COPA
Cutting refrigerant emissions

Implementation Models Working Group

11 September 2025

COPA
Cutting refrigerant emissions

1. Welcome remarks

AGENDA

1. Welcome and member introductions
2. Lifecycle Refrigerant Management updates
3. Country presentations
4. COPA implementation plans 2025 and next steps for the WG
5. Wrap-up

COPA – THE CLIMATE AND OZONE PROTECTION ALLIANCE

- **Initiated 2021 by the German Federal Ministry of Economic Affairs and Climate Action** to pave the way for an enhanced environmental stewardship of ODS and HFCs
- **Today a member-driven coalition** of over 80 organizations and countries working together, supported by a Secretariat
- Driving and accelerating the **holistic solutions needed to reduce ODS and HFC banks** globally

Vision: A global shift to sustainable refrigerant management & thereby closing the loop to a circular economy in the cooling sector

Implemented by:

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

In cooperation with:

UNIDO UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNDP

Supported by:

Federal Ministry for Economic Affairs and Climate Action

IKI INTERNATIONAL CLIMATE INITIATIVE

on the basis of a decision by the German Bundestag

1. CLIMATE AND OZONE PROTECTION ALLIANCE (COPA)
Thematic Working Groups (TWG)

Together with partners and members from **academia, the private sector, civil society, finance institutions and policy makers**, we are working on the following topics

Policy Framework

For an effective managemenof refrigerants and foams at end-of-life, **suitable policy measures are required** like venting bans or mandatory recovery

Technology Solutions

Working towards the **best technical solutions** for ODS and HFC recovery, reclamation and destruction

Financing Mechanism

The infrastructure for and operation of a collection scheme and the destruction or reclamation of ODS and HFCs needs to be based on a **sustainable financing mechanism**

Implementation Models

Putting theory into practice and demonstrating how sustainable refrigerant management can be implemented

2. LIFE-CYCLE REFRIGERANT MANAGEMENT UPDATES

Science

- New global HFC Banks inventory published by COPA in June 2025

Policy

- Updates from the OEWG July 2025

Financing

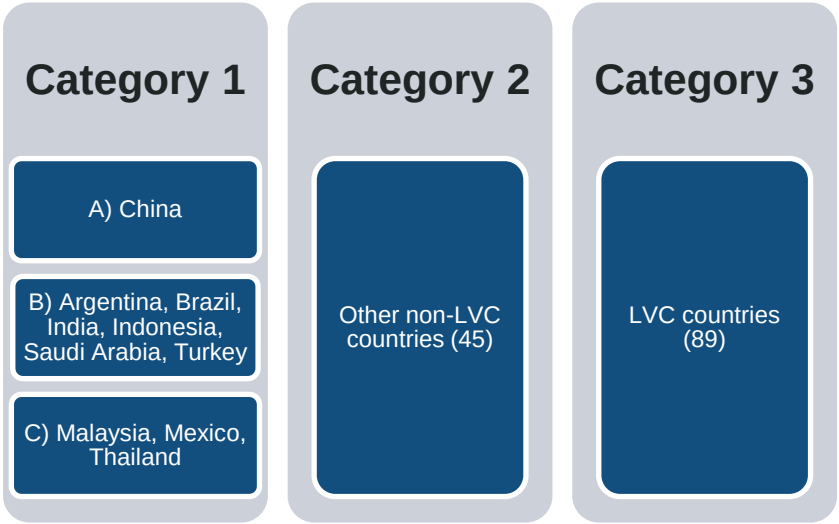
- Country financing from the Multilateral Fund for Inventories and Actions Plans

Impl Models

- COPA members case studies

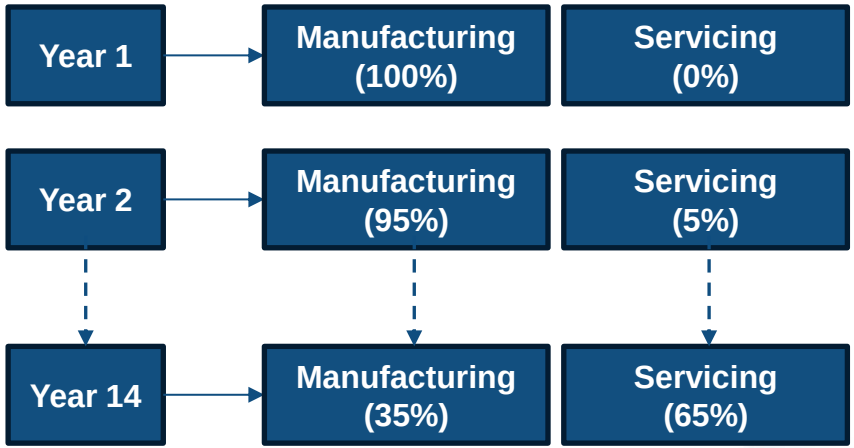
SCIENCE - SECTORAL DISTRIBUTION OF HFCS

For Article 5 countries distribution used from a CCAC report.



For Non-Article 5, the IPCC guidelines were used.

