



1.06 Scale up sustainable cold chain technology

The Solution: The solution proposed is an ambitious, multi-stakeholder effort to deliver the widespread implementation of highly integrated, sustainable cold chain with an emphasis on the 'Community Cool Hub' (CCH) model. This will be implemented through a comprehensive package of measures: expanding high-level political commitment to sustainable cold chains; conducting needs-driven cooling and cold-chain assessment and preparing comprehensive national cooling action plans that include sustainable cold chain; ensuring policies are aligned; establishing in-market Living Labs to develop and demonstrate step-change pathways and provide technical and business assistance and training to small-holder farmers and rural communities; and mobilising finance assistance for implementation. The solution sits at the critical intersect between the goals of Food Systems and Climate Action, identifying net-zero pathways to create local and global "field to fork" connectivity to nutritiously feed 10 billion people sustainably from small-scale farmers while ensuring they are ready and resilient to adapt to climate change.

A CCH is a community-led and integrated flexible system approach to affordably meet a portfolio of rural community cooling needs including food (domestic and value chain), health (including human and animal vaccines and pandemic response), and human comfort and safe working environments. The purpose of this project is to upscale CCHs as a leading strategy for financially accessible, low-carbon cold-chain and cooling development pathways that generate economic wealth, better health and nutrition, and a sustainable future for rural communities. Demonstrator CCH projects in India and Africa (e.g., through the new Africa Centre for Sustainable Cooling and Cold-chain) are showing what is possible and defining the technical, financial, and policy interventions to provide access to cooling for all who need it. The task now is to scale this programme through co-ordinated actions drawing on the government, industry, academia, society, and finance to expand cold chain, meet wider rural cooling needs, and shift the sector into clean technologies.

Source of the Solution: This idea stems from discussions between AT1 and the Cool Coalition, one of the "Transformation Initiatives" put forward by the Executive Office of the Secretary-General for the UN Climate Action Summit, which works with over 100 partners from private sector, government, international organisations, and civil society. CCHs stem from different sources, including in-market research and study tours. It was developed by Professor Toby Peters of University of Birmingham, in collaboration with Prof Pawanexh Kohli, previously CEO, National Centre for Cold-chain Development, India and is being advanced by a multi-national collaboration of academic and expert partners.

Problem addressed within food systems: Lack of effective refrigeration directly results in losses of [13% of total food production](#). In many LMICs, food is lost between farm and market due to lack of cold chains. Five key obstacles need to be addressed to accelerate the transition towards sustainable cold chain: (1) lack of appropriate **financing and business models** for aggregation and processing hubs and integrated cold chains; (2) lack of **robust data** to assess cooling needs **and a lack of knowledge and capacity** to act on this need; (3) lack of access to **energy and technology**; (4) the **fragmented nature of agricultural land-holdings** in LMICs; and (5) no **"one-size-fits-all" model**: models used in more industrialised countries may not always be successful in LMICs.

How this solution will address that problem: Most farming communities need temperature-controlled pack-houses / aggregation hubs, which will typically include energy-intensive cooling systems to pre-cool and store the aggregated perishable produce as the first stage of the cold-chain. By designing the cooling system based on a broader set of community needs, aggregating cooling demand to reduce overall demand, create system efficiencies, and bundle multiple revenues streams, CCHs can meet a portfolio of



a rural community's societal needs with economic accessibility and resilience. Specifically, they can support farmers and fishers with reducing post-harvest food losses, increasing productivity through animal shelter and access to veterinary vaccines, protecting quality and value, and providing new distant market connectivity, whilst ensuring that the wider community has continuing access to life-saving vaccines, domestic refrigeration, and properly cooled health facilities and community services as well as heating for water, drying, and cooking. Service management, modularity, local participation and efficiency through circularity and systems-thinking can ensure uptake and resilience where other stand-alone models have failed or been too expensive. (See further details on the theory of change in Annex 2).

Solution's alignment to the 'game changing and systemic solution' criteria:

Impact at scale - Increasing access to rural cooling and cold chain can improve and protect the livelihoods of hundreds of millions of smallholder farmers (men and women) by increasing their revenue. It enables farmers to enhance income through diversification into high-value and high-return, but often temperature-sensitive, crops.

Sustainability & Actionability - Innovative business models, such as Cooling as a Service, have shown that expanding rural cooling and cold chain can quickly create returns on investments and a sustainable source of income for service providers. Pilots for the solutions, including data collection and needs assessment frameworks, CCH and CECC, are now underway in initial markets with government support. Comprehensive, integrated, and sustainable system approaches to rural cooling and cold chain provide a long-term sustainable vision for enhancing access to cooling that is in line with sustainable development and climate imperatives beyond 2030.

The mobilisation strategy for mass deployment of CCH in rural areas contribute to the five Summit ATs as follows: **AT1:** Help preserve food and its safety, maintain nutritional value, reduce loss, improve access; **AT2:** Additional income fosters more sustainable practices and local circular economy efforts; **AT3:** Efficient use of farming inputs; reduced food loss and related emissions, land-use change, water-use and pollution; **AT4:** Increased farmers' incomes, reduced inequality in food access and income; and **AT5:** Stabilise the food supply, increase supply chain resilience, and contain changes in food prices.

Existing evidence: Researchers from University of Birmingham, Heriot-Watt University, and the Centre for Environment Education in India undertook in-depth research into the design and development of CCHs; the report is currently under review for publication. Further needs assessment and market studies to support CCH development were undertaken in Rwanda in 2020. Demonstrations of the model are underway in India and Rwanda, supported by a collaboration of academic, industry, government, and community partners; its component parts have been successfully demonstrated for years in numerous countries.

Current/likely political support: This effort will build on the political momentum gained by the Cool Coalition at the Climate Action Summit, where over 20 countries recognised the need to accelerate transition to sustainable cooling, as well as on the 2019 Rome Declaration in which ministers and heads of delegation of parties to the Montreal Protocol reaffirmed the need to develop sustainable and efficient solutions in the cooling sector to meet future cooling demand, including cold-chain initiatives for food preservation, and highlighted the key role of cold chain in SDGs implementation. In addition, Cool Coalition Steering Committees members (including UK, Denmark, Ghana, Costa Rica, Cambodia and France) agreed to create a focused working group on cold chain, while significant financial support has been committed by the UK and Rwanda Governments to the Africa Centre of Excellence for Sustainable Cooling and Cold-chain as a pan-Africa applied research, teaching, and learning development centre for CCHs.



Contexts for which this is well suited: The solution is designed to be flexible, but given the majority of farmers in LMICs are small-scale and marginal without access to finance or electricity, it is specifically designed to provide access to cooling and cold-chain services to the poorest and most marginalised by aggregation of demand and service management business models. It is also being developed in India through private-sector partnerships with mid-sized farmers as the anchor customers around which community farming groups can be coalesced.