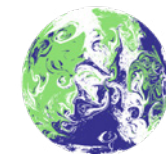




# UK LEADERSHIP ON SUSTAINABLE COOLING: FROM COVID-19 TO COP26





**Lord Goldsmith**

International Environment Minister



**Inger Andersen**

UNEP Executive Director



**Lord Callanan**

Minister for Climate Change and Corporate Responsibility

“ As we prepare for COP26, it’s vital to consider how we can mitigate and adapt to climate change and sustainable cooling is one way we can do this. Sustainable cooling can improve our food security, reduce food waste, protect vital vaccines, and reduce emissions of climate damaging refrigerant gases. It underpins our mission to promote sustainable development around the world. The UK is a pioneer of innovative, climate friendly cooling solutions and we look forward to working with other Cool Coalition members to advance this important work. ”

“ Getting cooling right offers a concrete example of how countries can build back better. It creates jobs and brings us closer to achieving the goals of the Paris Agreement and delivering on the 2030 Agenda. The UK’s leadership on sustainable cooling can inspire others to act, thereby supporting the world in building resilience and addressing global warming. Together, with the Cool Coalition and stakeholders, we can accelerate the transition towards sustainable cooling. ”

“ Sustainable cooling is essential to meeting international climate change goals and supporting a clean and resilient recovery. Innovation will be necessary to address the growing global demand for cooling by providing clean, affordable and energy efficient solutions whilst reducing emissions. Ahead of COP26, we welcome support for UK plans to raise global ambition and deliver these approaches at scale. ”



# INTRODUCTION



As a champion member of the Cool Coalition, and co-lead of Mission Innovation’s “Affordable heating and cooling of buildings” innovation challenge (IC7) with the European Commission and United Arab Emirates, the UK pledges to share knowledge, advocate and act on sustainable cooling.

This guide outlines UK efforts at home and abroad and opportunities for action as we build back better from Covid-19 and look towards the United Nations Climate Conference COP26 in the UK in 2021.

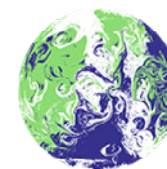
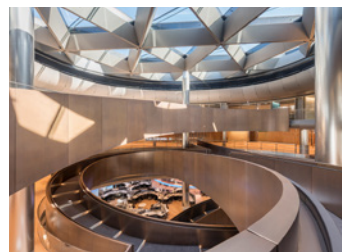
*This guide contributes to the Cool Coalition’s objective to support governments and industry to implement/take ambitious action to meet growing cooling demands in a comprehensive manner, in line with the Paris Agreement, SDGs, and the Kigali Amendment.*

Cooling is critical for health, prosperity, and the environment. It keeps our vaccines safe and food fresh, ensures we have comfortable buildings to live and work in, and is central to our industrial and transport infrastructure. Sustainable cooling for all underpins many Sustainable Development Goals (SDGs), including SDG 7 on achieving sustainable energy for all by 2030 and SDG 13 on climate action, and represents an opportunity to avoid substantial greenhouse gas (GHG) emissions. Today over 1.1 billion people are at significant risk from a lack of access to cooling and continued warming and demographic changes are likely to see these risks grow.<sup>i</sup>

Cooling is essential for adapting to warmer temperatures. However, most cooling is currently energy-intensive and highly polluting due to the refrigerants used and the emissions from the electricity generated to power this equipment. Conventional cooling already causes up to 10 percent of global greenhouse gas emissions – more than those from the aviation and maritime transport sectors combined.<sup>ii</sup> By 2050, it is estimated that 5.9 billion new cooling devices will be needed and an additional 4.5 billion appliances to include those who cannot afford access.<sup>iii</sup> Existing pollution needs to be cut urgently and booming demand for future cooling met sustainably.

