU and relevant government energy and environment stakeholders; and separately private and public stakeholders working on EE and the F-gas agenda.
- A 'soft plan' or roadmap on cooling EE is prepared and published.
- Event held to share roadmap.

Impact

Stronger and more effective coordination between MP and EE activity in Venezuela.

Nationally-Determined Contribution

This project will help Venezuela to integrate its HPMP with its EE-related NDC plans.

EE is a core component of Venezuela's NDC. This includes an energy efficiency law as well as specific pledges on the replacement of RACs for more efficient models.

Link with Montreal Protocol

Venezuela has ratified the MP and all its amendments except for the Kigali Amendment. Work on national efficiency cooling plans can help to identify potential opportunities to link with national HPMPs.

Timeframe

18 months over 2017-2019.

Viet Nam

Supporting Market Transformation to Higher Energy-Efficient, Lower GWP Refrigerant Room Air Conditioning Through Manufacturing Readiness

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

Objective

The overall objective is to support country readiness for longer-term transformation of the market towards lower GWP, high EE room AC products, by:

- Creating an enabling environment for the supply and demand of high energy efficient room AC with lower GWP refrigerants
- Strengthening the local room AC industry by improving its technical capacity, thereby increasing the confidence of government regulatory bodies to raise MEPS
- Catalyze a cost-efficient market shift to more efficient ACs.

Background

Economic and political reforms in the late 1980s have spurred rapid economic growth, pushing Viet Nam from one of the poorest, to a lower middle income country, with a relatively stable political system. Since 1986, it has moved away from a centrally planned, agrarian economy, to a more industrial and market based economy. In the 2000s, the economy grew by 6.4% annually on average, and strong growth is expected to continue (though there has been a recent slowdown in economic growth). This growth has been fairly equitable, with poverty reducing dramatically.

The country has a 99% electrification rate, and households declaring unsatisfied electricity needs is below 3%. However, the cost of electricity is becoming a heavier burden on more households. If the price of electricity is raised to finance clean energy development, this could increase the affordability problem.

The primary energy sources are coal, petroleum, hydropower and natural gas (though a significant number of households using traditional solid fuels). Its oil and coal resources mean the country is a net exporter of energy, and 58% of the total installed electricity capacity comes from fossil fuels (41% from hydropower). The emissions from the energy sector in 2013 were 142 Mt CO_2eq.

The increased demand for ACs in the early 2000s had already prompted the country to commence manufacturing domestically. Room ACs today, however, are still mostly imported, these taking 70% of the market. These units are mostly imported from Malaysia, Thailand and China. The Market for ACs in Viet Nam is forecast to grow at a compound annual growth rate of almost 15% between 2016 and 2021. The development of major cities, increased urbanisation, and the growth of the hospitality and tourism sectors are anticipated to be behind much of the increased demand.

Drivers of Change

The cooling and food cold chain industries are of strategic importance to Viet Nam countries as its economy depends heavily on agriculture, food processing, and tourism.

The success of EE programs and activities such as MEPS and labelling schemes is thus far largely attributed to the ability of governments to secure industry buy-in. However, the incremental gains in energy improvement become smaller and smaller for the same amount of investment costs in mechanical design when dealing with one technology.

Local companies are interested in the electronic control (inverter) technology driven by bottom-line benefits but also policy and market pressures to improve energy performance. Although now no longer unsurmountable, barriers for local manufacturers to adopt the technology persist including cost and the lack of know-how to match electronic and electrical components.

Scope of Work

- **Strategy support activities** including market assessment, regional workshop, and preparation of cooling plans.
- **Technical support to room AC manufacturers**.
- **Policy support** through field assessments of inverter room ACs and review of MEPS/labelling schemes.

Implementing partners

The World Bank is the main implementing partner for this project but will partner with CLASP for the regional workshops.

Activity

- Room AC market assessment and policy/regulatory framework analysis.
- Regional workshops.
- Options to accelerate EE improvements for room AC identified.
- Key stakeholders from the government and the room AC industry trained.
- Reports of field tests on energy performance assessment of inverter room ACs.
- Plans prepared for the revision of MEPS/ energy rating labelling schemes for room AC.
- Energy efficient cooling management plan.
- Government's agreement to implement the targets contained in plans.

Impact

Cumulative electricity savings of 35,590 GWh and cumulative CO_2 emissions savings of 20.13 $MtCO_2$ from 2020-2027.

Nationally-Determined Contribution

Viet Nam's NDC includes a target of an 8% and 25% (unconditional and conditional respectively) reduction in GHG emissions over BAU by 2030. By reducing the projected cooling demand through policies and programs, Kenya can reduce bills for consumers, decrease requirements for additional supply to meet growing demand, reduce emissions, and meet its NDC targets under the Paris Agreement.

Link with Montreal Protocol

Vietnam has ratified the MP and all its amendments except for the Kigali Amendment. Upgrades to more energy efficient room AC equipment will be linked to introducing new replacement refrigerant (lower GWP HFCs).

Timeframe

24 months from 2018 to 2019.

Conclusion

These country profiles provide a consolidated summary of the wide range of work that K-CEP is already supporting to advance efficient clean cooling around the world.

K-CEP plans to fund more projects to improve cooling efficiency which will be included in an updated version of this publication. This will be disseminated widely through various channels including K-CEP's website, newsletter, and social media. K-CEP has also launched a new support window in 2018 on financing cooling efficiency. We will be making further announcements about this shortly.

We hope that these profiles encourage you by showing the action already taking place to transform cooling efficiency and catalyse your own thoughts on potential opportunities to transform this area. We welcome your feedback, queries and suggestions including on potential connections between this work and other efficient clean cooling activities internationally.