



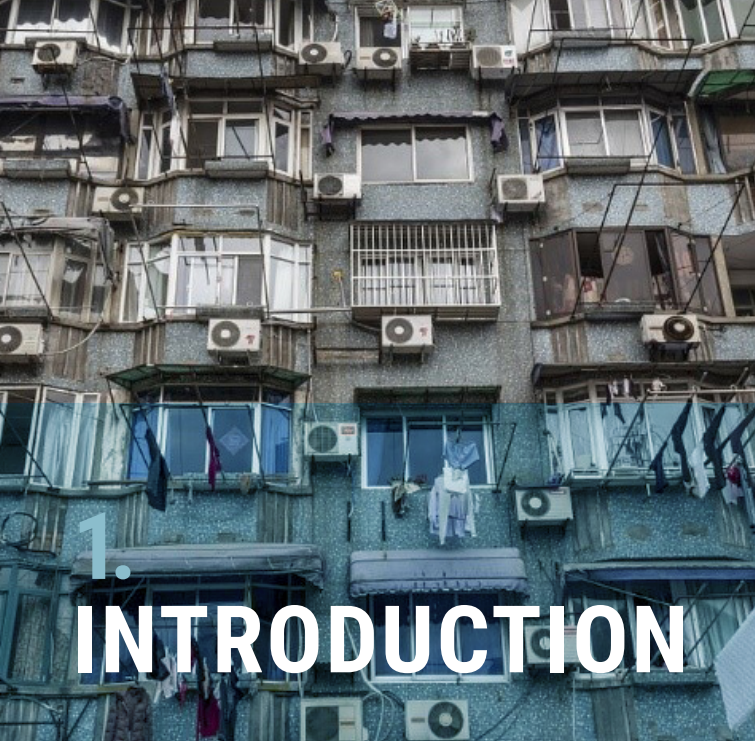
BUSINESS ACTION



ON EFFICIENT, CLIMATE-FRIENDLY COOLING

This guide outlines the opportunity for businesses to advance efficient, climate-friendly cooling.





1. INTRODUCTION

Cooling is central to health, prosperity, and the environment. It can be provided actively (e.g. via air conditioning) or passively (e.g. through cool building design). Applications range from space cooling for buildings and vehicles and cooling of industrial processes to cold chains for food and medicines. Efficient, climate-friendly cooling for all underpins many Sustainable Development Goals and represents an opportunity to avoid substantial greenhouse gas emissions.

However, most cooling is currently highly polluting due to the use of high global warming potential (GWP) refrigerants and the indirect emissions from the electricity used to run appliances such as air conditioners and refrigerators. Existing pollution needs to be cut urgently and booming demand for cooling met sustainably, complementing the Kigali Amendment that phases-down HFCs. The Cool Coalition has come together to accelerate efficient, climate-friendly cooling through a unified effort of governments, businesses and civil society. It takes a cross-sectoral approach to cooling, including building design, energy efficiency, renewables, and energy storage.

Ensuring we meet cooling needs affordably, efficiently, cleanly and innovatively, including for the 1.1 billion people who lack access to basic energy services, is a big opportunity for businesses across stationary and mobile cooling, whole building and district-scale solutions, cooling appliances, and cold chains. Delivering efficient, climate-friendly cooling can unlock operational savings for customers, meet demand for sustainable solutions, improve brand competitiveness and ensure compliance with government policies and regulation. It also enables a stronger energy system and cleaner air, and delivers more food, better health, and higher productivity for society.

