



Clean Cooling
COLLABORATIVE



MID-PROGRAM IMPACT REPORT (2022-2024)

Setting a Course for Efficient, Climate-Friendly Cooling for All

August 2024

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GLOSSARY OF TERMS AND ORGANIZATIONS

28th UN Climate Change Conference	COP28	Global Warming Potential	GWP
35th Meeting of the Parties of the Montreal Protocol	MOP35	Greenhouse gas	GHG
Adrienne Arsht-Rockefeller Foundation Resilience Center	Arsht-Rock	Heat action plan	HAP
Air conditioners	ACs	Hydrofluorocarbons	HFCs
Alliance for an Energy Efficient Economy	AEEE	Institute for Governance and Sustainable Development	IGSD
Association of Southeast Asian Nations	ASEAN	Institute for University Cooperation Onlus	ICU
Building Decarbonization Coalition	BDC	Kigali Cooling Efficiency Program	K-CEP
Carbon dioxide	CO ₂	Lawrence Berkeley National Laboratory	LBNL
Clean Cooling Collaborative	CCC	Mahila Housing Trust	MHT
ClimateWorks Foundation	CWF	Minimum Energy Performance Standards	MEPS
Collaborative Labeling and Appliance Standards Program	CLASP	Nationally Determined Contributions	NDCs
Deutsche Gesellschaft für Internationale Zusammenarbeit	GIZ	Natural Resources Defense Council	NRDC
East African Community	EAC	Sustainable Development Goals	SDGs
Economic Community of West African States	ECOWAS	Sustainable Energy for All	SEforALL
Energy Efficiency Services Limited	EESL	UN Economic and Social Commission for Asia and the Pacific	UN ESCAP
Energy Foundation China	EF China	UN Environment Programme	UNEP
Environmental Investigation Agency	EIA	UN Industrial Development Organization	UNIDO
Environmental Protection Agency	EPA	United for Efficiency	U4E
Global Cooling Prize	GCP	Universitas Pendidikan Indonesia	UPI
Global Green Growth Institute	GGGI		

FOREWORD



When I joined the [Clean Cooling Collaborative \(CCC\)](#) three years ago, one of our key priorities was raising awareness about the risks of extreme heat and the need for sustainable cooling solutions for all. Needless to say, the word is out. Stories about record temperatures and unprecedented levels of heat-related illnesses and deaths abound. In recent years, China, Thailand, Australia, Mexico, and West Africa have experienced temperatures exceeding 50° C

(122° F), and just this year, New Delhi hit its highest-ever temperature, and fatalities occurred during the Hajj pilgrimage amid extended heat waves in Saudi Arabia. Under these extreme conditions, people are increasingly unable to work, study, or sleep safely.

Simply stated, access to cooling is not a luxury — it's a human right.

CCC, our partners, and the broader cooling community have been hard at work designing and implementing solutions that aim to protect people from extreme heat and to ensure cooling equipment is as energy-efficient as possible. As a projected 3 billion new air conditioners (ACs) are installed over the next few decades, we must get cooling right. It's essential that we not only reduce massive emissions but also take stress off of overloaded power grids, minimizing the frequency and duration of dangerous power outages.

In 2022, when we refreshed our program and rolled out a new strategy, the CCC team built out a diverse portfolio of projects with our remarkable group of funding and implementing partners. Now, after more than two years, we are proud to continue the legacy of our formative years as the [Kigali Cooling Efficiency Program \(K-CEP\)](#) by making significant strides in fostering an environment for efficient, climate-friendly cooling at scale.

This Mid-Program Impact Report provides a comprehensive review of the progress this amazing collaborative has achieved over these past couple of years — progress that has already locked in gigaton-level greenhouse gas (GHG) emissions savings by mid-century. From national policies to community-level programs, we've taken numerous actions to transform how we cool.

We are raising the efficiency of ACs, ceiling fans, and refrigerators and putting money back in people's pockets through lower utility bills. Additionally, we are reducing food loss through a more connected cold chain and expanding access to vital mechanical and passive cooling solutions for heat-vulnerable people in need of relief from rising temperatures. If we succeed, 100 gigatons of CO₂e emissions could be avoided by 2050.

We hope you enjoy reading this report. We are committed to working alongside our partners to scale up efforts that are already underway. The urgency and importance of our purpose has never been greater.

Noah Horowitz
Senior Director, Clean Cooling Collaborative

PROGRAM OVERVIEW



THE CHALLENGE

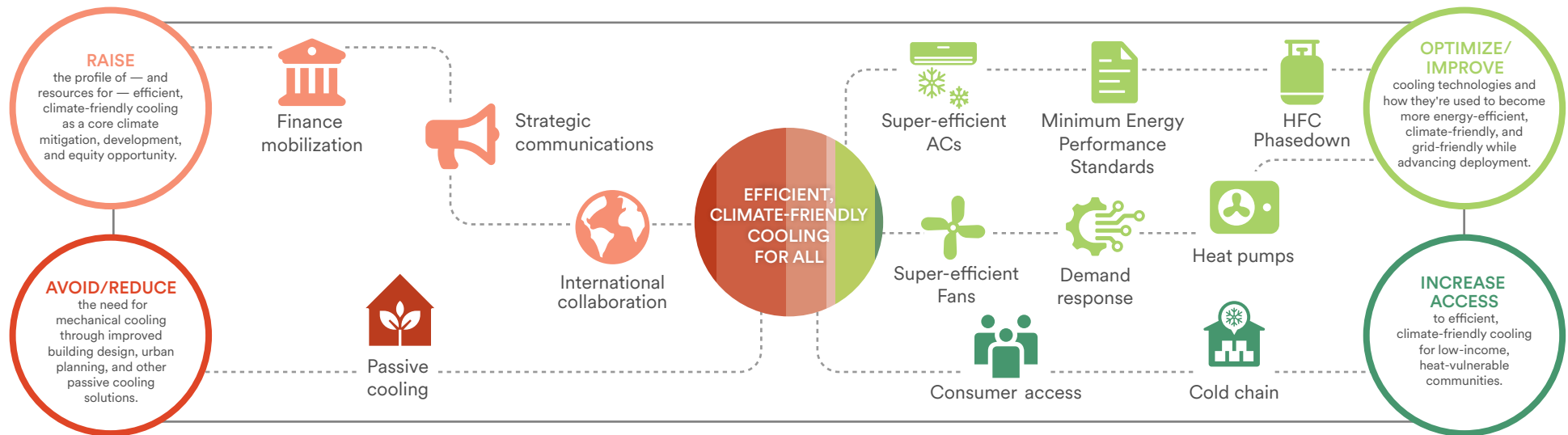
Growing use of today’s conventional, energy-intensive cooling appliances and frequent leakage of their super-pollutant refrigerant gases have put the cooling sector on an unsustainable trajectory. Without intervention, cooling-related GHG emissions could climb from 7% of the world’s total emissions today to 10% over the next 25 years, driven by escalating demand that will more than triple AC adoption.

Two realities exist: today’s cooling appliances are contributing to higher GHG emissions, and more than 1.1 billion people worldwide still face dangerous

risks from inadequate access to cooling — challenges poised to intensify as global temperatures rise.

The cooling sector faces a critical juncture: undergo transformative changes to ensure increased and affordable access to life-saving cooling while making solutions more energy-efficient and climate-friendly or create a vicious feedback loop of cooling appliance use, increased emissions, and further warming of the planet, which will drive more appliance use, and so on.

OUR APPROACH



CCC’s north star is to transform cooling by reducing the sector’s GHG emissions and ensuring that efficient, climate-friendly cooling is accessible to all. To do so, CCC has developed a comprehensive strategy that addresses the cooling challenge from various entry points. We have strategically organized our

grantmaking into the four areas above, and within each area, we focus on multiple interventions. Each intervention amplifies the other and helps leverage various tools to move the needle for the entire cooling sector. We believe that simultaneous action in these diverse areas is needed to swiftly achieve our goals.

GEOGRAPHIC FOCUS

CCC is a global program, with grantmaking primarily focused on four priority geographies: China, India, Southeast Asia, and the United States. Projections show that, together, these regions will account for an estimated 75% of cooling-sector related GHG emissions between now and 2050.¹

Additionally, CCC has supported various projects outside of these regions through its Nationally Determined Contribution (NDC) Support Facility for Efficient, Climate-Friendly Cooling.²



1 CEA Consulting analysis based on the International Energy Agency's Buildings Model Reference Scenario. See IEA, [The Future of Cooling](#), 2018.

2 The NDC Support Facility is supporting projects in Burkina Faso, Cambodia, Chile, Ethiopia, Jordan, Morocco, Nigeria, Pakistan, Tunisia, and Vietnam.

3 U.S. Energy Information Agency, Annual Energy Outlook 2020, 2020.

4 Ministry of Environment, Forest & Climate Change, Government of India, India Cooling Action Plan, 2019.

5 IEA, [The Future of Cooling](#).

6 IEA, [The Future of Cooling in Southeast Asia](#), 2019.

A COLLABORATIVE MODEL

CCC serves as a philanthropic hub for global activities related to energy-efficient, climate-friendly cooling and is currently the only global intermediary focused on the topic of clean cooling. Over the past few years, we have helped grow the cooling field and its knowledge base, created infrastructure and networks to power high-impact collaborations, and laid the groundwork to create the environment for clean cooling to thrive and scale.

With a focus on collaboration, CCC has established a powerful coalition of funding and implementing partners to mobilize governments, industry stakeholders, financial institutions, and businesses to act on cooling.

