



IKI Brown Bag Lunch

End-of-Life Management in the Cooling Sector

*The Climate and Ozone Protection Alliance – COPA
Cutting refrigerant emissions and protecting the climate & the ozone layer*

IKI Office

Online, 19 February 2026, 13:00-14:00 CET



Welcome

IKI BBL

Netiquette:

- Please log in with your full name and organization.
- Please switch off all microphones.
- Please, raise your hand for questions and comments.
- Use the chat for content-related questions and technical questions.  Chat
- This event will be recorded.



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Your host today: Mark Nowakowski, IKI/ZUG

Agenda

End-of-Life Management in the Cooling Sector

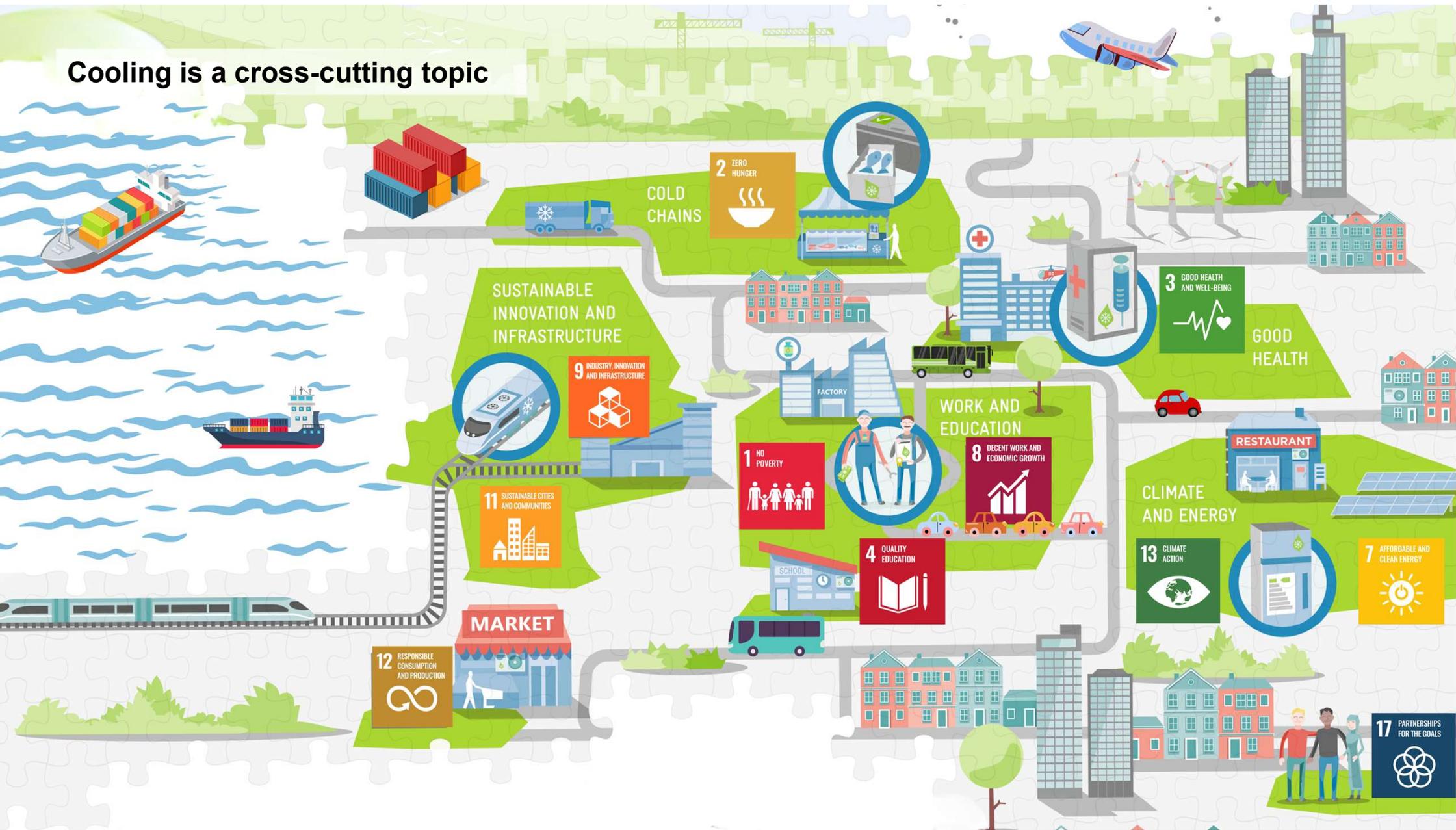
1. **Welcome & Moderation** (M. Nowakowski, IKI Office / ZUG)
2. **COPA Impact & Role** (R. Pekker, BMUKN)
3. **End-of-Life Management in the Cooling Sector** (E. Michel, GIZ)
4. **COPA: Project & Alliance**
 - The set-up (Y. Zhou, COPA Secretariat, UNIDO)
 - Support available for countries (E. Michel, GIZ)
 - Mitigation pilots (E. Michel, GIZ)
 - Sustainability beyond IKI (S. Jacobs, COPA Steering Committee, Energy Partners)
5. **Discussion, Q&A**
6. **Closure**