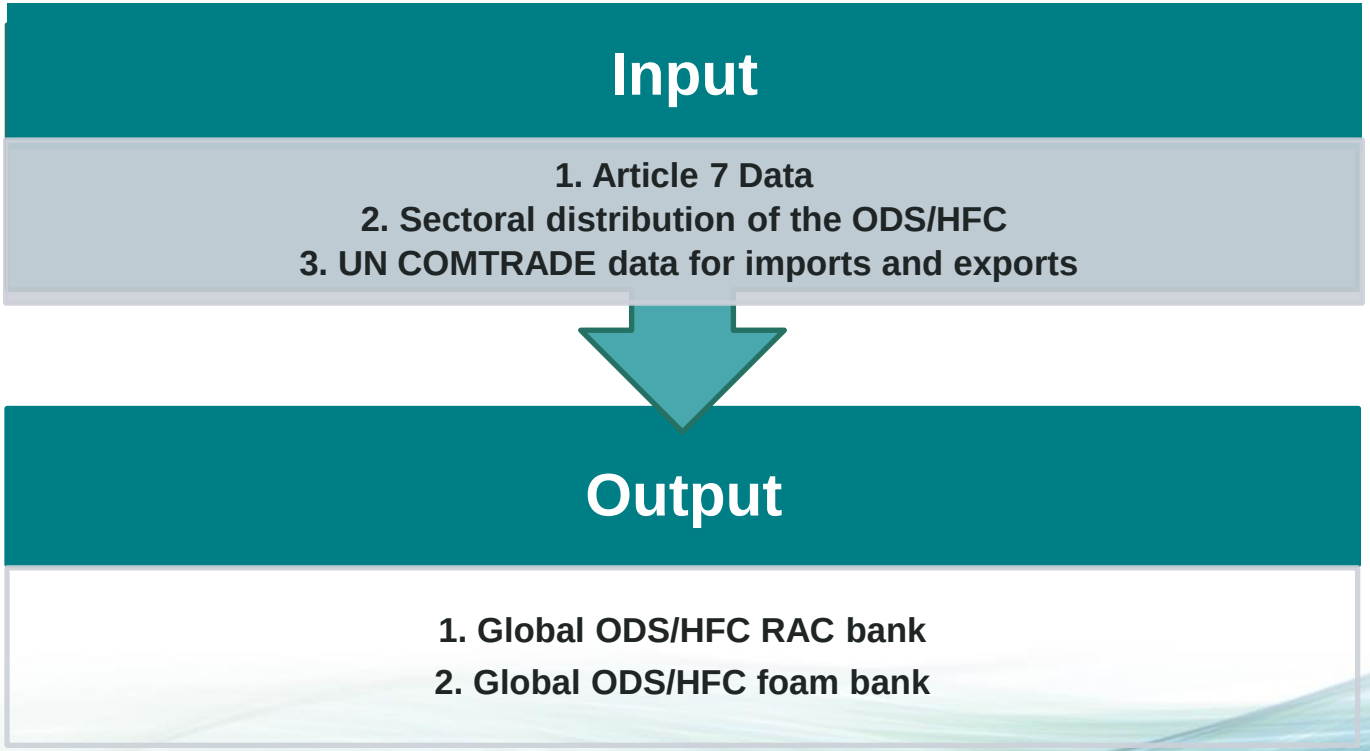
Sectoral Distribution of a refrigerant overtime



Sources: CCAC,2022: A study on the Impacts of HFC Consumption Trends In Article 5 Countries.

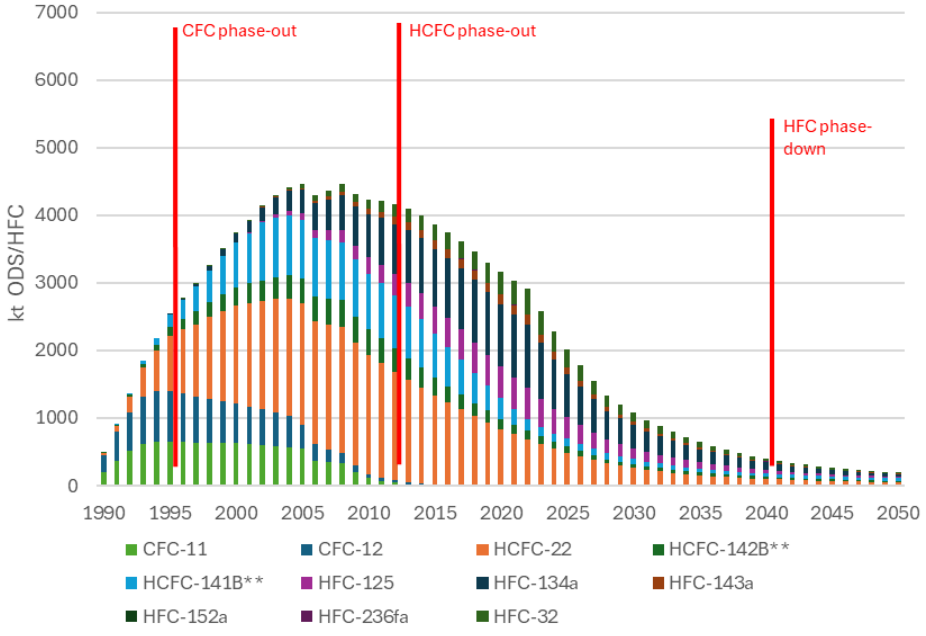
IPCC, 2006: Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change, Switzerland.

