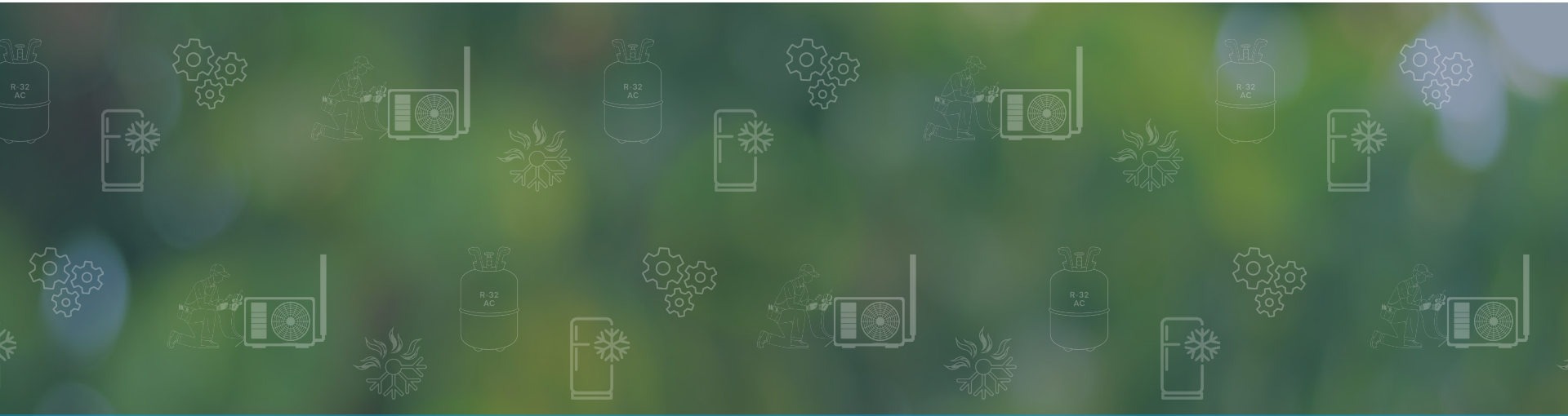
UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION
Progress by innovation

60 YEARS

MOP38
2-6 NOVEMBER 2026 | KIGALI, RWANDA



From inventories to action: UNIDO's support for country-specific lifecycle refrigerant management

Findings from the inventories of banks of used or unwanted controlled substances and the national action plans under MLF decision 91/66

Refrigerant banks: emissions risk and servicing supply

As phase-down steps tighten, refrigerant already in equipment matters for servicing and for emissions

ILLUSTRATIVE NATIONAL INVENTORY

19.19 Mt

CO_2-eq in the 2025 installed bank

Example country: 9,541.7 tonnes of controlled substances in RAC equipment and closed-cell foam.

A potential climate impact, not a forecast of emissions.

What the bank contains (Mt CO_2-eq)



Tonnes: HFCs 6,894.8 · HCFCs 804.8 · HCFC-141b in foam 1,842.1

Avoid emissions

Each tonne recovered and reclaimed, reused or destroyed avoids release. The benefit depends on substance, residual charge, recovery efficiency and treatment.

Supply the servicing tail

As quotas tighten and prices rise, recovered and reclaimed refrigerant helps meet servicing demand and reduces the need for virgin gas.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Progress by innovation

60 YEARS

MOP38
2-6 NOVEMBER 2026 | KIGALI, RWANDA

How UNIDO supports countries in RRR

Under decision 91/66, UNIDO supports **42 countries** in preparing their inventories and action plans.

A five-step approach

1 Bank and waste inventory

Installed bank, EoL flows and accessible quantities

Result: estimates by substance and subsector

2 System assessment

Legal framework, RRR infrastructure, stakeholders

Result: gap analysis

3 Consultation

NOU, end-users, RAC technicians, WEEE operators

Result: agreed priorities and roles

4 Action plan

Components, phasing, budget and business model

Result: a costed, phased plan

5 Validation

National endorsement and funding request

Result: an endorsed plan

Strategic interventions

National ODS and HFC inventories

- Data collection
- Action plans tailored to each country
- Viable, sustainable LRM systems

Enabling regulatory framework

- Recommendations to improve regulations
- Local adaptation of standards and certification
- Support to the NOU on enforcement

Capacity building and awareness

- Technician training
- Awareness campaigns
- Work with technician associations and vocational institutes

Technology transfer

- Business models
- Tools and equipment
- Testing laboratories
- RRR networks and recovery incentives

A common UNIDO toolkit

Methodological manual · sector questionnaires · Excel templates with validation rules · sampling

The goal: a sustainable national LRM system, not a one-off destruction campaign

WHAT THE INVENTORIES SHOW

Large installed banks, low accessibility

Installed bank
Refrigerant in RAC equipment in use: the upper limit, not a target

Servicing
During repair and maintenance, mainly at large end-users

End of life (EoL)
Residual charge in equipment retired each year

Recovered today
Only a small share of both

The action plans aim to close this gap, step by step.