**Sustainable cooling** means the adoption of climate friendly, energy efficient and cost effective solutions for cooling. Sustainability in cooling allows great scope for innovative action by governments, cities or organisations and includes active and passive technologies, smarter building design and nature based solutions.

i SE4All (2018), *Chilling Prospects: Providing Sustainable Cooling for All, Sustainable Energy for All (SE4All)*  
 ii <https://www.unenvironment.org/news-and-stories/speech/we-will-efficient-climate-friendly-cooling-all>  
 iii UN, 2020



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These challenges are significant yet also provide a big opportunity for ambitious government, business and civil society action. The market for cooling equipment is already estimated to be worth US\$135 billion a year and is forecast to grow significantly.<sup>iv</sup> Governments are adopting ambitious cooling action plans and raising minimum energy performance standards. Cities are using their planning powers to advance heat mitigation policies that promote green landscaping or cool roofs and surfaces, district cooling, and passive buildings/sustainable public procurement standards. Businesses are developing innovative new technologies and business models. Civil society, academia, and enabling organisations are helping to mobilise action. But much more is needed, including work to ensure that any Covid-19 vaccine is sustainably refrigerated during dissemination, and to keep people sheltering in place, sustainably safe from extreme heat.

Ahead of the UN Secretary General (UNSG)'s Climate Action Summit in September 2019, the UK joined the Cool Coalition – a global network connecting over 100 partners from governments, the private sector, cities, international organisations, finance, academia and civil society to address a major blind spot in the transition to net-zero emissions. The Cool Coalition members are collaborating on science, policy, finance and technology to support governments and industry in implementing comprehensive actions to meet their growing cooling demand. “Comprehensive action” is required to reduce the need for mechanical cooling, shift to cooling with lower emissions including by using renewables, improve cooling efficiency, and protect those most vulnerable to a lack of cooling. This all aims to raise climate ambition in the context of the SDGs, the Kigali Amendment to the Montreal Protocol, and the Paris Climate Agreement.

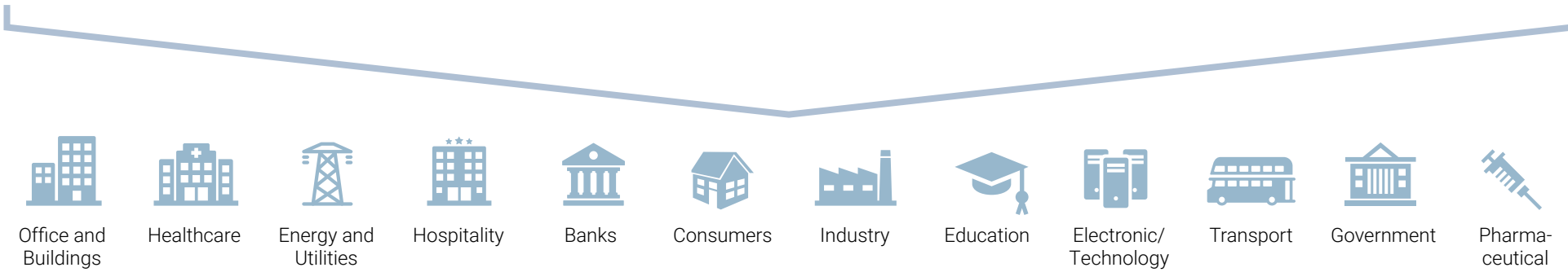
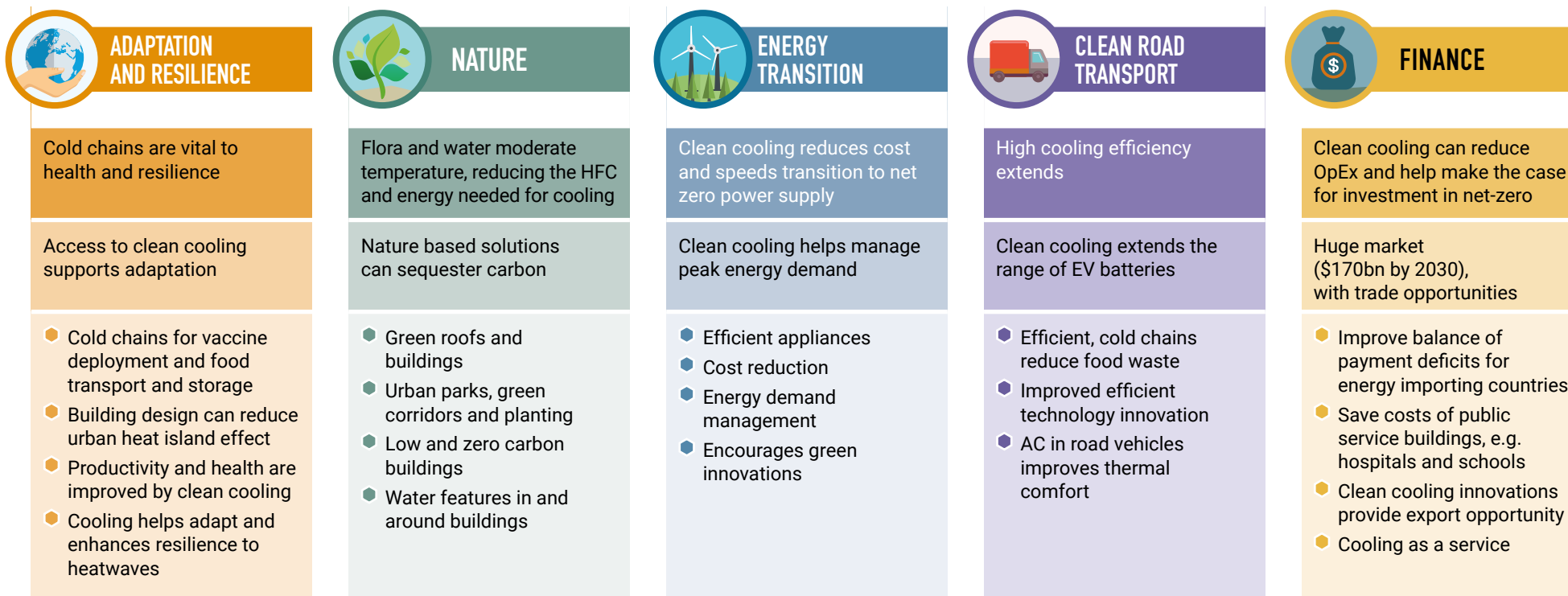
A key focus for the Cool Coalition is to support ambitious action on cooling for COP26. This includes supporting countries to mainstreaming efficient, sustainable cooling in the NDCs plans and targets. COP26 is organised around 5 priorities, which are also central to building back better after Covid-19 – adaptation and resilience, nature, energy transition, clean road transport and finance. Cooling underpins each of these priorities as summarised in Figure 1 below.



