

# How countries can enhance Nationally Determined Contributions in 2021 with climate-friendly cooling

May 2021





## Background

While national commitments to reduce greenhouse gas (GHG) emissions have successfully bent the global emissions curve downward, they are still projected to result in a global temperature rise of 2.6-3.1°C. This is dangerously higher than both the level of warming that scientists advise for a climate-safe world, and the 1.5° C of warming that countries agreed to work toward, as reflected in the Paris Agreement. These commitments, known as Nationally Determined Contributions (NDCs) to the Paris Agreement, are in the process of being enhanced in advance of the 2021 climate negotiations (COP26) in Glasgow, Scotland. An important trend is emerging in these enhanced NDCs; one that has huge mitigation potential while simultaneously being critical for adapting to the warming climate and delivering multiple Sustainable Development Goals (SDGs) relating to health, productivity, nutrition, and education. That trend is climate-friendly cooling.<sup>1</sup>

Emissions from cooling currently represent 7% of global GHG emissions, but this is projected to double by 2050 if left unmanaged. They result from the energy used to power cooling appliances and the refrigerants (gases) used in cooling appliances. These gases, typically fluorinated gases (F-gases) such as hydrofluorocarbons (HFCs), are super-pollutants that can have a global warming potential (GWP) thousands of times greater than carbon dioxide. Cooling emissions come from different sectors, but particularly buildings, transport, and industry, so action is needed on multiple fronts. In recognition of this opportunity to enhance NDCs, the Kigali Cooling Efficiency Program (K-CEP) launched the NDC Support Facility for Efficient, Climate-Friendly Cooling in 2020, through which 10 countries are receiving technical assistance for further action.

This paper categorizes the types of action that countries can take to enhance their NDCs with climate-friendly cooling. It summarizes the work being done in the 10 countries receiving support from the NDC Support Facility, as well as providing an overview of how an additional 45 countries have included climate-friendly cooling in their enhanced NDCs. In so doing, the paper aims to increase the understanding of how climate-friendly cooling can enhance NDCs, and inspire more governments to follow the examples set by these countries, so that the world can secure greater climate ambition by COP26.

**This paper categorizes actions that can be taken to enhance NDCs with climate-friendly cooling, summarizing the work being done in 10 countries, as well as signposting how an additional 45 countries have included climate-friendly cooling in their enhanced NDCs.**

<sup>1</sup> The term 'climate-friendly cooling' is used to refer to cooling that has minimal GHG emissions. This can result from greater energy efficiency, cleaner power, lower GWP refrigerants, or other low- and zero-emissions solutions.

## Actions to reduce emissions from cooling

Action on climate-friendly cooling cuts across multiple sectors. However, getting to zero-emissions cooling can be simplified into three impact areas as set out in the recent [Climate Action Pathway to Net Zero Cooling from the Race to Zero campaign](#):



Passively cooled buildings



Super-efficient equipment and appliances



Ultra-low (<5) GWP refrigerants<sup>2</sup>

The following table highlights how these three impact areas can be integrated into multiple sectors. The table outlines the type of action and the co-benefits (many linked to the SDGs) that such action can help deliver in addition to emissions reductions (and thus supporting both the Paris Climate Agreement and the Kigali Amendment to the Montreal Protocol).