This guide is one in a series that is also being disseminated to businesses, investors and civil society to elevate cooling as an inclusive, impactful and urgent opportunity. It:

- Sets out the case for business action
- Introduces a framework for business action
- Outlines the types of actions that can be taken
- Highlights case studies of business cooling action
- Recommends next steps, resources, and contacts

2. THE CASE FOR BUSINESS ACTION

2.1 Cooling demand is growing rapidly

Demand for cooling and associated services is rapidly expanding. For example, since 1990, annual sales of air conditioners (ACs) have more than tripled with about 1.6 billion units currently in use.ⁱ Growth continues to be driven by rising incomes, lower prices for products, electrification, urbanisation, and a warming world.ⁱⁱ AC sales in many emerging high population economies with a relatively low stock of ACs such as Brazil, India, and Indonesia, are growing at 10-15% per annum.ⁱⁱⁱ

The global cooling market today consists of about 3.6 billion pieces of installed equipment with annual sales of around 350 million units of all sizes and types from domestic fridges to industrial cooling for sports stadiums.^{iv} This is projected to increase to annual sales reaching 700 million units per year and a global market size growing to 9.5 billion installed units by 2050 – this would mean sales of a further ~19 billion pieces of equipment between now and 2050 or 19 every second.^v However, even at this rate of deployment, by 2050 we would have only met around two-thirds of cooling needs worldwide and may need to increase to 14 billion cooling appliances in total – compared to the 3.6 billion today – to meet the total need and deliver cooling for all.^{vi}

2.2 Cooling needs are diverse and often unmet

Cooling needs are diverse and include: thermal comfort of domestic, commercial and industrial buildings; refrigeration of food to extend shelf life, cooling of industrial processes and equipment, and air conditioning in vehicles and transport refrigeration equipment. A diverse array of businesses currently meet these cooling needs. However, many cooling needs remain unmet. For example, while around 70% of food is chilled or frozen at some stage between farm and consumer in developed economies, only 20% of food globally which requires refrigerated processes is preserved using refrigeration according to the International Institute of Refrigeration.

Access to sustainable cooling also underpins the ability of hundreds of millions of people to realize the Sustainable Development Goals. In a warming world, access to cooling is not a luxury – vulnerable populations are depending on it for nutritious food, safe medicines, productivity and protection from extreme heat.

2.3 Cooling needs business leadership

There is an urgent need to deliver affordable efficient, climate-friendly cooling. Average efficiency of air conditioners is at the low end of what is typically available on store shelves and online and one third of the best available technology.^{vii} More than 2 billion people represent a growing middle class where limited purchasing options mean they may only be able to afford to buy less expensive and less efficient cooling devices, which will spike global energy demand with profound consequences for the climate.^{viii} In developing countries, 30-50% of perishable food produce is estimated to be lost post-harvest primarily because of lack of adequate cooling provision in the form of a cold chain.^{ix} Efficient, climate-friendly cooling products and services exist and business is central to the delivery of these solutions at scale.



3. FRAMEWORK FOR BUSINESS ACTION

The Cool Coalition takes an inclusive view of business action to promote efficient, climate-friendly cooling for all. To help elevate cooling as an inclusive, impactful and profitable opportunity, the Coalition welcomes ambitious action that:

- Is transformational for mitigating greenhouse gas (GHG) emissions and/or adapting to climate change, in terms of novelty or scale;
- Brings sustainable development co-benefits;
- Is replicable and can be scaled up;
- Is measurable, especially in terms of GHG and particularly carbon pollution reduction, and deliverable in 3 – 5 years;
- Is an innovative technology or approach and visibly inspiring for others looking to take action.

Our framework for business action on cooling highlights how businesses can act within the diverse cooling sector. It considers a lifecycle approach and focuses on three main categories:

- Supply – particularly manufacturers of cooling equipment and technologies including refrigerants but also project developers, installers and maintenance businesses;
- Demand – customers and end users ranging from retailers with high cooling loads to landlords and logistics companies;
- Enablers – other actors including engineers, architects, distributors, building operators and maintenance companies, trade associations and member organizations and innovators.



4. EXAMPLE OF ACTIONS

We encourage businesses to commit to ambitious action on efficient, climate-friendly cooling and to raise awareness of the need for action by others, including other businesses, governments, investors and civil society – not only domestically but also in collaboration with regional and international partners.

The examples set out in the table below illustrate some of the actions that businesses can take. Other actions may be appropriate and better suited to individual business needs and/or contexts. Where additional solutions that meet the scale of the challenge are identified, we encourage businesses and other actors to advocate them, and to contact the Cool Coalition for partnership opportunities.