Since 2022, we have brought together funding partners with varying interests and expertise — from energy efficiency and refrigerants to passive cooling and cold chains — with more than 35 implementing partners, ranging from grassroots community groups to major intergovernmental organizations. Together, we have helped place cooling on the map as a climate and development priority.

To further create a space that facilitates knowledge exchange, peer learning, and coordination, CCC brings together all of its partners at its Annual Funder-Grantee Convening. The CCC program flourishes because of its strategic collaborations, and its successes are a result of collective action.



Clean Cooling Collaborative implementing partners, funders, and staff at our 2024 annual convening

PROGRAM IN NUMBERS

Since 2022, CCC and its implementing partners have had great impact on the cooling sector. In addition to directly driving positive change through our grantmaking, our work has also had a ripple effect that can be felt far and wide.

Some highlights from the past two years include:



71
national governments have signed the Global Cooling Pledge



2 million
super-efficient ceiling fans deployed in India



\$965 million
replenishment of the Montreal Protocol's Multilateral Fund to phase out HFC refrigerants



142,000m²
of cool roofs installed across Indonesia



6
cooling products Minimum Energy Performance Standards adopted



50
CCC-led or -supported resources published



36
implementing partners



\$30 million
in grants committed



The Clean Cooling Collaborative has put the need for climate-friendly cooling on the global agenda and exemplifies philanthropy at its best — deep engagement with funders and implementing partners to co-create strategies, learn together, and catalyze transformative climate solutions that benefit people today and help secure a safer tomorrow. As we see extreme heat events rapidly becoming more frequent and deadly globally, CCC's work is more vital than ever. I am inspired by the dedication and urgency with which the CCC partners approach their common mission. Together, we are not just ensuring affordable and low-emission cooling options can be available to all, but actively saving lives and livelihoods today."

Helen Mountford
President and CEO, ClimateWorks Foundation

RESULTS FRAMEWORK SCORECARD (BASIC)

As part of its 2022–2025 strategy, CCC has established a comprehensive results framework with measurable indicators and targets to monitor progress across the entire portfolio. This framework is structured around the program’s four strategic outcome areas (Raise, Avoid/Reduce, Optimize/Improve, Increase Access) and ten intervention areas.

As you will notice in the scorecard on the following page, we have 20 total indicators of progress. Among the targets set, we have already exceeded five, achieved three, and are making progress toward the other set targets in twelve of the indicator areas.

CCC will continue to share updates on progress being made toward all of its targets via the results framework scorecard, which will form the foundation of future impact reports. For more detailed explanations of each of the results shown below, please refer to the [full results framework scorecard](#) in the annex of this report.

STRATEGY AREA	INTERVENTION AREA	INDICATOR OF PROGRESS	TARGET (2025)	RESULTS (AS OF JUNE 2024)	STATUS
RAISE	Cross-cutting	# of countries that add efficient, climate-friendly cooling commitments to their enhanced Nationally Determined Contributions (NDCs)	9	9	✓ Achieved
		amount of new funding resources mobilized for the field of clean cooling	-	-	→ In Progress (No Target)
		# of CCC-supported knowledge products and briefs shared with stakeholders	-	50	→ In Progress (No Target)
		# of times cooling is mentioned in media [disaggregates] with reference to, or involvement of, CCC's work	-	5,401	→ In Progress (No Target)
		# of manufacturers signing on to join the Race to Zero Cooling campaign and/or demonstrating progress toward meeting its milestones	5	15	↑ Exceeded
		# of governments that sign on to the Global Cooling Pledge	50	71	↑ Exceeded
AVOID/REDUCE	Passive cooling	# of national, state, or city governments that design, propose, adopt, or implement policies, plans, or programs that incorporate passive cooling measures	5	5	✓ Achieved
OPTIMIZE/IMPROVE	5X AC	# of manufacturers that have 5X room air conditioners that are developed and/or market-ready	2	0	→ In Progress /On Track
		# of updated proposed test methodologies that better reflects real world performance in hot and humid climates and related energy savings is submitted to the international standards bodies for their consideration and potential future adoption	1	0	→ In Progress /On Track
	Minimum Energy Performance Standards (MEPS) and labels	# of countries that propose, adopt, or implement MEPS and/or labels to raise the efficiency floor for cooling products	3	9	↑ Exceeded
		# of MEPS and/or labels (for residential or commercial ACs, refrigerators, ceiling fans, and/or other cooling products) comparable to or better than U4E model regulations that are designed, proposed, adopted, and/or implemented	8	20	→ In Progress
		# of new or updated model regulations or procurement specifications published that set best practice levels	2	4	↑ Exceeded
	HFC phasedown	# of countries that incorporate elements of the model regulations into their MEPS	-	10	→ In Progress (No Target)
		# of countries that have proposed or adopted regulations that establish Global Warming Potential (GWP) limits for the refrigerants contained in new air conditioners/heat pumps and household refrigerators at 750 and 150, respectively	3	29	↑ Exceeded
	Fans	amount of new funding commitments to replenish the Multilateral Fund for phasing down HFCs and increasing the efficiency of cooling equipment	-	\$965 million	✓ Achieved (No Target)
		# of additional super-efficient ceiling fans that have been deployed in India	10 million	2 million	→ In Progress /On Track
	Demand response	# of governments (city, state, or national) and/or utilities that design, pilot, and/or implement demand response solutions	2	1	→ In Progress /On Track
	Heat pumps	# of governments (city, state, or national) and/or utilities that have designed, approved, or implemented policies or incentive programs to increase deployment of two-way heat pumps	3	2	→ In Progress /On Track
	Cold chain	# of solutions that enable efficient and climate-friendly cold chain expansion that are scoped, piloted, and/or implemented	5	3	→ In Progress /On Track
INCREASE ACCESS	Consumer access and cold chain	# of policies/plans, financing/fiscal programs, and/or initiatives focused on enhancing access to clean cooling for low-income, heat-vulnerable communities (including farmers who need sustainable cold chain) that are designed, proposed, adopted, and/or implemented	10	7	→ In Progress /On Track



IMPACT SPOTLIGHTS

OUR WORK IN ACTION

The featured spotlights in these subsequent pages showcase some of the work of CCC's implementing partners and their achievements to date.

NDC SUPPORT FACILITY: RAISING AMBITION FOR NATIONAL ACTION ON CLEAN COOLING



PROJECT PERIOD: 2021–2024

COUNTRIES: Burkina Faso, Cambodia, Chile, Ethiopia, Jordan, Morocco, Nigeria, Pakistan, Tunisia, Vietnam

PARTNERS: Climate Group, Collaborative Labeling and Appliance Standards Program (CLASP), Cool Coalition, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Econoler, Global Green Growth Institute (GGGI), Institute for University Cooperation Onlus (ICU), Perspectives, UN Economic and Social Commission for Asia and the Pacific (UN ESCAP), UN Environment Programme (UNEP), UN Industrial Development Organization (UNIDO)

[Nationally Determined Contributions \(NDCs\)](#) are climate action plans in which countries set out their commitments for reducing GHG emissions and adapting to the impacts of climate change. The plans are a central part of the 2015 Paris Agreement, an international treaty on climate change, and they are expected to be reviewed and enhanced every five years to include more ambitious commitments.

Efficient, climate-friendly cooling is a key component of enhanced NDCs. Cooling is a significant contributor to global GHG emissions and a critical resilience-building tool, impacting multiple [Sustainable Development Goals](#) (SDGs) related to health, productivity, nutrition, and education.

LAYING THE GROUNDWORK FOR IMPACT

Recognizing the pivotal role of cooling in countries' climate mitigation and adaptation strategies, CCC launched the NDC Support Facility for Efficient, Climate-Friendly Cooling (NDC Support Facility) in 2020. Through the initiative, we have [supported the efforts of nine countries](#) — Burkina Faso, Cambodia, Ethiopia, Jordan, Morocco, Nigeria, Pakistan, Tunisia, and Vietnam — to incorporate cooling in their NDCs and to implement related programs. The facility has also supported Chile, which included clean cooling in its [Long-Term Climate Strategy](#).



NDC Support Facility projects have covered various cooling-related commitments, from improving the energy efficiency of cooling technologies and deploying passive cooling solutions in buildings and cities, to improving cold chain infrastructure and developing national cooling policies. Because clean cooling is a relatively new focus for many of the participating countries, much of the work has involved laying the groundwork for long-term success.

Despite delays caused by the Covid-19 pandemic and political instability in some recipient countries, the NDC Support Facility's implementing partners have effectively supported countries in taking actions to fulfill their cooling commitments, and tangible change is underway.

Some of the most notable results so far include Pakistan's proposed Minimum Energy Performance Standards (MEPS) and procurement specifications for refrigerated display cabinets (known locally as visi coolers), Morocco's MEPS for room ACs and refrigerators, and Vietnam's commitment to tackling urban heat islands and increasing cooling access in two national-level policies.

In terms of long-lasting impact, if Pakistan's proposed standards are adopted and complied with, shopkeepers could collectively save more than US\$900 million in electricity costs while also reducing GHG emissions.⁷

The influence of the NDC Support Facility and CCC's partners extends well beyond the governments we directly engaged with through this work. Cooling-related commitments have now been included in more than 100 countries' NDCs, up from just seven in 2015, indicating greatly increased awareness of the importance of clean cooling.

WHAT'S NEXT?