TABLE 1

Sector	Action type	Co-benefits (beyond GHG reductions)
Economy-wide	F-gas or cooling efficiency policies counted toward economy-wide GHG targets National Cooling Action Plan	<ul style="list-style-type: none"><li>Improved air quality</li><li>Economic and employment opportunities</li><li>Energy security and grid reliability</li><li>Energy cost savings</li></ul>
Agriculture and food	Cold chain efficiency policies (e.g., minimum energy performance standards [MEPS] for commercial, industrial, and mobile refrigeration) Refrigerant standards (e.g., ultra-low [<5] GWP [linked to efficiency]) Off-grid, renewable energy-powered cold storage	<ul style="list-style-type: none"><li>Reduced food loss and waste (and associated methane emissions)</li><li>Improved food security and reduced hunger and food poverty</li><li>Enhanced livelihoods</li><li>Energy cost savings</li></ul>
Health	Vaccine cold chain efficiency Efficient, low GWP cold storage (medicines, treatments, and samples) Cooling of medical facilities (e.g., hospital buildings) Bulk procurement programs	<ul style="list-style-type: none"><li>Improved health outcomes and patient comfort, and reduced infant mortality</li><li>Reduced waste of pharmaceuticals</li><li>Energy cost savings</li></ul>
Transport	Mass transit refrigeration cooling standards Refrigerant standards (e.g., ultra-low [<5] GWP [linked to efficiency]) Thermal energy transfer and storage systems (e.g., cooling underground metros)	<ul style="list-style-type: none"><li>Improved thermal comfort and productivity (commuters and mobile workers)</li><li>Reduced food waste (and associated methane emissions)</li><li>Improved food security and reduced hunger and food poverty</li><li>Faster and cheaper transition to EVs with electricity infrastructure savings</li></ul>

<sup>2</sup> Many refrigerants have a significantly higher GWP, e.g., the widely used R-410A has a GWP of 2088.

<b>Cities and buildings</b>	 Passive cooling technologies and design such as cool roofs, ventilation, and insulation  Urban planning and greening  District cooling   Cooling as a service (CaaS) models (e.g., leasing schemes)   Bulk procurement programs (e.g., supermarkets, hotels)   Behavioral approaches, (e.g., consumer campaigns, Heat Action Plans)  Thermal energy storage and other demand-side management technologies   Research and development (R&D) and national prizes for passive cooling designs and solutions	<ul style="list-style-type: none"> <li>• Energy cost savings</li> <li>• Enhanced comfort and wellbeing both indoors and outdoors (adaptation)</li> <li>• Carbon sequestration through increased vegetation</li> <li>• Improved air quality</li> <li>• Increased productivity in workplaces and schools</li> <li>• Enhanced city- and community-level aesthetics and sense of place</li> <li>• Grid stability and resilience</li> <li>• Reduced urban inequalities and enhanced social and racial justice through community cold hubs and spaces</li> <li>• Job opportunities, skills development, and local participation</li> </ul>
<b>Industrial and commercial</b>	   R&D and demonstration funds  MEPS for industrial equipment    Servicing and maintenance initiatives (including CaaS)  Refrigerant standards, e.g., ultra low (<5) GWP   Data center cooling standards	<ul style="list-style-type: none"> <li>• Energy cost savings</li> <li>• Enhanced resource efficiency (combining with F-gas transition)</li> <li>• Promotion of R&amp;D (long-term jobs, benefits, and trade gains)</li> <li>• Increased lifespan of products to reduce embodied emissions<sup>3</sup></li> <li>• Increased productivity</li> </ul>
<b>Power supply</b>	 Systems for energy efficiency to bid into capacity markets  Support for demand side management and demand response programs  Standards for connected/smart cooling technology	<ul style="list-style-type: none"> <li>• Grid stability and reduced blackouts or brownouts</li> <li>• Lower costs of energy service provision</li> <li>• Faster and cheaper transition to net zero power supply</li> <li>• Reduced dependence on polluting peak demand fuels, e.g., coal and gas</li> </ul>
<b>Equipment and appliances</b>	 MEPS with staged targets  Refrigerant standards (e.g., ultra-low [<5] GWP [linked to efficiency])    Compliance and spot testing    Labels – thresholds and endorsement    Market measures and financial mechanisms (e.g., incentives, rebates, on-bill financing)   Servicing, replacement, and disposal programs   Import standards (e.g., no dumping)	<ul style="list-style-type: none"> <li>• Energy cost savings</li> <li>• Grid stability and resilience</li> <li>• Greater consumer trust</li> <li>• Increased affordability and access to cooling</li> <li>• Cross-border climate benefits (e.g., in export markets)</li> <li>• Increased productivity, job opportunities, and skills development</li> </ul>

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<sup>3</sup> Embodied emissions are the emissions associated with the production of a product.