We encourage businesses to quantify the outputs of these actions to the extent practicable and to monitor progress against these actions.



CATEGORY	TYPE	EXAMPLE ACTION
SUPPLY	Refrigerant manufacturers	- Phase down the production of high global warming potential (GWP) refrigerants including HFCs as fast as feasible in global operations consistent with achieving the lowest life-cycle carbon footprint. - Offer refrigerants across all markets that are consistent with the United for Efficiency Model Regulations for Air Conditioners and/or Refrigerating Appliances to drive ambition on the transition to efficient, climate-friendly cooling - Input to the development of government led national cooling action plans and campaigns to educate people on the use of cooling (for instance to avoid over cooling and on the importance of maintenance)
	Cooling equipment manufacturers	- Phase down the consumption of high global warming potential (GWP) refrigerants including HFCs as fast as feasible in global operations consistent with achieving the lowest life-cycle carbon footprint. - Pledge to manufacture and sell cooling equipment and technologies that are highly efficient and use low- or zero-GWP refrigerants. - Offer cooling products across all markets that are consistent with the United for Efficiency Model Regulations for Air Conditioners and/or Refrigerating Appliances to drive ambition on the transition to efficient, climate-friendly cooling. - Offer cooling-as-a-service (leasing and maintaining equipment rather than selling) to encourage adoption of efficient equipment and improve servicing - Support innovation to develop and demonstrate new efficient, climate-friendly cooling technologies and solutions - Input to the development of government led national cooling action plans and campaigns to educate people on the use of cooling (for instance to avoid over cooling and on the importance of maintenance) - Support solutions (e.g. minimum energy performance standards, equipment labelling, monitoring and incentive mechanisms) which encourage customers to purchase energy efficient products and avoid or ban importing cheap equipment with poor efficiency - Release a Global Warming Potential reduction plan for all products that utilize refrigerant gasses or foam blowing agents
	Project developers (e.g. district cooling, commercial and industrial)	- Pledge to promote efficient, climate-friendly cooling technologies using low- or zero- GWP refrigerants in operations and through sales platforms and procurement policies - Commit to co-finance and support market preparation studies and trainings to cities/proponents, through international platforms, on climate friendly district cooling - Encourage clients and partners to reduce cooling demand in project designs including through systems thinking, improving the thermal envelope of buildings, and using passive solutions where possible which do not rely on technology and minimise maintenance requirements - Only buy cooling products with high energy efficiency and low GWP refrigerants
	Installers and maintenance operators	- Training and improving access to training resources on efficient, climate-friendly cooling for installers and maintenance personnel - Support the global qualification program for refrigerant supply chain networks known as the “refrigerant driving license” to ensure the sound and safe management of refrigerants - Support mechanisms (e.g. minimum energy performance standards, equipment labelling, monitoring and incentive mechanisms) which encourage customers to purchase energy efficient products and avoid or ban importing cheap equipment with poor efficiency - Support the development of campaigns to educate people on the use of cooling (for instance to avoid over cooling and on the importance of maintenance)
DEMAND	Customers (residential, commercial, real estate developers and public entities)	- Only buy cooling products with high energy efficiency and low GWP refrigerants - Pledge to promote efficient, climate-friendly cooling technologies using low- or zero- GWP refrigerants in our operations and through our sales platforms and procurement policies - Regular servicing and maintenance of cooling equipment to ensure design efficiencies are continuously achieved - Pilot/test innovative efficient, climate-friendly cooling solutions to help improve their performance, affordability and reliability - Collaborate with suppliers to develop efficient, climate-friendly cold chains and reduce food waste
ENABLERS	Architects and engineers	- Reduce cooling demand in project designs including through systems thinking and improving the thermal envelope of buildings - Use passive solutions where possible which do not rely on technology and minimise maintenance requirements - Support building regulations which include prescriptions for reducing thermal demand and promoting the use of efficient solutions for new buildings and refurbishment works to prevent overheating and minimise the need for active space cooling in all buildings - Commission all new installations or major retrofits of cooling equipment to ensure it runs as anticipated - Ensure the role of infrastructure, urban and rural planning in avoiding cooling need (e.g. green spaces, cool roofs and refreshing pavement) and shifting its provision (e.g. district cooling systems, off-grid solutions) are considered
	Building operators and maintenance companies	- Measure and monitor energy use and F-gases used for cooling to better mitigate leakage and manage energy use - Regularly maintain cooling equipment to ensure design efficiencies are achieved
	Trade associations, member organisations and key influencers	- Work with governments implementing policies to stimulate market penetration of lowest carbon footprint products, including support of bulk procurement, and avoiding environmental dumping in developing countries through energy efficiency labelling and related public education efforts, energy efficiency prizes, and linkage to green procurement and other market transformation programs - Support the development of cooling technology, stakeholder engagement and investment roadmaps based on meeting national and/or regional cooling needs - Raise members’ awareness of the need for action on efficient, climate-friendly cooling
	Technology developers/ innovators	- Design, develop and demonstrate innovative efficient, climate-friendly cooling solutions which are affordable and a significant improvement on existing solutions - Develop effective knowledge transfer systems to help enable the development of new solutions faster, at lower cost, and with less risk