Incorporating cooling in NDCs is an important first step, but more work is needed to support detailed implementation, subsequent targets, and progress tracking. As countries update their contributions ahead of the next submission deadline in early 2025, the Cool Coalition, our implementing partner, is developing guidelines on how national governments can include cooling commitments in NDCs.

⁷ CLASP, [New Visi Cooler Policy could Save Pakistani Shopkeepers Millions, 2022](#).

STRATEGIC COMMUNICATIONS: SHIFTING THE NARRATIVE ON CLEAN COOLING



PROJECT PERIOD: Ongoing

REGION: Global

PARTNERS: Adrienne Arsht-Rockefeller Foundation Resilience Center (Arsht-Rock), UNEP Cool Coalition, Sustainable Energy for All (SEforALL)

Over the past few years, CCC and key partners — including the Cool Coalition, SEforALL, and Arsht-Rock — have been working to shift the public narrative surrounding extreme heat from a conversation primarily focused on the challenges posed by rising global temperatures to one that emphasizes actionable solutions, such as sustainable cooling.

Efforts have included coordinating with partners to develop cohesive messaging around extreme heat and sustainable cooling, strategic engagement with the media, and participation in major international events like the 28th UN Climate Change Conference (COP28).

We have also worked with our implementing partners to amplify their work and demonstrate real-world impact. In early 2023, we collaborated with BBC StoryWorks to create a [short film](#) about Cool Roofs Indonesia. This film contributed to that initiative [winning the Social Justice category](#) in the 2023 Fast Company Innovation by Design Awards.

In recent years, we’ve seen a significant uptick in cooling-related media coverage. In fact, between 2021 and 2023, stories covering both extreme heat and cooling solutions increased sevenfold. This surge indicates broader societal recognition of the critical importance of sustainable cooling in combating the adverse effects of climate change. CCC and its partners have played a pivotal role in this shift, promoting discussions beyond problems to spotlight solutions and drive action.

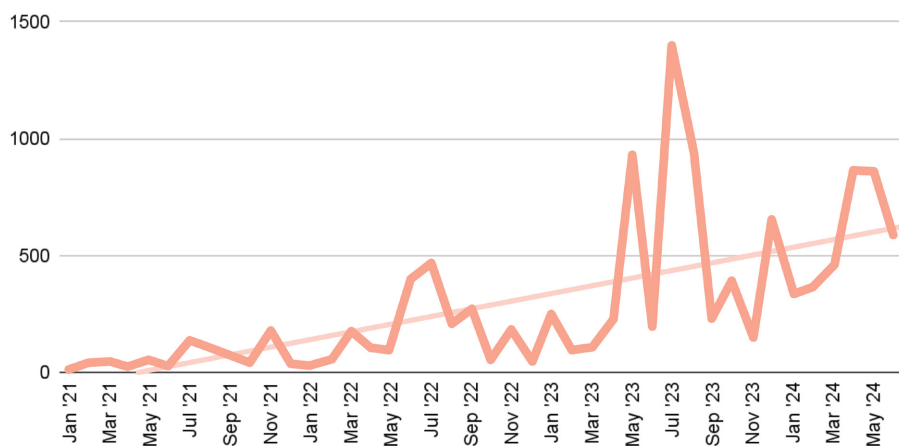
Increased interest in and coverage of extreme heat and clean cooling solutions signify a growing awareness and engagement with these pressing issues.

CCC has also supported the publication of key resources highlighting the importance of sustainable cooling for all. Major resources have included SEforALL’s annual [Chilling Prospects](#) reports, the inaugural [Global Cooling Watch](#) report, and [Beating the Heat: A Sustainable Cooling Handbook for Cities](#), all of which are invaluable tools for educating stakeholders about the transformative power of clean cooling solutions.

This heightened awareness has catalyzed global action, as evidenced by the funding for sustainable cooling initiatives. In recent years, multiple sizeable funds have announced their support for action on sustainable cooling, including through the [Multilateral Fund](#) for the Implementation of the Montreal Protocol, the [World Bank’s Cooling Facility](#), the [Programme for Energy Efficiency in Buildings Cool initiative](#), and the [Sustana Cooling Impact Fund](#).

WHAT’S NEXT?

CCC remains committed to sustaining this upward trend in awareness, action, and funding for sustainable cooling through strategic partnerships, targeted campaigns, and engagement initiatives. By continuing to drive conversations and advocate for sustainable solutions, CCC is poised to make a lasting impact by driving investments and ambitious policies to mitigate the cooling sector’s emissions and by advancing global climate resilience through efficient, climate-friendly cooling for all.



Increase in “Cooling Solutions” mentions in extreme heat coverage (Source: Cision)

INTERNATIONAL COLLABORATION: A GLOBAL PLEDGE FOR ACTION



PROJECT PERIOD: 2023–2025
REGION: Global
PARTNERS: UNEP Cool Coalition

Achieving energy-efficient, climate-friendly cooling for all will require global ambition and wide-scale action from all stakeholders. To maximize impact, we must foster international collaboration among national and subnational governments, the private sector, financial institutions, and other organizations.

FIRST-OF-ITS KIND PLEDGE

On December 5, 2023, at COP28 in the United Arab Emirates, the UNEP-led Cool Coalition and COP28 Presidency launched the [Global Cooling Pledge](#). The initiative aims to raise the ambition of countries to establish a comprehensive set of commitments to reduce global cooling-related emissions by 68% by 2050. This first-ever global pledge focused on all aspects of cooling builds on the strong foundation set by the Kigali Amendment to the Montreal Protocol.

In the run-up to COP28, the Cool Coalition engaged dozens of national



UNEP Executive Director Inger Andersen (center left), COP28 President Dr Sultan Ahmed Al Jaber (center), and U.S. Special Envoy for Climate John Kerry (center right), with several Global Cooling Pledge signatories and supporters at the launch event at COP28. (Source: UNEP)

governments and other key coalition stakeholders to provide input on the pledge text. Those early efforts culminated in a commitment by 63 countries to the pledge at its high-level launch event at COP28. Since then, an additional eight countries have become signatories.

The Global Cooling Pledge was recently highlighted in the G7 Climate, Energy, and Environment Ministers' Meeting Communiqué, in which G7 countries reaffirmed their commitment to it.

More than 60 private sector companies, financial institutions, and international organizations have also committed to supporting Pledge implementation.

The Global Cooling Pledge consists of 14 commitments, including adopting best-practice appliance efficiency standards, phasing down the production and use of hydrofluorocarbon (HFC) refrigerants, and scaling up passive cooling solutions.

According to the [Global Cooling Watch](#), a report published at the time of the pledge's launch, collective action could achieve sizeable emissions reductions and significantly increase access to sustainable cooling by 2030 and increase the global average efficiency of new ACs by 50% compared to today's models.

WHAT'S NEXT?

The Cool Coalition is focusing on collaborating with its numerous partners and nongovernmental members to identify and coordinate support and resources for pledge implementation. This effort aims to ensure the success of national government signatories in implementing all of the pledge's commitments. The Global Cooling Watch will serve as a transparency mechanism to track and report on signatories' progress every two years.

At the same time, other CCC partners will work to engage additional cooling stakeholders. For example, the Carbon Trust is developing a set of resources to support cooling manufacturers' sustainability efforts under the [Race to Zero campaign](#).

PASSIVE COOLING: A MARKET TRANSFORMATION APPROACH FOR SCALING COOL ROOFS



PROJECT PERIOD: 2021–2025

COUNTRIES: Indonesia

PARTNERS: Cool Roofs Indonesia (Universitas Pendidikan Indonesia/UPI)

Like many places around the world, Indonesia is facing significant urban heat challenges, with rising temperatures exacerbating the [urban heat island effect](#) and increasing energy consumption from air conditioning.

Cool Roofs Indonesia — a multipronged initiative led by architecture professor Beta Paramita from UPI — is working to tackle these issues head-on. By transforming roofing and wall materials to reflect solar radiation, Cool Roofs Indonesia enhances thermal comfort for urban residents by lowering buildings’ interior temperature, and it aligns with Indonesia’s climate targets to reduce energy use and carbon emissions.

FROM COOL ROOFS TO COOL BUILDINGS

Cool Roofs Indonesia, launched in 2019 as part of the global Million Cool Roofs Challenge, is committed to strengthening the supply and demand for solar-reflective cool roofs and walls across Indonesia and neighboring countries.

The initiative cultivates an ecosystem of innovation by advancing research and training, developing a testing facility, and establishing standards. Through this comprehensive approach, it is working to ensure that solar-reflective materials



Cool Roofs Indonesia team hard at work (Credit: Clean Cooling Collaborative)

are widely available and are supported by a robust framework for continuous improvement and adoption.

Over the last five years, the initiative has catalyzed an ecosystem-wide movement, rallying a broad spectrum of local champions, from university faculties and students engaged in hands-on projects to residents and business owners in low-income communities benefiting from cooler living and working conditions thanks to cool roofs. Even government officials are taking note. Interest in the possibility of integrating cool roofs into housing subsidy programs is growing.

To date, the team has deployed more than 142,000m² of cool roofs, benefiting approximately 12,000 people.

A pivotal collaboration with PT. TATALOGAM LESTARI, one of Indonesia’s premier metal manufacturers, has significantly broadened the project’s potential impact. It has enabled the innovative mass production of “cool panels,” versatile building materials that could be used for roofing and wall cladding. These panels have the potential to reshape the construction landscape with sustainable solutions.

