

### WWF – Cool, Blue Food

## A strategic approach to cold chain projects in ocean communities

October 2023







# WWF

#### WWF Foreword

Executive summary

WWF projects on Cold Chain in coastal communities

Other Cold Chain projects in the South West Indian Oceans

Appendices



### WWF currently applies a seascape approach in 15 operational seascapes across the SWIO Region



A seascape approach recognises the strong interdependence of ecological, gender, social, economic / financial perspectives

old chain investments are a key intervention within the WWF Seascape Approach in the SWIO region. Taking a seascape approach ensures strong social and environmental safeguards. Cold chain projects undertaken in isolation from a broader set of intervention will result in reduced effectiveness and could present social and environmental risks.

#### Ecological perspective

To effectively manage marine and coastal ecosystems, an ecosystem-based approach within a seascape is essential. This ensures sustainable management and avoids exceeding the region's carrying capacity. Seascapes must be suitably sized for multi-level governance yet manageable.

#### Social perspective

Coastal communities depend on a variety of ecosystem services and marine goods within a seascape for their livelihoods, food, and well-being. Coral reefs and mangroves also offer protection against tropical storms and tidal surges.

#### Gender perspective

The seascape approach acknowledges that men and women differ in their needs and responsibilities concerning coastal and marine ecosystems. It emphasizes gender-specific roles and barriers, advocating for inclusive, sustainable decision-making for equitable benefit sharing.

#### Economic e perspective

Strong governance and business planning in a seascape allow for larger-scale financing. This follows a blue entrepreneurship and value chain strategy to sustainably transform livelihoods of coastal communities, especially women.



### WWF uses an integrated, five-pronged strategy in each seascape to help build resilient ecosystems



**1. Co-management** is enshrined in policy and communities' rights to access areas adjacent to the MPA secured



2. Ecosystem resilience is enabled, including having an effective network of marine managed areas in place (effectiveness is supported by evidence) and/or key habitats have been effectively restored



**3.** Effective small-scale **fisheries management** is in place i.e., data informed management decisions results in measurable improvement in resource and stock status



**4. Community-led governance** is strengthened including creation of a constitution, which includes appropriate leadership, decision-making mechanism, an equitable and inclusive benefit-sharing arrangement, regular meetings with good participation and a mechanism to deal with transgressions



**5. Socio-economic well-being** of coastal communities is improved through alternative livelihood and expansion of services (access to finance) and ensuring communities are more resilient to the impacts of climate change (including disaster risk reduction)



### **Executive Summary**

### WWF has implemented cold chain projects across the Southwest Indian Ocean (SWIO) region

Map of SWIO seascape locations



Through this engagement, WWF is looking to enhance how it designs cold chain projects

- WWF currently invests in small scale fishery (SSF) cold chain interventions in 9 of the 15 seascape locations across the SWIO to help build socio-economic resilience in the coastal communities
- There is currently significant interest in scaling cold chain infrastructure and equipment, both from investors and communities
- However, projects implemented by a range of actors across the SWIO region have yielded varied results, including significant stranded assets
- This study aims to provide important insights to inform future programme design on cold chain projects in small scale fisheries across the region



WWF

## The study's objective was to gain and synthesize important insights to inform future program strategy on cold chain projects in fishery



**Project objectives** 

The project aimed to identify success factors for cold chain projects in the Southwest Indian Ocean (SWIO), create a strategic framework, and offer WWF engagement recommendations. This encompassed various factors, including:

- How to build sustainable business models and partnerships for cold chain solutions
- How to best engage with fishing communities
- How to ensure sustainable operations for the project
- How to improve access to finance and scale financing solutions for cold chain projects in fishery communities
- How to ensure environmental sustainability



Technical approach

A 5-step process to deliver on the project's objectives:

- 1. Analyzed existing market research to understand challenges, solutions, and lessons learned
- 2. Conducted additional market research and consultations on innovative initiatives in SWIO
- 3. Interviewed 5 SWIO regional WWF office to understand WWF programs & key learnings
- 4. Summarized key market insights and supported stakeholder workshops in Mombasa and Nairobi
- 5. Consolidated the findings and recommendations into the final report





### Cold chain, like freezers, ice machines or cold rooms, should be implemented throughout the fishing value chain

Taking a systemic approach with commercial and ideally scalable market linkages, and uninterrupted cold chain operations, is critical for success



Linking to the market

Below are pictures of some of the cold chain projects on the Kenyan coast



Freezer in Gazi BMU (WWF project)



Ice machine at SolCoolDry in Kwale



Fish drying facilities at SolCoolDry in Kwale



Privately run ice plant in Malindi



Freezer at privately run fish market in Malindi



Government run ice machine in Malindi

Successful implementation of cold chain projects require a holistic approach to yield long-term sustainable impact to fishery communities

Capital

8 1. Fishing image, Noun Pro,; 2. Refrigerated truck and fish image, Adobe Stock

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## WWF works with different business models, partnerships structures on cold chain projects

Project example	Summary of Project / Report	Funding	Management	Other Partners
Finance Earth Scaling ice machines in Lamu	<ul> <li>Potential 2-year pilot to assess the business case for solar powered ice flake machines to combat PHFL</li> <li>Assesses feasibility of the technology, business model and generates implementation learnings to ultimately develop an investment-ready opportunity to attract private financing</li> </ul>	Grant funded	<b>Publicly run</b> Amu Community Interest Group	Ziegra, Grid X, Greenlink, W. Giertsen
Kigali Cooling Evaluation Project (K-CEP)	<ul> <li>A 3-year pilot providing nine freezers in Kenya and four ice-flake machines in Tanzania to reduce waste</li> <li>Evaluates the sustainability of the project, the impact on food security and livelihoods and how to improve scale</li> </ul>	Grant funded	<b>Publicly run</b> Local BMUs in Gazi, Ngomeni & Songo-Songo	KFS, Kilifi & Malindi counties, Kilwa District Govt
DANIDA Market Development Partnerships (DMDP) Solar for Cooling project	<ul> <li>Project aims to expand the supply chain for off-grid energy &amp; refrigeration solutions, mature the market, build capacity and enhance access to market for small-scale fishers</li> <li>Ongoing 4.5-year started in 2020 project providing freezers to fish dealers in coastal Kenya</li> </ul>	Grant funded	Privately run (freezers leased) X-Solar Vestfræs	KCB Foundation, Women Enterprise Fund, TKEMFSED, Pangea
Pêche Côtière Durable (PCD) project	<ul> <li>Project introduced to provide holistic solution to the fishery-value chain focusing on 9 fisher communities in Madagascar</li> <li>Project included shared service centers which provide two cold storage units with ice machines &amp; six freezers directly to fishers</li> </ul>	Grant funded	Privately run TBD*	Blue Ventures, Mihari
Abalobi	<ul> <li>Social enterprise in South Africa across entire value chain ensuring quality is maintained from fisher to end customer</li> <li>Developed a technology platform where fishers can aggregate catch data which can be viewed directly by end customer, with delivery within 72 hours</li> <li>WWF provides funding to Abalobi and also implements its technology</li> </ul>	Private & grant funded	Privately run	Future of Fish, Stanford, ThisFish, FAO/UNDP
*Private partner in process of chang Abbreviations: PHFL – Post Harvest	in some of our project locations Fish Loss			Oper Capita

## Implementing successful cold chain projects have 7 key elements, and there are 4 strategic pillars for strengthening projects

in projects involve 7 key elements:
Project Design
Operations
Partnerships & Business models
a Technology & Energy Source
Training
Funding
Impact and Sustainability





## We identified 7 critical elements to focus our analysis, with the first two being project design and operations



#### Element 1: Project Design

Project design are the steps that need to be taken in the planning phase of a project before implementation

#### Key Interventions



Perform a tailored needs assessment of the community to ensure the implementation of appropriate solutions



Establish the right players, matching partners' skillsets to the right roles within the project



Ensure upfront engagement and alignment with the local communities and governments



Articulate the economic value proposition to the community to ensure buy-in for the project



Consider the long term viability of the business model to ensure long-term project functioning and avoid stranded assets



#### **Element 2: Operations**

Operations is the running of a project after it has been implemented. It is broken into three segments

Finding the right partners with the right skill-set for the three segments is critical for the success of the operations of the project. Below are a few key interventions to increase likelihood of success



Provide **equipment & training** on the importance & best practices of hygiene and **proper handling & grading**, implement solutions that can run at different periods in the day & night, & provide **adequate** project **security. Diversify uses** of cold chain solutions,



Train & monitor **proper use of technology**, provide **expertise** from the **onset**, ensure local availability of **spare parts**, use solar powered **solutions** & **batteries** at night & run projects in **strategic locations** 



Train on financial reporting & record keeping, adopt innovative payment models, consider other cooling options, integrate more players in the value chains

Dedicating sufficient time upfront to planning an end-to-end project strategy, including key operational policies is imperative for success.