GLOBAL ODS/HFC BANKS MODEL

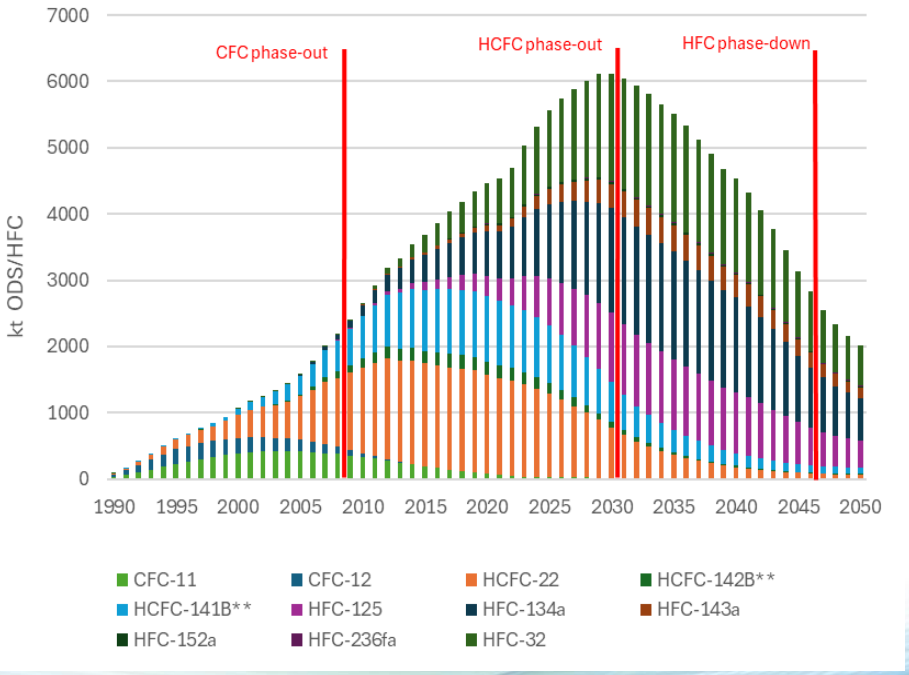


RESULTS – BANKS (METRIC TONNES)

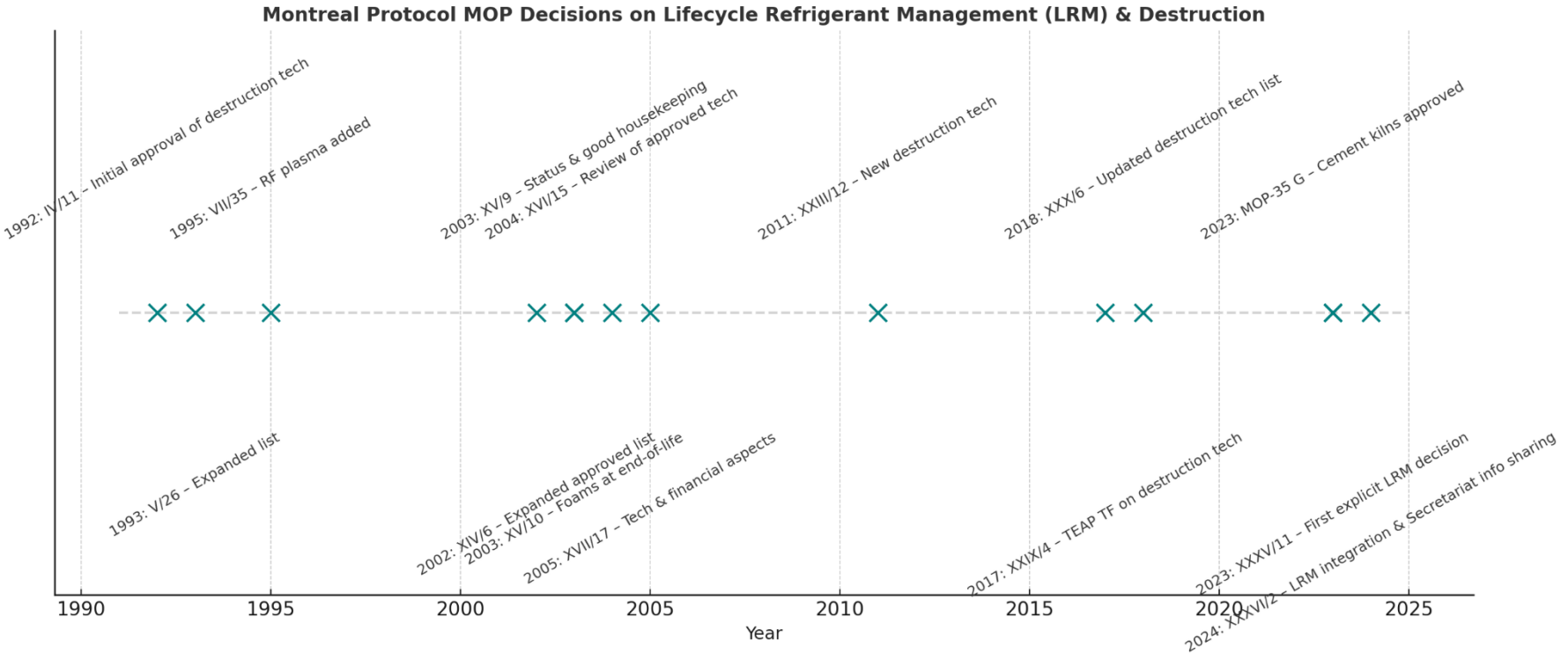
Non-Article 5 Countries



Article 5 Countries



POLICY - A LENGTHY TIMELINE OF REFRIGERANT LIFE CYCLE MANAGEMENT



POLICY

Two explicit MOP decisions on LRM (2023–2024)

Decision XXXV/11 (MOP-35, Nairobi, Oct 2023) —

"Life-cycle refrigerant management." The first MOP decision to name LRM: requests TEAP to prepare a dedicated LRM report; asks the Secretariat to organize an LRM workshop; and invites Parties to share experience and information on LRM good practice. This effectively puts LRM on the Protocol's policy workstream.