The initiative has established Indonesia’s first testing lab for solar-reflective materials, paving the way for reliable performance data and fostering further collaboration between academia and industry.

WHAT’S NEXT?

Looking ahead, Cool Roofs Indonesia will keep advancing the market transformation of solar-reflective materials while ensuring inclusive access. The team is preparing to showcase “cool houses” for low-income communities as part of the Indonesian government’s housing programs. This effort aims to ensure that sustainable living conditions are not a privilege for the few but instead are accessible to all.

SUPER-EFFICIENT “5X” AC: LEAPFROGGING TO INNOVATIVE COOLING TECHNOLOGIES



PROJECT PERIOD: 2022–ongoing

REGION: Global

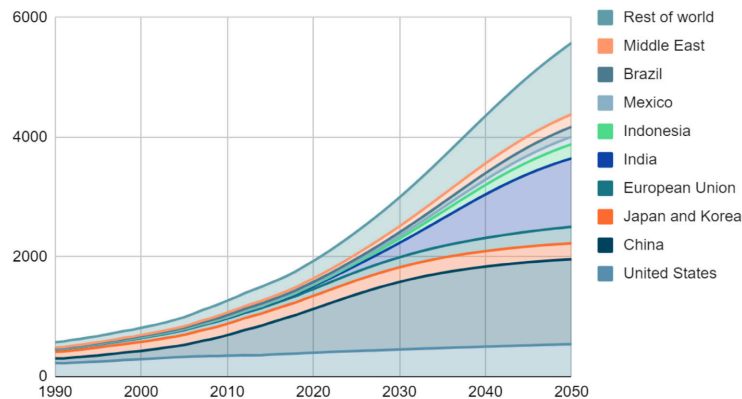
PARTNERS: Alliance for an Energy Efficient Economy (AEEE), CEPT University, Lawrence Berkeley National Laboratory (LBNL), Natural Resources Defense Council (NRDC), RMI

In 2021, the Global Cooling Prize (GCP) — an innovation challenge led by RMI, Mission Innovation, and India’s Department of Science and Technology — demonstrated the feasibility of [super-efficient room ACs](#) using currently available technology. The prize led to development of “5X” prototypes — ACs with five times lower climate impact than conventional units. The next step: establishing a pathway to bring these prototypes to market and to ensure the necessary conditions were in place for these units to thrive.

COMMERCIALIZATION OF 5X ACs

CCC formed a coalition called the [Global Cooling Efficiency Accelerator](#) to help make 5X ACs a reality. The coalition includes technical and policy experts from RMI, LBNL, NRDC, AEEE, and CEPT University in India.

As a broad-based coalition, the accelerator is working to establish the right preconditions to address several supply and demand barriers to make 5X ACs commercially available. This foundational work includes updating the test methodology to better align with real-world operations, particularly in humid climates; catalyzing



Projected global air conditioner stock, 1990-2050 (millions of units)
Source: IEA 2018; The Future of Cooling, License: CC BY 4.0

the manufacturing ecosystem; gathering real-world field data through testing and validation; preparing markets and consumers; and building momentum through targeted technical, regulatory, and commercial outreach.

To date, extensive lab testing and analysis have supported the development of a revised test methodology that more accurately reflects the real-world operation and performance of ACs in hot and humid conditions. This methodology can be adopted without wholesale changes to the existing testing infrastructure. It is currently being validated in the lab and socialized among key research institutions to pave the way for its formal adoption by international standard-setting bodies.

In addition, field testing is underway to generate important data on real-world performance, energy savings, and expected payback period of these units. This work will help further refine the lab test methodology, inform the design of financial incentives to drive product demand, and inform the development of appropriate performance specifications, which can serve as a blueprint for manufacturers to drive their products toward 5X performance levels. If adopted on a wide scale, 5X ACs have the potential to prevent a cumulative **68 gigatons of CO₂ emissions** — the equivalent of more than a year’s worth of emissions from all anthropogenic sources today — by 2050.⁸

WHAT’S NEXT?

Philanthropic efforts have been geared toward establishing the right foundations and identifying pathways forward. Substantial additional investment is now needed for ongoing implementation. In particular, investment is needed to support technical assistance for manufacturers, retool factories, strengthen production supply chains, and catalyze demand.

Our ongoing work with Global Cooling Efficiency Accelerator partners and grantees is generating interest among a broad set of stakeholders, and we are optimistic that at least one manufacturer will bring a product that is based on some of the 5X-performance attributes to the market in the next 12 months.

⁸ This estimate is based on [RMI analysis](#) from the GCP. The published number has been updated to account for the delayed timeline. Because the launch of 5X-derivative ACs will occur only in select markets in 2027, the impacts of this work will begin to scale in 2030 and beyond.

MODEL REGULATIONS: SETTING A BEST-PRACTICE BLUEPRINT FOR EFFICIENT COOLING APPLIANCES



PROJECT PERIOD: 2022–ongoing

REGION: Global

PARTNERS: Lawrence Berkeley National Laboratory (LBNL), United Nations Environment Programme (UNEP), United for Efficiency (U4E)

Well-designed and enforced MEPS ensure that every appliance sold in a country meets a basic level of energy efficiency, while energy labels help consumers identify the more efficient models offered for sale. Together, these tools can help address the excess electricity use and GHG emissions associated with cooling equipment while also improving energy security, reducing utility bills, and enhancing quality of life.

UNEP's U4E initiative develops [Model Regulation Guidelines](#) to facilitate regional harmonization of such policies and support national and local implementation efforts. These guidelines provide global best practices as a starting point for customization to meet local needs, driving markets toward more sustainable cooling appliances and helping prevent countries from being dumping grounds for products banned elsewhere.

Through the guidelines, U4E, LBNL, and other partner organizations are encouraging countries in the Global South to pursue ambitious policies and programs for various cooling appliances.

NATIONAL AND REGIONAL IMPLEMENTATION

Since the development of guidelines for [ACs](#), [household refrigerators and freezers](#), and [commercial refrigeration equipment](#) under K-CEP, CCC's grantmaking has shifted to supporting national-level implementation in priority countries as their governments work to meet climate and energy commitments through improved efficiency. As a result, an

increasing number of countries, including [Pakistan](#), [Chile](#), and [Nigeria](#), have used these guidelines to develop MEPS and labels.

At the regional level, both the [Southern African Development Community](#) and the [Association of Southeast Asian Nations](#) (ASEAN) are using these guidelines to harmonize their efficiency standards for cooling products sold in member countries.

ASEAN's regional roadmap for room ACs includes recommended MEPS levels. Successful passage of regional MEPS at these levels could save 268 TWh of electricity and 209 MtCO₂e by 2040 and yield \$32 billion in consumer utility bill savings.

To help realize these benefits, CCC's implementing partner, U4E, hosted a [regional workshop](#) to facilitate knowledge sharing and cooperation. Additionally, U4E is leading AC MEPS implementation efforts in Singapore and Malaysia and is coordinating similar activities in the Philippines and Vietnam. In March 2023, Singapore became the first country in the region [to announce](#) its adoption of the top-tier efficiency level in ASEAN's regional roadmap for room ACs, which is aligned with U4E's model regulation guidelines.

CCC is encouraged to see program partners and other organizations promoting the adoption of these guidelines in other key regions, including the Economic Community of West African States (ECOWAS) and the East African Community (EAC).

To further accelerate the transition to efficient, climate-friendly cooling appliances, U4E and LBNL, in partnership with CCC, have created similar frameworks for [off-grid refrigeration appliances](#) and [ceiling fans](#). These frameworks were launched in October 2023 at the 35th Meeting of the Parties of the Montreal Protocol (MOP35).

WHAT'S NEXT?

CCC's efforts will focus on supporting global adoption of the newly released guidelines and assessing their potential impact. In collaboration with U4E, CCC will update existing guidelines to reflect market changes, aiming for further reductions in energy use, utility bills, and GHG emissions. U4E is also continuing to build capacity of National Ozone Officers and energy officials from over 130 countries on the use of these guidelines and a variety of other tools.



(Credit: Clean Cooling Collaborative)

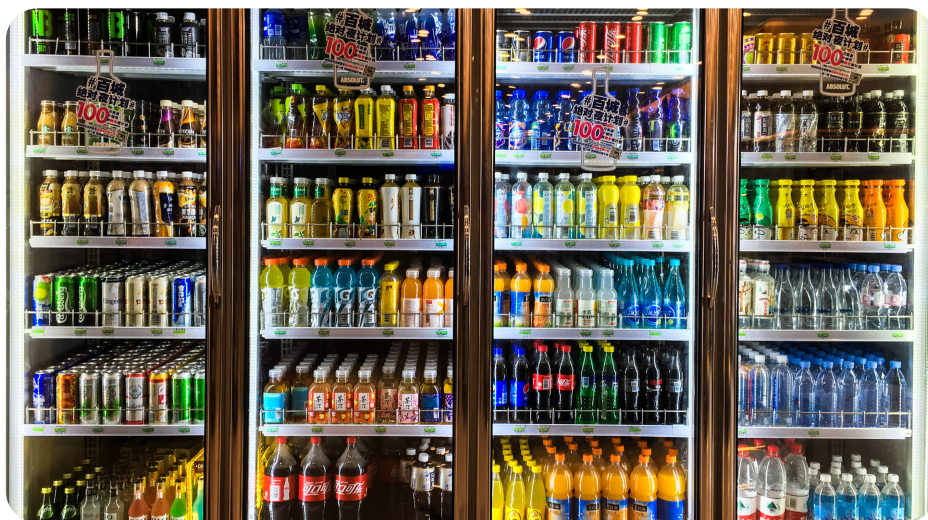
MEPS: RAISING APPLIANCE EFFICIENCY STANDARDS IN ONE OF THE WORLD'S LARGEST MARKETS



PROJECT PERIOD: 2022–2023
COUNTRIES: China
PARTNERS: Energy Foundation China (EF China)

If designed and implemented well, MEPS (minimum energy performance standards) are among the most effective policies for facilitating a market's transition to efficient technologies. China's room AC MEPS exemplifies this impact. Following the [introduction of updated standards in 2020](#), the market rapidly shifted from inefficient fixed-speed ACs to efficient variable-speed models that reduce annual AC energy use by up to 35%. As a result, variable-speed ACs now dominate China's domestic market with a 98% share as of late 2021.