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## Cold chain projects can be structured in various ways, and should consider the situational nuances during project design

#### **Element 3: Partnership Structures**

From our research, we have identified 3 main partnership structures, with each having their own pros, cons, and key considerations\*

	S		e Hie		<b>[\$]</b> (	2	
	1 m	Grant / Publicly funded ➡ Community / Publicly run		Grant / Publicly funded ➡ Privately run		Fully private model	
Overview	•	Tech provided by NGOs / gov'ts / DFIs; Managed by community (often BMU or equivalent) i.e., operations of the machines, revenue collection & maintenance	•	Tech funded by NGOs; Private partners to provide the technology and its maintenance, operations management & revenue collection		<ul> <li>Private entity provides/funds the tech, it's maintenance, operations management &amp; revenue collection</li> </ul>	
Pros	•	Promotes active community involvement Generating job opportunities Reducing dependence on external partners	•	Ability to leverage business expertise leading to improved efficiency Better management and maintenance		<ul> <li>Market forces ensure cost-effective solutions are provided to the community ensuring sustainability</li> <li>Minimal training required</li> </ul>	
Consid.	•	Prone to mis-management/stranded assets Dependent on robust community buy-in Need for financial/technical training requires ongoing NGO / public funds	•	Requires partners to be aligned with WWF's impact goals who understand local dynamics, with the capability to maintain equipment		<ul> <li>Needs substantial upfront patient funding</li> <li>Scarcity of proven business models given low income of the fishers</li> </ul>	
Th	The implementation of projects & ideal partnership structure is dependent on various factors. We explored three different scenarios:						

1. More remote areas (e.g., Mahafaly seascape) with limited grid, clean water, and market access might struggle to crowd-in private financing 2. Smaller, established ports which are growing (e.g., Lamu) that would require upfront patient capital but can display scalability **3. Large, established markets** (e.g., Mombasa) with export opportunities, there are more opportunities for private sector involvement

#### Although WWF should focus on strengthening the private sector, other partnership structures may be necessary given the situational nuances

Abbreviation: Consid. – Consideration, gov't – government, DFIs – Development Finance Institutions, NGOs – Non-Government Organizations; The lists above are not exhaustive, see more detailed explanation within the various sections



### Cold chain projects can take any of the three partnership structures that have diverse considerations for implementation

We have seen 3 main partnership / business models across our research, with each having their own levels of effectiveness.

Partnership Structure		ership Structure Business Ops		Technical Ops Financial Ops		Comm. engagement
13 13 13	Grant/public funded ⇒ Community / Publicly run: Tech provided by NGOs; community (often BMU or equivalent) manage operations of the machines, revenue collection & maintenance	<b>Low*</b> Prone to mismanagement given lack of business experience	<b>Low</b> Lack of technical and operational expertise regarding cooling technologies	<b>Low</b> Prone to mismanagement given lack of financial experience & tracking	<b>Low</b> High level of training required across all operations and difficult to incentivize community to attend	<b>High</b> Generally higher community engagement given BMUs are running operations
	<b>Grant funded</b> ⇒ <b>Privately run:</b> Tech funded by NGOs; private partners to provide the technology and its maintenance, operations management & revenue collection	<b>High</b> Efficient business management given increased business experience	<b>High</b> Technical operations to be provided by partner with expertise	<b>High</b> Efficient financial management and increased tracking to ensure profits	<b>Medium</b> Less training required on technical & financial; training on basic operations still required	Medium Community engagement less than if run by BMU but often more involved given public funding
ං ම සිං සිං සිං	<b>Fully private model:</b> A private party provides the tech, it's maintenance, operations management & revenue collection; varying revenue models w/ company funding to come from different avenues (see slide 35)	<b>High</b> Efficient management given increased business experience	<b>High</b> Technical operations to be provided by partners with expertise	<b>High</b> Efficient financial management and increased tracking to ensure profits	Medium Less training required on technical & financial; training on basic operations still required	<b>Low</b> More difficult to encourage community engagement ; requires large amount of trust building

13 Abbreviation: Comm. - community; Note: definitions and examples of private players in the appendix \* Scores reflect the level of effectiveness of these 5 workstreams in each partnership structure

Highest rating across criteria



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Different value chain stages require varying cold chain solutions Selected based on suitability, benefits, etc.

Technology	Cost		Value chain		Benefits	Considerations
Cooler boxes	\$				<ul><li>Easy to transport (to markets and at sea)</li><li>Easy to operate</li></ul>	<ul> <li>Limited storage</li> <li>Ice melting poses contamination risk</li> <li>Easily broken during transport</li> </ul>
Ice flake machines	\$-\$\$\$*				<ul> <li>Easy to operate</li> <li>Diversified uses</li> <li>Useful for fish of all sizes</li> </ul>	<ul> <li>Small machines have limited/no ice storage &amp; large machines require sig. power/water</li> <li>Technically more complex than freezers</li> </ul>
Freezers	\$\$				<ul> <li>Can be used to also produce ice</li> <li>Excess space can be used to store non-fish products, increasing revenue streams</li> </ul>	• Limited storage capacity for large catches
Refrigerated trucks	\$\$\$				<ul><li>Help access markets at scale</li><li>Can be used as storage units at landing sites</li></ul>	<ul> <li>Poor road infrastructure can cause the insulation and refrigeration in the truck to be damaged</li> </ul>
Cold storage rooms	\$\$\$				<ul> <li>Large storage to store diversified produce</li> <li>Can be combined with other technologies e.g., ice machines</li> </ul>	<ul> <li>Require sig. amounts of energy &amp; space</li> <li>Require technical expertise to maintain</li> <li>Often oversized for fisher's needs</li> </ul>
Functional ice**	\$				<ul> <li>Diversified uses</li> <li>Relatively easy to produce</li> <li>Safe for use across value chain</li> </ul>	<ul> <li>Early stages of testing with varied functionality</li> </ul>
S Low-cost < (USD - 300) S Medium cost (USD - 300 - USD - 2,500) S High-cost (>USD - 2,500) E Fishing ite Transportation Retail/processing						

\*Depending on size and functionality of the ice machine; \*\*Functional ice is where low-cost products (e.g., vinegar, citric acid) are added into water before it is frozen to slow the melting process and help wash bacteria from the fish; Abbreviation: Sig - significant



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## It is critical to separate cooling technologies & energy source, & to identify suitable energy sources for different situations