5.CASESTUDIESOFCOOLINGACTION

Using the demand, supply and enabler categories, we have set out below a few examples of the many businesses and initiatives already taking action to support efficient, climate-friendly cooling:

Case Study 1: Supply

Support to manufacturing businesses to develop clean cooling equipment and raise efficiency standards

The Kigali Cooling Efficiency Programme (K-CEP), the Multilateral Fund, and UNDP have directly supported equipment manufacturers to raise energy efficiency while reducing emissions from F-gases. Starting in December 2017 funding and technical support was provided to Walton Hi-Tech Industries Ltd in Bangladesh. Walton makes nearly all of the country's refrigerators and throughout 2018, a new compressor design was developed and tested and is due to launch with a 10-35% increase in energy efficiency. Similarly, in Mexico, K-CEP and partners are working with the air conditioner and refrigerator manufacturer Mabe to improve energy efficiency and transition away from F-gases. Retooling manufacturing of domestic refrigeration equipment will increase the efficiency of these locally produced appliances by 25%.

Case Study 2: Demand

Business commitments on cooling



Photo by Dearman Engine Company Ltd (www.dearman.co.uk)

For some companies, refrigeration can be as much as 50% of their energy bill. Energy efficient, climate-friendly cooling equipment helps save money alongside other practical measures – for example controlling temperature (every 1°C saved could reduce your energy consumption by two per cent), ensuring effective maintenance (saving 10% or more on energy costs), and positioning units away from heat sources. Leading businesses are acting on these opportunities. For example, UK supermarket Sainsbury's have cut absolute carbon emissions by 24% and achieved a 50% intensity reduction in carbon emissions since 2005. They are deploying natural refrigerants, have developed a science-based target, and are deploying innovative solutions including trucks cooled by liquid nitrogen engines and a Formula 1 inspired aerofoil technology to keep cold air in the fridge while saving around £10m per year on refrigeration costs.^x

Business acceleration of district cooling

Along with electricity and water, district cooling constitutes an innovative form of energy service whereby chilled water is produced in a centralized manner and distributed to many buildings. The output of one cooling plant is enough to meet the cooling demand of many buildings, reaching up to 90% of energy efficiency compared with conventional chillers, with reduced charges of refrigerant fluids (<2% annual leakage), and when using not-in-kind (NIK) technology, zero use of HFCs. Businesses are promoting highly efficient, low-GWP district cooling (using zero HFC) in cities ranging from Stockholm to Curacao and Copenhagen to Amman. For example, ENGIE's district cooling utility in Paris, France – Climespace – uses river water, geo-exchange and excess heat for cooling all of the city's hospitals, offices, and administrative buildings. The city has thereby achieved a 50% reduction in primary energy consumption and CO₂ and a 90% reduction in HFC emissions.