"WITH CHALLENGING TIMES ALL AROUND THE WORLD, IT IS GREAT TO SEE PEOPLE FROM SO MANY COUNTRIES WORKING TOGETHER TO PROVIDE SOLUTIONS FOR URGENT CLIMATE CHANGE AND OZONE PROTECTION CHALLENGES."

Rachel Pekker, German Federal Ministry for Economic Affairs and Energy (BMWE), COPA Plenary, 2nd July 2025

Cooling is a cross-cutting topic



End-of-Life Management in the Cooling Sector

Cutting refrigerant emissions and protecting the climate & the ozone layer

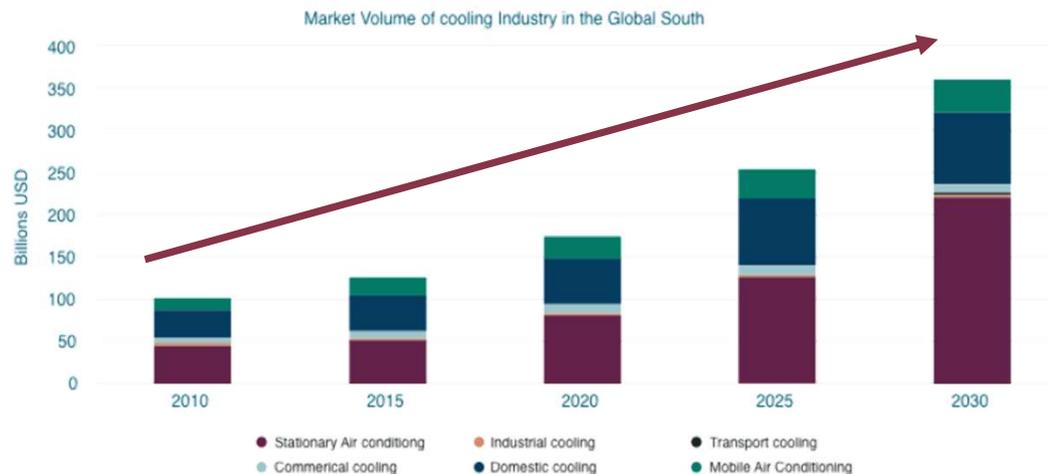


The Cooling challenge – Breaking a vicious circle

Climate change increase both the global temperature and the demand for cooling and air conditioning units.

Ozone depleting substances (ODS) and climate-damaging hydrofluorocarbons (HFCs) used in existing and old cooling equipment, insulation foam or cylinders, has led to the **accumulation of large “ODS and HFC banks” globally.**

If old cooling devices are not maintained and disposed of in an environmentally friendly way, the **ODS and HFC banks release their emissions freely into the atmosphere.**



End-of-Life Management in the Cooling Sector

Cutting refrigerant emissions and protecting the climate & the ozone layer



Climate and environmental impacts from of common refrigerants

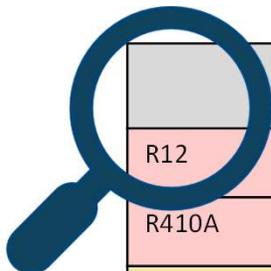


- **HFC-based Refrigerants** have a Global Warming Potential (GWP) ranging from GWP 270 and up to GWP 12,500.
- Released into the atmosphere, **the environmental impact on climate** from these cooling substances will be substantial.
- In comparison, **Natural Refrigerants**, such as CO₂, Ammonia and Propane, have a GWP value below 1.5