<sup>iv</sup> Economist Intelligence Unit, *The Cooling Imperative*, 2019

Figure 1. How sustainable cooling underpins each of the priority themes for COP26.

# BENEFITS OF SUSTAINABLE COOLING AND RESILIENCE





## ADAPTATION AND RESILIENCE



Access to cooling improves resilience and health and increases human comfort and productivity. The global Covid-19 pandemic has demonstrated the vital need for efficient, sustainable cooling for adaptation and resilience. The U.N. World Food Programme estimates that an additional 130 million people could be at risk of starvation by the end of 2020 as a result of workers falling ill, rising food prices and social isolation due to the Covid-19 pandemic. Vaccine deployment, which is likely to be central to addressing Covid-19, relies on effective cold chains. Green buildings can also support adaptation and improve resilience by reducing urban heat island effects and enabling productive work throughout the year.

### UK GOVERNMENT SUPPORTS GLOBAL VACCINATIONS:

The UK's Department for International Development (DFID) is the largest individual donor to the Global Alliance for Vaccines and Immunisation (Gavi). Gavi is a public private global health partnership committed to increasing access to immunisation in poor countries. Gavi supports vaccine delivery in 68 of the world's poorest countries and has immunised over 56 million children. Between January 2015 and December 2017, Gavi saved 990,000 lives around the world.



### BRITISH MANUFACTURING EXPERTISE:

Dulas is a leading British solar refrigeration manufacturer based in Wales which delivers solutions for vaccine storage in remote areas where electricity access is often lacking. This is a significant problem for immunisation programmes as lack of consistent cooling can render vaccines ineffective. Dulas has worked with UK refrigerator manufacturer Polestar to deliver fridges to support Gavi's vaccination programme. Dulas has developed an energy efficient off-grid solar refrigerator which does not need a battery. Additionally, they use Freeze Free® technology to protect the vaccines from being exposed to harmful freezing temperatures which renders vaccines unusable.