Decision XXXVI/2 (MOP-36, Bangkok, Oct–Nov 2024)

"Life-cycle refrigerant management." Encourages Parties to incorporate LRM into national policies and planning for Kigali/Protocol implementation; requests the Secretariat to compile LRM information (including Parties' submissions and international initiatives) and keep it updated.

Decisions that build the end-of-life "toolkit" for LRM (destruction technologies & banks)

- Approval & updating of ODS destruction technologies (1992 → 2018 → 2023):
- Banks & inventories — foundational context for LRM:

Over the years the MOP has repeatedly recognized banks of controlled substances as a climate-material issue and tasked TEAP to analyze options

FINANCING OPPORTUNITIES

- COPA WG on financing mechanisms explore and exchange on possible financing models for sustainable ODS & HFC banks management
- Financing can be clustered in three different finance flows:
  - ✓ **Public finance;** grants, concessional debt and equity, impact investments
  - ✓ **Private finance:** debt, equity & investment
  - ✓ **Public-Private-finance mix:** different forms of blended finance
- One example of public finance is the **Multilateral Fund (MLF),** which provide grants for MP Article-5 countries for specified purposes contributing to LRM. Many of these countries are COPA members, so let's take a closer look.

FINANCING FOR COUNTRIES - MLF

Decision 91/66 Multilateral Fund

Purpose

Fund national inventories of banks
+

national plans for collection, recycling, reclamation & destruction.

Eligibility & Timing

Article 5 Parties (except with 90/49(b) funding).

Submit at ExCom 93–97 = Dec 2023 to Dec 2025

must be in the implementing agency business plans.

Completion deadline: 24 months.

Funding

<1 ODP-t: US$70k

1–6 ODP-t: US$80k

6–100 ODP-t: US$90k

>100 ODP-t: US$100k

Scope

- Methodology & stakeholder consultation.
- Policy/regulatory review & role definition.
- Business model (domestic destruction or export under Basel).
- Alignment with HPMP/KIP; new regulations if needed.
- Annual reporting & final plan.

Next Steps

MOP-35 (2023) & MOP-36 (2024)

encouraged use of 91/66.

ExCom to consider funding window for implementation (post-97).

FINANCING FOR COUNTRIES - MLF

Decision 91/66 Multilateral Fund (funds allocated)

Grant Size (US$)	Number of Countries	Total Funding (US$)
70,000 (<1 ODP-t)	3	210,000
80,000 (1–6 ODP-t)	7	560,000
90,000 (>6–100 ODP-t)	26	2,340,000
100,000 (>100 ODP-t)	7	700,000

Total funding approved through ExCom meetings 93 (Dec 2023) through 96 (Jul 2025) now stands at approximately US $3.81 million, covering 43 countries

COPA FINANCE 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

3. COUNTRY PRESENTATIONS – IMPLEMENTATION MODELS

Mexico

Ms. Teresa Zarate,

KIP Coordinator, National Ozone Unit

Dominican Republic

Ms. Bettina Schreck

International Expert, HEAT GmbH

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ODS and HFC LRM and destruction experiences and future activities in Mexico

Climate and Ozone Protection Alliance

2025 Año de La Mujer Indígena

September 11, 2025

Recent activities on F-gases recovery / disposal and EOL of RAC equipment

SPODS

- EOL Strategy*
- 4-Best Practices Guidelines*
- Circular Economy - Conceptual Model for Self-contained refrigerators*

KIP-CRRR COMPONENT

- CRRR Assessment
- Project **portfolio** (CRRR Strengthening**)**

**No actions implemented*

Waste of RAC equipment
(yearly generation)

- **3,550 t of refrigerant gases (mainly R-22 and HFC)**
- 189, 215 t of steel
- 53,600 t of plastics
- 19,650 t of aluminum
- **13,700 t of foams**
- 7,220 t of lubricating oils
- 1,500 t of electronic cards and electrical components

2025
Año de
La Mujer
Indígena

- **Recovery rate of the F-gases <2%**

CRRR network now

- 24 C&DC
- 7 RRRC

2025 Año de La Mujer Indígena

What is missing on CRRR and F-gases disposal/destruction?

- Account/characterize banks of HCFCs and HFCs (MLF)
- Strengthen the CRRR network (KIP)
- Increase F-gas recovery rates
- Establish extended/shared producer responsibility programs
- Work on the recovery of F gases from domestic RAC equipment
- Generate technology for the handling/recycling of foams
- Develop circular economy models in the RAC sector
- Reduce costs of destruction of F gases (contaminated, high GWP and remaining ODS)
- Pilot project for destruction of existing F-gases banks
- Be prepared to recover and destroy HCFC-22 (HPMP closure) (MLF)

Proposal: Study on ODS/HFC destruction

1. This project seeks to strengthen the network of destruction technologies, adding another company that has clinker kiln technology, that complies with the destruction test protocol required by current regulations, and that also has with increased ability to remove high GWP refrigerants as well as existing ODS banks.

2. Includes the preparation of a Demonstration Project for ODS/HFC Disposal
   - Detailed description of the destruction facility
   - Monitoring and measurement of emissions, emission values of the destruction technology
   - Develop an ODS/HFC destruction plan
   - **Determine destruction costs (including destruction protocol testing cost, capital cost, operational cost, etc.)**
   - Environmental mitigation benefits.

Proposal: Study on ODS/ HFC destruction Initial activities

1. **Review Mexican Regulations** required for ODS/HFC banks management.
2. Evaluate previous experiences and pilots on ODS destruction in the country, and report on the lessons learned.
3. Analysis and integrated activities with the MLF portfolio and relevant national initiatives, policies, regulations, and standards associated with RAC waste and ODS/HFC management.
4. Coordinate meetings with local authorities or other relevant stakeholders.
5. Detailed description of Refrigerant Recovery and recycling centers (CRRR) operating in Mexico and the national RAC waste managers chain.
6. Identify installed/viable technologies for ODS/HFC destruction in the Country.
7. Estimate actual cost ratio for ODS/HFC destruction by available technologies in the Country.

