

Sustainable Cooling in Kenya's Agrifood Sector Transformation: A Case for Multisectoral Policy Alignment and Investment

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This policy brief highlights current developments in Kenya to guide and secure investments toward a sustainable cold-chain in the agrifood sector in alignment with the relevant policies and strategies. It then outlines how Kenya is leveraging the Africa Centre of Excellence for Sustainable Cooling and Cold-Chain (ACES) to pursue an integrated approach to meet the nation's cold-chain needs while achieving climate and development targets.

Introduction

Sustainable cold chain is a critical infrastructure that requires robust investment to unlock its potential in sustainable agrifood sector development, improve rural livelihoods, and enhance the health and well-being of Kenyans. The agrifood sector is integral to Kenya's economic and social development, contributing 51% of GDP (26% directly and 25% indirectly) and accounting for 60% of employment and 65% of exports (World Bank, 2018). According to the Agriculture Sector Transformation Strategy (ASTGS) (MoALFI, 2019), the sector has been experiencing annual growth of about 4.8 % annually since 2012.

However, Kenya's food deficit persists. A major contributor is post-harvest food loss and waste (FLW) valued at US \$ 662 million annually (FAO, 2020) excluding social and environmental costs (FAO, 2020; FAO, 2015). This is mainly due to poor post-harvest practices and lack of effective cold-chain from farm to fork. Of this, an estimated 30 – 40% of fruits and vegetables worth US\$140 million are lost annually in Kenya (FAO, 2020). Also, about 7.3% of milk that is produced is lost through spoilage, poor handling and limited cold-chain (Kang'ethe et al, 2020; MoALFI, 2019).

Transition to sustainable cooling and cold-chain is critical to reducing FLW, curbing GHG emissions linked to conventional cooling technology and promoting clean energy (GOK, 2020a, 2020b). Accelerating this transition requires an enabling environment through national and subnational policies and strategies that are aligned with global commitment such as the Paris Agreement on Climate Change, Kigali Amendment to Montreal Protocol and Sustainable Development Goals (SDGs) that guide the ambition for sustainable cooling as part of climate action for development. The integration of sustainable cooling cuts across multiple sectoral policy issues.

This means adopting a radical shift in the approach to multisectoral interventions to make sustainable cooling and cold-chain part of the infrastructure that governments actively invest in to maximise social welfare as well as to ensure equity, rather than leaving it primarily to the private sector that often solely focus on financial returns and struggles to access capital for more sustainable solutions than legacy technologies resulting in lost opportunities.

Key Messages

- Developing a sustainable cold-chain requires a clear understanding of the current and future scale and nature of the cold-chain demand, the system complexities and its impact on energy consumption and climate risks.
- The Ministry of Agriculture, Livestock, Fisheries and Co-operatives in Kenya should take a holistic systems approach to cold-chain provision, recognizing that individual cooling technologies/interventions delivered in silos are not enough to meet the cooling needs sustainably.
- There is need to develop the skills and training required to deliver current sustainable technologies and provide necessary technical support in the market, but also to scan the horizon by engaging with industry and technology developers to understand the potential future skill requirements and capacity to deliver the technologies under development.
- It is critical to develop and implement finance and business models that create and share value equitably among stakeholders and overcome perceived issues around affordability and viability. There is a need to develop holistic, robust, sequenced, and budgeted evidence-driven delivery roadmaps with identified and quantified impacts.
- It is imperative to consider equity issues to understand the real value of delivering sustainable and resilient cooling and cold-chain to facilitate the government investments in infrastructure, and the development of business and finance models, and policy frameworks to support them.
- Government-as-investor should be a new model as cooling infrastructures is at the heart of the multiple sustainable development goals. To enable this, wider benefits should be quantified and monetised as part of cost-benefit analyses to improve the return on investment.
- Effectiveness of delivery of the ambitions and commitments related to sustainable agriculture cold-chain transition will require policy coherence across multiple sectors and levels of governance and multistakeholder coordinated action.

Key policies and strategies linked to sustainable agrifood cold chains

Kenya has ratified global agreements and crafted several policies and strategies on climate action for development that have a bearing on sustainable cooling solutions in the agrifood sector. These are summarised in the table below:

Policies/Strategies	Description/Status	Link with sustainable cooling
Agriculture Sector Transformation Strategy (ASTGS) (2019-2029)	The ASTGS recognizes the need to address post-harvest losses (PHL) through storage including cooling/chilling/ambient storage facilities coupled with value addition.	Reducing PHL can be achieved by facilitating access to sustainable, inclusive cold-chain through training and creating awareness on the same.
Montreal Protocol	Kenya is a signatory to the Montreal Protocol on Substances that Deplete the Ozone Layer; and is in the process of ratifying the Kigali Amendment which has set a target to phase out Hydrofluorocarbons (HFCs) having zero Ozone Depletion Potential (ODP) but high Global Warming Potential (GWP).	Expanding agricultural cold chain using low-GWP refrigerants, low carbon energy-efficient technologies and sources and sustainable agriculture cooling solutions decreases food loss, reducing GHG emissions, saves energy, land and water use.
National Policy on Climate Finance (2016)	The policy recognises the important contribution of the agricultural sector to national economic development and should be prioritised for climate-action investment including reduction of PHL and promotion of clean energy for household and agro-industrial uses.	As part of reducing the climate footprint of agriculture, it is imperative to target climate financing to sustainable cooling investments. Sustainable cooling is integral to climate-action, required for a resilient agri-food sector development in Kenya.
Kenya National Energy Efficiency and Conservation Strategy (NEECS) 2020	NEECS identifies agriculture as a priority sector and aims to develop projects on EE in Productive Use of Energy related to off-grid solutions including cold chain. Relatedly, the National Cooling Action Plan (NCAP), aims to transition to energy efficient cooling equipment/services including refrigerants in the agricultural value chain.	Sustainable agriculture cold-chain solutions consider applying energy efficient technologies with low-GWP refrigerants as a priority to reduce energy consumption and the negative environmental impacts.
Kenya Climate Smart Agriculture Strategy (KCSAS)- 2017-2026	The broad objective of KCSAS is to adapt to climate change, build resilience of agricultural systems while minimizing emissions in key and minor sources in the sector for enhanced food and nutritional security and improved livelihoods.	Sustainable cooling is part of the pathways to climate smart food systems in Kenya. Promoting sustainable food cold-chain systems also contributes to access to nutritious food and opportunities for new green jobs to improve livelihoods.
Updated Nationally Determined Contribution (NDC) 2020	Kenya's planning process on mitigation and adaptation hinges on the NDC commitments and targets. Kenya's contribution will be implemented with both domestic and international resources. The updated NDC set the target to abate GHG emissions by 32% by 2030 relative to the BAU scenario of 143 MtCO ₂ eq;	Agriculture seeks to reduce GHG by 2.77 MtCO ₂ eq. Sustainable agricultural cold chain has potential to contribute to the target directly but also indirectly through energy demand (6.09 MtCO ₂ eq), PHL reduction and transportation (3.46 MtCO ₂ eq) showing that it is an integrated approach.
Kenya Vision 2030-Midterm Plan phase III (2018-2022) including the Big Four Priority Agenda for 2017-2022	The Kenya Vision 2030 goal is to create a globally competitive and prosperous country with a high quality of life by 2030. The Big Four' agenda prioritises food security, affordable housing, manufacturing and affordable healthcare accelerate the economic growth and improve livelihoods. Pursuing an inclusive low emission climate resilient development is noted as a pathway to realise Vision 2030.	Sustainable cooling contributes to resilient economic development as it cuts across some of the Big Four agendas. Sustainable cooling can reduce food loss and contribute to food security and simultaneously stimulate agro-industrial growth. It also can improve access to high-value markets, regional and international trade and facilitate innovation and competition in the agrifood sector.
County Integrated Development Plans (CIDP)	The CIDPs capture the strategic and operational plans for sub-national governments in Kenya to deliver sustainable development to communities at the county level. Agriculture is a priority for all counties and related to the ambition of reducing post-harvest losses through investment in cold storage facilities as articulated in the CIDPs.	The CIDPs targets related to investing in cold storage can be re-aligned toward sustainable cooling that promotes clean energy and low-GWP refrigerants to meet national targets and commitments. Inclusive, enhanced access to sustainable cooling will have multiplier effects such as time saving for household activities which can then be used for other productive activities.

Challenges for transitioning to sustainable agrifood cold chains

The transition to sustainable agrifood cold-chain solutions in Kenya faces a number of challenges:

- Underdeveloped cold-chain infrastructure, with significant gaps across all counties.
- Low market demand for sustainable cold-chains solutions due to high upfront investment required.
- Limited supply and availability of technologies as Kenya is largely a technology receiver and still a relatively nascent market and low demand for the most efficient systems.
- Lack of adequate financial and soft regulatory measures that promote adoption of sustainable cold-chain solutions.
- Innovation in sustainable cooling technology (e.g., efficient equipment and lower GWP refrigerants) is not accompanied by requisite capacity and skills essential to enable the installation, servicing and maintenance.
- Private sector-led business models in the cooling and cold-chain space often solely focus on narrow opportunities for financial returns and do not factor in the importance of cold-chain as critical infrastructure for wider socioeconomic benefits.
- Limited policy levers for Sustainable agrifood cold-chain transition taking a holistic (system) approach. This means combining suitable technology solutions with appropriate business models that can integrated agrifood related solutions with other diverse community cooling needs such as health (vaccine storage and delivery) and thermal comfort.