## K-CEP's NDC Support Facility for Efficient, Climate-Friendly Cooling

Countries are already recognizing the benefits of climate-friendly cooling and committing to further action as they enhance their NDCs or long-term (2050) climate plans. K-CEP is providing technical assistance to the following 10 countries in support of their leadership on climate-friendly cooling.

TABLE 2

### Burkina Faso

#### Sector: Cities and buildings, equipment and appliances

1. Integration of architectural and structural solutions for approximately 40,000 public housing units, most of which are low-income housing.
2. Cooling guidance developed and integrated into the National Housing Policy.
3. Capacity building for local stakeholders.
4. MEPS for lowest-cost and secondhand air conditioners (AC).
5. Nationwide awareness campaign on low-cost cooling measures for homes.

Project partner: 



### Cambodia

#### Sector: Economy-wide, cities and buildings, equipment and appliances

1. Include passive cooling in building energy codes (20% of new build to comply).
2. Demonstrate application of passive cooling in buildings (target 2% of buildings retrofitted).
3. Awareness and capacity building campaign for large-scale replication.
4. Implement national cooling action plan (including MEPS, labels, and F-gas transition for ACs and refrigerators – reducing 1.2TW/h in 2030).

Project partner:  



### Chile

#### Sector: Industrial and commercial

1. Develop best practice guides and standards for commercial refrigeration efficiency.
2. Conduct four pilots, for refrigerated cabinets and cold chambers, to demonstrate the energy efficiency measures promoted by the guidelines.
3. Develop a business case to help scale best practices in the selection and management of energy-efficient commercial refrigeration technologies.

Project partner: 



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## Ethiopia



### Sector: Agriculture and food

1. MEPS for commercial refrigerators.
2. Establish cold chain evidence base, awareness raising, and capacity building measures.
3. Develop methodological tools for climate finance mobilization, carbon market participation, and a roadmap for sectoral upscaling.
4. Submit climate finance application to scale-up funding for climate-friendly cold chains.
5. Design monitoring, reporting, and verification (MRV) for climate-friendly cold chains supporting their inclusion in next NDC.

Project partner:  

## Jordan



### Sector: Cities and buildings (public and private)

1. Support the development of GHG emission reduction targets to be achieved through cooling-related mitigation actions.
2. Develop a Strategic Cooling Action Plan to improve access to efficient and climate-friendly cooling solutions for public and private sectors.
3. Pilot interventions in public schools with efficient passive and active cooling solutions.
4. Technical guidelines for intervention in public buildings and a capacity building program.

Project partner: 

## Morocco



### Sector: Equipment and appliances

1. Strengthen MEPS for domestic refrigerators, unitary ACs, and AC chillers in line with international best practices.
2. Formulate policies and measures to support HFC phase down by conducting techno-economic analyses of impacts on various industry sectors.
3. Design an MRV framework to enhance market monitoring and enforcement of efficiency standards.
4. Identify finance sources for implementation, including carbon revenues from Article 6 mechanisms.

Project partner:  



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## Nigeria

### Sector: Equipment and appliances

1. Include new targets for cooling efficiency in enhanced NDC, including a chapter on cooling.
2. Revise the MEPS for room ACs, including phased bans on non-compliant imports.
3. Communications strategy and launch of campaign to increase awareness and use of labeling for efficient, climate-friendly AC models for consumers and compliance with new MEPS for retailers.
4. Technical training for AC installers and maintenance technicians.

Project Partner: 

## Pakistan

### Sector: Economy-wide, equipment and appliances

1. Develop a cooling action plan to define and address national cooling needs.
2. Expand efficiency policies to include additional domestic and commercial cooling products (on- and off-grid), specifically fans and commercial refrigeration.
3. Develop provincial procurement specifications for Punjab to stimulate demand for efficient cooling products.
4. Develop institutional capabilities to implement policies.

Project Partner: 

## Tunisia

### Sector: Cities and buildings, equipment and appliances

1. Develop a roadmap for passive cooling building design.
2. Update ecolabel and MEPS for domestic cooling appliances.
3. Develop a financial mechanism to encourage the replacement of domestic AC appliances and conduct one or two pilots.
4. Capacity building measures for professionals in the sector, including a strengthened certification scheme.

