Sustainable Cold-Chain

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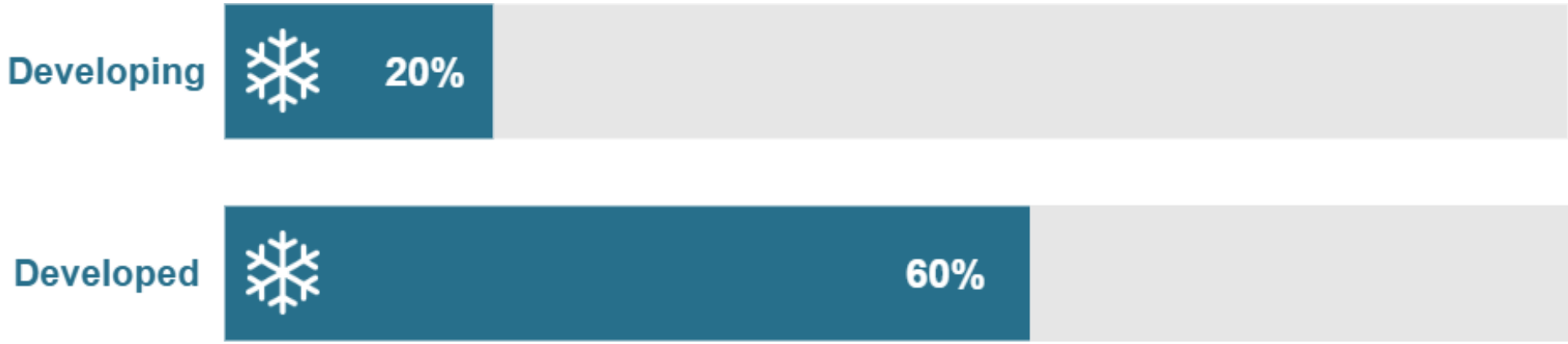
The need for cold-chain

- **Less than half of the food is refrigerated that should be:**



Social cost

- **12% of the total food produced** is lost due to lack of cold-chain; enough to feed **1 billion people**
- **1.5 million people/year lose their lives** due to vaccine-preventable diseases; **25% of vaccines wasted**

Environmental cost

- **Cold-chain technologies + food loss = 4% of total GHG emissions**
- **Cold-chain technologies: 1/3 of HFC emissions**
- **All Cooling technologies: 7% of GHG emissions**