Legal Framework

Political Constitution of Mexico

International Treaties

Montreal Protocol

Kigali Amendment

Basel Convention

Legislation and Standards of General Application

- Ley General del Equilibrio Ecológico y Protección al Ambiente
- Ley General para la Prevención y Gestión Integral de los Residuos
- Ley General de Cambio Climático

Mexican Official Standards

Management Plans

Hazardous waste

Local Legislation

State and Municipal Legislation

Special waste and urban solids

National inventories of controlled substances banks, ODS/HFCs

Financing Window, National Inventory of SAOs/HFC Banks

Financing window of $90,000 to create national bank inventories and national plans.

Requested funds

Funding for implementation activities (January 2024 – December 2025)		
Activity	**Financing required* (US $)**	**Agency**
i) National inventory of ODS/HFCs and analysis of types of equipment using HFCs	70,000	ONUDI
ii) New information on SAO regulation	30,000	ONUDI
Total	**100,000 USD**	

**Funding levels[1] determined based on ODP tonnes of HCFCs (1,094.85 tPAO of Mexico)*

[1] **Decision 90/49 C document UNEP/OzL.Pro/ExCom/91/66**

Actores involucrados en el ciclo de vida de SAO-HFC

- Gas importers
- Equipment importers
- Customs
- Gas manufacturers
- Equipment manufacturers
- Distributors
- Marketers

- Users
- Local Installers and Assembly
- Maintenance service technicians
- Training and evaluation centers

- Obsolete team managers
- Collection and dismantling centers
- Uncontrolled scrap metal dealers
- RRR Centers
- Destruction Facilities

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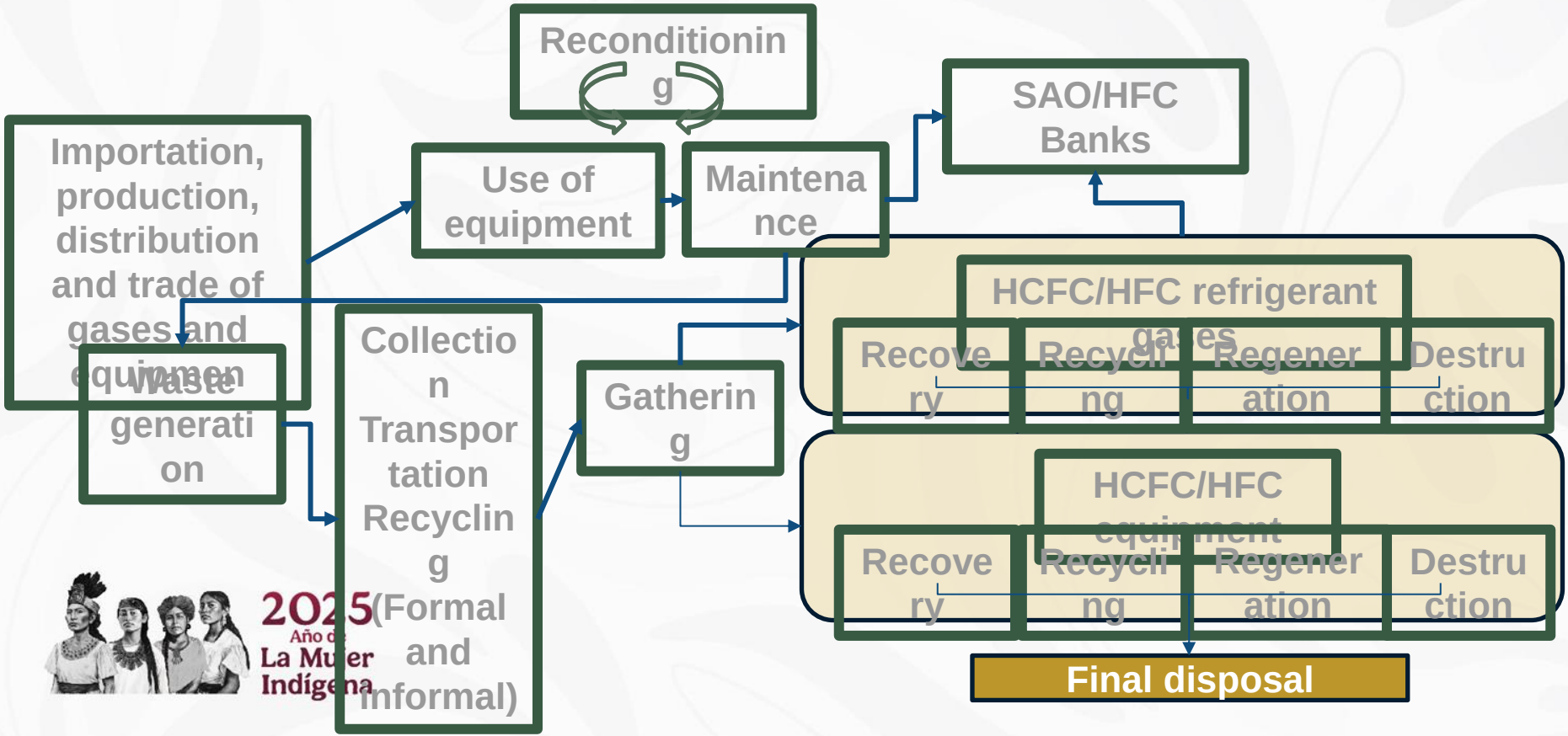
Life Cycle Refrigerant Management Methodology and Circular Economy



