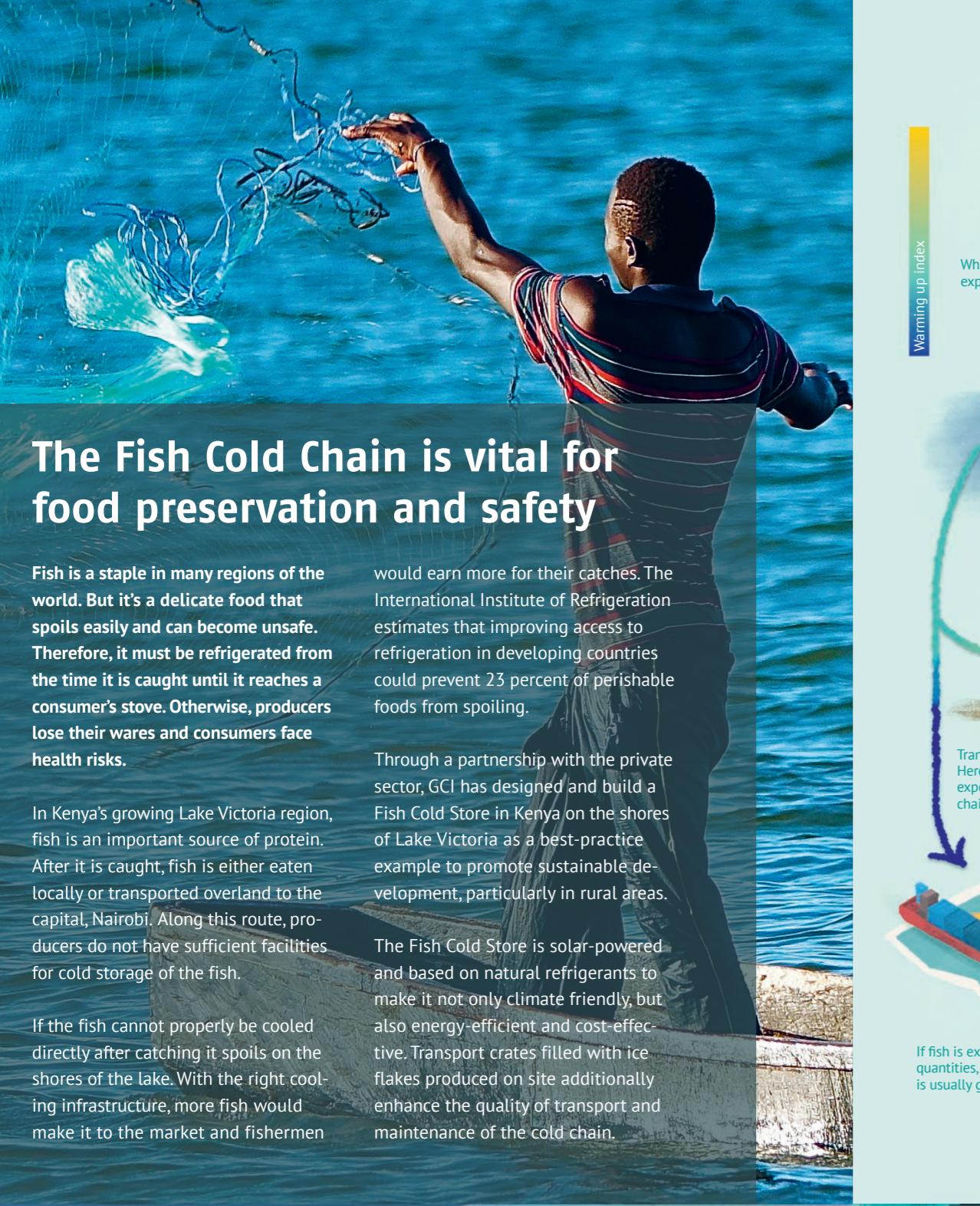


Environmentally friendly cold storage for fish – an example from Kenya

Off-grid, high-efficiency cold storage can help secure the livelihood of fishermen



green cooling initiative



The Fish Cold Chain is vital for food preservation and safety

Fish is a staple in many regions of the world. But it's a delicate food that spoils easily and can become unsafe. Therefore, it must be refrigerated from the time it is caught until it reaches a consumer's stove. Otherwise, producers lose their wares and consumers face health risks.

In Kenya's growing Lake Victoria region, fish is an important source of protein. After it is caught, fish is either eaten locally or transported overland to the capital, Nairobi. Along this route, producers do not have sufficient facilities for cold storage of the fish.