End-of-Life Management in the Cooling Sector

Cutting refrigerant emissions and protecting the climate & the ozone layer

Climate and environmental impacts from of common refrigerants



	Type	GWP (20y)	GWP (100y)	Lifetime (yr)	Ozone depleting?	PFAS?
R12	CFC	12,700	12,500	102	Yes	No
R410A	HFC blend	4,715	2,256	-	No	Yes
R32	HFC	2,690	771	5.4	No	No
R290 (Propane)	Natural	0,072	0,02	0,036	No	No
R744 (CO ₂)	Natural	1	1		No	No

High-GWP: red; Medium-GWP: yellow; Low-GWP: green

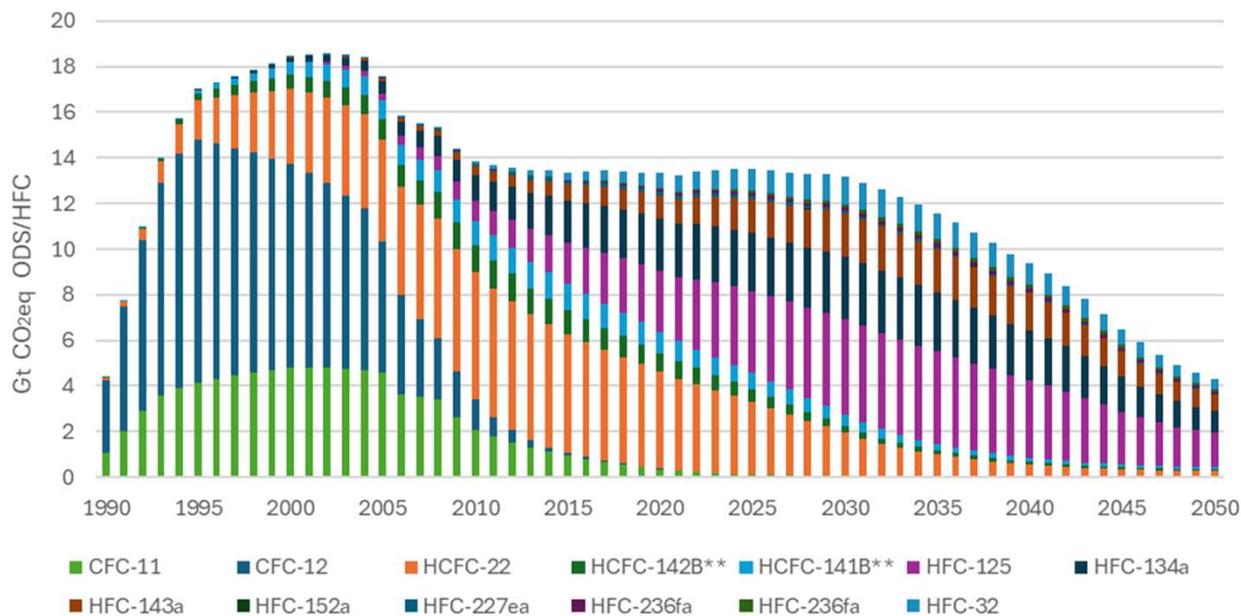
	Type	GWP (20-yr)	GWP (100-yr)	Lifetime (yr)	Ozone Depleting?	PFAS?
R11	CFC	8,320	6,230	52	Yes	
R12	CFC	12,700	12,500	102	Yes	
R22	HCFC	5,690	1,960	11.9	Yes	
R141b	HCFC	2,710	860	9.4	Yes	
R125	HFC	6,740	3,740	30	No	Yes
R134a	HFC	4,140	1,530	14	No	Yes
R143a	HFC	7,840	5,810	51	No	Yes
R404A	HFC blend	7,208	4,728		No	Yes
R407C	HFC blend	4,457	1,908		No	Yes
R410A	HFC blend	4,715	2,256		No	Yes
R452A	HFC/HFO blend	4,273	2,292		No	Yes
R32	HFC	2,690	771	5.4	No	No
R452B	HFC/HFO blend	2,275	779		No	Yes
R454A	HFC/HFO blend	943	270		No	Yes
R513A	HFC/HFO blend	1,823	673		No	Yes
R290 (Propane)	Natural	0.072	0.02	0.036	No	No
R600a (Isobutane)	Natural	<1	<1	0.019	No	No
R717 (Ammonia)	Natural	<1	<1	<1	No	No
R744 (CO ₂)	Natural	1	1		No	No
R1234yf	HFO	1.81	0.501	0.033	No	Yes
R1234ze(E)	HFO	4.94	1.37	0.052	No	Yes