HCFC-22: a declining bank
It shrinks as old equipment is decommissioned. Recover it while flows remain.

HFC banks are growing
New HFC and HFC/HFO blends, often A2L, need identification and segregation.

Foam blowing agents
CFC-11 and HCFC-141b in old PU insulation. Recovery units can't reach them.

Air-conditioning dominates
Commercial, residential and mobile AC hold most of the CO_2-eq bank.

Banks are modelled
Refrigerant type and charge are not declared at import, so estimates need updating.

RAC SUBSECTORS

Four subsectors, four different needs

Subsector	Equipment	Main substances	Main emission point	LRM need
Commercial and industrial	Supermarkets, cold stores, chillers, commercial AC	HCFC-22, R-404A, R-410A, R-134a	Leaks during operation and servicing	Leak inspections, recovery plans, service contracts
Domestic and small commercial	Domestic refrigerators, plug-in units, residential AC	R-134a, R-600a, HCFC-22, R-410A	At end of life (decommissioning)	Recovery before dismantling, via WEEE take-back
Mobile AC (MAC)	Cars, buses, trucks	HFC-134a	During servicing in informal workshops	Recovery and recycling units, training for workshops
Foam blowing agents	PU insulation in refrigerators and panels	CFC-11, HCFC-141b, HFC-245fa	At end of life, during dismantling	Controlled dismantling, foam extraction or co-processing

Large end-users: the easiest start

Few sites, large charges: recovery can be planned

Dispersed sources: the hardest to reach

Many units, small charges: need collection networks

Key gaps to scaling LRM

10

shared gaps in the refrigerant chain

The main gap is not equipment. It is a regulated, traceable and financed flow of refrigerant.

A. ENABLING ENVIRONMENT

Data & inventories
Refrigerant type and charge not declared at import; banks are modelled

Policy and regulations
No mandatory recovery; WEEE and waste rules ignore refrigerants

Traceability
Recovered quantities can't be reconciled with banks

Financing
Services rely on projects; recovery is a net cost

Technical capacity
Leaks go unchecked; too few certified technicians, units and cylinders

B. IMPLEMENTATION CAPACITY

Recovery rates
Only a small share of refrigerant is recovered at servicing or end of life

RRR infrastructure
Low throughput, mostly in major cities

Reclamation & destruction facilities
Few facilities; stockpiling or export

Informal sector challenges
Scrap dealers vent refrigerant to recover metals

Foam management
No proven route to capture blowing agents

What the action plans have in common

Traceability and shared infrastructure

RRR centres · transport · destruction · tracking system

Large end-users

Registers, leak inspections, recovery plans

Dispersed sources and MAC

Collection points, WEEE take-back, workshop tools

Foam blowing agents

Controlled dismantling, trials, proven route

Regulatory framework first

Mandatory recovery · venting ban · registers · transfer manifest · technician certification · inspections

Phased approach

Regulation, then pilots, then permanent services

Build on HPMP and KIP

Use RRR centres, tools and training already funded

Waste hierarchy

Recycle or reclaim first; destroy only what can't be reused

Evidence-based targets

Validate the baseline and real costs first

From recovery to reuse or destruction

Recovery

Labelled recovery cylinders; venting ban

RAC technicians, service workshops

→

Collection

Collection points, then consolidation centres

Municipalities, WEEE operators

→

Transport

Dangerous-goods rules; every movement recorded

Licensed carriers

→

Treatment

Analyse purity; recycle, reclaim or destroy

RRR centres, destruction facilities

→

Reuse

Reclaimed refrigerant back into servicing

RAC service companies, end-users

Traceability of every batch

Cylinder labels · transfer manifest · mass balance · independent verification

Foam blowing agents: separate track

Controlled dismantling, mechanical extraction or cement-kiln co-processing

Three-tier network: collection points → consolidation centres → national reclamation centre

Financing LRM beyond the project

Regulated model

EPR fees, import levies or tax measures. Clear results, but needs enforcement.

Market-based model

Refrigerant prices and carbon credits (voluntary, Article 6, JCM). Flexible, but less certain.

MLF funding window

Decision 91/66 funds inventories and plans only. Funding might be considered.