If the fish cannot properly be cooled directly after catching it spoils on the shores of the lake. With the right cooling infrastructure, more fish would make it to the market and fishermen

would earn more for their catches. The International Institute of Refrigeration estimates that improving access to refrigeration in developing countries could prevent 23 percent of perishable foods from spoiling.

Through a partnership with the private sector, GCI has designed and built a Fish Cold Store in Kenya on the shores of Lake Victoria as a best-practice example to promote sustainable development, particularly in rural areas.

The Fish Cold Store is solar-powered and based on natural refrigerants to make it not only climate friendly, but also energy-efficient and cost-effective. Transport crates filled with ice flakes produced on site additionally enhance the quality of transport and maintenance of the cold chain.



Keeping Fish Cool



A climate-friendly sustainable cooling solution

The refrigeration and air conditioning industry is responsible for a significant share of global greenhouse gas emissions, because many appliances use fluorinated gases as refrigerants, which deplete the ozone layer.

In addition, in poorly insulated cold stores, much of the cold air gets lost, which increases energy consumption and contributes to global warming. Smart designs start with rooms that have insulation that is thicker than 150 millimeters. This enables cold store operators to keep energy consumption low and secure food safety during prolonged power shortages.

The Fish Cold Store on Lake Victoria keeps fish fresh with technology that protects the environment, while helping the operator save energy. A cold store is not simply a room used to keep

food cold. It is a room specifically designed to meet the conditions for safe storage of perishable goods.

Typically, cold stores are built to maintain the temperature of a particular product, not make it colder. When planning a cold store, its designers need to consider the cooling temperature, the design of the rooms and the thermodynamic aspects of the particular goods that are to be cooled.

Building designers must also take into account the location and external conditions, such as average temperatures, terrain characteristics and accessibility. When constructing the building, it is also important to consider insulation, additional rooms, the power supply and water access. Since Lake Victoria has a lot of sun and water, the building designers chose a solar powered

cooling system with an ice machine that takes its water directly from the lake. The ice is needed to cool down the fish so that when it is taken inside the cold store, it already has the desired temperature. The cold store refrigeration unit can then keep the fish at the desired temperature. The cold store room uses an air conditioning system that works with natural refrigerants and insulation that are made from climate-friendly material.



Fresh fish for a warming world

From snow-capped mountains to wide-open plains and endless beaches at the Indian Ocean – East Africa sounds like a dream in many ways. But the “Hakuna Matata”-way of life is endangered as it is getting hotter every year. The global warming target of 1.5 degrees Celsius has already been exceeded in some parts of the region. Adaption will become increasingly challenging. The world will suffer more negative impacts on intensity and frequency of extreme events, on resources, ecosystems, biodiversity and food security.

The East African region is trying to tackle those problems by focusing on

afforestation, clean energy, energy efficiency and climate-friendly agriculture. Fish production, for example, is one of the fastest growing markets.

As fish is a vital source of essential macro- and micronutrients, it could also play an important role in reducing the high prevalence of under-nutrition. However, food security has still much room to improve: up to 60% of the fish spoils due to interrupted cold chains.

The Green Cooling Initiative starts right here by supporting the development of environmental-friendly and energy-efficient cold stores.

green cooling initiative

The Green Cooling Initiative and GIZ Proklima

GIZ Proklima is a program of the *Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH*, which provides technical support to developing countries to implement the provisions of the *Montreal Protocol* and the *Kigali Amendment* on substances that deplete the ozone layer and affect the global climate.

As part of *GIZ Proklima*, the *Green Cooling Initiative (GCI)* is working on behalf of the German *Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)* under its *International Climate Initiative (IKI)* to promote ozone- and climate-friendly technologies.

The overall objective of GCI is to minimize the environmental and climate impact of cooling systems used in the private and public sectors.

Three key objectives include:

- * Promoting natural refrigerants and energy-efficiency
- * Establishing advanced training institutions and certification schemes
- * Encouraging public and private financing of projects



The Fish Cold Store has changed the lives of fishermen

Before the Cold Store was built, local fishermen often had to throw away 40 to 60% of their catch because they had no way to keep the fish cool. Now, 5 tons of fish can be stored and kept fresh for two to three days in the Fish Cold Store. It is climate- friendly, cost effective and sustainable because it's powered by solar energy, and ice to cool the fish is made from lake water.

To operate the Fish Cold Store so that little energy is lost, fishermen must be trained about how it can and should be used.

Some of the aspects to be considered include:

- * The amount of food planned to be stored in the cold store, since this impacts the temperature. On the basis of that calculation an optimisation of cooling unit and ice makers can be made



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