Project Partner: 

## Vietnam

### Sector: Cities and buildings

1. Develop Urban Cooling Action Plans (UCAPs) in two pilot cities with emphasis on extreme heat response, passive cooling, nature-based solutions, urban design, and efficient and renewable active cooling solutions.
2. Pilot projects, outreach, and capacity building.
3. Mobilize finance for implementation of UCAPs, including unlocking municipal budgets and designing a national cooling fund.
4. Support the integration of urban cooling into national policy frameworks including: NDC Implementation Support Program, Climate Change Strategy, Environmental Protection Law and National Cooling Action Plan.

Project Partner:  



## Additional countries including climate-friendly cooling in their enhanced NDCs

In addition to the 10 countries working with K-CEP on their NDCs, many more governments have included climate-friendly cooling in their enhanced NDCs. Table 3 summarizes these efforts and links them to the action types identified in Table 1.

TABLE 3

Country	Sector(s)	Action(s)
 <b>Bangladesh</b> 	<ul style="list-style-type: none"> <li>Economy-wide</li> </ul>	<ul style="list-style-type: none"> <li>F-gas or cooling efficiency policies counted toward economy-wide GHG targets.</li> </ul>
 <b>Bosnia-Herzegovina</b> 	<ul style="list-style-type: none"> <li>Cities and buildings</li> </ul>	<ul style="list-style-type: none"> <li>Energy efficiency to reduce heating and cooling needs.</li> </ul>
 <b>Cabo Verde</b> 	<ul style="list-style-type: none"> <li>Equipment and appliances</li> <li>Cities and buildings</li> </ul>	<ul style="list-style-type: none"> <li>Enhance energy efficiency of air conditioners.</li> <li>Technical specifications for passive cooling in building codes.</li> </ul>
 <b>Colombia</b> 	<ul style="list-style-type: none"> <li>Cities and buildings</li> <li>Equipment and appliances</li> </ul>	<ul style="list-style-type: none"> <li>Promotion of district-level cooling for the replacement of cooling systems in cities.</li> <li>Replacement and collection of old and inefficient AC/refrigeration equipment.</li> <li>Production of more efficient refrigerators.</li> </ul>
 <b>Costa Rica</b> 	<ul style="list-style-type: none"> <li>Economy-wide</li> <li>Industry</li> <li>Equipment and appliances</li> </ul>	<ul style="list-style-type: none"> <li>F-gas or cooling efficiency policies counted towards economy-wide GHG targets.</li> <li>MEPS for industrial equipment.</li> <li>Updated standards and regulations for cooling equipment.</li> </ul>
 <b>Dominican Republic</b> 	<ul style="list-style-type: none"> <li>Economy-wide</li> <li>Equipment and appliances</li> </ul>	<ul style="list-style-type: none"> <li>F-gas or cooling efficiency policies counted toward economy-wide GHG targets.</li> <li>AC replacement program.</li> </ul>
 <b>European Union<sup>4</sup></b> 	<ul style="list-style-type: none"> <li>Economy-wide</li> </ul>	<ul style="list-style-type: none"> <li>F-gas or cooling efficiency policies counted toward economy-wide GHG targets.</li> </ul>
 <b>Grenada</b> 	<ul style="list-style-type: none"> <li>Economy-wide</li> </ul>	<ul style="list-style-type: none"> <li>F-gas or cooling efficiency policies counted toward economy-wide GHG targets.</li> </ul>
 <b>Japan</b> 	<ul style="list-style-type: none"> <li>Economy-wide</li> <li>Cities and buildings</li> <li>Equipment and appliances</li> </ul>	<ul style="list-style-type: none"> <li>Increase the efficiency of air conditioners.</li> <li>Promote nationwide campaigns (e.g., Cool Biz) to reduce AC demand.</li> <li>Increase efficiency of local government buildings.</li> </ul>
 <b>Lebanon</b> 	<ul style="list-style-type: none"> <li>Economy-wide</li> </ul>	<ul style="list-style-type: none"> <li>National Cooling Strategy.</li> </ul>
 <b>Macedonia</b> 	<ul style="list-style-type: none"> <li>Cities and buildings</li> </ul>	<ul style="list-style-type: none"> <li>Setting limits to final energy consumption for heating and cooling.</li> </ul>
 <b>Marshall Islands</b> 	<ul style="list-style-type: none"> <li>Equipment and appliances</li> <li>Cities and buildings</li> </ul>	<ul style="list-style-type: none"> <li>Appliance standards for AC units and building code reforms to reduce electricity demand for cooling.</li> </ul>

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<sup>4</sup> The European Union's NDC represents all 27 member countries.