End-of-Life Management in the Cooling Sector

Cutting refrigerant emissions and protecting the climate & the ozone layer



Spotlight on F-Gas Banks Management



2022
7680 kt ODS & HFKW
13.4 Gt CO₂eq

~1 Mt CO₂eq Are emitted **daily** from global ODS & HFC banks

Global ODS banks in kt of substance. HCFC consumption is interpolated between 2023 and 2030 (deadline for the phase out in Article 5 countries).; Source COPA publication, 2025

End-of-Life Management in the Cooling Sector

Cutting refrigerant emissions and protecting the climate & the ozone layer



Cooling Sector: F-Gas Banks Management has an **enormous mitigation potential**

~1 Mt CO₂eq Are emitted **daily** from global ODS & HFC banks

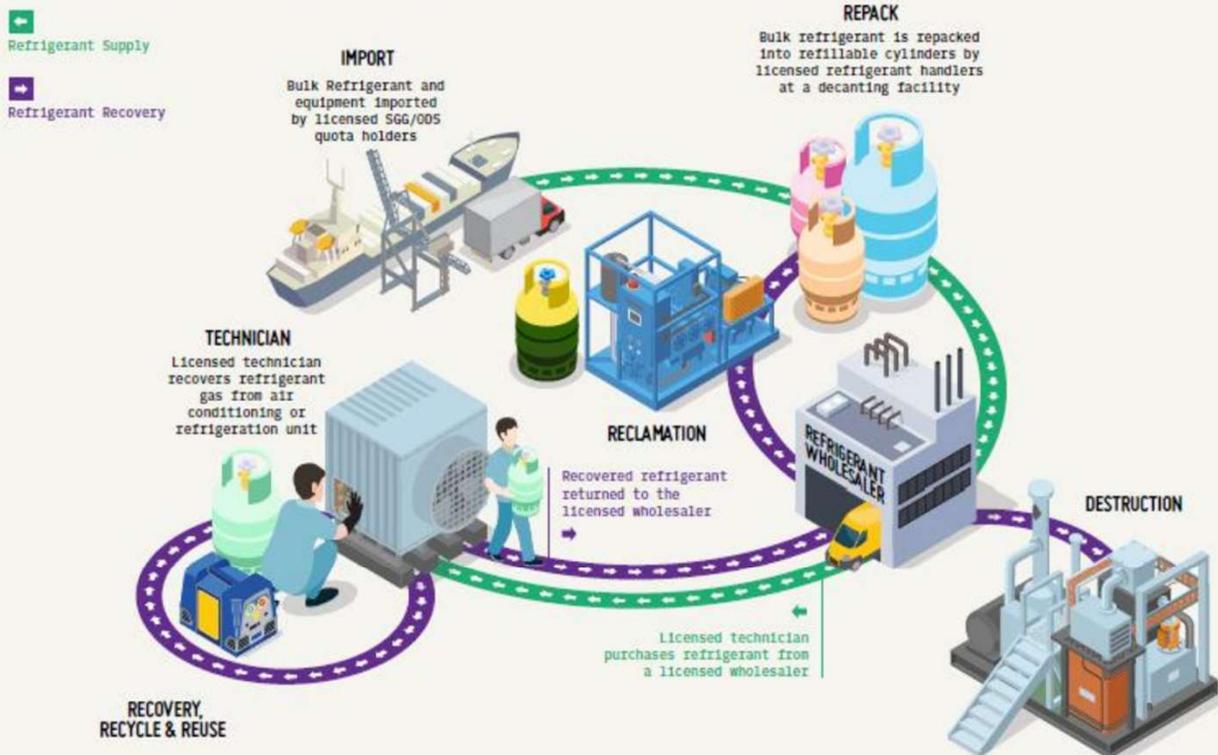
Emission equivalent

- **Driving:** About 4 billion kilometers (2.5 billion miles) in an average gasoline car - enough to circle the Earth 100,000 times.
- **Flying:** The CO₂ emissions from about 250,000 one-way flights from Berlin to New York.
- **Electricity:** The annual CO₂ emissions from powering roughly 125,000 European homes.
- **Coal:** Burning about 400,000 tons of coal.
- **Forest:** The amount of CO₂ absorbed by about 17 million tree seedlings grown for 10 years.

End-of-Life Management in the Cooling Sector



REFRIGERANT SUPPLY AND RECOVERY CHAIN



Licensed technicians

- trained and informed
- Monetary incentive for RRR
- limiting “free venting” practice

Refillable cylinders

not disposable single-use containers

Certified handlers

guarantees quality of content in cylinders through verification
 ➤ both for virgin and reclaimed substances

The Climate and Ozone Protection Alliance – COPA

COPA Project & Alliance - The set-up