FINANCING TOOLS THE PLANS COMBINE

Results-based payment

Paid per kg recovered, weighed and verified

Phased-out out support support

MLF funds start-up; tariffs take over

EPR and service service fees

Producers and end-users fund collection

Reclaimed refrigerant sales

Revenue from certified refrigerant offsets costs

Public budget

Registers, inspection and enforcement

What differs from country to country

RRR infrastructure

From a full RRR and destruction network to none

Build new, or connect what exists

Inventory method

Equipment-based model, WEEE-stream model, or surveys

Shapes how targets are set

Financing approach

Results-based, phased-out support, EPR, or still open

Sets the exit from MLF funding

Legal framework

Ozone, waste, WEEE and EPR rules to build on

Decides how fast rules can change

Geography

Country size, location of end-users, distances

Sets the collection tiers needed

Destruction options

Domestic destruction, cement kilns, or export

Sets the cost of final disposal

UNIDO's role

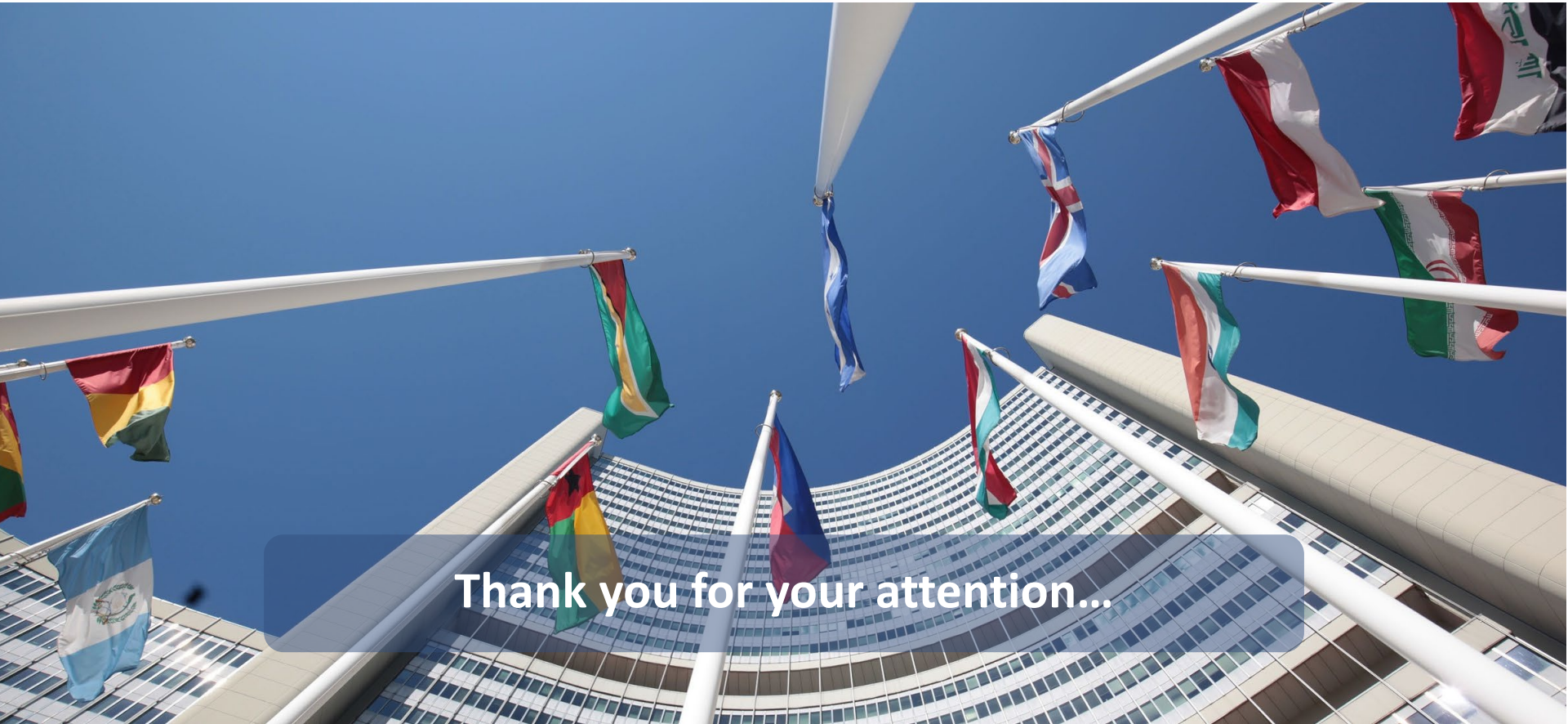
Technical assistance, business-model design, procurement, and alignment with HPMP and KIP, so each LRM system is country-tailored.

Key lessons and next steps

1. **Plan on the accessible bank**
   Size the plan on EoL flows, not the installed bank. Validate the baseline first.
2. **Regulation first**
   Mandatory recovery, registers and a transfer manifest make refrigerant flow.
3. **Differentiate by subsector**
   Leak management for large end-users; WEEE-linked collection for dispersed sources.
4. **Treat foam blowing agents separately**
   They need their own dismantling, treatment route and accounting.
5. **Design the exit early**
   EPR fees, service contracts and reclaimed refrigerant sales should replace MLF funding.

Next steps

- Help countries finalise and endorse their plans
- Prepare funding requests to the MLF
- Launch pilots with large end-users
- Keep inventories updated
- Explore regional reclamation and destruction centres
- Share lessons with Article 5 countries



Thank you for your attention…