### BRITISH INNOVATION EXPERTISE:

Sure Chill is a platform cooling technology which harnesses a unique property of water to enable continuous cooling from inconsistent power. The Wales based company started by delivering solutions for the vaccine cold chain and is now adapting its technology to suit multiple cooling requirements from food to data at a range of different scales. Their technology is now used in 38 countries, is proven in the health sector and is now being developed to improve access to cooling for agri-food, off grid energy and other sectors.



### EFFICIENCY FOR ACCESS:

As a member of the global coalition to accelerate clean energy access through high-performing appliances, DFID is funding research and development (R&D) projects with a particular focus on fans, refrigeration and cold chains for off- and weak-grid settings. In 2019, £1.67 million was made available from DFID and the IKEA Foundation to 12 organisations across a range of countries.

More information can be found at: <https://efficiencyforaccess.org/>

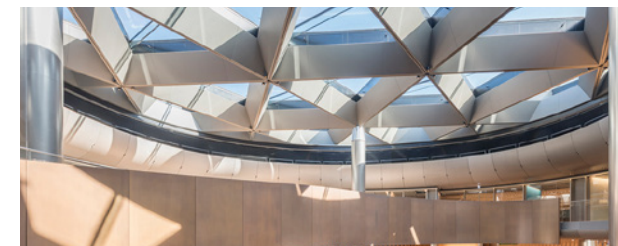




## NATURE



Efficient, sustainable cooling includes solutions to avoid the need for active cooling through nature-based solutions, smart building and city design. The UK is deploying a range of nature-based solutions including natural ventilation systems, green roofs, and green spaces. These nature-based solutions also have secondary economic, environmental and social paybacks, for example reduction of air pollution, quality of life, and the incidence of mental and physical illness.



### UK CITIES ARE AMONG THE GREENEST IN THE WORLD:

Green areas keep cities cooler while reducing energy use and carbon dioxide emissions, helping to mitigate the urban-heat island effect and making urban centres more liveable. London aims at greening half of the city's area by 2050 and has created a £12 million Greener City Fund to support these efforts. The Greater London Authority (GLA) is working with Business Improvement Districts (BIDs) in central London to identify and then deliver opportunities for increasing green cover. The "Greening the BIDs" project has supported 15 green infrastructure audits and part-funded demonstration projects with the aim of catalysing urban greening in central London. In total, over 500 hectares have been audited identifying the potential for over 300 rain gardens, 200 green walls and more than 100 hectares of green roofs.

### LOW CARBON OFFICE REFURBISHMENTS INCLUDING CHILLED BEAMS:

A 3,800 square metre office at Premier House, Twickenham in London refurbished by Low Carbon Workplace, a property development partnership between Carbon Trust, asset manager Columbia Threadneedle and developer Stanhope. A series of improvements were implemented including the installation of active chilled beams, air tightness and new metering and control systems. Certified to BREEAM Excellent level, the EPS rating improved from E to B, energy consumption was reduced by 64% and occupier energy bills reduced by £60,000 per year.



### GREEN ROOFS AND FACADES HELP REDUCE THE NEED FOR COOLING:

Green roofs, walls and facades on urban buildings reduce the need for active cooling as they provide effective thermal insulation. These nature-based solutions have important co-benefits in terms of increased air-quality, rainwater absorption, and biodiversity support within urban areas. UK cities are global pioneers in the deployment of green roofs and facades thanks to the implementation of groundbreaking policies over the last decade. The ambitious 2008 Living Roofs and Walls Policy in London led to the deployment of 1.5 million m<sup>2</sup> of green roofs being installed across the whole of the Greater London Authority area.



### ZERO CARBON BUILDINGS INCLUDING NATURE-BASED SOLUTIONS:

Fosters + Partners is a leading British architectural practice using its global influence to promote sustainable design around the world around the world. They became the first architecture practice to sign up to the Net Zero Carbon Buildings Commitment to ensure the building they use will be carbon neutral by 2030. They have designed many innovative buildings including the Headquarters for Bloomberg in London, opened in 2017. The building has a BREEAM Outstanding rating achieved through using technology such as integrated cooling ceiling panels, a smart CO<sub>2</sub> sensing system, which controls the distribution of air in the building, and a natural ventilation system using fins on the window glazing that allows air to flow through the floorplate and into the atrium. The building also includes a Green 'Living Wall' to increase the flow of oxygen through the space.



## ENERGY TRANSITION



Cooling demand is booming due to rising incomes, electrification, urbanisation and a warming world. This has great impacts on energy demand and infrastructure. For example, during the warm season, air conditioners in cities like Delhi and Beijing are responsible for up to 50% of electricity use. It is critical to develop efficient, sustainable cooling solutions to enable the clean energy transition and provide access to cooling for all.



### VIRTUAL POWER SUPPLY AND EMISSIONS SAVINGS FROM BUSINESSES:

Asda is the UK's third largest supermarket chain and in November 2019 signed a deal with National Grid to provide demand side response by using fridges located in 300 of its stores and 18 distribution depots to act as a virtual 13 MW power source. Energy to the fridges will be cut at short notice when demand for electricity needs to be reduced, powering up to 8,500 homes. Asda are also at the forefront of trialling new energy efficiency improvements including a world-first by delivering a system on the 'very-low-GWP' HFO refrigerant.

### UK DISTRICT COOLING:

London Olympic Park is the largest decentralised energy scheme in the UK. There are two energy centres with 16 MW of cooling using combined heat and power (CHP) engines and low-GWP absorption chillers with capacity to expand. The University of Edinburgh's trigeneration energy centre is a £9 million project to provide a 1.5 MW(e) CHP engine, a 600 kW absorption chiller, two 4 MW boilers and a 1.5 MW chiller. It includes a 4 km buried district energy network to transport hot and chilled water around the campus.

### INDUSTRIAL REFRIGERATION PIONEERS:

Star Refrigeration, headquartered in Scotland, is the UK's largest independent industrial refrigeration engineering company and a pioneer in the use of natural refrigeration technologies. In preparation for the 2018 winter Olympic games, Star constructed a state-of-the-art training rink for the Scottish curling team using their new air-cooled low charge ammonia chiller. This technology improves upon industry energy standards by 66% and will reduce the facility's carbon emissions by 700 tonnes in the first 20 years. This transformative project will be used as a base case scenario for Star in the construction of future leisure facilities.

### DRIVING AMBITION ON PRODUCT EFFICIENCY STANDARDS:

The UK, as COP26 President, is prioritising opportunities to deliver ambitious action in the build up to COP26 in the UK next year and beyond. This includes an initiative aimed at driving ambition on product energy efficiency standards in lighting, electric motors and cooling in order to reduce global greenhouse gases emissions, promote business innovation, and ensure consumer access to affordable and high-performing technologies. The UK Government, in collaboration with the International Energy Agency, are seeking partners from Governments, international organisations and NGOs to support the objectives of this COP26 initiative and deliver global action to improve the energy efficiency of these products which, to date, have often been overlooked in the context of global action on climate change.

### REVOLUTIONARY DUCTED REFRIGERATION SYSTEMS:

The Mistral Air system is a completely new development in the area of refrigeration. The ducted air system does not require drainage on the sales floor and is more efficient than standard technology. In addition, the number of working parts has been reduced, and all engineering parts have been removed from the shop floor refrigeration cases and relocated to the roof. Basically a cold shelf, it reduces running and maintenance costs, is more sustainable and removes the requirement for engineering works to be carried out in stores.





## CLEAN ROAD TRANSPORT



Transport refrigeration is the fastest growing source of cooling emissions. Efficient, sustainable transport cooling is essential in the UK and globally for providing populations with fresh food and medicines. Similarly, mobile air conditioning (MAC) is also important in providing comfortable vehicles and consumes large amounts of energy and refrigerants.