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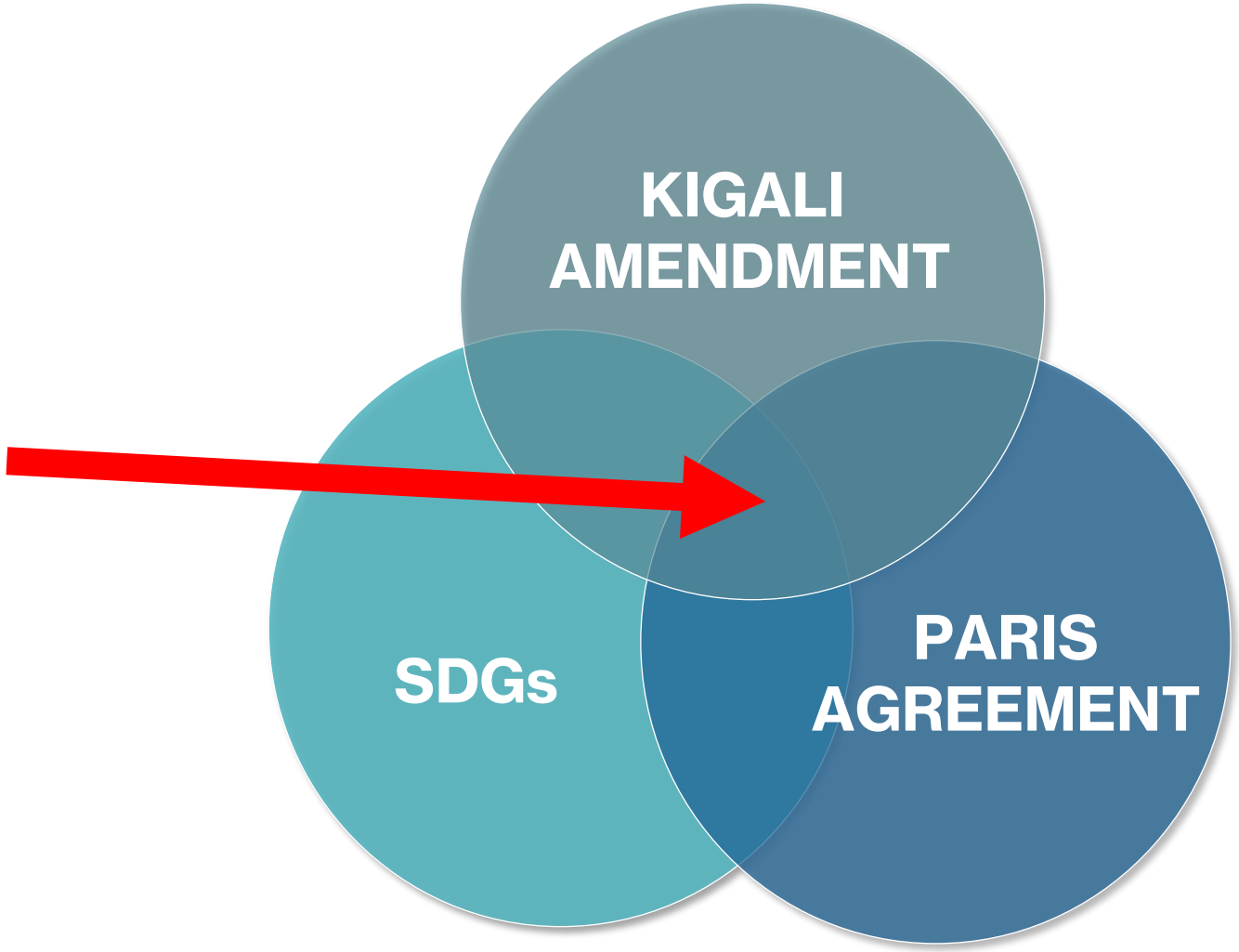
Food saved as important as food produced

How do you create the local and global “field to fork” connectivity to nutritiously feed 10bn people from hundreds of millions of small-scale farmers whose livelihoods and well-being are often dependent on only 1-2 hectares or less, as well as ensure they are climate change adaptation ready and resilient …. sustainably