Тес	chnology	CAPEX	OPEX	Benefits	Considerations
-ọ-	Solar	\$\$\$	\$	<ul> <li>Can operate in remote areas with no grid access</li> <li>Reduces green house gas emissions</li> </ul>	<ul> <li>Reliant on strong sunlight availability hence less optimal during less sunny periods</li> <li>Needs to be tied with batteries if no grid</li> </ul>
贫	Grid	Grid \$		• Not dependent on weather	<ul><li>Unavailable in remote areas</li><li>Exposed to outages</li></ul>
	Diesel	\$	\$\$\$	<ul> <li>Not dependent on weather</li> <li>Relatively easy to access</li> </ul>	<ul> <li>Results in green house gas emissions</li> <li>Highly dependent on global oil prices</li> </ul>
	Batteries	\$\$\$	\$\$	• Complements other sources of energy for cold chain solutions	<ul> <li>Requirement to be properly maintained</li> <li>Must be kept out of the sun in a well-ventilated area</li> </ul>
	Ice batteries*	\$\$	\$	<ul> <li>Reduces requirement for energy 24/7</li> <li>Complements other sources of energy</li> </ul>	<ul> <li>Limited battery capacity so can only be used with freezers (not cold rooms or large ice machines)</li> </ul>
- KEX-	Low-cost \$\$ -	Medium cost \$	55 - High-cost		

\*Ice batteries are batteries that are charged during that day that can act as "ice pack" which are then used as a battery through the night



## Providing the right training via appropriate methods is critical to the success of projects, and to build capacity within communities



#### Element 5: Capacity Building & Training

Training can be provided to the community, with different training types requiring varying parties to provide, and to private sector through Technical Assistance

• These trainings should be provided by:

• Financial: consulting partner or WWF

• Technical: technology provider or end market player

• Legal frameworks, leadership & governance: government

Operational: technology provider, community learning or end customer user

Sustainable fishing practices: technical provider, government or WWF

#### Community capacity building

- While private sector players should be brought in to provide expertise from day 1 to help with overall project efficiency, ensuring a skill gap assessment is completed during project design is critical to determining appropriate training
- Several of the below areas might be handled by outside, private sector support, but training will still be important in the following areas:
  - **Operational**: fish handling, post-harvest fish preservation, hygiene & monitoring
  - Technical: basic operations & troubleshooting of machinery
  - Financial: financial accounting & record keeping
  - **Other**: leadership and governance, sustainable fishing practices and fisheries legal framework

#### Training considerations

- Training can be delivered through e-learning platforms, Trainer of Trainers programs, or on-the-job / practical training
- Training should be monitored to ensure implementation and identify when additional training required
- Technical assistance can be provided to communities or private sector players

Training is imperative for the long-term sustainability of the project and must be delivered effectively



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## Businesses need to prove viable models to attract long-term, sustainable financing. In some cases, public subsidies may be needed



#### **Element 6: Funding**

Majority of projects are currently funded through grants or government funding while private business models need to be proven to attract more equity and debt into the sector

#### Funding

- Cold chain projects are mostly capital intensive with long payback periods and hence require patient capital
  - As a result, most of the cold chain projects are funded through grants
- Innovative financing solutions such as Results Based Financing (RBF), has been used but is not industry standard yet
- We have seen varying business models to ensure solutions are more affordable for local communities including CaaS and PAYGo models
- In some remote areas, **public subsidies** may be required, given lack of profitablity of solutions and contribution to community livelihoods



Patient capital currently required to assist in proving successful business model



### Cold chain solutions can have significant, positive impact on livelihoods, but sustainable fishing practices must be enforced

#### **Environmental impact goals**

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Reduction of PHFL and wastage of produce throughout the value chain since fish is kept fresh in storage & during transportation



Reduction of greenhouse gas emissions and other local pollutants into the environment by using clean energy technologies

#### Livelihood impact goals



Increase in fisher incomes from increased volume of unspoiled fish, increased prices given there is no need to sell at throwaway prices as fish will not spoil, and increased access to larger markets



Creation of employment for wider community, including the upkeep of the technology and bookkeeping of the project



**Diversified revenue streams** available if the fishing community owns the machinery (e.g., selling ice to bars/restaurants)



**Reduced input costs** by using clean energy solutions leading to an increase in income

#### **Negative impact consideration**

**Overfishing** due to **increased fishing hours** which are no longer dictated by dealers at landing sites and an increase in fishers' income (see above), attracting more fishers to fish the area in the longer term

#### Overview of current fishing sustainability interventions

Although fishing sustainability is a key focus area, there is limited data on its impact. It is key for the government to collect accurate data and enforce proper regulations. Below are some interventions currently implemented:



Conduct data captures to enable more informed decisions to be made e.g., WWF KE work with KFS to collect data on sizes and species from fishers in Gazi, to inform sustainable fishing practices



Encourage offshore fishing (beyond 4 nautical miles) in the short term to combat juvenile fishing while collecting accurate data to determine fish stock levels both inshore and offshore



Implement marine closures e.g., in the Blue Ventures project in Madagascar, where Octopus fishers have 2 days every quarter to fish which is aimed towards preserve threatened Octopus species



Implement no take zones in areas that have threatened fish species. WWF TZ, noted that no take zones not only impacted threatened species but also decreased fuel costs for fishers



Provide just enough cold storage capacity to meet the demand from fishers/dealers and limit overfishing



Engage with communities that have implemented or have a plan to implement sustainable fishing practices and understand the benefits (e.g., Kumbatia Seafood)

Only purchase fish that is within specific regulations e.g., KeepITCool only buys fish sizes that comply with the fishing regulations in Kenya



## The research has identified four strategic pillars that are critical for successful and sustainable systemic solutions

The interventions have been structured within four key strategic pillars, to cover the different dimensions required for project success:

Tailored technical support

- Partner with ecosystem players to provide capacity building support to local entrepreneurs and companies on critical strategic and operational key topics
- Partner with ecosystem players to provide investment readiness support and transaction services
- Financial support and increase access to capital
  - Provide or design grants, results-based financing, and patient capital to encourage innovative companies to enter the market and secure holistic cold chain solutions
  - Provide direct financial support to companies to scale their business models and reach viability for commercial financing
- Support networks and strategic partnerships
  - Partner with networks to increase links between WWF's network and other ecosystem player's networks, linking private sector players with other companies as well as financing institutions
  - Be a leader in value chain development support by promoting strategic partnerships and further integration and collaboration

#### Access to basic MSME services and cold chain technology

- Provide support / capacity building for MSMEs and technology companies by using tailored curriculums and accelerators
- Build partnerships with technology providers and develop a WWF wide platform for bundling of demand for technology across the SWIO region to access better terms and technology guides to be used by WWF offices and implementers
- Support the establishment of partnership and networks for maintenance and repair of technology and ensure upfront budget is allocated for on-going technical maintenance

#### Increase access to finance

- Conduct workshops & learning exchanges with banks, MFIs, and Fintechs to help them understand sector opportunities
- Partner with existing guarantee and other de-risking facilities to unlock first loss guarantees for lending
- Partner with funders to set up either direct or intermediated lending vehicle
- Support innovative technology providers, such as PAYGo, to access facilities to refinance their trade receivables





Create access to critical enabling services, including technology and finance

Build a strong, sustainable and

growing private

sector along the fishery value chain

## The research has identified four strategic pillars that are critical for successful and sustainable systemic solutions



Develop community-level capacity and engagement



Improve governance and public support structures Strategic community selection

- Develop sector wide Needs Assessment template to identify suitable communities and select suitable technology
- Require project teams to meet with communities and BMUs, local entrepreneurs and technology providers early in the project and ensure alignment on impact and sustainability goals
- Skills analysis and provision of critical community trainings
  - Develop a skills gap assessment template for identifying critical areas of training for community members
  - Partner with ecosystem players, technology providers & government agencies to develop & run tailored training modules and curriculum for communities based on skills gap assessment
  - Ensure partners conduct random operational checks to ensure learnings from trainings are being implemented **Cultivation of community and private sector relationships**
  - Facilitate meetings between the private solution providers and community to build the relationship & ensure local buy-in
  - Invite potential financiers to meet the community and see the impact of how the cold chain solutions are being used