Estimated inventory and visits made to CRRR-CAYD

CRRR o CAyD	Estimated inventory (Kg)
CAyD CADEMEX, Oaxaca	0
CAyD DE RIOVERDE, SAN LUIS POTOSI	0
CAyD Ecoplus, Morelos	200
ECOSAVE MX, EdoMEx	40,000
Silver Breeze, Mexicali, Guadalajara, Monterrey	250,000
Refrighohar, Oaxaca	250
Equipos de Baja Eficiencia Energética, Celaya	0
SARE, Yucatán	87.5
Eco Tekna , La Paz BCS	70
RCH Recicladores, Los Mochis	200
EOS Repare	250
TOTAL	**Aprox. 300,000 kg or 300 tons**

CRRR and CAyD Location

- SISSAO (WEB)
- CAyD (FIDE)
- CAyD (ASI)
- RP SEMARNAT
- RME Estados

ODS/HFC destruction technologies installed in Mexico

Currently, there are two technologies available for the destruction of ODS/HFCs in Mexico (authorized and complying with national and international legal provisions)

Quimobásicos with 2 PDU units, Monterrey, México

Holcim México with cement kiln technology, Tecomán Colima

Registration of companies for the management of ODS as hazardous waste

Only two technologies have been authorized in Mexico for the final disposal of ODS

Argon Plasma Arc U

Clinker rotary kiln

Quimobásicos, S.A. de C.V.

Plasma Arc Destruction Unit

# Authorization	**19-VI-43-22** Extension
Validity	
Capacity	525.6 mt/yr

Trichlorofluoromethane (CFC-11); dichlorodifluoromethane (CFC-12); chlorotrifluoromethane (CFC-13); chlorodifluoromethane (HCFC-22); trifluoromethane (HCFC-23); difluoromethane (HFC-32); 1,1,2 trichlortrifluoroethane (CFC-113); 1,2 dichloro-1,1,2,2 tetrafluoroethane (CFC-114); chloro-1,1,2,2,2 pentafluoroethane (CFC-115); hexafluoroethane (HCF-116); 2,2 dichloro 1,1,1 trifluoroethane (HCFC-123); 2,3,3,3 tetrafluoro 1 propene (HFC-123yf);

Clinker rotatory kiln
Co-processing

Holcim Mexico Operaciones, S.A. de C.V. (before Cementos Apasco, S.A. de C.V.) (Planta Tecoman)

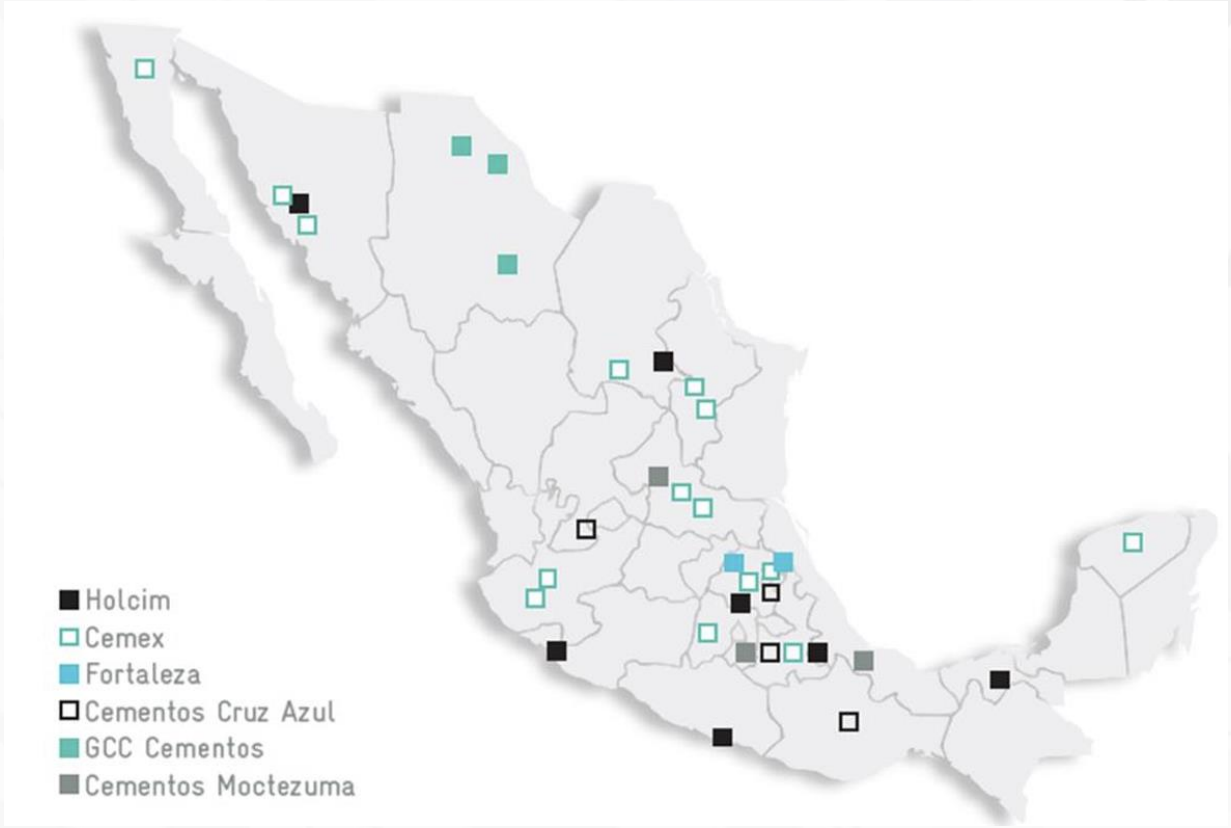
 # Authorization: 06-IV-01-19 (Extension)