Deploying and refining game changing solutions for sustainable cold chain

The Community Cooling Hub (CCH) project in Kenya linked to Africa Centre for Excellence for Sustainable Cooling and Cold-Chain (ACES), is a Specialized Outreach and Knowledge Establishments (SPOKES) being rolled out throughout Africa to deploy ACES solutions in real-world settings. ACES is a first-of-kind centre dedicated to sustainable cooling, cold-chain and post-harvest management. The mission of ACES is to accelerate the uptake of sustainable cooling and cold-chain solutions in the agriculture and health sectors in Africa, improving livelihoods, health, food and nutritional security of rural communities, thereby bringing environmental, social and economic development. It is funded by the Department for Environment, Food and Rural Affairs (Defra) of the UK Government and hosted by the University of Rwanda in Kigali.

Transforming the cold-chain sectors from farm to fork in order to deliver cooling for all who need it sustainably, especially in rural communities in developing regions such as Kenya is critical.

The CCH is an integrated, systems-level approach that seeks to understand and design sustainable cooling services targeting the broad portfolio of diverse rural women and men farmers as well as SME owners. The proposed cold-chain shall be highly accessible, efficient, affordable, resilient, and sustainable.

CCH as SPOKES has the potential not only to accelerate the transition to inclusive sustainable and resilient cold-chains by tapping into clean energy options and refrigeration, reducing food loss and waste but also offers an out of the box opportunity to integrate improving vaccine/health supply chains, thereby bringing broader social and economic development, especially to rural community.

UK-PACT is supporting the CCH research project in Kenya, a collaborative effort of the Centre for Sustainable Cooling (CSC) led by University of Birmingham, the Africa Centre for Technology Studies (ACTS) and the London South Bank University (LSBU). The project is implemented in three counties: Homa Bay, Kiambu, and Kitui, with a focus on fish, dairy, and fruits (mangoes) respectively as the entry point agricultural value chains to guide design of flexible and efficient self-sustaining cold chain services.

Delivery of CCH is being developed through ACES (Figure 1).

ACES is developed by the Governments of Rwanda and the United Kingdom (UK), the United Nations Environment Programme and the UK's Centre for Sustainable Cooling leading a consortium of UK universities with more than \$20M of seed investment committed by governments and industry.

The CCH also benefits from the focus of ACES on working with governments, academia, industry, rural communities and wider stakeholders to develop systems of 'Farm Gate to Fork' and 'Manufacturer to Arm' strategies for the global food and vaccine systems, demonstrate the solutions and provide the skills and capacity building and business modelsto:

- Accelerate the deployment of fit-for-market and purpose driven sustainable cooling solutions.
- Improve the overall integrated sustainability of food and economic aspects), whilst meeting societal goals.
- Increase awareness among all stakeholders (e.g., policy makers, businesses, investors, entrepreneurs, institutions, and end-users of innovative systemic solutions) to support their potential for uptake at scale in Africa.

To underpin the investments and the development of supporting financial and policy interventions, ACES will develop comprehensive, robust, sequenced, and costed roadmaps to achieve access to cooling and cold-chain for all sustainably, for developing a market with full return-on-investment analysis considering multiple benefits across social, economic, and environmental dimensions.

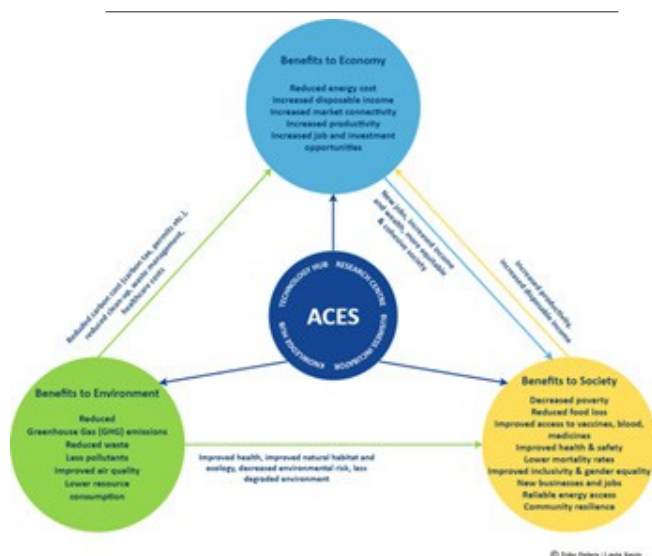


Figure 1: Multiple benefits delivered by ACES

health systems (including social, environmental and

Transforming the cold-chain sectors from farm to fork in order to deliver cooling for all who need it sustainably, especially in rural communities in developing regions such as Kenya requires a robust system-level model and multi-stakeholder coalition, collaborating at all levels. This is what informed the innovate idea of the CCH.

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