Setting up the Alliance – COPA was initiated in 2021 by the German Federal Ministry of Economic Affairs and Climate Action as phase II of an IKI project.



The main objective was establishing a **member-driven coalition** of organizations and countries, working together across all member groups, to:

- ✓ Promote a global shift to **sustainable refrigerant management**
- ✓ **Accelerate holistic solutions** for managing end-of-life of cooling systems, thereby avoiding emission of the refrigerants locked into the systems (ODS & HFC Banks)

GIZ Proklima was commissioned to set-up the Alliance in cooperation with **UNIDO and UNDP**.

Implemented by:



In cooperation with:



Supported by:



on the basis of a decision
by the German Bundestag

The Climate and Ozone Protection Alliance – COPA

COPA Project & Alliance – The set-up

COPA Secretariat

- 2021-2025 GIZ Proklima, support UNIDO & UNDP
 - ✓ Website, Mailbox, Newsletter
 - ✓ Member acquisition & management
 - ✓ Exchange formats, working groups, Annual Plenaries
 - ✓ Election & support of Steering Committees
- 2026 – UNIDO, support UNDP
 - ✓ Website, Mailbox, Newsletter
 - ✓ Member Management → **83 members, 26 countries (02/2026)**
 - ✓ Exchange formats, working groups
 - ✓ Supporting Steering Committee



UNIDO & GIZ, Vienna 10/2025

The Climate and Ozone Protection Alliance – COPA

COPA Project & Alliance - The set-up

- COPA has 4 thematic working groups
- Aligned to the challenges of an efficient End-of-Life management in the cooling sector
- Infrastructure and technology for collecting, re-cycle, reclaim, analyze, treat or destroy substances are necessary
- Knowledge about financing mechanisms and policy frameworks are essential
- Implementation models - e.g. exchanging best practices and lessons learned