China is now focused [on commercial refrigeration](#), aiming to replace low-efficiency equipment with green alternatives by 2030. Implementing stricter MEPS could boost efficiency by 15% to 25%, saving an estimated 495 billion kWh of electricity by 2035 and preventing more than 300 million tons of CO₂ emissions over the coming decade.



Convenience stores refrigerators in Shanghai, China (Credit: Nisit Keawnoi)

SIX PRODUCTS, ONE STANDARD

In partnership with EF China, CCC is assessing potential energy efficiency improvements in commercial refrigeration. The collaboration includes evaluating best-available technologies and international efficiency standards and analyzing testing models, refrigerant use, and cost-efficiency.

These efforts have led to policy recommendations shared with the Standardization Administration of China and government ministries like the National Development Reform Commission and the Ministry of Ecology and Environment.

One of the project's main objectives is to inform the revision of China's MEPS for three key products — remote commercial refrigerated cabinets, self-contained commercial refrigerated cabinets, and vending machines — and to set new MEPS for commercial kitchen refrigerators, ice makers, and ice cream makers in line with U4E's [model regulation guidelines](#).

Using a unique approach, the project aims to bundle all six products into one standard. Although initially challenging, this unified approach will streamline compliance testing, enforcement, and market coordination, optimizing efficiency improvements for greater energy savings and promoting international standard harmonization.

WHAT'S NEXT?

The updated MEPS for commercial refrigeration equipment sold in China is expected to be ready for review in the coming months and could be released by the end of 2024. This initiative is set to drive significant advancements in energy-efficient and climate-friendly practices within China's commercial refrigeration sector. Similarly, work with EF China and CNIS has been initiated to achieve greater efficiency levels in residential sector refrigeration.

HFC PHASEDOWN: A FUTURE WITHOUT SUPER-POLLUTANT REFRIGERANTS



PROJECT PERIOD: 2022–2024

REGION: United State and European Union

PARTNERS: Environmental Investigation Agency (EIA-US and EIA-Europe), Institute for Governance and Sustainable Development (IGSD), NRDC

Refrigerants are a key component of air conditioning, refrigeration, and heat pump technologies. Unfortunately, most refrigerants used today contain HFCs, which are potent GHGs with global warming potentials (GWPs) that can be hundreds to thousands of times greater than carbon dioxide (CO₂).

As these appliances are used or disassembled at the end of their life, their refrigerants tend to leak into the environment and, in the case of HFCs, cause significant damage to our climate.

Regulations must ensure that all equipment manufacturers shift to low- or near-zero-GWP refrigerants for new cooling products. This transition is particularly important as the number of new refrigerators and room ACs sold worldwide is expected to grow dramatically.

SIGNIFICANT MITIGATION POTENTIAL

Over the past few years, the U.S. Environmental Protection Agency (EPA) and the European Commission have updated the regulations that govern the GWP of refrigerants that can be used in new cooling equipment.

CCC's implementing partners — EIA-US, EIA-Europe, NRDC, and IGSD — have actively participated in the rulemaking processes by providing oral and written testimony, building coalitions with aligned manufacturers, and working with the media to counter exaggerated claims by incumbent manufacturers that opposed the standards.

In the United States, our partners have worked at the state level to update building codes to allow for the use of low-GWP refrigerants classified as moderately flammable such as R32, which has a GWP that is one-third that of incumbent refrigerants such as R410A.

In October 2023, the United States EPA published the [final rule](#) setting maximum GWP limits on HFCs and HFC blends used in new cooling equipment. The EPA estimates this rule will prevent up to 876 million metric tons of CO₂ equivalent through 2050.

Date	Equipment	GWP limit
January 1, 2025	Household refrigerators	150
	Room ACs and heat pumps	700
	Commercial food refrigeration equipment	150
January 1, 2027	Supermarket refrigeration systems	150–300 ⁹

GWP limits for refrigeration, air conditioning, and heat pump technologies under the U.S. Technology Transition Rule

On the other side of the Atlantic, in February 2024, the European Commission adopted the revised [EU F-gas Regulation](#), which will prevent roughly 300 million metric tons of CO₂ equivalent by 2050. The updated legislation has some interim dates leading to a ban on HFCs in the newest cooling equipment by 2035. The regulation permits some higher-GWP refrigerants to continue to be used past these dates if safety regulations have not been updated to allow for the use of low-GWP alternatives.

WHAT'S NEXT?

Paving a smooth path to the adoption of ultra-low-GWP refrigerants like propane and otherwise ensuring successful implementation of the new rules in the United States and European Union will be a major focus. CCC partners will also work to lay the foundation for both similar HFC phasedown/phaseout rules and market uptake of low-GWP alternatives in China and India.

Since the historic [\\$1 billion replenishment](#) of the Montreal Protocol's Multilateral Fund, CCC grantees have been working to ensure the effective use of these funds to accelerate action and to integrate energy efficiency in the refrigerant transition.

⁹ Depending on system charge

SUPER-EFFICIENT CEILING FANS: UNLOCKING SWIFT DEPLOYMENT



PROJECT PERIOD: 2023–2024

COUNTRIES: India

PARTNERS: Alliance for an Energy Efficient Economy (AEEE), CLASP, Energy Efficiency Services Limited (EESL)

Ceiling fans are among India’s most commonly used household appliances for cooling. Today, some 90% of Indian households have one or more ceiling fans, and nationally, more than 450 million are in place. Because almost all of these fans are energy inefficient and have high operating hours, they represent nearly 40% of India’s annual residential electricity consumption. Although ceiling fans that use half the energy of a typical unit are commercially available in India, they currently represent less than 3% of all the country’s annual sales due to their higher purchase price and limited availability.

Transforming the existing residential ceiling fan segment toward super-efficient fans could reduce India’s annual residential power consumption by some 15% and could avoid around 33 million metric tons of CO₂e per year.



(Credit: Frederick Shaw)

TRANSFORMING INDIA’S FAN MARKET

Since 2023, CCC and its partners have been working to transform India’s ceiling fan market via the integrated Fan Hub program. One catalytic activity of the program is to support [EESL](#) — an energy services company promoted by India’s Ministry of Power — in the deployment of 10 million super-efficient fans by the end of 2024. This target represents 25% of national ceiling fan sales. EESL’s initiative, which is in line with the Government of India’s policy goals, presents a timely opportunity to accelerate the uptake of super-efficient fans.

CCC’s grantees and partners are supporting EESL in designing a robust bulk procurement and deployment program to achieve price reductions through economies of scale and to catalyze demand. In parallel, CCC’s work with the Fan Hub will strengthen the manufacturing capacities and supply ecosystem for super-efficient ceiling fans made in India. In turn, this work will lay the foundation for extended sales growth and a longer-term transformation of the Indian ceiling fan market.

To date, EESL has completed a tender for 2 million units, achieving a price reduction of nearly 30% and bringing the cost of super-efficient fans closer to that of much less efficient alternatives. This price reduction has triggered a high level of manufacturer interest in producing high-efficiency models. Simultaneously, a marked increase in consumer advertising campaigns for super-efficient fans has raised the fans’ visibility.

WHAT’S NEXT?

Building on the initial deployment of 10 million super-efficient ceiling fans, CCC and its grantees will work to advance efforts on the supply side of the ecosystem. This work will include boosting the production capabilities of small- and medium-sized manufacturers and developing a blueprint for a broader transformation of India’s ceiling fan market. Such a transformation will simultaneously close the cooling access gap and optimize the future energy efficiency of millions of fans. It will also meaningfully support India’s NDC and Thermal Comfort for All agenda.

CCC also plans to support other countries’ efforts to adopt super-efficient ceiling fans, with an initial focus on countries in Southeast Asia.

DEMAND FLEXIBILITY: ENHANCING GRID-FRIENDLY COOLING



PROJECT PERIOD: 2022–2024

COUNTRIES: China

PARTNERS: Energy Foundation China (EF China)

China, with the world's largest installed power generation capacity, still faces significant challenges in managing its energy demand, especially during extreme weather events. The 2022 heatwave exposed vulnerabilities in the country's electrical grid. A spike in cooling demand caused widespread power outages, highlighting the need for innovative solutions to stabilize the energy supply and minimize the need for fossil fuel-based peaker power plants — high-emitting power plants used in times of high demand.

MANAGING PEAK COOLING DEMAND

To demonstrate the potential impact of smart appliances and controls that enable users or utilities to better manage electricity use in response to overall demand on the power grid — i.e., demand response — CCC partnered with EF China for a [pilot project in Huzhou](#). This



Smart home control switch in China (Credit: Wengen Ling)

project leverages smart technology to optimize cooling-related energy use in the residential sector, aiming to reduce peak electricity loads, enhance grid stability, and cut emissions.