Validity: 15.01.2019 – 15.01.2029

Alternative fuel substitution percentage: 80%
replacement in clinker oven 1
30% replacement in clinker oven 2

Energy recycling and co-processing of hazardous waste such as formulated or recovery fuels, hazardous waste such as chlorofluorocarbons, hydrochlorofluorocarbons and

Co-processing potential in Mexico



Source: CANACEM

Test protocol

To verify the efficiency of the system:

- Compliance with legal provisions*
- Analysis of the substances to be fed
- Control of operating conditions
- Determination of the level of destruction efficiency achieved by the combustion and emissions control systems.
- Continuous emissions monitoring systems: Particles, Nitrogen Oxides (Nox), Sulfur Oxides (Sox), Carbon Monoxide (CO), Total Hydrocarbons (HCT), Hydrochloric Acid (HCl)
- Test methods for other contaminants: dioxinas y furanos, metales pesados, entre otros
- Safe handling procedures for waste and byproducts.*

*** NOM-040-SEMARNAT-2002 Protección ambiental- Fabricación de cemento hidráulico – Niveles Máximos de Emisión a la atmósfera.; SEMARNAT, 2012. "*Guía técnica para la elaboración del protocolo de pruebas de incineración de residuos peligrosos, validación y presentación de resultados*"**

Linked actions

- Kigali Implementation Plan: Recovery, Recycling, Reclamation of HFCs (RRR)
- Preparation of national inventories of banks of controlled substances, ODS/HFCs

Refrigerant Life Cycle Management Workshop, October 13th, 2025

Linked actions

- **Regeneration**
  - **For maintenance service**
  - **For integration into new equipment**
- **Thermal destruction**
  - Plasma Arc
  - Cement Kiln
    - Rotary Kiln Incineration **(In the process of evaluating the destruction protocol)**
- **Plan of action**
  - **Public policies**
  - **Financial incentives**
  - **Labor inclusion of informal collectors**
  - **Extended producer responsibility**
  - **Expansion of CRRR and CAyD capacities**
  - **Traceability of equipment and refrigerants**
  - **Observation of large users**
  - **Coordination with energy efficiency initiatives**

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Thank you!

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3. COUNTRY PRESENTATIONS – IMPLEMENTATION MODELS

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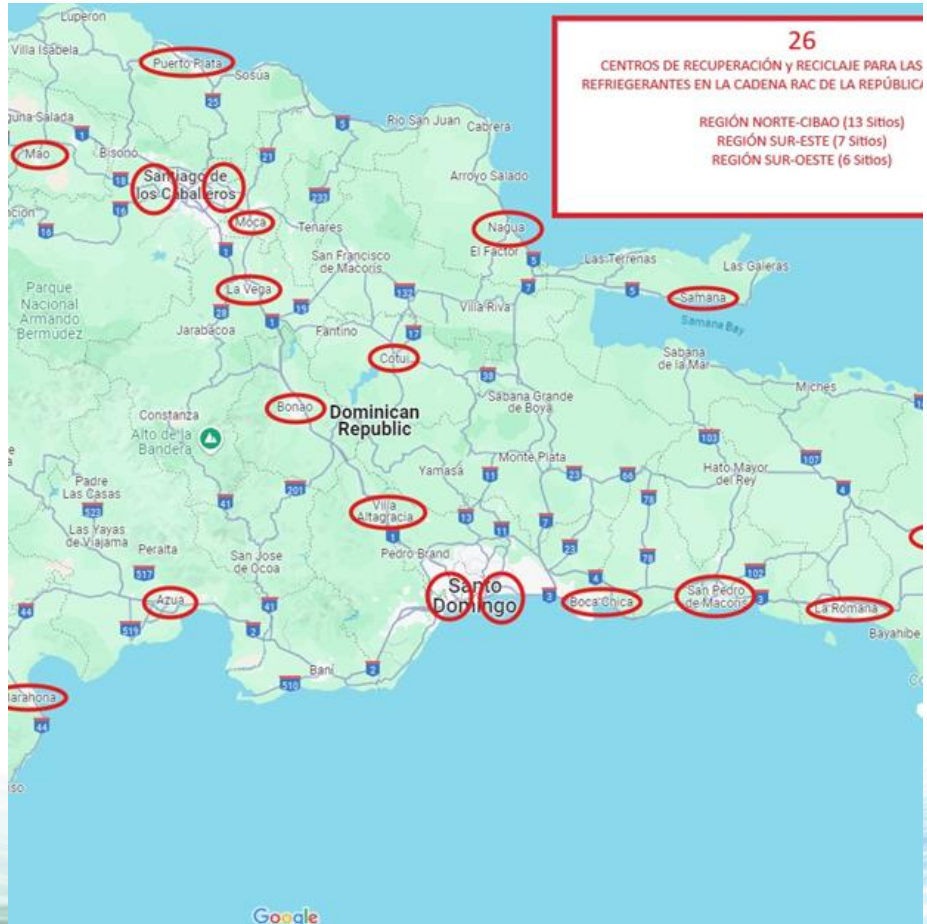
International Expert, HEAT GmbH