**Policy
Framework**



**Technology
Solutions**



**Financing
Mechanism**

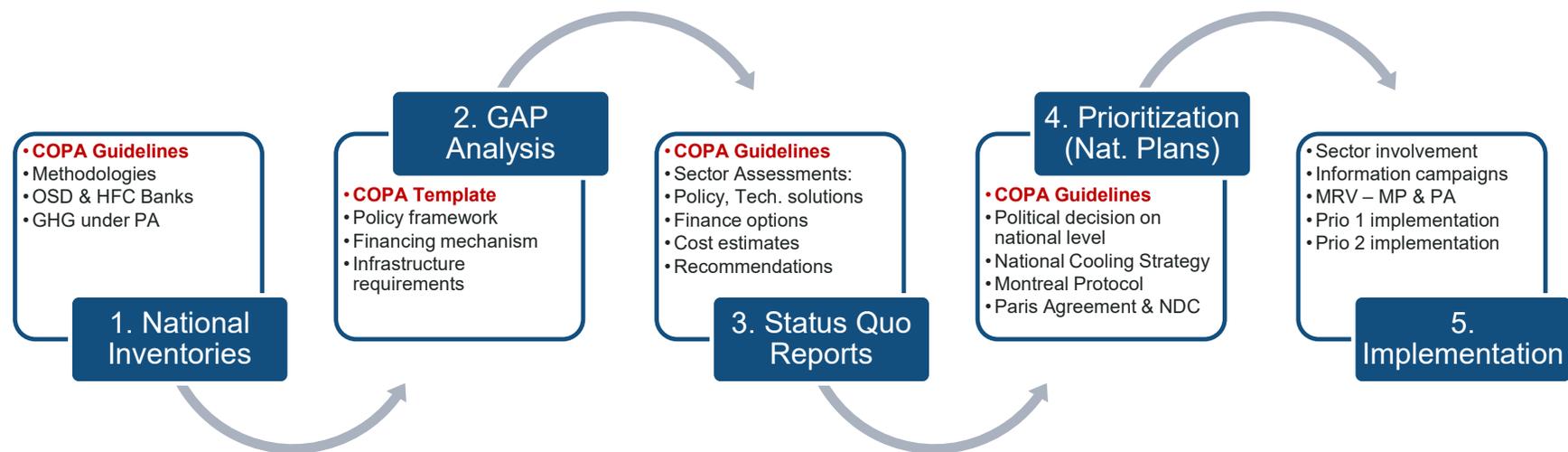


**Implementation
Models**

The Climate and Ozone Protection Alliance – COPA

COPA Project & Alliance – Support available for countries

COPA resources purposefully support countries in the steps towards a sustainable life-cycle refrigerant management



The Climate and Ozone Protection Alliance – COPA

COPA Project & Alliance – Mitigation pilots



MAC

- **China**
- Mobile ACs (cars)
- Refrigerant recycling
- Cooperation with the private sector & research institute
- Methodology: Baseline & Scenario calculation
- [Weblink](#)



Business Case

- **Grenada**
- Recovery, Recycling, & Reclamation (RRR) Centre
- Techno-economic model developed
- Business Case Building

The Climate and Ozone Protection Alliance – COPA

COPA Project & Alliance – Mitigation Pilots



ODS-Destruction

- South Africa & Zimbabwe
- Transboundary movement
- Basel convention
- Certified destruction of 971 kg of gas (R12)
- Destruction of the cylinders too



A-THERMAL
for the environment

Certificate Number **A-0026856**

THERMAL DESTRUCTION CERTIFICATE

Description	Quantity	UOM
THERMAL TREATMENT R12 DESTRUCTION FROM DRUM	971	KG
R12 - E-003 - 301 KG		
R12 - E-024 - 1 KG		
R12 - E-033 - 2 KG		
R12 - E-249 - 199 KG		
R12 - E-268 - 315 KG		
R12 - E-293 - 153 KG		
DESTRUCTION OF CYLINDER - 3795 KG		
Total:	971	KG

DESTRUCTION DATE: 02/12/2025

CLIENT: GERMAN DEVELOPMENT COOPERATION GIZ
GIZ OFFICE PRETORIA, FINANCE UNIT,
HATFIELD GARDENS
BLOCK C, 333 GROSVENOR STREET, HATFIELD
0083

WASTE GENERATOR: ZIMBABWE MINISTRY OF ENVIRONMENT,
WATER AND CLIMATE, NOU





SIGNED: 
Sherwin Naicker
BSc. Chemical Engineering

DATE OF ISSUE: 02/12/2025

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COPA Project & Alliance – Sustainability beyond IKI

COPA Steering Committee (2025 – 2027)

PUBLIC SECTOR



Rachel Pekker
BMW, Germany

PRIVATE SECTOR



Adrian Bukmanis
Veridien RM, Australia

COUNTRIES



Samuel Jacobs
Energy Partners Refrigeration,
South Africa



Leslie Smith
Grenada



Igobe Gobsie Mbulawa
Botswana

Website: <https://www.copalliance.org>

COPA Secretariat (GIZ, UNDP & UNIDO): contact@copalliance.org

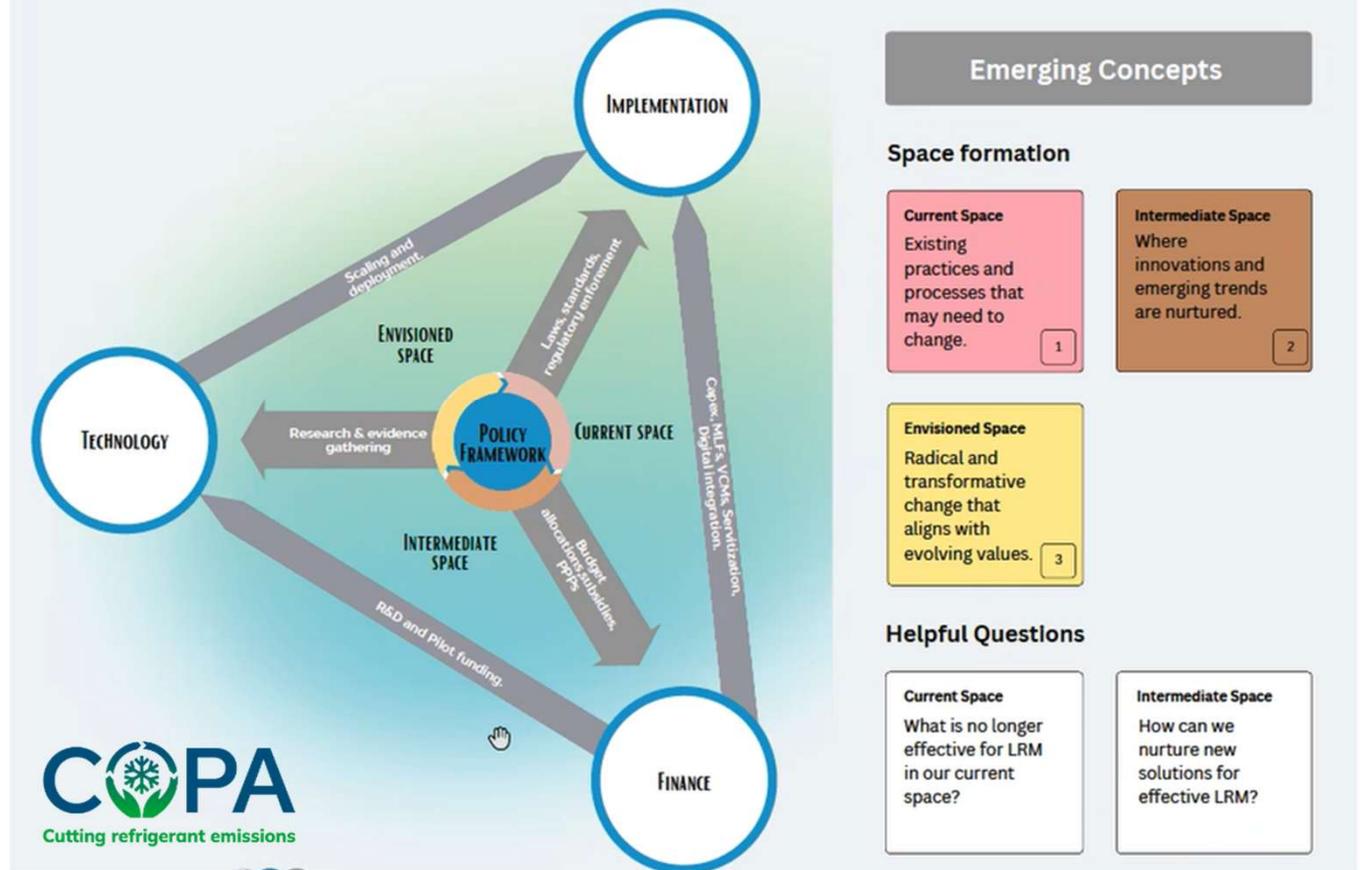
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COPA Project & Alliance – Sustainability beyond IKI

Value proposition for members joining COPA

- Knowledge sharing
- Networking and exchange
- Going beyond current utilisation → towards implementing mitigation. Initiating new action and new financing.