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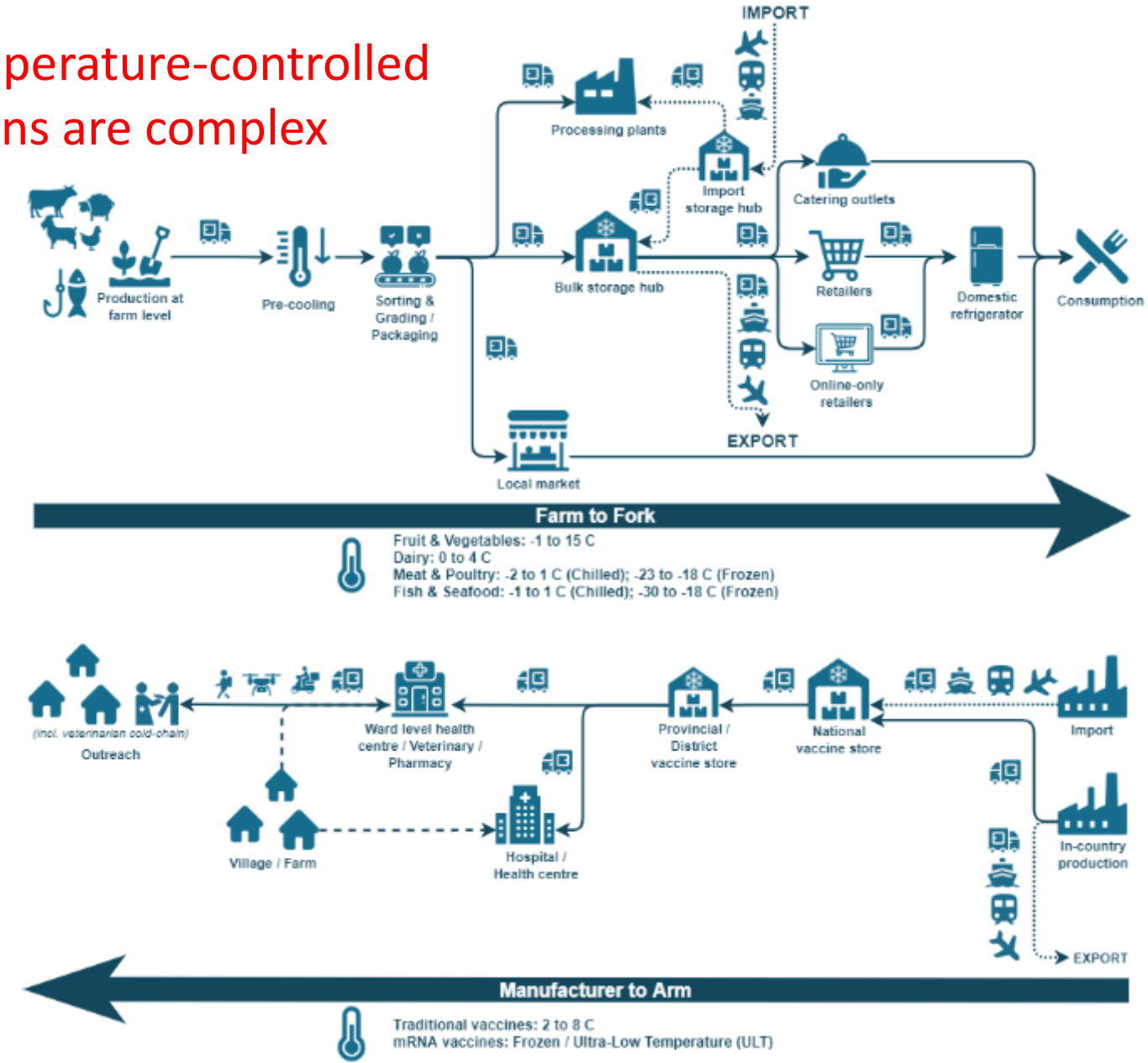
Key failings from many current donor strategies

- **MORE PRODUCTION** without addressing Post-Harvest Loss
- **MORE COLD STORAGE** buildings without other functioning elements & connectivity
- **MORE DONOR-DRIVEN PROJECTS** that are not market-oriented and depend on grant funding to continue
- **OLD TECHNOLOGY** that is not climate friendly and expensive