COUNTRY CONTEXT

- Growing RAC (Refrigeration & Air Conditioning) sector with 5,000 mostly informal technicians vs. only 1,050 licensed.
- Weak enforcement: 100% of surveyed stakeholders unaware of legal framework for handling used refrigerants.
- Recovery equipment widely available (70% of technicians have machines, 93% in good condition).
- Strong preference for regeneration (63%) over destruction as final treatment.
- Gaps: limited infrastructure, no national treatment centre, insufficient financing mechanisms

SCOPE OF THE STUDY

- Feasibility study for a national refrigerant collection system.
- Surveys: 208 stakeholders (27 importers, 16 collection centres, 165 technicians) across main regions.
- Mapped the current RAC chain (importers, collection centres, technicians, users)
- Identified barriers: regulatory gaps, weak infrastructure, financing challenges, low technical training.D



RESULTS

Designed a system:

- National Treatment & Collection Centre (NTCC) via public–private partnership.
- Network of 26 regional recovery & recycling centres.
- Clear roles/responsibilities (importers, technicians, PRONAOZ, Environment Ministry).
- Action plan with 3 horizons: Short-term (frameworks), Medium-term (agreements, training), Long-term (dialogue, financing)
- Proposed financing mechanisms: import fees, sales contributions, incentives for recovery

Corto Plazo
6 meses - 1 año

MMARN - Gobierno
Diseño, elaboración e implementación de Marcos habilitantes para la recuperación de sustancias

PRONAOZ
Diseñar e implementar un organigrama que contenga las funciones y responsabilidades

Asociaciones
Diseño e implementación de medidas funcionales para centros de recuperación y reciclaje

Medio Plazo
1-2 años

MMARN - Gobierno
Diseñar y establecer acuerdos institucionales entre sector público y asociaciones privadas

PRONAOZ
Sistema de certificación para técnicos en gestión del ciclo de vida de refrigerantes

Agencias Implementadoras
Estudios sobre mecanismos de financiación para gestión del ciclo de vida

Todos los sectores
Promover acciones de capacitación y sensibilización

Largo Plazo
3-5 años

MMARN - Gobierno
Procesos de diálogos con actores de la cadena RAC y consumidor final

PRONAOZ
Mejora continua en políticas públicas y gestión del ciclo de vida de refrigerantes

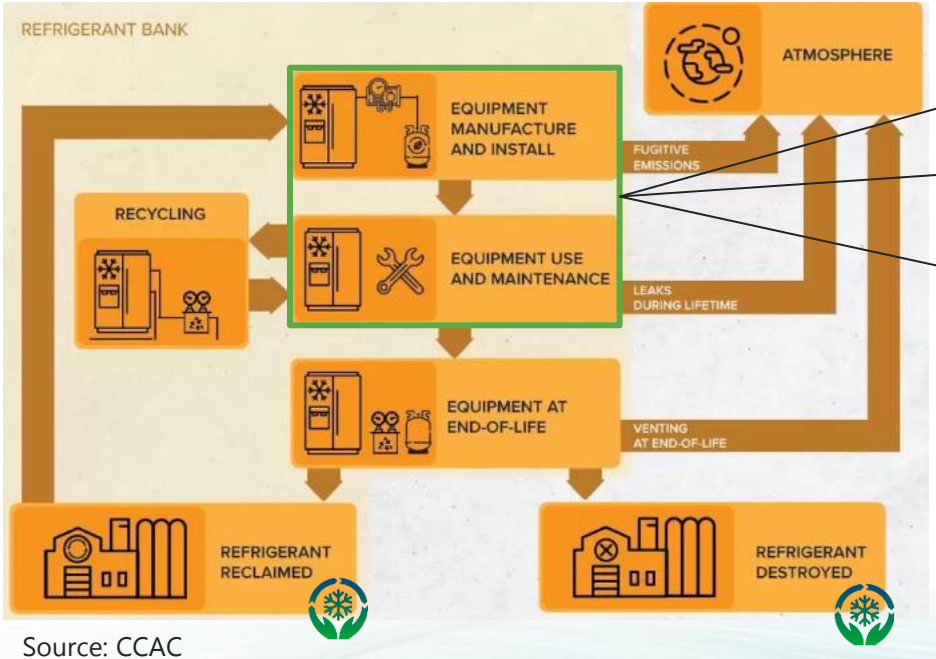
Asociaciones
Procesos de diálogos con actores de la cadena RAC y consumidor final

COUNTRY CONTEXT

- RRR centre established & operating (2024): The facility is operational and serving technicians and service companies.
- Techno-economic assessment completed:

  Before commissioning, the team carried out a techno-economic assessment to test financial viability under realistic collection volumes and to inform the service-fee structure, logistics (cylinders/transport), and QA/SOPs for processing recovered refrigerant.
- Early operations are working effectively: The centre is receiving recovered refrigerant, applying standard procedures for acceptance, basic testing/processing, and safe storage, with growing engagement from technicians and companies.

4. COPA IMPLEMENTATION PLANS 2025 AND NEXT STEPS FOR THE IMPLEMENTATION MODELS WG



Source: CCAC

Potential areas for implementation models:

Additional focus on *industry shift*: Demo projects on natural refrigerants like c02, propane and ammonia.

Strengthening & enabling end-users: Inventory, record keeping, leak and emissions management, with integrated digital tools. (baseline dev & KPIs)

Education & Training : Equip institutions of learning and accreditation to produce competent techs in recycling/recovery.

COPA SC focus: a member-driven alliance (2025/2026)

A gap analyses on LRM (efficacy analyses).

A pictorial nodal map of TWGs (efficiency analyses).

GET IN TOUCH

- **Website:** www.copalliance.org/
- **Email:** contact@copalliance.org

SCAN ME

COPA
Cutting refrigerant emissions

Thank you!