# A seven-point plan to tackle the world's biggest cooling challenge

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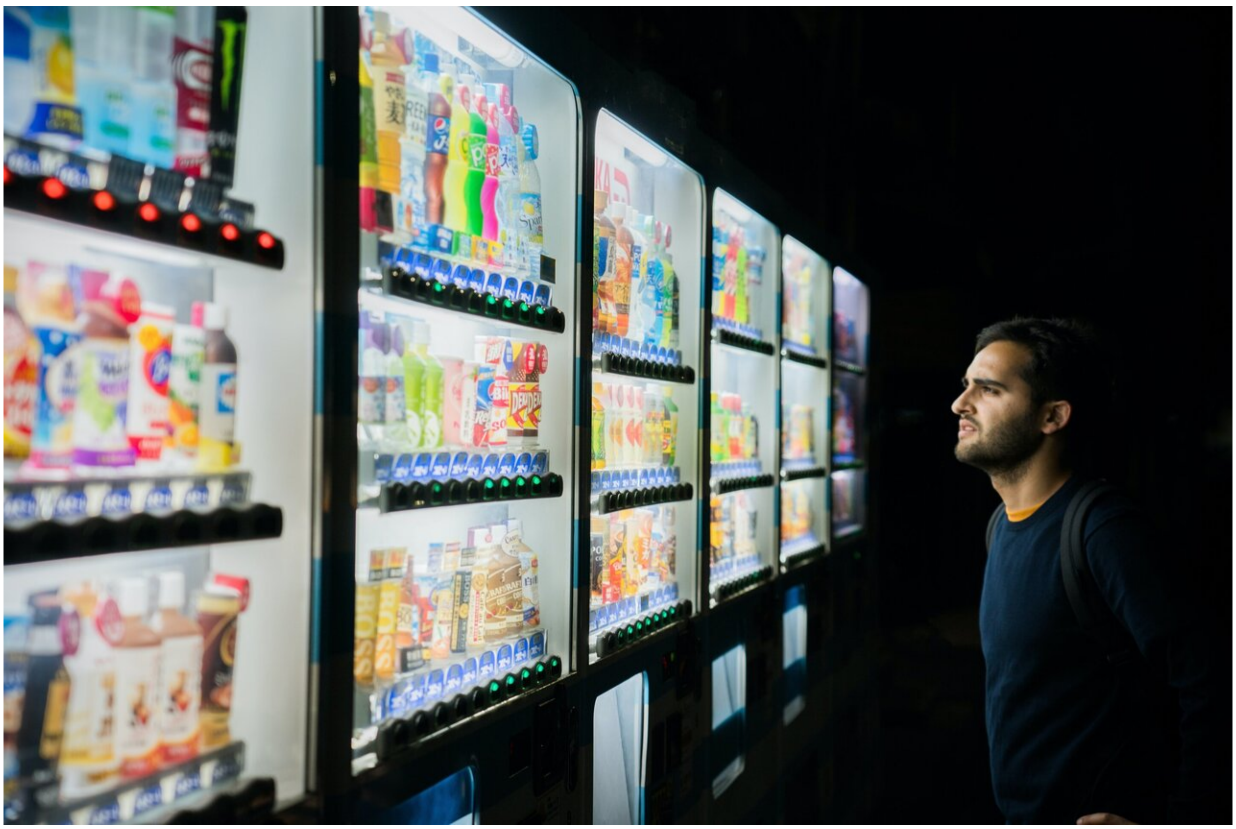

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The COVID-19 logistics response could be the biggest, single refrigeration challenge the world has ever faced. Cold chains are energy intensive and rely on refrigerants, often with high Global Warming

Potential (GWP).

Sustainable cold chains that use novel technologies can unlock modal shifts and allow us to think about opportunities in broader temperature opportunities. This opens the door to developing a lasting COVID-19 cold chain legacy that is both resilient and sustainable.

Professor Toby Peters, University of Birmingham and Professor Phil Greening, Heriot-Watt University says it shows at a minimum, more financing focused on solar-powered refrigerators and freezers can support health facilities in developing countries that suffer from a lack of reliable electricity and not rely on diesel systems or high GWP refrigerants. However, it is worth noting that WHO still lists equipment using R404A, which has a GWP of 3922, the highest of all the commonly used refrigerants and has been banned in Europe with only recovered or reclaimed R4040A able to be used until 2030.

A seven-point plan has been made to tackle the world's biggest cooling challenge.

- Intervention 1—Fridges purchased today will likely remain in field for all of this decade. We don't just need energy consumption and refrigerants listed in equipment specifications, but up to date sustainability goals embedded into pre-qualification criteria for equipment.
- Intervention 2—We need to better explore the opportunity for Cooling as a Service to enable optimized asset utilization to address a multitude of cooling needs given the long lifespan of the equipment versus the potential timeline for vaccine needs.
- Intervention 3—Explore the opportunity of "Community Cooling Hubs' supported by appropriate technology and business models to sustainably provide access to a portfolio of refrigeration dependent services to rural (and urban) communities, aggregating

demand to optimize energy and resource use.

- Intervention 4—Regardless of the strategy large volumes of new equipment will be deployed. While each country is quantifying the number of health workers required to immunize their population, we must not miss the fact that a lack of qualified in-field refrigeration technicians will lead to long response times to equipment malfunctions and broken cold chains.
- Intervention 5—Ensure we invest in joined-up and embedded data capture and management alongside deploying hardware. Usage and performance data is critical in developing the capacity to run self-organizing models (see Intervention 7) which in turn are vital to developing resilient self-healing systems.
- Intervention 6—Let's not forget that alongside vaccines, disposable syringes, Personal Protective Equipment (PPE) and other vaccination supplies will all need to be shipped out to every health center and rural outreach point. As we plan the capacity to move everything out, we also need to ensure we are ready to deliver the sustainable and safe waste management and disposal recycling.
- Intervention 7—where it all starts. Measure thousands of times in a matter of days before deploying thousands of pieces of equipment with multi-year life. Using virtual systems populated with intelligent, decision making capability and driven by clear objectives and high powered computing environments will allow us to identify robust solutions for more scenarios.

In rushing to deploy hardware, an underestimation of the scale of the cooling demand, the system complexities and its impact on energy consumption risks contributing to a lack of ambition in policies, infrastructures and technology developments as well as capacity building. It could ultimately have far-reaching social, economic and environmental consequences.

A modeling approach—essentially creating a virtual world which combines both existing capacity, with demand profiles, infrastructure, climate and new technology choices—will therefore be the most efficient and fastest route to a robust solution. Modeling allows us to develop parallel universes in which we can experiment at speeds not achievable in the real world. It can rapidly test thousands of scenarios, self-organizing to define the optimum—and most energy efficiency and sustainable—investment strategies.

In the short term, it will be the poor who will face the most significant challenges in accessing a vaccine for COVID-19 and cooling will become a serious issue of equity underpinning access to vaccines. As governments and NGOs develop distribution plans, cold chains must both guarantee the health response and draw on the most sustainable solutions to build long-term resilience. These choices and the costs and environmental impacts will impact all of us for decades to come. We need to get them deployed quickly but we also need to ensure they are right.

Provided by Heriot-Watt University

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