#### Cultivation of government and private sector relationships

- Have upfront meetings with the local government to establish formal agreements for land use
- Present expected key benefits for the communities and alignment with policy to build rapport with the government
- Promote government initiatives to private players so local entrepreneurs are aware of relevant government incentives Tracking and promoting of key metrics
- Partner with ecosystem players to develop key impact metrics which will help track post harvest lost and revenue of fishers
- Develop an online tracker (e.g., Google Sheets) so personnel who are leading on M&E can input impact metrics live
- Review all impact results and publish the findings in a report on the WWF website to help create awareness
- Promote and incentivize sustainable fishing practices using monitoring frameworks
- Promote sustainable fishing practices and enhance awareness of the economic impact of unsustainable fishing
- Partner with the government to provide support and funds for data collection and stock checks
- Partner with ecosystem players to develop and implement M&E frameworks to track sustainability and provide incentives

interventions will require (i) a comprehensive, systemic approach to address key bottlenecks from fishing to market, ensuring scalable market linkages, and (ii) customization to local circumstances and requirements



#### **Executive summary: Recommendations**

## While several project models can be successful, a BMU-led model that is managed privately with profit sharing makes sense in several landscapes

#### Funding

- Initial funding from public/NGO grants because it will most likely take time to have a proven viable and sustainable business model so upfront subsidy is extremely helpful (see slide 36)
- Long-term commercial funding (e.g. equity and debt) after the model has proven Rol

**Innovation center with aggregation of services** to create sufficient demand for ice and a more sustainable business model. Center could include:

- Capacity building on a range of topics
- Data centre (centralised data capture & storage)
- Aggregated end market
- Aligned businesses driers, seaweed etc



**BMU** 

#### Management

BMU

- Consistent, privately owned ice delivery and ice collection
- Project privately managed by a player who is motivated to generate profit
- Creation of a community profit-sharing model where BMU, manager and government\* receives % of profits (e.g. Ice plant in Malindi)

**Privately managed centralised ice and aggregation of product** which overcomes transaction costs and security of supply to the market, helping facilitate off take agreements

> JCMA SSF management committee at JCMA level which create off take agreements, ice provisions, profit sharing structure,

> > etc.



\*In the case that it is publicly funded by the government, not relevant when funded by NGO / DFI
 Abbreviation: JCMA – Joint Community Management Area; comm. – Community; SSF – small scale fishery; RoI – Return on Investment

BMU

## Example WWF projects on Cold Chain in coastal communities

### WWF

## *The Kigali Project 3-year pilot providing cold storage facilities* in coastal communities in Tanzania and Kenya

#### Project overview and objectives

The Kigali Cooling Evaluation Project (K-CEP) was a 3-year pilot providing cold storage facilities at marine fisheries to reduce waste

- Ran from January 2019 to April 2021, and installed nine freezers in Kenya (Gazi & Ngomeni) and four ice flake machines in Tanzania (Songo-Songo)
- The evaluation report aims to evaluate the sustainability of the project and the impact on food security and livelihoods, while documenting lessons learned to help with future projects and improve ability scale

#### Participating stage(s) of the value chain



#### Key intervention areas

- Installed nine freezers in Gazi & Ngomeni
- Installed four ice flake making machines (350Kg daily capacity) in Songo-songo

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**Grant funded / publicly run:** Cold storage solutions are run and owned by the BMUs

#### Partners

- Finance & PMU: WWF-UK
- Technical: WWF-Denmark, CAT
- Local: Kenya Fisheries Service (KFS),
- Kilifi and Malindi counties, Kilwa
- District Government, BMUs

#### Key impact

- Increased fish prices and fisher income
- Greater consistency of fish prices provides stabilized income
- Reduced PHFL from 30% to almost zero
- Increased bargaining power for fishers given more traders at the landing site
- Two jobs created to operate ice machines

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#### Key insights

Inadequate water storage **limits ice production** 



**Proximity of ice flake machine to the landing site** reduces time and costs related to acquiring ice



**Limited machine operating hours** (8:00am – 5:00pm) limit fishers who land their catch in early mornings or late evenings



Preventing theft and damage of machines through **security**, such as fencing and guards, **increases operational lifespan** 



**Accountable record keeping through simple systems** enhance financial transparency



Support and proactive participation from local/county governments increases sustainability

**Quality training** in accounting and fish handling to be prioritized, with virtual training proving ineffective



### *Finance Earth:* Study to assess the business case and impact of solar powered ice flakes machines in Lamu, Kenya

#### **Report overview and objectives**

The Finance Earth report discusses a potential 2-year pilot to assess the business case for solar powered ice flakes machines to combat Post Harvest Fish Losses

• Published in May 2022 to assess environmental & social impacts and the business case of potential installation of three ice flake machines in Lamu, Kenya

**Business Model** 

machines are publicly owned with the

self-sustainable. Ongoing grants are

Partners

Technical: Ziegra, Grid X, Greenlink, W.

Local: Amu Community Interest Group

Finance & PMU: Finance Earth. WWF

Grant funded / publicly run: ice

aim to become financially

provided to fund training

Kenva

Giertsen

• The report aims to assess the feasibility of the technology, assess the business model, and generate implementation learnings to further refine the model with the ultimate aim of developing an investment-ready opportunity to attract private financing for further scaling

#### Participating stage(s) of the value chain



#### Key intervention areas

· Assessed the business case for planned installation of three solar powered ice flake machines for the fishing community to buy ice for at sea and at the landing site

#### Key impact

- Increase volume of sellable catch to increase fishers' income
- Reduce waste
- Improve food security
- Reduce pressure on fish stocks
- Reduce reliance on traditional fossil fuel power sources

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IRR is around 6%, based on some realistic assumptions. This will require patient capital to finance it







#### Key insights

Thorough training on basic operation of ice flake machines and post harvest preservation multiplies the impact



BMU training in **financial management**, record keeping & surveillance improves the project success and sustainability



Long term access to land through government and community partnerships reduces potential disruptions





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Correct sizing of ice machines is imperative to meet local demand while optimizing CAPEX and operating costs

**Diversified use cases to account for seasonality**; during low fishing season, sales to transporters or tourism sector **E** 



## *DMDP Solar for Cooling project:* Delivering access to freezers in Kenya's coast to increase sector development and income growth

#### Report overview and objectives

DANIDA Market Development Partnerships (DMDP)'s Solar for Cooling project aims to expand the supply chain for off-grid energy & refrigeration solutions, mature the market demand, build capacity of small-scale fishers and enhance their access to markets to unleash the economic potential of small-scale fishing

- Initiated in July 2020, expected to be 4.5 years and provides access to freezers to fish dealers in coastal counties in Kenya
- The project partners with commercial partners looking to close the gap between off-grid energy & refrigeration solutions and to minimize postharvest loss

#### Participating stage(s) of the value chain



#### Key intervention areas

- Provide fish dealers with access to freezers
- Training provided for BMUs through mentorship by Trainer of Trainers ("TOT")
- Facilitate linkages to finance for BMUs
- Provide linkages to the market for BMUs

#### Key impact

- Trained 37 fishery officers from county government to then mentor 29 BMUs
- Created three linkages to larger fish markets
- Created four linkages to potential financing parties
- Developed six community fisheries enterprise business plans

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#### Business Model

**Grant funded / privately run:** privately leased freezers with support on linkages to financing and markets and training. Commercial player was willing to rent freezers only to BMUs

#### Partners

**Finance & PMU:** DMDP, WWF-KE **Finance:** KCB Foundation, Women Enterprise Fund, KEMFSED, Pangea **Commercial/Technical:** X-Solar,

Vestfrost, Total Hospital Solutions

#### Key insights

- A structured, iterative process of decision-making and project
   adaption increases effectiveness and flexibility.
- **Providing freezers to fish dealers** is more effective than to the fishers, as they have higher business acumen



Engaging **community members with technical partners early** is essential to gain buy-in on the proposed project