To maximize the pilot project's impact, we engaged local grid companies, universities, government agencies, experts from LBNL, and AC manufacturers.

Central to the project are Wi-Fi-enabled room AC controls that allow consumers to proactively manage their energy use in real time. When users opt in, utility providers can use these smart controls to adjust cooling settings based on grid demand, ensuring efficient energy use without compromising user comfort. By dynamically managing the cooling load, the system helps flatten peak demand curves, reducing the risk of power outages during high-demand periods.

The program started with 300 volunteer households across the city, with plans to expand the project to tens of thousands of Huzhou residents over the coming year. Rough estimates suggest that if the city's 3 million residents participated in the program, nearly 1 million tons of CO₂ emissions would be prevented annually.

The pilot project in Huzhou has shown promising results and has garnered the attention of multiple interest groups, indicating that use of its smart technology could be scaled up.

WHAT'S NEXT?

EF China continues to research and develop new demand-response technologies and strategies to improve the project's effectiveness. Options include integrating the project's smart technology with the municipal government's Carbon Talent Platform to enable project participants to collect "green credits" and exchange them for gifts or a discounted electricity rate.

EF China plans to expand the initiative to other cities in China to facilitate the wider adoption of smart cooling technologies. It hopes to further enhance the country's energy resilience and to contribute to global sustainability goals. In addition, it will explore opportunities to replicate the project in other countries.

HEAT PUMPS: PROVIDING EFFICIENT YEAR-ROUND THERMAL COMFORT



PROJECT PERIOD: 2022–2024
COUNTRIES: United States
PARTNERS: Building Decarbonization Coalition (BDC)

Heat pumps are an energy-efficient alternative to outdated ACs and fossil fuel-based heating systems and, thus, a key technology to accelerate building decarbonization and electrification. When coupled with a decarbonized energy grid, heat pumps can [reduce GHG emissions by up to 93%](#) over their lifetime compared to a gas furnace.

The popularity of heat pumps in the United States has surged over the last decade, with [sales outpacing those of gas furnaces](#) in 2022 and 2023.

MARKET COLLABORATION AND CONSENSUS

CCC's implementing partner, the BDC — consisting of policymakers, industry groups, and consumers — has played an instrumental role in advancing heat pump deployment across the United States.

Several key developments have occurred over the last year. In early 2023, the BDC's [“Why Cooling is Key”](#) report highlighted how states can accelerate building decarbonization by converting the sale of central AC units to electric heat pumps. The report found that, by



Modern heat pump system (Credit: Maxshot)

2030, this transition could accelerate the decarbonization of space heating in millions of homes across the United States, including in over half of the homes in California, Maryland, and New Jersey.

In November 2023, the BDC held a market development summit attended by 11 major manufacturers representing 95% of the water heater market and 80% of North America's heating, ventilation, and air conditioning market. The companies unanimously agreed to sign onto a [joint market development policy platform](#) that, among other things, calls for a clear regulatory backstop for policy certainty, all-electric new construction, a mandate to replace one-way ACs with two-way heat pumps on burnout, and equitable rate reform. The platform reflects consensus among major market actors regarding the need for an approach to decarbonize.

Most recently, in May 2024, the BDC launched the [California Heat Pump Partnership](#), a public-private partnership of California state agencies, energy providers, and major industry actors. The partnership will work to reform policy, grow the workforce, and educate consumers to accelerate heat pump adoption in support of the governor's target of installing 6 million heat pumps by 2030.

Due to the efforts of the BDC and allied organizations, the rate of building decarbonization in the United States is on the rise, and new programs and resources are emerging through the [Inflation Reduction Act](#). One in five Americans now lives in a jurisdiction that has adopted a building decarbonization policy. New incentive programs and financing models are being rolled out across multiple states, helping make efficient heat pumps available to the masses.

WHAT'S NEXT?

The next three to five years will be critical for delivering efficient cooling and heating via heat pumps to millions of households across the United States. Within that timeframe, the BDC will pursue electric rate reform, establish building and appliance standards, and redirect billions of dollars from fossil fuel infrastructure to heat pumps.

COLD CHAIN: SCALING SUSTAINABLE SOLUTIONS IN AGRICULTURE



PROJECT PERIOD: 2022–2025
COUNTRIES: India
PARTNERS: AEEE, UNEP

An [estimated 30% to 40% of the fruits and vegetables](#) produced in India are lost between farm and fork due to a variety of factors, including subpar transportation, technological gaps, and lack of sufficient refrigeration equipment. Among the detrimental effects of high rates of post-harvest losses are food insecurity, increased GHG emissions from decomposing food, and reduced income for farmers, which can hinder rural development.

To combat post-harvest losses, India plans to expand its cold chain capacity. Our implementing partners, UNEP and the AEEE, under the framework of the Cool Coalition, are collaborating to ensure this development is sustainable. The team aims to improve economic outcomes for farmers (particularly rural women and youth), reduce food loss and its associated emissions, and boost food and nutritional security across the country.

POLICIES AND PILOTS FOR IMPACT

Leveraging international expertise and local insights, UNEP and AEEE have built a project based on activities designed to ensure the long-term expansion of sustainable, integrated cold chains. The project includes national and state-level policy and planning; scaling up project demonstrations, business models, finance mechanisms, and investments; and capacity building and training.

The project focuses on Bihar and Haryana, two key agricultural states burdened by the lack of integrated and sustainable cold chains. It aims to increase the development of essential



Fresh vegetables and fruits in Udaipur, India. (Credit: Vitalii Karas)

infrastructure, particularly first-mile packhouses linked with refrigerated transport.¹⁰

So far, the initiative has propelled the Bihar state government's efforts to enhance policy frameworks, analysis, and planning, with the aim of fostering an environment conducive to expanding sustainable cold chains. This work has made sustainable cold chain development a flagship initiative within the state's [Climate Resilient and Low Carbon Development Pathway](#).

In Haryana, subsidy programs encourage cold chain development, but their uptake has been limited, and key sustainability issues, such as equipment efficiency and the GWP of refrigerants, have not yet been factored in. To address this gap, the project team is working closely with the state government to strengthen existing policy and program frameworks, ensuring sustainability is integrated into the infrastructure's development and linked effectively with existing subsidies.

In both states, the project team is supporting the development of detailed project reports (DPR) for prospective demonstrations of efficient, climate-friendly packhouses. These reports outline the key aspects of project design, planning, execution, and management, including technical specifications, financial planning, and environmental impacts. The team aims to ensure that packhouses improve market connectivity and post-harvest practices and that they reduce food loss and contribute to broader environmental sustainability objectives.

WHAT'S NEXT?

Haryana's Department of Horticulture plans to create more than 500 integrated packhouses and other cold chain facilities with US\$320 million from the Japan International Cooperation Agency and the state government over nine years.

UNEP and AEEE will explore opportunities to support the Haryana state government in setting up a financing facility that will help scale up commercial financing, demonstrate viability, and incentivize the operational performance of efficient, climate-friendly packhouse projects for long-term sustainability.

¹⁰ Immediately after harvesting, farmers bring their fresh produce to these facilities for sorting, cleaning, packing, and, sometimes, cooling.

ACCESS: COMMUNITY-DRIVEN SOLUTIONS FOR CLEAN COOLING



PROJECT PERIOD: 2023–2025

COUNTRIES: India

PARTNERS: Village Empowerment, in partnership with Mahila Housing Trust (MHT)

With temperatures frequently soaring above 40° C (104° F) during the heat season, Jodhpur is one of India's hottest cities.

In 2022, in response to requests from heat-vulnerable community groups, Jodhpur developed its first-ever heat action plan (HAP) in consultation with the NRDC and MHT, a grassroots development organization focused on empowering women in low-income urban communities.

By incorporating local data and community feedback, Jodhpur's HAP has effectively characterized heat risk at the ward level, enabling targeted and localized interventions to protect the most vulnerable communities. The city is now focused on implementing and strengthening its HAP.

COMMUNITY ENGAGEMENT FOR SUSTAINED IMPACT

Under the Jodhpur HAP, Village Empowerment, in partnership with MHT, is implementing several interventions across the city. Efforts include introducing a heat early warning system, piloting passive cooling solutions, and developing heat awareness campaigns.



Cool roofs have been rolled out across some 750 homes in Jodhpur. (Credit: Mitul Kajaria)

With a firm belief that sustained impact can only be achieved with active community engagement, the project has facilitated the development of women-led grassroots collectives known as community action groups. To date, some 300 local female leaders have been mobilized to act as champions for cooling access, and more than 160 women have participated in training sessions on heat awareness, prevention, and mitigation. The community action groups have played a crucial role in assessing community needs and priorities, implementing impactful action plans, and mobilizing support from other city stakeholders.

One of the HAP's crucial initiatives has been the development of the [Net-Zero Cooling Station](#), a space dedicated to keeping people in heat-vulnerable communities cool and safe during soaring temperatures. The station incorporates passive and low-carbon cooling features to offer thermal comfort while reducing environmental impact. Since 2023, the project has directly installed cool roofs on more than 750 homes, benefiting some 4,500 individuals to date.¹¹ This initiative was carried out in close collaboration with the local community, which also received hands-on cool roof training.

In addition to delivering tangible benefits in Jodhpur, partners are sharing lessons learned at national-level workshops and events. Community leaders from Jodhpur have been invited to present their initiatives in their own words, highlighting the effectiveness of the projects.