Temperature-controlled chains are complex



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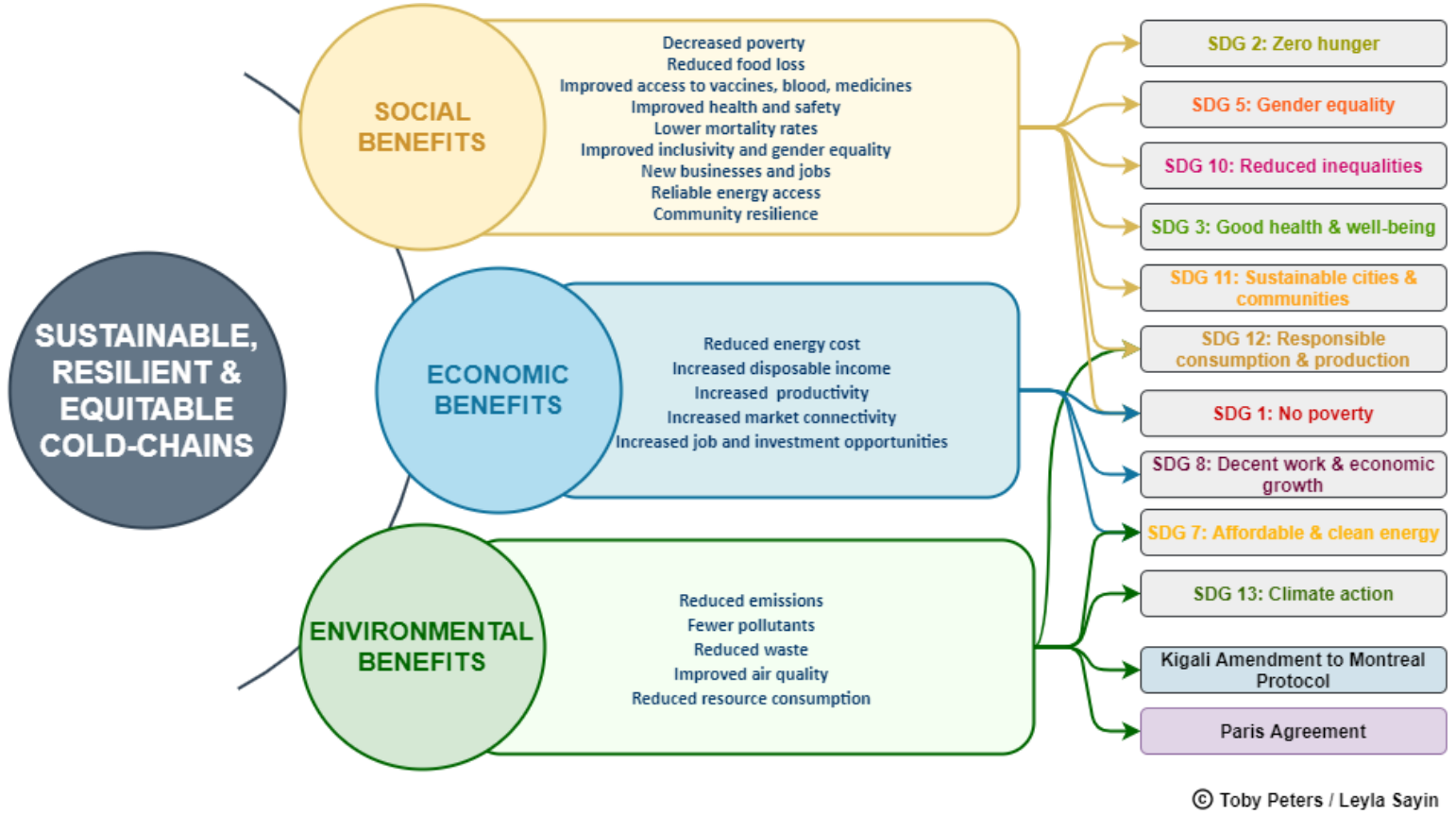
Flaw in the business model

- Mainly owned and governed by the private sector
- Societal benefits are typically treated as a “soft win”
- Lack of long-term investment and a piecemeal approach
- Fails to deliver against society’s most acute cold-chain needs



Cold-chain should be part of Governments’ critical infrastructure

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Understanding what the cold-chain should look like

Need to identify drivers that will shape the needs and provision over the coming decades to support the delivery of future-proofed solutions

- Interplay with renewable energy & climate friendly refrigerants
- Changing needs
- Innovations:
  - Electric vehicles, blockchains, drones, e-commerce, IoT, etc.
  - *A*lternative proteins, vertical farming etc.
  - New vaccines which might require sub-zero cold-chains.

