German Environment Agency

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Organised by

Green Cooling Summit 2023:

Green Cooling along the cold chain

Concept paper for the symposium

Overview

On behalf of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the Federal Ministry for Economic Cooperation and Development (BMZ), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the German Environment Agency are organizing the "Green Cooling Summit 2023" from 10 to 11 October. The international virtual conference is dedicated to the question of how the cold chain can best be designed politically and technically to use natural refrigerants and employ improved energy efficiency standards. The insights and practical examples that will be presented at the conference will provide a solid basis for critically rethinking the dominant refrigeration technologies in stationary and transport refrigeration.

1 Background: What is sustainable cooling and why is it so important?

Refrigeration is an essential part of daily life - from cold chains for fresh food and the safe storage of medicines and vaccines, to air-conditioned workplaces and schools where it can boost productivity. Cooling is a basic need. However, the positive effects of cooling and air conditioning also have a downside. The cooling and air-conditioning industry is a massive contributor to greenhouse gas emissions. This is due to the large number of inefficient refrigeration and air conditioning systems that still have low efficiency standards, and the high climatic effect of refrigerants in the majority of the systems made today.

What is sustainable cooling ("Green Cooling")?

Our understanding of Green Cooling is the interplay of energy-efficient refrigeration and air conditioning systems with natural refrigerants, ideally powered by renewable energies.

These refrigerants are hydrofluorocarbons (HFCs) with a global warming potential up to 14,800 times higher than CO_2. The Kigali Amendment (latest supplementary agreement to the Montreal Protocol) regulates the phase-down of HFC use. This will prevent global warming by up to an estimated 0.5 degrees Celsius by the end of this century[1]. Natural refrigerants such as ammonia, CO_2 and hydrocarbons play a particularly decisive role in the replacement of HFCs.

By switching to natural refrigerants, which have no or very low global warming potential (GWP), and introducing higher energy efficiency standards, the climate will be protected and a vital need of people around the world can be secured.

2 What is blocking the widespread introduction of technologies using natural refrigerants?

In the past, the phase-out of environmentally harmful refrigerants only led to the use of less environmentally harmful substances. This occurred during the switch from chlorofluorocarbons (CFCs) to hydrochlorofluorocarbons (HCFCs) and later to hydrofluorocarbons in industrialized countries. The same phase-out pattern is currently seen in developing countries, where HCFCs are being replaced by HFCs. Alternatively, however, it is possible to switch from ozone-depleting and climate-damaging substances such as HCFCs directly to energy-efficient systems with natural refrigerants and to avoid the diversions via HFCs. This concept, known as "leapfrogging", is a way for countries in the Global South to avoid the mistakes made in the industrialized countries.

Nonetheless, there are certain hurdles to overcome in pursuing this path. These hurdles include financing (e.g. for the retrofitting of production lines for air conditioning units), standards and regulations as well as the education and training of refrigeration technicians in the safe handling of natural refrigerants.

3 Importance of the cold chain in an international context

Globally, about one third of food produced for human consumption is currently lost or wasted. The lack of effective refrigeration leads to a direct loss of 475 million tons or 13% of total food production[2]. Sustainable cold chains (i.e. based on natural refrigerants, insulating materials with natural propellants, high energy efficiency and renewable energy supply) could remedy this and reduce food losses due to lack or absence of refrigeration, especially in developing and emerging countries.

Population growth is increasing the demand for food, which is why increasing numbers of people depend on well-functioning cold chains for their daily supply. However, in many

[1] UNEP (2016). The Kigali Amendment to the Montreal Protocol: Another Global Commitment to stop climate change (unenvironment.org). https://www.unenvironment.org/news-and-stories/story/kigali-amendment-montreal-protocol-another-global-commitment-stop-climate (20.05.2021)
[2] Dupont, J.L, El Ahmar A., Guilpart, J.: The Role of Refrigeration in Worldwide nutrition (2020), 6th Informatory Note on Refrigeration and Food. International Institute of Refrigeration, The Role of Refrigeration in Worldwide nutrition (2020), 6th... (iifiir.org)

countries of the Global South, cold chain coverage is rudimentary. In addition to the lack of infrastructure, there is often a lack of technology and management skills needed to develop integrated cold chains for the distribution of perishable food, especially in rural areas. Due to the rise in temperature caused by climate change and the associated increased demand for refrigeration, the situation will become even more acute in the coming years. The challenge is to make the expansion of cold chains climate neutral.

The global mitigation potential from organic waste prevention is estimated at 4.4 Gt CO_2eq annually, of which missing or inefficient refrigeration accounts for 1 Gt CO_2eq annually (Global Food Cold Chain Council, 2015). Direct and indirect emissions from refrigeration equipment in food cold chains account for 1% of global greenhouse gas (GHG) emissions (Cool Coalition, 2021). Thus, large amounts of GHG emissions can be mitigated globally and in a cost-effective manner, especially in countries of the Global South. In addition to the significant reduction potential through increased energy efficiency and the widespread use of natural refrigerants and natural propellants, there is a much higher reduction potential through the avoidance of organic waste and thereby avoided methane emissions.

4 Goals, participants, and concept of the Green Cooling Summit

The symposium will take place on 10 to 11 October 2023. The Green Cooling Summit 2023 will focus on environmentally friendly cooling options along global cold chains. Policy makers, refrigeration companies and other stakeholders involved in the cold chain will present and discuss strategies, environmentally friendly techniques and best practices for planning and operation. One focus will be on the importance of the cold chain for food safety and the transport of medicines and vaccines, especially in emerging and developing countries.

Natural refrigerants are the key to long-term environmentally and climate-friendly refrigeration and air conditioning technology worldwide. The lasting value of the event will be the new impulses for the political sphere, as well as for manufacturers and end users. The results of the conference in the form of the recorded presentations, discussions, and other materials will be published afterwards on the website www.green-cooling-initiative.org.

The Green Cooling Summit 2023 is organized jointly by the German Environment Agency and GIZ Proklima on behalf of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the Federal Ministry for Economic Cooperation and Development (BMZ). The circle of participants is international; due to the virtual format, there is no limit to participation. The event will be held in English with simultaneous translation into Spanish and French.

The target groups of the Green Cooling Summit are:

- **country representatives** involved in the implementation of the Kigali Agreement,
- **manufacturers** of refrigeration and air conditioning equipment,
- **end users** interested in future-proof refrigeration and air conditioning solutions with natural refrigerants.

In addition, guests from science and media as well as additional international organizations will be invited.

5 Concept of the "Green Cooling Summit

On the first day of the virtual summit, we will discuss political approaches, financing options and innovative business models to promote sustainable cooling along the entire cold chain. International representatives from science, business and politics will present international agreements, EU regulations, national climate protection plans and national logistic plans. In addition, potentials and market trends along the cold chain for green cooling technologies will be highlighted and good practice examples will be shown.

On the second day of the summit, international representatives from the private sector will present technologies for stationary and transport refrigeration systems. Available refrigeration technologies will be presented and opportunities and challenges in their application will be highlighted. In addition, recommendations will be given on how cooling in stationary and transport refrigeration systems can be made more efficient and environmentally friendly. To conclude, we will have a panel discussion where we will summarize the most important insights. We will discuss which barriers still exist and which changes are necessary. Participants are warmly invited to actively participate with questions and comments.

6 Implications of the virtual format

As the virtual format of the conference has already been proven successful in the last two years, this year's Summit will also take place exclusively virtually. All presentations will be made accessible through a digital event platform. This will significantly expand the circle of participants on a global level and raise awareness of the topic. The lack of face-to-face interaction will be partially compensated by virtual networking rounds as well as live voting and live chats during the sessions. All presentations will be recorded and made publicly available afterwards. The registration is in advance, and participation is free of charge.

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Umweltbundesamt
Wörlitzer Platz 1
06844 Dessau-Roßlau
Tel: +49 340-2103-0
buergerservice@uba.de
Internet: www.umweltbundesamt.de
/umweltbundesamt.de
/umweltbundesamt

Authors, Institutions

Maja Schmauser

Proklima International

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn
Deutschland

Tel: +49 6196797123
maja.schmauser@giz.de
Internet: www.giz.de

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