In Colombia, Medellin's Public Utility Company EPM - Empresas Publicas de Medellin – co-financed a study for the design and implementation of a low-GWP, high efficiency district cooling solution. EPM then provided \$11 million of investment together with \$2.5 million from the Swiss Cooperation Agency, and \$500,000 from the Multi-lateral Fund to build and operate the district cooling system using ammonia and absorption chillers in 2016 providing 3,600 tons of refrigeration of capacity and reducing 30% of its CO₂-equivalent emissions. Private operators – including Danfoss, ENGIE, Enwave Empower, EMAAR District Cooling, and Tabreed – have committed to similarly co-finance and support market preparation studies and/or trainings, through the District Energy in Cities Initiative, to promote the use of efficient, low-GWP district cooling.

Case Study 3: Enablers

Technology innovators delivering new solutions

Ice storage is a clean, reliable and least-cost distributed energy storage solution for the grid. Ice Energy was founded in 2003 with the vision that thermal energy storage could transform inefficient and polluting air conditioners, which are a burden on the grid, into efficient, climate-friendly cooling systems that are an asset. Since launching Ice Bear battery in 2005, more than 40 utility services have delivered efficient, climate-friendly cooling systems which provide cost-effective and reliable energy storage.



InspiraFarms produces energy-efficient pre-cooling and cold rooms, packhouses and automated ripening chambers; client-centered technical support; and affordable asset financing terms. This allows agribusinesses to leapfrog barriers to emerging technology and finance and grow sustainably while significantly cutting energy costs, reducing food losses, and meeting major international food safety certifications. Their solution is solar powered, allows for remote performance monitoring on or off-grid, and is already being used by customers in East Africa and Central America.



6. NEXT STEPS



6.1 About the cool coalition

The Cool Coalition is a global multi-stakeholder network that connects a wide range of key actors from government, cities, international organizations, businesses, finance, academia, and civil society groups to facilitate knowledge exchange, advocacy and joint action towards a rapid global transition to efficient and climate-friendly cooling. The Cool Coalition promotes an 'avoid-shift-improve-protect' holistic and cross-sectoral approach to meet the cooling needs of both industrialized and developing countries through urban form, better building design, energy efficiency, renewables, and thermal storage as well as phasing down HFCs. Cool Coalition members are collaborating on science, policy, finance and technology to meet growing demands for cooling in a comprehensive manner, all aimed at raising climate ambition in the context of the Sustainable Development Goals while complementing the goals of the the Kigali Amendment to the Montreal Protocol and Paris Climate Agreement.

The overall approach is to:

- **REDUCE** where possible the need for mechanical cooling through better urban planning and building design, and the use of nature-based solutions such as green public spaces and green roofs and walls.
- **SHIFT** cooling to renewables, district cooling approaches, solar powered cold chains, etc.
- **IMPROVE** conventional cooling by increasing the efficiency of air conditioning and refrigeration equipment and demand response measures.
- **PROTECT** vulnerable people from the effects of extreme heat and consequences of unreliable medical and agricultural cold chains.
- **LEVERAGE** cooperation between different actors active in cooling to achieve a greater collective impact.

6.2 Get in touch

The Cool Coalition already has more than 80 leading organisations driving change in the cooling sector. Please reach out to unep-coolcoalition@un.org to find out more about how you can engage including on how to join, actions, and events.

Please contact for more information on:

- EP100: The Climate Group - jchu@thetheclimategroup.org
- For cooling-as-a-service: Thomas.motmans@energy-base.org
- For model regulations: Brian.Holuj@un.org
- For District Energy: Celia.Martinez@un.org

6.3 Commit to cooling action

Businesses are critical actors in addressing the cooling challenge. Adoption of the actions and case studies outlined above can catalyse much needed progress and position businesses as innovators and climate leaders.

An endorsement form to join the cool coalition and commit to action is enclosed at the end of the document. Please complete and send back to unep-coolcoalition@un.org. Join us and showcase your leadership!

A range of additional resources are set out below to help businesses to find out more about the importance of cooling and how to take action.