ACES
Africa Centre of Excellence for Sustainable Cooling and Cold-Chain

First-of-kind centre dedicated to sustainable cooling and cold-chain for food and health

REMA
U4E United for Efficiency
Centre for Sustainable Cooling
Department for Environment Food & Rural Affairs
UNIVERSITY OF BIRMINGHAM
HERIOT WATT UNIVERSITY
EDINBURGH BUSINESS SCHOOL
Cranfield University
EST 1892 LSBU
SRF The Centre For Sustainable Road Freight

Research and Teaching / Training Areas

Post-harvest Handling, Storage, Quality, Process and Packing Zone

Off-grid mobile pre-cooling; Controlled Atmosphere systems; Refrigerated storage; Precision Cooling for soft fruit and perishable crops (blast chilling/vacuum coolers); Hydrocooling; Ripening Rooms; Sustainable packaging; modified atmosphere packaging.

Distribution, Cold-Chain and Logistics Zone

Ice-production; Zero-emission transport refrigeration; PCMs and small-scale rechargeable cooling boxes; Zero-emission refrigerated transport.

Energy and Energy Storage Centre

Integrated thermal systems; waste heat to cold (sorption cooling); Thermal storage (PCMs).

Data and Digital Transformation

Needs assessment tools, data capture and use monitoring, virtual models, electronic trading and fulfilment platforms.

Business Start-Ups, and Incubation Suite

Design service, business models market engagement and finance, export distribution network, meeting and conference facilities, co-location space for business and industry partners.

Quality control and Certifications Lab

Codes and Standards; Farm to Fork QA, Setting quality thresholds for retail sector and export markets; Food safety.

Other areas – vaccine and health, retail domestic.

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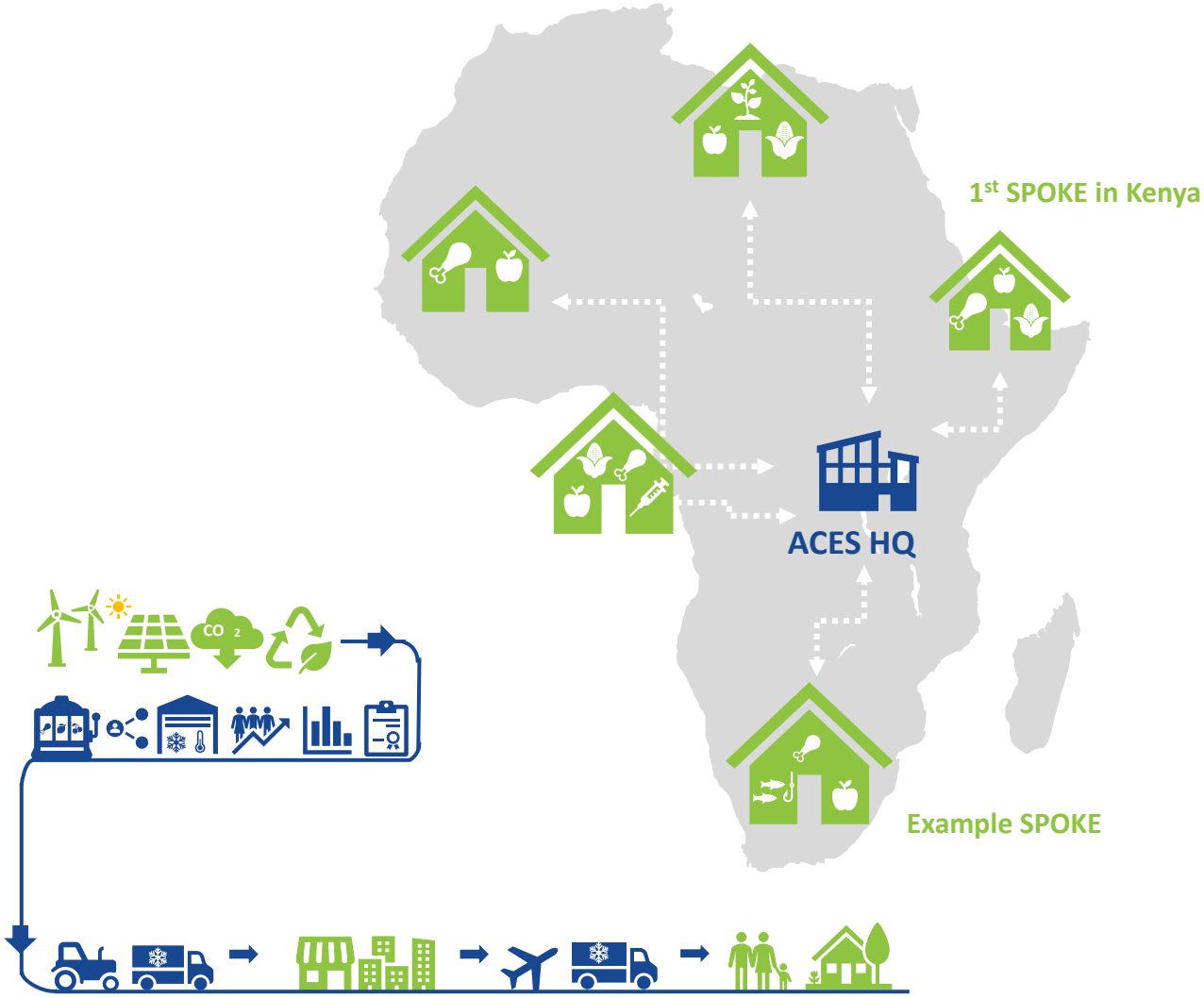
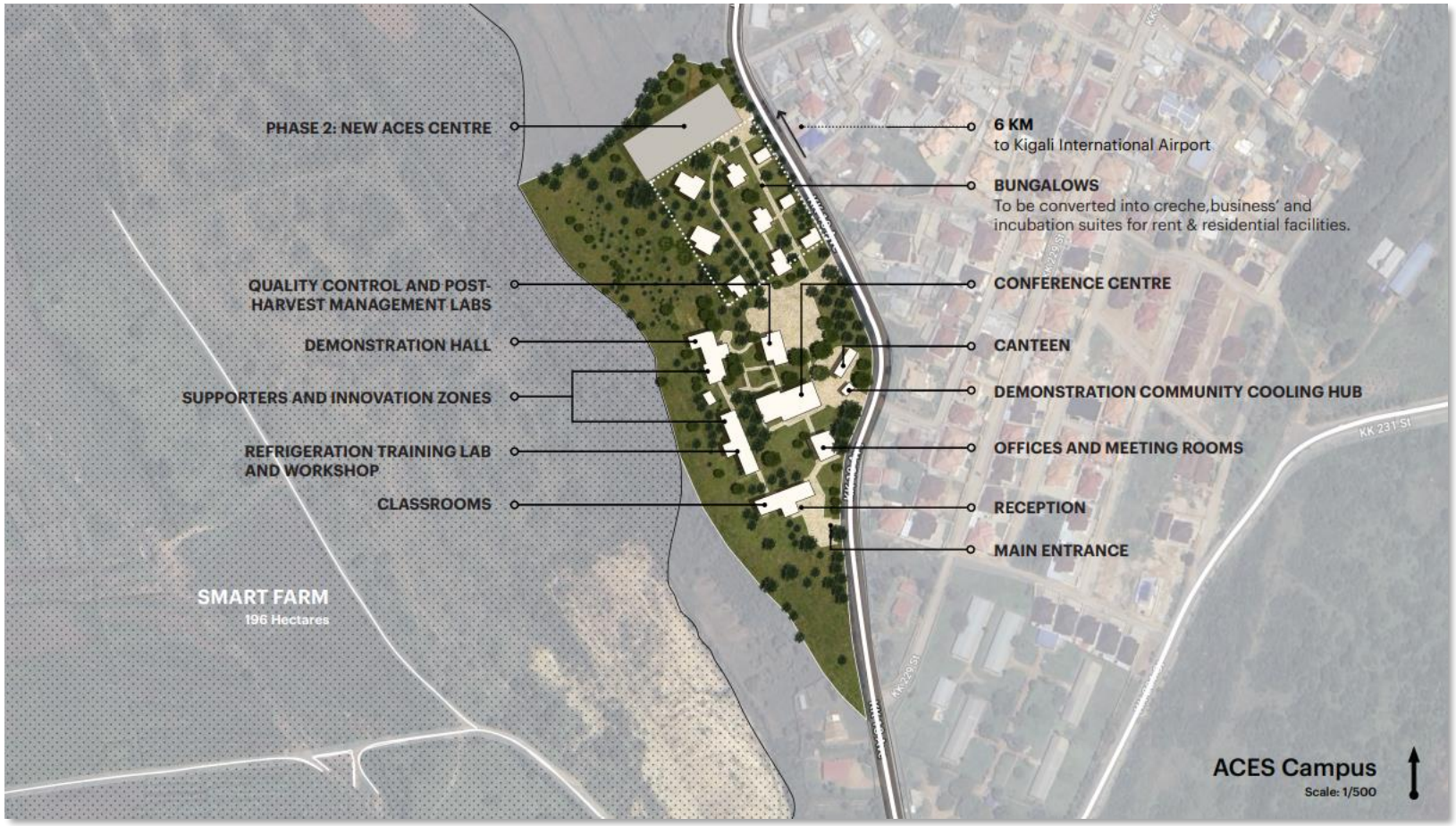
Hub and Spoke Models