**Training on the job is more effective** as fishers generally cannot take a whole week out of work



**Creative funding solutions** can be effective e.g., using a rental model to reduce upfront costs

**E** 

**Community members promoting financial model** to the local community is advantageous given higher levels of trust

Having **several commercial partners** is important to enhance flexibility and reduce execution delays





## PCD project: Managing Shared Service Centers to unlock potential of fishing sector and combat unsustainable fishing practices

#### Project overview and objectives

The Pêche Côtière Durable (PCD) project was introduced to provide a holistic solution to the fishery-value chain, focusing on 9 fisher communities in Madagascar • Initiated in Feb 2019 & funded by KfW with various programs across Madagascar and two projects in the Southwest Indian Ocean region

• It includes (1) a private partner operating & managing shared service centers which provide cold storage units with ice machines & (2) providing freezers directly to fishers. It aims to tackle unsustainable fishing & bolster untapped potential in the fishery sector

#### Participating stage(s) of the value chain



#### Key intervention areas

- Operate & manage a **Shared Service Centre** with **two cold storage** units (with ice machines) & **five desalination units**
- Provided six freezers to artisanal fishers

#### Key impact

- Ability to remove middleman to help increase prices for the fishers
- Increased fisher income through higher sales volumes, higher prices and better market access
- Upskilling of local fishers and technical team

**Business Model** 

**Grant funded / privately run:** Private partner to provide and operate the Shared Service Centres. Initially wanted to be community led but profitability is too low

#### Partners

**Finance & PMU:** WWF-Morondava & Private sector partner (TBD) **Finance:** KfW, Blue Ventures, Mihari

#### Key insights

- **Local availability of spare parts is critical** to minimize importation costs, time and disruption
  - **Multiple sources of energy** provides efficient alternatives regardless of changes in weather conditions



(30)

- Ensure **community land does not have any land related disputes** as WWF does not have the mandate to buy land
- **Trained technical assistance on the ground from the onset** ensures effectiveness from day 1



- **Consistent training** to be provided to local communities throughout the programme helps with sustainable impact
- Third parties to finance the operating of machinery if **potential income generation for local community is insufficient**



To achieve the sustainable long-term goal of empowering the communities, **funders need to be patient** 



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### WWF Madagascar has implemented one cold chain project run by cooperatives & will implement a private led project in Nov 2023

Background of Previous / Ongoing Projects	Key Contacts
<ul> <li>WWF Madagascar have completed one project and are preparing to launch anothe</li> <li>1. They provided 6 solar powered refrigerators with cold room storage in Mahafaly</li> <li>2015. They worked in conjunction with cooperatives who run the management of</li> <li>through the Blue Action Fund</li> <li>2. They completed a feasibility study for a private led project they intend to launch</li> <li>looking to put in service center with cold storage to help communities and facility</li> </ul>	<ul> <li>r project in November 2023:</li> <li>v seascape in the South-West region in of the cold solutions and was funded</li> <li>in Nov to be funded by KfW and is rate access to markets</li> <li>Lalaina Rakotonaivo:</li> <li>Irakotonaivo@wwf.mg</li> <li>Santatra Razafindratsimba@wwf.mg</li> <li>Danny Ravelojaona:</li> <li>dravelojaona@wwf.mg</li> </ul>
Challenges         Inadequate ice production for fishers: One cold storage facility with limited refrigerators does not meet the communities' ice demands for approx. 1,000 fishers         Image and maintain the cold chain solutions as they are located in remote areas	Successes Collaboration with the local community: WWF succeeded in securing local community buy in for the cold chain solutions
<b>Limited partnership options:</b> The team did not agree a maintenance package with the provider upfront and there are limited partners with the technical expertise required	projects. For example, they have seen increased buy-in in service centers that allow community members to charge their phones



**Lack of commercial viability of the projects:** Lack of project design & upfront maintenance agreements has led to projects that have not met desired impact and resulted in redundant solutions

#### Key Takeaways

- The initial investment cost is too high compared to product selling price hence sometimes making the projects economically unsustainable and unviable
- It is important to organize and facilitate capacity building every year to ensure the community members are trained on critical components on cold chain
- The projects should be able to reinvest revenue earned back into the growth of the fishery cold chain sector
- It is critical to make projects commercially viable so that they are not fully reliant on grant financing in the long term and involve private sector in management



### WWF-Mozambique has engaged in two activities and drawn key lessons on training, community buy in & private sector model

Background of Previous / Ongoing Projects	Key Contacts
<ul> <li>WWF Mozambique has one finished and one ongoing cold chain intervention activities:</li> <li>Purchased and implemented an ice machine through a cooperative fishing association, Conselho Comunitário de Pescas (CCP), who run the machine &amp; sold the ice to fishers and the wider community. Program ended in Dec-20</li> <li>Purchased an ice machine in the Inhambane Seascape and the community is in the process of constructing the infrastructure to house it. They are working with the CCP to create a business model and have already provided training on maintenance of the equipment and establishment of governance mechanisms</li> </ul>	<ul> <li>Rodrigo Fernandez: rfernandez@wwf.org.mz</li> <li>Eduardo Videira: evideira@wwf.org.mz</li> <li>Carlos Verao: cverao@wwf.org.mz</li> </ul>

#### Challenges



**Lack of governance structure & business model creation:** In the first activity, they failed to create the long-term management & business model to ensure long term project sustainability



**Limited foresight and short warranty periods:** Lack of foresight into ability to pay for repairs and only a 1-year warranty period has meant that the batteries in the first activity are not performing well



Lack of tracking for impact & lessons learned: Lack of tracking impact and key learnings has led to estimations of the project benefits & limited ability to apply lessons learned to future projects

#### Key Takeaways

- Project success is highly dependent on community level involvement and buy in
- Projects should consider assisting CCPs in creating governance and business plans to develop long-term strategies for future projects
- Expect projects to have higher success if working with the private sector, as the better management would improve longevity & sustainability of the project









**Conducted training:** They have trained members of the CCP on legislation, business model & management, governance mechanisms, financial operations and infrastructure management



**CCP closures to limit overfishing:** Implementation of temporary & permanent closures to reduce adverse impact to marine life has been possible through community buy-in



Adopted innovative pricing model: The CCP developed a sustainable pricing model that gave preferential pricing to those in the CCP to increase affordability of ice for fishers

### Other cold chain projects in the South West Indian Ocean

### Abalobi: Addressing challenges throughout the small-scale fish value chain without large CAPEX investments in infrastructure

#### **Project overview and objectives**

Abalobi assist fishing communities in South Africa across the entire value chain to ensure quality of the catch is maintained from the fisher to end customer

- Company started as a database platform and moved into cold storage in 2018. Now they have a technology platform where fishers can aggregate their catch data which can be viewed and ordered directly by the end customer. Abalobi facilitates delivery to the end customer within 72 hours
- The social enterprise has multisource funding from impact investors, philanthropy, DFI and blended finance

#### Participating stage(s) of the value chain



#### Key intervention areas

- App **connecting** fishers to end markets
- Avails re-usable cooler boxes to fishers
- Provides cold storage + ice machines at landing sites
- Offers cold transport for fish to market
- Provides coaching e-learning program

#### Key impact

- Direct access for fishers to the end consumer markets
- Increase in income for fishers and fisher community
- More consistent demand and pricing, enabling sustainability of increased income
- Improved quality of fish from small-scale fishers
- Traceable catch & supply chain for end customers

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#### **Business Model**

Fully private model: Abalobi provide cold storage units for a fee and provide a platform for fishers to sell their fish

#### Partners

- Abalobi is a social enterprise
- working with several partners,
- including WWF-SA and various
- financing parties

#### Key insights

Funders must be patient on returns on investment as community projects take time to turn profitable



Articulating the value proposition of increased income and consistency builds fisher confidence and engagement



Creating an uninterrupted cold chain with market linkages is important to make the project sustainable



Community buy-in and accountability improves chances of success



Communities working collectively to provide larger volumes of high quality catch increases the capacity to scale



Intensive monitoring, including cameras and ground people, ensures quality of product

Appropriate hygiene and cleaning facilities increase sustainability and quality of product



### IFAD/SunDanzer report: Lessons learned from research conducted after the deployment of 50 solar freezers in three countries

#### **Report overview and objectives**

The 2021 International Fund for Agricultural Development (IFAD)/SunDanzer report summarizes the lessons learned in the pilot of small scale, solar powered, PAYG fridges and freezers in the Artisanal Fisheries sector in 2022 in Rwanda, Tanzania and Mozambique, which was funded through a GreenTech grant.<sup>1</sup>

- The pilot was used to collect feedback and conduct research on suitable technologies, implementation and business models, including direct sales, CaaS, PAYG
- The aim of the pilot project is to specify and commercialize a solar cooling product to increase income and improve living standards

#### Participating stage(s) of the value chain



#### Key intervention areas

 Provide PAYG solar-powered fridges and freezers to artisanal fishers and cooperatives in Rwanda, Tanzania and Mozambique

#### Key impact

- Increase savings of \$300 in first four months of having access to a fridge from increased income in relation to smaller PAYG payments
- Greater consistency in supply, enabling better management of sales
- Reduction in post harvest losses
- 1. SunDanzer, Lessons Learned: Preparing for Solar Refrigeration Pilots in the Artisanal Fisheries Sectors of Rwanda, Tanzania and Mozambique, 2021, Link; 2 Formerly known as First Change Materials these are ice packs that are cooled in the day and act as a battery when there is no access to power

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Grant funded / mix of privately and publicly run: In Rwanda, a public business model is embraced where the fridges are owned and managed through cooperatives

#### Partners

- **PMU:** SunDanzer
- **Financial:** IFAD (GreenTech Grant)
- Technical: Zimpertec, Clean Energy
- Technologies (Rwanda), Simusolar
- (TZ) and SolarWorks (Mozambigue)

#### Key insights<sup>1</sup>

Fishers require subsidized prices given affordability and financing **R**SA concerns Feedback on business models showed that cooling-as-a-service (CaaS) is interesting to fishers given the low upfront cost Fish dealers have higher incomes and business acumen than **E** fishers so are a more favorable target for these solutions Access to cooling solutions increases fishers' sales options and **S** therefore increases their pricing power & increases prices



Fridges/freezers with "ice batteries"<sup>2</sup> have lower upfront and maintenance cost than those with electric batteries.



Supplying to fisher cooperatives can increase bargaining power for the fishers when selling to fish traders



Preference for freezers over fridges, by both fishers and fish dealers given that freezers can also be used to make ice

Value chain focus lcon









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### *KeepITCool:* assessing the impact that cold chain technology can have on fish retailers and fishers in Kenya

#### Report overview and objectives

KeepITCool ("KIC") is a company set up in 2020 under the Raino Tech4Impact social enterprise which aims to address post-harvest fish losses in Kenya

• KIC has been testing a blended CaaS model with fishers to lower the cold chain access barriers for small-scale fishers. KIC have partnered with a small-scale fishers association along L. Victoria to provide an integrated cold chain solution, develop an online trading platform and deliver products. The reports provides insights on how access to off-grid cooling can increase financial outcomes and how to address cold storage needs of first mile consumers<sup>1</sup>

#### Participating stage(s) of the value chain



#### Key intervention areas

 Aggregates online fish orders, collects orders using company-operated cold trucks & pays for fish at the landing site, transporting them to the end market

#### Key impact

- 39%<sup>2</sup> have reduced wastage upon accessing cold truck facilities
- 31%<sup>2</sup> increase in income after enlisting sale of fish to KIC
- Higher price of sale per fish for fishers by KES 10

**Business Model** 

**Fully private model:** KIC provides solutions to fishers in its ecosystem. Fishers sell their fish to KIC who sell them onto the end market. They also provide solutions to the retail market

#### Partners

PMU & Technical: Raino (KIC)Finance: Shell Foundation, UK AID,FCDOLocal: Mbita Bay Landing Site (Lake Victoria)

#### Key insights<sup>1</sup>

Strong demand for transportation services given the increase in
 transparency and availability of fish supply

- Preservation of fish throughout the cold chain retains catch
   quality, leading to higher available prices in the end market
- Offering cash or MPESA payment at site and guaranteed off-take is an attractive proposition to the fishers



Use of ice in **fabricated cooler boxes** without sufficient insulation is **ineffective** & **inefficient** 



Solar-powered cool boxes can be used by **players in different stages of the value chain** 



Cold **transportation of fish** to domestic markets is crucial for linking the fishers' quality catch to a proper end market buyer

1. KeepITCool, Potential impact of cooling technologies on the fish value chain, 2022, Link; 2. Respondents to a survey that received 74 valid responses, including 30 fishers and 65 traders, with 21 respondents engaged in both





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### GIZ ProKlima: Study to analyze several cold chain projects & identify the challenges and potential solutions throughout the cold chain

#### **Report overview and objectives**

The GIZ Proklima report on cold chains discusses existing and potential cold chains for food products across SSA and India. In addition, GIZ has also worked closely with the Green Cooling Initiative (GCI) that has built a fish cold store on the shores of Lake Victoria<sup>1</sup>

• The report provides an overview of the existing challenges and potential solutions for better cold chain coverage, improved cold chain management & reduced food losses in developing countries

#### Participating stage(s) of the value chain



#### Key intervention areas

- GCI: Built solar-powered cold storage **system** by Lake Victoria with 2 cooling units and an ice machine
- Peracod: Provides ice-production for fish cooling in Senegal

#### Key impact

- GCI: Significantly reduced PHFL given five tons of fish can be stored and kept fresh for two to three days
- Peracod: created three jobs earning up to \$5 daily
- 1. GIZ, Promoting Food Security and Safety via Cold Chains, 2016, Link 33

#### Value chain focus Icon



#### **Business Model**

GCI: Grant funded / privately run GIZ funded the facility, run by private player Peracod: Grant funded / publicly run where ownership of the ice machine is with the cooperatives

#### Partners

PMU: GIZ. GCI. Peracod Finance: German Federal Ministry for the Environment, Nature Conservation & Nuclear Safety, International Climate Initiative

#### Key insights<sup>1</sup>

- Holistic approach across the value chain ensures end to end success and long-term impact of cold chain solutions
- Ice production is highly effective for fish, although melting £0) poses contamination risks



- To efficiently operate ice machines, a pre-cooler to manage water input temperature is required in hot climates
- Diversified uses for excess water and energy results in (30) additional income



Training on management of the cold storage and handling of the fish improves sustainability



Monitoring is necessary to ensure effective use of the cold storage unit



Facilities for grading and sorting fish ensures high-grade produce can be identified and sold for a premium



### InspiraFarms report: Study to assess effectiveness of distributed cold storage in improving farmer incomes through CaaS model

#### **Report overview and objectives**

The InspiraFarms 2022 report discusses insights from their study in developing cold storage solutions for the first-mile in agricultural value chains

- The report aims at identifying the effectiveness of small-scale, distributed cold-storage solutions for agribusinesses and smallholder farmers
- The key recommendations have been validated by InspiraFarms' experience in the sector, with the adoption expected to reduce PHL and costs, increase income and provide greater access to export markets<sup>1</sup>

#### Participating stage(s) of the value chain



#### Key intervention areas

• Provide access to mobile cold storage **solutions** to small scale farmers through cooling-as-a-service ("CaaS") model