WHAT'S NEXT?

Inspired by the success of Jodhpur's HAP, other cities in India are beginning to develop their own plans, focusing on passive cooling solutions to enhance urban resilience against extreme heat.

The cities of Amalner, Patan, and Surat have already approached MHT for assistance in developing HAPs that will extend to implementation. This work is expected to positively impact approximately 3 million residents across the three cities.

¹¹ By reflecting the sun's radiation, cool roofs absorb less heat than standard roofs, helping reduce internal temperatures as well as energy costs.

THE ROAD AHEAD



WHAT'S NEXT?

As this Mid-Program Impact Report indicates, great work is being done with our implementing and funding partners to create an enabling environment in which clean cooling solutions can be developed and thrive. However, as we confront the harsh realities of a rapidly warming climate with record-breaking temperatures each year, the urgency to accelerate, replicate, and scale our successes has never been greater.

If we as a community succeed at transforming the cooling sector, we have the opportunity to reduce emissions by 100 gigatons of CO₂e by mid-century — a monumental achievement for the future of the planet. But the benefits extend beyond emissions reductions: clean cooling also enhances the lives of millions of people by building resilience to the extreme heat threats that are already a reality.

As a community, we must champion cooling innovations, promote solutions that bridge the gap between mitigation and adaptation in the context of clean cooling, and mobilize public and private investment to expand the adoption of clean cooling.

Our resolve to raise awareness of extreme heat issues and the opportunities that clean cooling presents for climate and development has never been stronger. We will continue to invest in innovative, high-impact solutions, facilitate enhanced collaboration and coordination, and demonstrate the compounded impact of collective action.

Together, we are committed to advancing toward a future with efficient, climate-friendly clean cooling for all.

THREE THINGS TO REMEMBER



3 BILLION new room ACs are projected to be installed between now and 2050



OVER 1.1 BILLION people currently lack access to the cooling they need to keep safe



100 GIGATONS of CO₂e emissions could be avoided by 2050 (~2 years of today's global GHG emissions) with clean cooling solutions

THE CLEAN COOLING COLLABORATIVE ECOSYSTEM



OUR TEAM

CCC is an initiative within ClimateWorks Foundation. Our team of experts sets CCC’s strategy, oversees grantmaking, facilitates programmatic partnerships, and tracks progress against an established results framework.



CCC staff at our 2024 annual convening

CORE TEAM (FULL-TIME CCC STAFF)



Mirka della Cava
Global Efficiency Lead



Noah Horowitz
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SUPPORT WITHIN CLIMATEWORKS FOUNDATION



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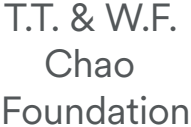
Tao Wang
China Strategist,
ClimateWorks

FUNDING PARTNERS (2022–PRESENT)

Through the generous support of our funding partners, we continue to advance our mission to transform the cooling sector and make efficient, climate-friendly cooling accessible to all. Our funding partners have contributed to CCC’s mission in meaningful ways, most by contributing to our pooled fund and some by supporting specific CCC initiatives.

Some of our funding partners also serve on CCC’s Funders Advisory Council, which advises the program on strategic direction and engages in dialogues on the latest cooling sector trends and developments.

Current and past CCC funding partners include:



IMPLEMENTING PARTNERS (2022–PRESENT)

A strong coalition of partner organizations is required to move the field on a path to efficient, climate-friendly cooling for all.

CCC is grateful for its many implementing partners, who bring insights, expertise, and vitality to this collaborative.

Current and past CCC implementing partners include:



ANNEX




RESULTS FRAMEWORK SCORECARD (FULL)

STRATEGY AREA	INTERVENTION AREA	INDICATOR OF PROGRESS	TARGET (2025)	RESULTS (AS OF JUNE 2024)	STATUS	DESCRIPTION
<p>RAISE the profile of and resources for efficient, climate-friendly cooling as a core climate, development, and equity opportunity</p>	Cross-cutting	# of countries that add efficient, climate-friendly cooling commitments to their enhanced Nationally Determined Contributions (NDCs)	9	9	✔ Achieved	Burkina Faso, ¹ Cambodia, ² Ethiopia, ³ Jordan, ⁴ Morocco, ⁵ Nigeria, ⁶ Pakistan, ⁷ Tunisia, ⁸ Vietnam. ⁹
		Increase in the amount of resources mobilized for the field of clean cooling	-	-	➡ In Progress (No Target)	In December 2023, national leaders decided to nearly double contributions to the Multilateral Fund (MLF) for the implementation of the Montreal Protocol to \$965 million over the next three years.
		# of CCC-supported knowledge products and briefs shared with stakeholders	-	50	➡ In Progress (No Target)	Key products include the Chilling Prospects series, the Global Cooling Watch report, the Keeping Cool in a Warming World animation, and the Transforming Cities: Cooling Jakarta film.
		# of times cooling is mentioned in media [disaggregates] with reference to or involvement of, CCC's work	-	5,401	➡ In Progress (No Target)	Significant media coverage surrounded the launch of the Global Cooling Pledge, the United States Inflation Reduction Act, and the Solar Decathlon India Challenge.
		# of manufacturers signing on to join the Race to Zero Cooling campaign and/or demonstrating progress toward meeting its milestones	5	15	⬆ Exceeded	Danfoss, Eaton, Electrolux, Emerson Electric Co., ENGIE, Fujitsu Limited, GEA Group, Johnson Controls, LG Electronics, Orbia Advanced Corp, Panasonic Holdings Corporation, SANDEN Group, Schneider Electric, Toshiba Corporation, Trane Technologies
		# of governments that sign on to the Global Cooling Pledge	50	71	⬆ Exceeded	Antigua and Barbuda, Albania, Armenia, Bahamas, Belgium, Bhutan, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Cabo Verde, Cambodia, Canada, Central African Republic, Chad, Chile, Comoros, Costa Rica, Côte d'Ivoire, Czech Republic, Denmark, Djibouti, Dominican Republic, El Salvador, Eswatini, Ethiopia, France, Germany, Ghana, Guatemala, Italy, Japan, Kazakhstan, Kenya, Kiribati, Kyrgyzstan, Lebanon, Maldives, Mauritius, Micronesia, Mongolia, Montenegro, Morocco, Nepal, Netherlands, Nicaragua, Nigeria, North Macedonia, Norway, Palau, Panama, Paraguay, Peru, Rwanda, Saint Lucia, Serbia, Seychelles, Singapore, Solomon Islands, Somalia, Spain, Sri Lanka, Syrian Arab Republic, Togo, Tunisia, United Arab Emirates, United Kingdom, United States, Uruguay, Vietnam, Zimbabwe

STRATEGY AREA	INTERVENTION AREA	INDICATOR OF PROGRESS	TARGET (2025)	RESULTS (AS OF JUNE 2024)	STATUS	DESCRIPTION
AVOID/ REDUCE the need for mechanical cooling	Passive cooling	# of national, state, or city governments that design, propose, adopt, or implement policies, plans, or programs that incorporate passive cooling measures	5	5	✔ Achieved	Burkina Faso, ¹⁰ Vietnam, ¹¹ Jodhpur (India), ¹² Can Tho (Vietnam), ¹³ Tam Ky (Vietnam). ¹⁴
OPTIMIZE/ IMPROVE mechanical cooling systems and their use to be more efficient, climate-friendly, and grid-friendly, and support their deployment	5X AC	# of manufacturers that have 5X room air conditioners that are developed and/or market-ready	2	0	➡ In Progress /On Track	While 5X ACs are not yet available on the market, several manufacturers are doing R&D and pre-commercialization work toward that goal.
		# of updated proposed test methodologies that better reflect real-world performance in hot and humid climates and related energy savings is submitted to the international standards bodies for their consideration and potential future adoption.	1	0	➡ In Progress /On Track	The draft version of a proposed test methodology that would fully capture the energy efficiency advantages of next-generation technologies has been developed. The team will next test the proposed test method's replicability and incorporate dehumidification efficiency in other dynamic test methods.
	Minimum Energy Performance Standards (MEPS) and labels and labels	# of countries that propose, adopt, or implement MEPS, and/or labels to raise the efficiency floor for cooling products	3	9	⬆ Exceeded	Burkina Faso, ¹⁵ Chile, ¹⁶ China, ¹⁷ Ethiopia, ¹⁸ India, ¹⁹ Morocco, ²⁰ Pakistan, ²¹ Singapore, ²² United States. ²³
		# of MEPS and/or labels (for residential or commercial ACs, refrigerators, ceiling fans, and/ or other cooling products) comparable to or better than U4E model regulations that are designed, proposed, adopted, and/or implemented.	8	20	➡ In Progress /On Track	6 adopted: ²⁴ Table and pedestal fans MEPS (India), wall-mounted fans MEPS (India), multi-door refrigeration MEPS (India), AC MEPS (Singapore), commercial AC/rooftop MEPS (U.S.), beverage/wine cooler MEPS (U.S.). 11 proposed: AC MEPS (Burkina Faso), refrigerator MEPS (Burkina Faso), commercial refrigeration MEPS (China), AC MEPS (India), domestic refrigeration MEPS (Morocco), room AC MEPS (Morocco), domestic refrigeration labels (Morocco), room AC labels (Morocco), visi-cooler MEPS (Pakistan), fans labels (Pakistan) and ACs labels (Pakistan). 3 designed: Commercial refrigeration MEPS (Chile), AC MEPS (Ethiopia), domestic refrigeration MEPS (Ethiopia).
	# of new or updated model regulations and/or procurement specifications published that set best practice levels	2	4	⬆ Exceeded	U4E fans model regulation guidelines, U4E off-grid refrigeration quality and performance guidelines, and 2 AC procurement specifications (Burkina Faso).	