For more information, visit our website: www.coolcoalition.org



FURTHER RESOURCES

The following organizations provide information and or technical assistance for efficient, climate-friendly cooling:

- Green Cooling Initiative www.green-cooling-initiative.org
- Heriot Watt and Birmingham Universities' Clean Cooling Landscape Assessment is a comprehensive online resource of data and research on efficient, clean and affordable cooling from multiple perspectives
- IEA's report on the Future of Cooling provides a compelling assessment of the risk of a 'cold crunch' from growth in space cooling demand in the decades ahead, and how it can be avoided.
- Kigali Cooling Efficiency Program's Resources page
- Rocky Mountain Institute's report on Solving the Global Cooling Challenge focuses on room AC and the role of innovation
- SEforAll's report: Chilling Prospects: Providing sustainable cooling for all provides an overview of the development risks from a lack of access to cooling, and sets out pathways to providing sustainable solutions.
- United for Efficiency <https://united4efficiency.org/resources>
- District Energy in Cities Initiative: www.districtenergyinitiative.org
- Climate Group EP100 www.theclimategroup.org/project/ep100
- Basel Agency for Sustainable Energy's Cooling as a Service initiative www.caas-initiative.org

ENDNOTES

- i International Energy Agency (2018) The Future of Cooling. Available at: www.iea.org/cooling
- ii Park WY, Shah N, and Gerke B (2017) Assessment of commercially available energy-efficient room air conditioners including models with low global warming potential (GWP) refrigerants, Lawrence Berkeley National Laboratory. Available at: https://eta.lbl.gov/sites/default/files/publications/assessment_of_racs_lbnl_2001047.pdf
- iii Shah N, et al (2015) Benefits of Leapfrogging to Superefficiency and Low Global Warming Potential Refrigerants in Room Air Conditioning, Lawrence Berkeley National Laboratory. Available at: <https://ies.lbl.gov/sites/all/files/lbnl-1003671.pdf>
- iv - v - vi - ix
- Heriot-Watt University and University of Birmingham, Clean Cooling Landscape Assessment, www.clean-cooling.ac.uk
- vii Dulac, J and Huang, H (2018) Special Report on Cooling, Opportunities for energy efficient air conditioning. International Energy Agency. Prepared for the Kigali Cooling Efficiency Program
- viii SE4All (2018) Chilling Prospects: Providing Sustainable Cooling for All, Sustainable Energy for All (SE4All) www.seforall.org/interventions/cooling-for-all/chilling-prospects
- x www.sainsburys.co.uk

COMMON STATEMENT AND ENDORSEMENT FORM



By joining the Cool Coalition, we recognize that efficient and climate-friendly cooling can make a huge difference in the fight against climate change and pollution, sustainably provide essential cooling to hundreds of millions more people, and bring huge financial savings.

The Cool Coalition is a unified front to seize this opportunity, linking the Kigali Amendment to the Montreal Protocol, the Paris Agreement on Climate Change, and the Sustainable Development Goals. It is a coalition of proactive governments, businesses, and civil society organizations that aims to inspire ambition, identify solutions, and accelerate progress toward efficient and climate-friendly cooling.

The Cool Coalition takes a cross-sectoral and holistic approach to reducing emissions from the cooling sector by looking at a broad range of solutions, ranging from urban form, building design, district cooling to nature-based solutions to highly efficient and climate-friendly cooling technologies that use low- or zero GWP refrigerants.

As members of the coalition, we commit to act boldly to get the best cooling solutions adopted at scale and within a meaningful timeframe. To that end, we will:

- Advocate: Raise awareness on efficient and climate-friendly cooling
- Collaborate: Actively participate in a community that breaks down silos and promotes cross-cutting actions for efficient and climate-friendly cooling
- Act: Help secure and/or make commitments on efficient and climate-friendly cooling

Name of entity:

The organization is a:

Private sector organization

Other:

I [CEO, Head of _____ organization] **confirm our involvement in the Cool Coalition, endorse the Cool Coalition Common Statement, and hereby** agree to pursue the following action(s) to promote efficient, climate-friendly cooling: *[Include here one or more actions that align with the aims of the Cool Coalition.]*

Last Name:

First name:

Website:

Email address:

Phone:

Please briefly describe the nature of your contribution to efficient, climate-friendly cooling:

Signature:

Date: