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## OXFORD FUTURE OF COOLING: COOLING FOR COP26 WEBINAR SERIES

October 18, 2021: Infrastructure for Sustainable Cooling with Madeleine Edl (U4E) and Amory Lovins (RMI)

Cooling by design: shifting the approach to meeting our thermal comfort needs.

Cooling is critical in a warming world to ensure thermal comfort, food security, reliable medical systems, sustainable industrial processes, and other critical infrastructure and development priorities. Following a BAU pathway, by 2050, demand for cooling is projected to triple, making up 30% of energy consumption.

This huge rise in demand has the potential to drive up GHGs and exacerbate the very problem it is designed to alleviate: exposure to heat. However, we can shift the trajectory of cooling towards sustainability by prioritising passive and energy efficient technology that use low global warming potential (GWP) refrigerants. Indeed, how we provide cooling – taking the right steps in the right order - must be rethought to meet our climate and development goals.

As we move towards one of the most important rounds of the UNFCCC Climate Negotiations, the Oxford **Future of Cooling Programme** is hosting a series of online seminars leading up to COP26, linking to the programme's **framework on sustainable cooling**. The **sixth webinar in the series, Infrastructure for Sustainable Cooling**, engaged in conversation with Madeleine Edl from UN Environment Programmes' United for Efficiency (U4E) and Amory Lovins of the Rocky Mountains Institute (RMI).



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## The right steps in the right order: needs-based cooling.

Infrastructure is critical to creating thermally comfortable spaces for people. Yet, the dominant approach to creating comfortable environments privileges air conditioning as a first principle rather than considering how to meet thermal requirements through design.

Amory Lovins, grounded in his decades-long work on integrative design, outlined the right steps in the right order to meet the thermal comfort needs of people in different environments. These steps included, in order:

- 0. Cool the people, not the building** by first considering who will use the space and what kinds of thermal needs they have. Use ‘task’ cooling, similar to ‘task’ lighting, provide wearable thermal solutions or furniture designed to keep occupants comfortable using targeted fans and heaters.
- 1. Expand the comfort envelop** by allowing temperatures to vary between 16 and 29 degrees depending on the activities undertaken in the space.
- 2. Minimize unwanted heat gains** by using super-windows, materials, or other features that allow natural light and block heat.
- 3. Integrate Passive Cooling:** provide thermal comfort via passive design and construction such as exterior shading and natural ventilation.
- 4. Deploy active non-refrigerant cooling** such as evaporative, desiccant, adsorption, and hybrid cycles which can yield >100 units of cooling per unit of electricity.
- 5. Deploy super-efficient refrigerative cooling** such as those technologies from Gree Electric with Tsinghua University and Daikin with Nikken Sekkei Ltd. that won the RMI 5x more efficient **Global Cooling Prize**.
- 6. Use coolth storage and controls** to store and deploy thermal energy as required for example through ice-based thermal energy storage systems.

A whole-system approach can save ~90–100% of cooling energy while providing better comfort at lower capital cost. Demonstrating the real-world applicability of this approach, the presentation highlighted several examples of integrative design for thermal comfort in practice across cold, temperate, and hot and humid climates. These examples include passive cooling in a commercial building in Harare, Zimbabwe to natural ventilation retrofits of the UK Parliament to Amory Lovins house in the Rocky Mountains which requires no heating or cooling system.



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## The right technology for the right steps: implementing super-efficient refrigerative cooling

While a shift in how we provide cooling is possible and necessary to achieve our climate and development goals affordably, some cooling needs will be provided by active or mechanical methods. In these cases, it is critical that cooling provision is super-efficient and uses low GWP refrigerants.

Madeleine Edl of UNE's United for Efficiency (U4E) highlighted the significant efficiency gains to be made between a business as usual (BAU), minimum ambition and high ambition scenario. Under BAU, with the rise in cooling demand, electricity consumption from AC is projected to rise 121% by 2040. Under a minimum efficiency scenario, electricity consumption is projected to decrease to 77%, and, under a high ambition scenario, consumption could be cut to as low as 39%.

U4E promotes a range of tools to support the achievement of a high ambition scenario, including 'setting the floor' of the market with guidance on Minimum Energy Performance Standards (MEPS) through expert-informed model MEPS for nations and regions. In addition, U4E emphasises the important role of product registration systems (PRS) at the national and regional level to achieving a high ambition scenario.

PRS are a tool which requires product manufacturers to register their products by applying for an assessment, passing the assessment, and given approval to gain access to a market. PRS can encompass several countries in a common system, for example as is the case in the Pacific, or act as a stand-alone system within a country as in China.

PRS are critical to the sustainable cooling transition the system monitors what appliances are on the market and ensures compliance to regulations and performance requirements. In addition, a PRS creates a comprehensive database of product information, generating a clear baseline and allowing for easier establishment and updating of effective MEPS.

U4E highlighted several national and regional approaches to PRS including in ASEAN where cooling demand is expected to rise rapidly in the coming three decades. This system incorporates already established national PRS which feed into a regional ASEAN database allowing for coordination and alignment among countries in the region.



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For questions on the policy recommendations above, please contact Malcolm McCulloch, co-lead of the Future of Cooling Programme at Oxford University ([malcolm.mcculloch@eng.ox.ac.uk](mailto:malcolm.mcculloch@eng.ox.ac.uk)) or Larissa Gross, Research Manager at E3G ([larissa.gross@e3g.org](mailto:larissa.gross@e3g.org))

**Watch a recording of the webinar here.**

## About E3G

E3G is an independent climate change think tank accelerating the transition to a climate-safe world. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere.

More information is available at [www.e3g.org](http://www.e3g.org)

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