#### Key impact

- Increased shelf life of fresh produce, leading to lower PHFL
- Increased volume and value of products
- Reduced logistical costs, boosting profitability margins
- Enables tapping into higher price point export markets
- 1. InspiraFarms, Facilitating inclusive agricultural sourcing practices through access to distributed cold storage, 2022, Link 34



lcon

Value chain focus



#### **Business Model**

Fully private model: provides mobile cold storage solutions to farmers through cooling-as-a-service business model

#### Partners

- **PMU:** InspiraFarm, Triple Line Finance: Shell Foundation. FCDO Data: AgroDer **Other:** Watt Solutions
- Multi-stakeholder partnerships should be created focusing on local actors' needs



Use of **innovative financial instruments** (e.g., first loss cash reserve for financiers) can increase private sector engagement



Partnerships with local players for distribution improves effectiveness and increase of larger community income



See slide 22 for key insights icon key

#### Key insights<sup>1</sup>

Familiarity with local dynamics and investing in local engagements increases impact and sustainability



Limited access to land and finance for cold storage infrastructure can hinder community and stakeholder buy-in



- CaaS model increases financing feasibility given flexibility of payment structures
- Commercial viability of the CaaS model is dependent on utilization, with breakeven at approx. 70%



## *The Energy4Access report:* Study to assess various Cold Chain Infrastructure solutions across different value chains in Kenya

#### Report overview and objectives

The Energy4Access report published in March 2023, uses secondary research, stakeholder consultations and modelling to assess Cold Chain Infrastructure (CCI) for various value chains, and assesses the gap current in CCI, highlighting the market opportunity by 2030

• The report aimed to identify current trends, barriers/technical challenges, and opportunities for market transformation in CCI, as well as strategies to accelerate the adoption of cold chain technologies at scale.<sup>1</sup> It also highlights that fresh-water fish production is higher than marine fish production by approximately 5x

#### Participating stage(s) of the value chain



#### Key intervention areas (case studies)

- Fresh Box: solar-powered walk-in cold storage rooms for fruit & veg
- **Baridi:** solar-powered walk-in cold storage rooms for meat

#### Key expected impact

- Innovative payment models such as rental, PAYGO and CaaS reduce the financial burden for the price sensitive first mile producer segment
- Higher quality product leads to higher prices
- Use of CCI technologies at the farm level is expected to increase farmers' net income by 30% as post-harvest losses are reduced<sup>1</sup>
- 35 1. Efficiency For Access Coalition, Assessment of the Cold Chain Market in Kenya, 2023, <u>Link</u>



#### **Business Model**

**Grant funded / publicly run:** The report highlight public models where donors provide the CCI solutions which are then transferred to farmer cooperatives

#### Partners

**PMU:** Efficiency for Access **Finance (of the report):** IKEA Foundation, FCDO **Technical:** PManifold, Intellecap, Clasp, FreshBox. Tree\_Sea.mals

#### Key insights<sup>1</sup>

Facilities, such as **results-based financing,** can lower initial payment requirements while providing economic incentives



Training on technical, health & safety, bookkeeping & financial recording increases project sustainability



**Effectively and proactively communicating** benefits of CCI solutions to rural farmers increases buy-in

- Ensuring high quality product enhances end customers'
   perception of the market and lead to higher prices
- - **Poor road infrastructure negatively impacts** refrigerated trucks resulting in leakage of high GWP refrigerants
- A system wide approach of combining technology, education, financing & policy is required to grow CCI in Kenya



**Climate implications should be considered** in the choice of technology, power and refrigerants used



## Recommendations

### Our recommendations leverage a market systems approach based on lessons learned from current/existing projects & stakeholders

The objective of the recommendation section is to highlight the key implementation areas for scalable cold chain projects within fisheries and how actors can support it

We've formed recommendations across the value chain. We have categorized them by:

- Critical strategic considerations: we have outlined the main points that should be considered to implement the most critical and impactful solutions for fishing communities. Details include:
  - Full value chain solution: Creating cold chain throughout the value chain is key to ensuring the long-term sustainability of any project. Creating links from the fishing communities to the end market will also increase the price, volume and hence income in the long-term
  - Situational analysis: It is critical to perform an upfront situational analysis to determine the key gaps at each level of the value chain and consider the different challenges faced by each local community
  - **Partnership structures**: We have presented the three high level partnership structures possible when setting up a project and considered the feasibility and sustainability of each structure. Within all three of these partnership structures, finding suitable partners is crucial for project success
- Critical success factors : We've identified four strategic pillars that are critical to the success of any project a



### It is imperative to provide relevant solutions across the entire value chain and link fishers to reliable, end buyers

Creating an uninterrupted cold chain from fishers at sea to the end market is important to reduce PHFL and retain the quality of the produce leading to increased volumes, hence raising fishers' income. It will be critical for WWF to develop solutions that are truly sustainable for the wider value chain.







### In addition to thinking across the value chain, geographical & situational nuances require suitable tailored interventions

Recommendations for the implementation of cold chain projects are dependent on geography and other specific situations in the local communities. Although there are many different scenarios, we have presented three scenarios to demonstrate how the interventions would differ

Identified scenarios	Key gaps	Tailored Intervention Opportunities
<b>Large, established commercial ports</b> (E.g., Mombasa) – established markets with export opportunities	<ul> <li>Suitable cold chain tech e.g., cold rooms, large freezers and refrigerated trucks</li> <li>Sustainable fishing practices</li> </ul>	<ul> <li>Private sector to provide tech with less need for NGO interventions</li> <li>Educate communities on sustainable fishing practices and encourage adherence through regulatory enforcement and conservation agreements (</li> </ul>
<b>Smaller, established ports which are growing</b> (e.g., Lamu) – formal BMU (or equivalent) structures with a lack of access to larger markets	<ul> <li>Suitable cold chain tech e.g., ice machines, cooler boxes and freezers</li> <li>Market linkages to be able to access larger domestic and export markets</li> <li>Experience in business and financial planning</li> </ul>	<ul> <li>Conduct needs assessment to identify suitable solutions and capacity requirements specific communities</li> <li>Create market linkages by linking fishers with end markets or through private sector engagement (e.g., KeepITCool)</li> <li>Provide training in financial management</li> </ul>
More remote areas (e.g., Mahafaly seascape in SW Madagascar) – in very remote and hard-to-reach areas with limited grid access, expensive input costs such as water and longer distances to established markets	<ul> <li>Suitable cold chain tech e.g., ice machines, cooler boxes and freezers</li> <li>Lower access / reliability of the grid</li> <li>High prices for water / ice make buying ice for fishers or running ice machines expensive</li> <li>Hard-to-reach areas for maintenance technicians to access</li> <li>Further from established markets</li> </ul>	<ul> <li>Conduct needs assessment to identify suitable solutions</li> <li>Provide renewable energy source</li> <li>Partner with private actors to run the ice machines or encourage end market players to supply inputs</li> <li>Engage with local tech providers that can reach the area</li> <li>Create market linkages by linking fishers with end markets or through private sector engagement (e.g., KeepITCool) and provide tech to enable transport (e.g., ice and cooler boxes)</li> </ul>