### INNOVATION IN CLEAN ROAD TRANSPORT:

Sunswap is a UK based company developing zero-emission transport refrigeration products to reduce noise and air pollution in our cities. Its mission is to replace the dirty diesel engines currently in use in the cold chain with its electric Transport Refrigeration Units (TRU).

### GOVERNMENT ACTION ON CLEANER ROAD TRANSPORT:

The UK government has introduced restrictions on the maximum GWP of the refrigerants used in road transport air conditioning systems (cars and vans) and has announced plans to abolish subsidies for red diesel used in transport refrigeration units.

### CENTRE FOR SUSTAINABLE COOLING:

Led by UK universities, multi-disciplinary researchers from around the globe have joined forces in an innovative new research centre aimed at speeding up the use of radical new cooling solutions to help small-holder farmers, medicine suppliers and others make the most of clean and sustainable chilled distribution systems. Their primary project harnesses UK expertise in creating sustainable cold chains for preservation of post-harvest crops to increase market connectivity in India.





## FINANCE



The cooling market is currently estimated to be worth \$135bn and is growing fast. Efficient, sustainable cooling offers finance opportunities and economic benefits to countries around the world. It also provides significant export opportunities to meet this rapidly growing demand and need for efficient, sustainable solutions.



### SDCL:

Sustainable Development Capital is a specialist financial and investment advisory firm, headquartered in London and established to help governments, financial institutions and companies finance and invest in environmental and social infrastructure. SDCL's advisory business is focussed on facilitating the supply of clean infrastructure. Its investment business aims at reducing demand for resources through energy efficiency. It is providing efficient, sustainable cooling finance with support from the Kigali Cooling Efficiency Program.

### GREEN INVESTMENT GROUP:

Launched by the UK Government as a publicly funded bank to mobilise private finance into the green energy sector, it was the first institution of its type in the world. Acquired by Macquarie in 2017, the Green Investment Group continues to run a joint venture with the UK Department of Business, Energy and Industrial Strategy through UK Climate Investments LLP. This targets transformational green energy investments in carbon intensive economies – currently focussing in India and sub-Saharan Africa.

### INVESTING IN NEW BUSINESS SERVICES TO ACCELERATE CLEAN COOLING DEPLOYMENT:

The Global Innovation Lab for Climate Finance was developed in 2014 by the UK, U.S. and Germany in partnership with major development finance institutions, key private sector actors, and several climate finance donor governments. Each year it selects and supports sustainable investment and included cooling-as-a-service in 2019. This pay-per-service model eliminates upfront costs for customers, who instead pay for units of electricity consumed. Technology providers are encouraged to provide the most energy efficient technology possible.

### DISTRICT COOLING AND HEATING INNOVATION:

The £320m capital investment Heat Networks Investment Project (HNIP) and the Heat Networks Delivery Unit (HNDU) provides upstream development support and investment for heat network projects which has catalysed action globally with Chile receiving Global Environment Facility (GEF) funding to build their district heating and cooling market and India using elements of the framework to help scale up trigeneration across the country. In the UK, the revolutionary Bunhill 2 Energy Centre – the first of its kind in the world – provides a blueprint for decarbonising heat in cities around the world, reducing heating bills and carbon emissions while improving air quality and making cities more energy self-sufficient. Waste heat from the London Underground train network can now provide heating and hot water to more than 1,350 homes, a school and two leisure centres and a two-metre fan, installed in an existing six-storey London Underground mid-tunnel ventilation shaft, can also be reversed to help with cooling the Tube tunnels in the summer months.

### BRITISH INNOVATION TO AVOID REFRIGERANT GASES:

Barocal Ltd are commercialising an innovative cooling technology to deliver efficient, sustainable refrigeration. This start-up company was co-founded by Cambridge University academics and was the only finalist from the UK and Europe in the prestigious Rocky Mountain Institute Global Cooling Prize final, winning \$200,000 to demonstrate its solution. Instead of using refrigerant gases, Barocaloric cooling takes advantage of solid organic 'plastic crystal' materials which undergo large thermal changes on application and removal of pressure to provide cooling. These crystals are low-cost, non-toxic and widely available.



# OPPORTUNITIES FOR ACTION



The UK Government and Cool Coalition recognise the tremendous opportunity for ambitious government, business and civil society action to meet the need of sustainable cooling for all.

COP26 provides an opportunity for enhanced action and new commitments from governments and non-state actors around the world. The examples on the next page illustrate some of the inclusive and impactful actions that can be taken.



GOVERNMENTS



BUSINESSES



CITIES



More information can be found:  
<https://www.k-cep.org/insights/resources/>

# OPPORTUNITIES FOR ACTION



## GOVERNMENTS

Introduce, raise, monitor and enforce standards including minimum energy performance standards (MEPS) for appliances and codes for buildings with significant beyond business-as-usual greenhouse gases reduction impact for different cooling end-users. Limit the import and export of second-hand equipment that fails MEPS and ban domestic second-hand equipment that does not meet minimum standards.

Engage with Official Development Assistance (ODA) and national development bank priorities and support the crucial engagement efforts with multilateral development banks.

Ratify the Kigali Amendment to the Montreal Protocol.

Drive demand and facilitate market transformation programmes by introducing fiscal incentives, financial mechanisms and consumer information programmes. Additional finance is needed for demonstration programmes and technical assistance for innovative business models.

Stimulate supply through research, development and demonstration (RD&D) in incremental and innovative sustainable cooling solutions.

Explore behavioural insights approaches to cooling consumption patterns and how to encourage the uptake of sustainable cooling solutions.

Seek to coordinate action with others to advance product efficiency by joining the SEAD (Super-efficient Equipment and Appliance Deployment) initiative and actively support raising global ambition. Take part in dialogue of best-practice sharing within the organisation and support harmonisation of policies to raise product efficiency across regions.

Consider how Government may develop and implement a National Cooling Action Plan.

## BUSINESSES

Suppliers of refrigerant and cooling equipment should help to phase-down the production of high global warming potential (GWP) refrigerants including hydrofluorocarbons (HFCs) and offer cooling products across all markets that are consistent with the United for Efficiency Model Regulations for Air Conditioners and/or Refrigerators.

Installer and maintenance business operators should support mechanisms to encourage customers to purchase energy efficient products and support training such as the global qualification programme for refrigerant supply chain networks known as the “refrigerant driving license”.

End users, including retailers, should collaborate with suppliers to develop efficient, clean cold chains.

Enablers including architects, building operators and trade associations need to act collaboratively and design innovatively by reducing cooling demand through systems thinking and support regulation and monitoring.

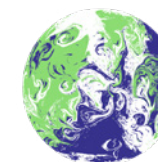
## CITIES

Local governments may consider using their planning powers to set targets within a long-term urban cooling strategy and develop building codes that incorporate active and passive cooling measures that set targets for greenhouse gases emission reduction.



Consideration and implementation of different fiscal incentives, including providing capital grants and/or facilitate loan guarantees, facilitate public private partnerships (PPPs) / energy-as-a-service models through heat/cool mapping and providing incentives like building density bonus.

Demonstrate municipal leadership by piloting innovative technologies and incorporating innovative designs. Cities should increase public awareness and promote clean cooling to a range of stakeholders by publishing city plans and engaging with training.



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The demand for cooling will result in additional greenhouse gas emissions, amplifying the need for further cooling. Sustainable cooling must be a priority for global climate action and is crucial for COP26 zero emissions ambitions. COVID-19 has further demonstrated the importance of cold chains (for food and vaccines) and keeping human shelter comfortable. **Responding to COVID-19 is an opportunity to improve cooling policy and technology as a pathway not only to zero emissions but also to saving energy costs, improving health (access to medicines and vaccines), creating jobs and enhancing resilience.**



## GET IN TOUCH

The Cool Coalition already has more than 100 partners driving change in the cooling sector.

To find out more, please visit <https://coolcoalition.org>

or reach out to [unep-coolcoalition@un.org](mailto:unep-coolcoalition@un.org)

to hear more about how you can engage including on how to join, actions, and upcoming events.

This document has been prepared by the Carbon Trust with invaluable support from the UK Government, UNEP and other Cool Coalition partners.