	<b>Mexico</b>	  	<ul style="list-style-type: none"> <li>• Economy-wide</li> <li>• National Cooling Strategy.</li> </ul>
	<b>Moldova</b>		<ul style="list-style-type: none"> <li>• Cities and buildings</li> <li>• Adaptation measures to combat the effect of temperature variation: heat-tolerant streets and highways; landscape protection; heat-resilient paving materials; milling out ruts; shifting construction schedules to cooler parts of the day; design for higher maximum temperatures in replacement or new construction; adaptation of cooling systems.</li> </ul>
	<b>Rwanda</b>	 	<ul style="list-style-type: none"> <li>• Economy-wide</li> <li>• F-gas or cooling efficiency policies counted toward economy-wide GHG targets.</li> </ul>
	<b>Saint Lucia</b>	 	<ul style="list-style-type: none"> <li>• Economy-wide</li> <li>• F-gas or cooling efficiency policies counted toward economy-wide GHG targets.</li> </ul>
	<b>Senegal</b>		<ul style="list-style-type: none"> <li>• Economy-wide</li> <li>• Accelerated F-gas reductions.</li> </ul>
	<b>United Kingdom</b>	 	<ul style="list-style-type: none"> <li>• Economy-wide</li> <li>• F-gas or cooling efficiency policies counted toward economy-wide GHG targets.</li> </ul>
	<b>United States</b>	  	<ul style="list-style-type: none"> <li>• Cities and buildings</li> <li>• Economy-wide</li> <li>• Accelerated F-gas reductions.</li> <li>• Wider use of heat pumps in buildings.</li> </ul>

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## Paris Agreement opportunities in addition to NDCs

In addition to the benefits that can be realized by including climate-friendly cooling in enhanced NDCs, the Paris Agreement is strengthened by countries' commitments to climate-friendly cooling in several ways, including:

- Mid-century, long-term, and low-emission development strategies in which sustainable cooling can play a vital role in avoiding warming beyond 2° C. So far, at least 10 countries have included cooling in their long-term strategies.
- The Transparency Framework, which requires each country to report on HFCs under Article 13 of the Paris Agreement.
- National Adaptation Plans (NAPs) in which cooling is a critical adaptation response to a warming planet. The actions cited in this paper can therefore be adopted in NAPs not just NDCs.
- Article 6 and the Internationally Transferred Mitigation Outcomes (ITMOS), which call for cooperative approaches to climate mitigation such as sustainable cooling projects.
- Recognition of wider obligations (such as the right to health) and of the fundamental priority of safeguarding food security given vulnerabilities of food production systems to the adverse impacts of climate change. Equitable access to sustainable cold chains is vital for these obligations.

### Call to action

GHG emissions need to be cut urgently and at scale. The 55 countries that have committed to reducing cooling emissions either in their enhanced NDCs or long-term plans are setting an important example for the world that the climate crisis cannot be solved without reforming the cooling industry to be more efficient and climate-friendly. Despite these examples, cooling remains overlooked in NDCs relative to the emissions that could be abated. The majority of countries still need to update their NDCs by COP26 in November 2021 and should look to the NDCs highlighted in this paper as examples of how to reduce emissions from cooling at a national level.

Governments interested in enhancing their NDCs with action on climate-friendly cooling can contact [k-cep@climateworks.org](mailto:k-cep@climateworks.org).

**As US Climate Envoy John Kerry said of COP26, “It is the last best chance the world has to come together in order to do the things we need to do to avoid the worst consequences of the climate crisis.”**

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