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OXFORD FUTURE OF COOLING: COOLING FOR COP26 WEBINAR SERIES

October 11, 2021: Circular Cooling Economy with Martin Dieryckx (Daikin) and Dave Mackerness (Kaer)

Cooling provision: picking up the pace of sustainable cooling transitions.

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. However, following a business-as-usual pathway, **by 2050**, demand for cooling is projected to triple, making up 30% of energy consumption.

This huge demand has the potential to drive up GHGs and exacerbate the very problem it is designed to alleviate: exposure to heat. Governments and businesses can prepare for extreme heat by prioritising passive and energy efficient technology that use low global warming potential (GWP) refrigerants, shifting the trajectory of cooling growth towards sustainability. However, the pace and mode of delivery must accelerate and shift 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 **fifth webinar in the series, Circular Cooling Economy**, engaged in conversation with Martin Dieryckx (Daikin) and Dave Mackerness (Kaer).



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Caterpillars to leapfrogs: three ways to accelerate the cooling sector transformation

Energy efficiency of cooling equipment and systems has improved over the past decades however, this improvement has been incremental with few breakthrough innovations in efficiency or performance. To realize our climate and development goals on the timescales needed for a just, climate-safe world, the pace of change must reflect that of the challenge at hand. The speakers highlighted three opportunities for the cooling sector to transform now.

1. Cooling as a Service

Transformational change to cooling delivery is needed now however the rate of change is too slow. **Cooling as a Service** (CaaS) business models create the opportunity to scale delivery of cooling and offer a step-change in how cooling is provided, with significant emission reductions. CaaS is an innovative business model that allows customers to procure cooling based on life cycle cost rather than on the up-front purchase price of cooling equipment. CaaS charges customers for the cooling they receive, rather than the equipment or infrastructure that delivers the cooling. CaaS coordinates with maintenance and production businesses for performance (including improving efficiency and reducing emissions) and circularity (including end of life) of cooling units. For example, Kaer highlighted that while the company currently only serves 10 million square feet of space with cooling, this has resulted in a reduction of 55 000 MTCO₂ annually. CaaS provides opportunities to leapfrog delivery models for new urban development and different models for rural or remote service provision.

2. Circular Cooling Production

The typical GHGs emitted during the lifecycle of cooling equipment includes 1% from raw materials and transport and 9% at end of life. This may seem like a relatively small share however multiply this by the **14 billion units expected to meet demand in 2050** and it becomes obvious that circularity will be key to sustainable cooling provision. The future for manufacturers is circular.

Economic incentives are necessary to pull the field of producers forward toward circularity. Some component parts of cooling equipment already have circular markets – such as steel, copper, and aluminium - however other key components, such as insulation materials, plastics, oil, and rare earth magnets, do not yet have circular markets. Under the Kigali Amendment phase down schedule, the world's transition away from HFCs will take place over the coming decades therefore there is an



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immediate need to focus on capture and reuse. Partnerships and coordination among actors will be key across the ecosystem of production, reuse, and disposal. Two examples of governance platforms to enable circularity include: the **Waste Electrical and Electronic Equipment (WEEE) Forum** which brought together a wide range of partners to discuss refrigerant recycling and requirements for recycling of other component parts and the **LIFE 3R project** which provides a re-tradable platform for installers to recover refrigerants and sell to others for re-use.

3. Systemic circular cooling

Bringing these two approaches together – CaaS and circularity - rapid transition to sustainable cooling requires a system change from cooling production to cooling provision. Integration with solar energy systems will complement sustainability goals however more coordination will be necessary between stakeholders in the production of cooling to innovate and ensure high quality delivery. There is a need for leadership from business to take these models forward within the context of policy that shifts the economics of cooling provision. For example, plastic pellets do not currently compete with virgin materials demonstrating a need for policy that encourages higher amounts of recycled content.

Beyond equipment and refrigerant circularity and smaller scale cooling service, there is an opportunity to conserve and recycle energy through thermal networks, for example, providing CaaS to multiple industry through a cooling district grid. Looking forward, the speakers emphasized that the future of cooling is circular, and service based. Policy measures must incentivize and encourage a pace of change that far surpasses an incremental approach to performance improvements.

For questions on the policy recommendations above, please contact Caitlin McElroy Departmental Research lecturer in Enterprise and the Environment (caitlin.mcelroy@smithschool.ox.ac.uk) or Giovanni Palafox-Alcantar, Research Associate in Sustainable Cooling Product Networks (giovani.palafox-alcantar@smithschool.ox.ac.uk) at the Smith School of Enterprise and the Environment or Larissa Gross, Research Manager at **E3G** (larissa.gross@e3g.org).

Watch a recording of the webinar here.



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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.

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