BASIC NODAL MAP OF THEMATIC WORKING GROUPS



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COPA Project & Alliance – Sustainability beyond IKI

COPA 2026 – upcoming activities

- In March, first SC meeting for the year → planning and scheduling, align with Secretariat
- **Promote Active Membership:**
Welcoming new members, Meet & Greet by members, Representation on Conferences and events
- **Exchange and Networking:**
Quarterly Newsletter, SC representation, link to relevant conferences, Working Groups sessions, presenting new research, etc.
- **Support Project and Business Development:**
with and for members, e.g. CaaS in South Africa, Destruction in Thailand, Reclamation in Indonesia

The Climate and Ozone Protection Alliance – COPA

COPA Project & Alliance – Sustainability beyond IKI

COPA Resources

COPA Compendium 2025:

provides an overview and links to all publications, activities and resources developed by COPA between July 2021 and 2025 in an interactive PDF file for download. ([Weblink](#))

COPA-Website:

Results & resources can be found filtered by topic, type and language, e.g. guidelines, presentations, studies, etc. ([Weblink](#))





Q&A SESSION

THANK YOU FOR YOUR ATTENTION



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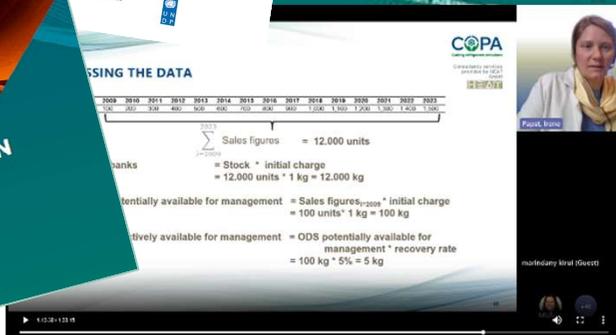
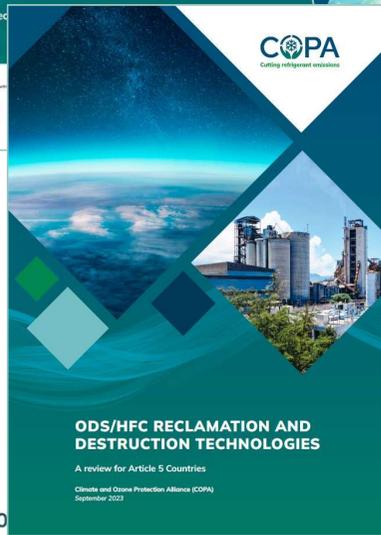
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End-of-Life Management in Cooling – Lessons learned

- **Major interest in sustainable end-of-life management**, especially by the private sector and the National Ozone Units (reporting ODS & HFC to Montreal Protocol)
- **Pilot projects and project development support** (including financing solutions) play an important role. They collect real data, forge new partnerships and inspire new initiatives
- **The COPA exchange formats and resources** are used extensively and are highly valued by the members and beyond, e.g. the “COPA Methodology” for ODS & HFC inventories (also used for NDC Greenhouse gas inventories)

COPA materials & resources online



COPA RESOURCES ONLINE

Publications:

- [Get ready with COPA for Article 6, a 5-step guide for national ozone offices](#)
- Online course: ["Cooling Carbon Markets" \(English, French and Spanish\)](#)
- ["COPA Financing and Fundraising Mechanism: A Review and Concept"](#)
- ["Using carbon markets to reduce emissions from end-of-life refrigerants and foam blowing agents" \(Study + excel template\)](#)

Session slides (ppt slides as pdf-files):

- [Cooling as a Service business case in South Africa](#), ppt-slides from Samuel Jacobs, Energy Partners
- [Introduction and Fundamentals](#) to Beyond Value Chain Mitigation (BVCM) by Adrian Bukmanis
- [Beyond Value Chain Mitigation](#) by Juliette de Granpré, New Climate Institute

Online sessions – video recordings:

- [Get ready for finance - Financing for project development](#)
- [ODS & HFC Projects Eligibility under Article 6](#)
- [Session: Carbon Credits introduction](#)
- [PPP for WEEE in Togo - CCAC 2025 Workshop on Lifecycle Refrigerant Management \(LRM\) in Bangkok 6 July 2025](#)