- Specialised Outreach and Knowledge Establishments (SPOKES) deployed in strategic locations as real-world applications of ACES' solutions
- Specialising in particular needs and opportunities for local markets
- Fixed and mobile assets – holistic and integrated system approach
- Provide technical assistance, demonstrations and knowledge transfer
- 1st SPOKE getting underway in Kenya; others in planning



ACES campus

- Developed by the University of Birmingham, London South Bank, Heriot-Watt and Cranfield, University of Rwanda and UNEP
- > $20M of seed investment committed by the UK and Rwanda Governments and industry
- + the campus and physical infrastructure
- + industry partnerships



From soil to plate

plus 200 Hectare Smart Farm for an integrated sustainable food system from soil to plate

=> Complete logistics chains for soil to fridge

Research centre for novel approaches to:

- increase the productivity and quality of agricultural products,
- reduce costs, food losses and environmental footprints
- the transition to renewables and climate- friendly refrigerants
- crop management to reduce food loss and waste

Whole-System Delivery

An essential mix of: applied research and demonstration, learning and teaching, industrial collaboration and investment, and awareness raising and outreach

R&D on comprehensive food and vaccine cold-chain solutions

- Future-proof, localised solutions for food loss and supply chain resilience
- Specifications and best practices for refrigeration, pack houses, logistics, etc.
- Integration of renewable energy, e-logistics and other advanced solutions
- Assess market gaps, leverage data acquisition and modelling capabilities

Demonstrate best available technologies

- Technologies developed at proven at ACES HQ get demonstrated and field tested at SPOKEs with feedback shared on the results

Deploy solutions and increase market connectivity and uptake

- Design and implement sustainable business models
- Foster linkages between entrepreneurs, investors, agri-businesses
- Encourage use of standards and certifications

Enhance capacity and raise awareness of rural communities

- Capacity building in the field for farmers and technicians
- Skills development and innovation support for students and start-ups
- Disseminate key findings, orchestrate communications campaigns

ACES

Africa Centre of Excellence for Sustainable Cooling and Cold-Chain

ACES is a demonstration of how we can work together, to help tackle rising emissions and keep alive the goal of limiting average global temperature rises.

Cooling and refrigeration are the fastest-growing source of greenhouse gas emissions in the world, especially in developing countries. But this challenge gives us the opportunity to develop innovative, energy efficient technologies of the future."

COP 26 President,
the Rt. Hon. Alok Sharma MP

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