STRATEGY AREA	INTERVENTION AREA	INDICATOR OF PROGRESS	TARGET (2025)	RESULTS (AS OF JUNE 2024)	STATUS	DESCRIPTION
OPTIMIZE/IMPROVE mechanical cooling systems and their use to be more efficient, climate-friendly, and grid-friendly, and support their deployment	MEPS and labels	# of countries that have referred to and/or incorporated elements of the model regulations into their MEPS	-	10	➡ In Progress (No Target)	Burkina Faso, Chile, China, Ethiopia, India, Morocco, Nigeria, Pakistan, Singapore, United States (see Optimize O4 for more details). ²⁵
	HFC Phasedown	# of countries that have proposed or adopted regulations that establish Global Warming Potential (GWP) limits for the refrigerants contained in new air conditioners/heat pumps and household refrigerators at 750 and 150, respectively.	3	29	⬆ Exceeded	The European Union (on behalf of its 27 member countries), Singapore, and the United States have passed final rules achieving these levels.
		Amount of new funding commitments to replenish the Multilateral Fund for phasing down HFCs and increasing the efficiency of cooling equipment	-	\$965 million	✅ Achieved (No Target)	In October 2024, the Multilateral Fund announced a \$965 million replenishment over a three-year period. \$100 million was allocated to energy efficiency projects.
	Fans	# of additional super-efficient ceiling fans that have been deployed in India	10 million	2 million	➡ In Progress /On Track	2 million super-efficient ceiling fans have been deployed in India through the first bid in the EESL program.
	Demand response	# of governments (city, state, or national) and/or utilities that design, pilot, and/or implement demand response solutions	2	1	➡ In Progress /On Track	1 Demand Response pilot program in Huzhou (China).
	Heat pumps	# of governments (city, state, or national) and/or utilities that have designed, approved, or implemented policies or incentive programs to increase the deployment of two-way heat pumps	3	2	➡ In Progress /On Track	<p>The California Energy Commission has launched three programs: the California Equitable Building Decarbonization Program (approved), the Heat Pump Partnership (in implementation), and the California Electric Homes Program (in implementation).</p> <p>The California Public Utilities Commission has launched the California Inclusive Financing Program (in implementation).</p>
	Cold chain	# of solutions that enable efficient and climate-friendly cold chain expansion that are scoped, piloted, and/or implemented	5	3	➡ In Progress /On Track	<p>2 solutions piloted for micro-cold storage and packhouses in four states in India.</p> <p>1 solution scoped for diary cold chain in Ethiopia.</p>

STRATEGY AREA	INTERVENTION AREA	INDICATOR OF PROGRESS	TARGET (2025)	RESULTS (AS OF JUNE 2024)	STATUS	DESCRIPTION
INCREASE ACCESS to efficient, climate-friendly cooling for low-income, heat-vulnerable communities	Consumer access and cold chain	# of policies/plans, financing/fiscal programs, and/or initiatives focused on enhancing access to clean cooling for low-income, heat-vulnerable communities (including farmers who need sustainable cold chain) that are designed, proposed, adopted, and/or implemented	10	7	 In Progress /On Track	2 have been designed: A sustainable cooling retrofit program for public schools (Jordan), the Ten Across Clean Cooling Prize project initiative (Northern Arizona, U.S.) 5 are being implemented: Jodhpur Heat Action Plan (India), CSR program for cool roofs (Indonesia), This is Cool Youth Challenge (global), Scaling Up of Green Agri-focused Micro Cold Storage Solutions initiative (India), Equitable Building Decarbonization Program (California, U.S.)

ADDITIONAL NOTES

- Burkina Faso's NDC mentions cooling only briefly but identifies two projects that will modestly reduce emissions in 2025 by promoting efficient cooling in social housing and public buildings. CCC is supporting the implementation of efficient cooling in social housing through the NDC Support Facility.
- Cambodia's NDC is the embodiment of a cooling commitment. The 158-page NDC mentions "cooling" 52 times and has specific commitments to reducing the energy consumption of cooling equipment on a climate-relevant timescale (i.e., by 2030). While the commitment to climate-friendly cooling of public sector buildings is small — 0.04 MtCO₂e of the country's total annual emission of 14 MtCO₂e — Cambodia's NDC is notable for its inclusion of passive cooling in public and commercial buildings. Passive cooling has been slow to scale everywhere, especially in low-income countries and in Southeast Asia, where it could be an effective climate measure. Cambodia's leadership in this area could help raise the profile of passive cooling in the region.
- Ethiopia's cooling commitments are minimal, other than mentioning that the scope of the NDC may be further enhanced to include sustainable cooling initiatives underway within the government. While it is good to know that Ethiopia is conscious of the climate impact of cooling, the current lack of inclusion in an otherwise detailed and comprehensive NDC appears to show sustainable cooling work as a relatively low priority.
- Jordan's NDC reaffirms its commitment to the Kigali Amendment and has several vague commitments to pilot projects for sustainable cooling. The direct mitigation potential of the pilot interventions is modest (~0.07 MtCO₂e); however, Jordan's NDC shows awareness of the use of improving the building envelope to scale passive cooling solutions to reduce the dependence on mechanical cooling.
- Morocco's NDC mostly reaffirms the country's ratification of the Kigali Amendment by emphasizing the importance of reducing HFC consumption in refrigerators and ACs. It also affirms Morocco's commitment to establish and implement MEPS and labels for ACs, with a claimed mitigation of 2.968 MtCO₂ per year. For context, Morocco's total annual emissions are ~65 MtCO₂. If implemented correctly, these MEPS could be extremely effective in reducing Morocco's energy consumption from ACs. Morocco adopted AC MEPS in June 2018, and its NDC reaffirms its MEPS implementation.
- Nigeria's NDC has the most explicit link between CCC's NDC Support Facility funding and the inclusion of cooling commitments in a country's NDC. The commitment covers both Kigali Amendment implementation — i.e., a transition to low-GWP refrigerants — and overall energy efficiency AC work in residential, commercial, and public buildings. This is an exemplar commitment that CCC can take credit for influencing.
- Pakistan's NDC affirms the country's commitment to developing a national cooling action plan, which has the potential to influence climate-friendly cooling across the country. As one of the largest consumers of energy for AC in the Middle East, this national-level action could have significant implications for cooling emissions in Pakistan.
- Tunisia's NDC recognizes the link between warming temperatures and increased dependence on AC, but the only cooling commitment is a reaffirmation of the country's commitment to the Kigali Amendment. However, Tunisia only recently ratified the agreement in August 2021, so the NDC is showing a relatively new commitment to reducing HFCs and should be applauded, despite not showing ambition on the energy intensity and efficiency side of cooling.
- Vietnam's NDC shows an awareness of increasing energy use for cooling, as well as the socio-economic co-benefits of providing efficient cooling. However, it does not make any official commitments to reducing the energy intensity of the cooling or refrigeration sectors. Vietnam does commit to improving energy efficiency and energy savings economy-wide and reducing the consumption of HFCs, both of which will likely include cooling measures in their implementation, though neither effort is yet detailed.
- Burkina Faso's draft decree on building energy efficiency requirements has been proposed.
- Vietnam's adopted National Climate Change Strategy incorporates plans for nature-based solutions and cooling-focused building design.
- Jodhpur's Heat Action Plan incorporates measures on cool roofs/coatings, which are currently being implemented.
- Can Tho's Urban Cooling Action Plan is being designed to include passive cooling measures.
- Tam Ky's Urban Cooling Action Plan is being designed to include passive cooling measures.
- Burkina Faso's AC and refrigeration MEPS have been proposed.
- Chile's commercial refrigeration MEPS has been designed.
- China's commercial refrigeration MEPS has been proposed.
- Ethiopia AC and domestic refrigeration MEPS have been designed.
- India's table and pedestal fans, wall-mounted fans, and multi-door refrigeration MEPS have been adopted.
- Morocco's domestic refrigeration MEPS and labels have been proposed and its room AC MEPS and labels have been proposed.
- Pakistan's fans and AC labels have been proposed and its visi-cooler MEPS has been proposed.
- Singapore's AC MEPS has been adopted.
- United States commercial AC/rooftop and beverage and wine cooler MEPS have been adopted.
- Only adopted MEPS can be compared to model regulation levels as MEPS at the "proposed" or "designed" stage may still change. For three of the six adopted MEPS — i.e. India's table and pedestal fans and wall-mounted fans and the United States commercial AC/rooftop — there are no model regulations to compare them to. For India's multi-door refrigeration MEPS, testing conditions, calculation method, and efficiency metric are quite different from model regulation levels so a one-to-one comparison requires additional analysis. Singapore's AC MEPS is at the top tier of model regulations. For the United States beverage/wine coolers, the Department of Energy has, with many assumptions and caveats, estimated that the new standards are more stringent than the "high efficiency" threshold in the model regulations; however, it is challenging to conclude definitively since a direct comparison is not always one-to-one.
- In addition, the Southern Africa Development Community (SADC) region has developed a regional roadmap for domestic refrigerator MEPS. Individual countries (Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe) will next pursue MEPS development and implementation according to national policy processes.



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