## Once you understand the situational nuances of a community, the appropriate partnership structure can be determined

Partnership Structure			Comments	Critical Success Factors	
Grant/public funded → Community / Publicly run Examples: Finance Earth, KCEP <sup>1</sup> ,	Feasibility	High	<ul> <li>Grant funding relatively feasible</li> <li>Reduced reliance on long-term external partners</li> </ul>	<ul> <li>For all partnership structures:</li> <li>Communities should:</li> <li>Demonstrate demand for solutions</li> <li>Are willing to engage in the project requirements</li> </ul>	
PCD <sup>2</sup> , Peracod <u>Potential scenario*</u> : Remote areas, which might struggle to crowd-in private financing		Low	<ul> <li>Insufficient financial management expertise within communities</li> <li>Lack of ongoing funding for maintenance</li> </ul>	<ul> <li>(e.g., reporting &amp; training) &amp; open to testing out different business models with WWF</li> <li>Are aligned with the funder on impact &amp; sustainability goals</li> </ul>	
Grant funded Trivately run Examples: DMDP <sup>3</sup> project, Green Cooling Initiative	Feasibility	Medium	<ul> <li>Grant funding relatively feasible</li> <li>Requirement to find suitable private partner</li> </ul>	<ul> <li>For community / publicly run partnership structures:</li> <li>Communities should produce a detailed &amp; sustainable business plan prior to engagement</li> <li>There should be incentives for the individual(s) operating the solution</li> <li>Ensure accountability and transparency of the individual operating the solution through reporting requirements</li> </ul>	
Potential scenario: Smaller, established ports that require upfront patient capital but can display scalability	Sustainability	High	<ul> <li>High business acumen and desire for profit provide incentive</li> <li>Ongoing maintenance managed by private party</li> </ul>		
<b>Fully private model</b> <u>Examples</u> : Abalobi, KeepITCool,	Feasibility	Low	• Lack proven business models hinders start-ups' access private funding	<ul> <li>For privately run partnership structures:</li> <li>Engage with a private partner that:</li> <li>Have aligned goals for impact &amp; sustainability</li> <li>Understands local dynamics and needs</li> </ul>	
Potential scenario: Large, established ports with clearer path to scale & profitability	Sustainability	High	<ul> <li>High business acumen and desire for profit provide incentive</li> <li>Ongoing maintenance managed by private party</li> </ul>	<ul> <li>Have capacity and capability to maintain the tech and access spare parts</li> <li>Are able and willing to run a business</li> </ul>	

40 1. Kigali Cooling Efficiency Programme; 2. Pêche Côtière Durable; 3. DANIDA Market Development Partnerships

\* The potential scenarios for each partnership structure is just a guide and under the right circumstances each partnership structure could thrive in each of the 3 identified scenarios



### Successful cold chain fishery projects should focus on for four key strategic intervention pillars







Projects analyzed

Consultations

Site visits

Glossary



### Other reports and projects have analysed cold chain projects in SWIO

Case Study	Summary of Project / Report	Funding	Management	Other Partners
International Fund for Agricultural Development (IFAD) / SunDanzer report	<ul> <li>Report summarizes learnings from a pilot of solar powered, PAYGo fridges &amp; freezers in the Artisanal Fisheries sector in 2022 in Rwanda, Tanzania and Mozambique</li> <li>Assesses suitable technologies, implementation and business models, with an aim to increase income and improve living standards</li> </ul>	Grant funded	Privately and Publicly run BMUs	Zimpertec, Clean Energy Tech., Simusolar, SolarWorks
KeepITCool (KIC) report	<ul> <li>KIC is a company aiming to address PHFL in Lake Victoria with a blended CaaS model to lower the barriers for small-scale fishers</li> <li>Report provides insights on addressing cold storage needs for first mile customers</li> </ul>	Private & grant funded	Privately run Keep IT Cool RAINO TECH4IMPACT	Mbita Bay Landing Site
GIZ report	<ul> <li>Report discusses cold chains for food products across SSA and India</li> <li>Discusses GIC project (solar powered cold storage in Lake Victoria) and Peracod project (ice production for fish cooling in Senegal)</li> <li>Provides an overview of the existing challenges &amp; potential solutions for better coverage, improved management &amp; reduced food losses</li> </ul>	Grant funded	<u>GIC:</u> Privately run <u>Peracod:</u> Publicly run	
InspiraFarms report	<ul> <li>InspiraFarm is a company that designs, develops, installs, services and finances cold chain technology for farmers</li> <li>Report discusses insights from their study in developing cold storage solutions for the first-mile in agricultural value chains</li> </ul>	Private funded SunFunder	Privately run	Triple Line, AgroDer, Watt Solutions
The Energy4Access report	<ul> <li>Report assesses cold chain infrastructure (CCI) for various value chains, &amp; the gap highlighting the market opportunity by 2030</li> <li>Aims to identify current trends, technical challenges, &amp; opportunities for market transformation in CCI, strategies to accelerate the adoption of cold chain technologies at scale</li> </ul>	Grant funded	<b>Publicly run</b> Report highlights public models in the farming industry	Intellecap, Clasp, FreshBox. Tree_Sea.mals



### OCA analyzed 5 WWF projects and 5 external projects, through reading reports and consultations (7 WWF & 16 external)

#### Projects

#### WWF projects:

- The Finance Earth report:
  - WWF SWIO Ocean Incubator for Coastal Communities
- Kigali Cooling Efficiency Project (KCEP)
- DANIDA Market Development Partnerships (DMDP) Solar for Cooling project
- Pêche Côtière Durable (PCD) project
- Abalobi (WWF partner)

#### External projects:

- International Fund for Agriculture Development (IFAD) & SunDanzer report:
  - Lessons Learned: Preparing for Solar Refrigeration Pilots in the Artisanal Fisheries Sectors of Rwanda, Tanzania and Mozambique
- KeepITCool reports:
  - Insights on the cold chain needs of fisherman and traders in Homa Bay County in Kenya
  - Potential impact of cooling technologies on the fish value chain
- GIZ Proklima report:
  - Promoting Food Security
  - Safety via Cold Chains & Environmentally friendly cold storage for fish
     an example from Kenya
- InspiraFarms report:
  - Facilitating inclusive agricultural sourcing practices through access to distributed cold storage
- Energy4Access report:
  - Assessment of the Cold Chain Market in Kenya

#### Consultations

#### WWF Consultations:

- DMDP project (including DMDP and WWF Kenya representatives)
- WWF Madagascar (x2)
- WWF South Africa
- WWF Kenya
- WWF Tanzania:
- WWF Mozambique

#### External consultations:

- International Organizations (NGOs)
  - Rabobank (Cool Move)
  - GFCCC (Cool Move)
  - GIZ
  - SADC
  - TechnoServe
  - WRI (Cool Move)
- Technology Providers / Private Partners :
  - Abalobi
  - ENDep
  - Functional Ice
  - Kumbatia Seafoods
  - Raino (KeepITCool)
  - Sollatek
  - Vestfrost
- Finance Organizations:
  - AfDB
  - ARCH
  - КСВ



### We visited six sites over two days in Kwale and Kilifi county with varying cold chain solutions

#### **Kwale County**

Gazi Beach Management 1. Unit (WWF Project): three freezers

- Shimoni Beach 2. machine (broken)
- Management Unit: ice









#### **Kilifi County**

Malindi privately run ice 1. plant

Malindi fish market with 2. two cold rooms (not currently operational) and three freezers









Malindi government ice 3. plant (not currently operational)







### Glossary

BMU	Beach Management Unit
CaaS	Cooling as a Service
CAPEX	Capital Expenditure
CAT	Centre for Alternative Technology
CBO	Community Based Organization
CCI	Cold Chain Infrastructure
CIG	Community Interest Group
CG	County Government
DFI	Development Finance Institution
DMDP	DANIDA Market Development Partnerships
FCDO	Foreign, Commonwealth & Development Office
FOREX	Foreign Exchange
GIC	Green Cooling Initiative
IFAD	International Fund for Agricultural Development
КСВ	Kenya Commercial Bank
K-CEP	Kigali Cooling Efficiency Program

KEMFSED	The Kenya Marine Fisheries & Socio-Economic Development
KES	Kenyan Shillings
KFS	Kenya Fisheries Service
KIC	KeepITCool
M&E	Monitoring & Evaluation
MFA	Ministry of Foreign Affairs (of Denmark)
PAYGo	Pay As You Go
PCD	Pêche Côtière Durable
PHFL	Post Harvest Fish Loss
PHL	Post Harvest Loss
PMU	Project Management Unit
SA	South Africa
SACCO	Saving and Credit Cooperative Organizations
SSA	Sub-Saharan Africa
ТОТ	Trainer of Trainers
TZ	Tanzania
VC	Value chain



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