Republic of Rwanda

MOP38
2-6 NOVEMBER 2026 | KIGALI, RWANDA

THE KIGALI AMENDMENT 2016–2026

UN environment programme
ozone secretariat

Vienna Convention
MONTREAL PROTOCOL

BUILDING THE INCLUSIVE COOLING WORKFORCE OF TOMORROW

THURSDAY
5 NOVEMBER 2026

13:00-15:00

MH2-A



Cool Up
Upscaling Sustainable Cooling

Building the Inclusive Cooling Workforce of Tomorrow



5 November 2026

Agenda

5 min	**Guidehouse**	Opening remarks
30 min	**UNDP Türkiye, Öko-Recherche, RSS, LCEC, ICU, IIF/IIR**	Spotlight Perspectives from the Field
40 min	**Öko-Recherche**	Moderated Panel Discussion
10 min	**Öko-Recherche**	Audience Q&A
5 min	**Guidehouse**	Key Takeaways and Closing Remarks

Opening Remarks

Cool Up Programme

Dr. Andreas Hermelink, Guidehouse

Spotlight Perspectives from the Field

Moderated by Cool Up Programme

Eslam Mohamed Mahdy, Guidehouse

Panelists

Zeynep Gökcen Asan

Barbara Gschrey

Öko-Recherche

Antoun Darakijan

الجَمعيّة العِلميّة المَلكيّة
Royal Scientific Society

Mohamed Hijazi

LCEC
LEBANESE CENTER FOR ENERGY CONSERVATION
المركز اللبناني لحفظ الطاقة

Dr Maurizio Casarci

CLIMATE & CLEAN AIR COALITION

Souhir Al-Hammami

IIR

National experience from Türkiye: Strengthening training systems & curriculum development

Cool Up Programme

Zeynep Gökcen Asan, UNDP Türkiye

Cool Up

Upscaling Sustainable Cooling

Building the Inclusive Cooling Workforce of Tomorrow

National experiences in Türkiye: strengthening training systems and curriculum development

MOP38 side event · UNDP Türkiye · Cool Up Programme



Skills are the first link in the cooling transition

Context: Türkiye's cooling demand is growing, and technicians decide how equipment is installed and serviced

~2×

air conditioners in Türkiye: 10.8 M (2020) to about 20 M by 2050

80%

HFC consumption phase-down by 2045 under Kigali; consumption frozen since 2024

~80%

of refrigerant escapes during servicing and dismantling; only ~20% is recovered

+1.2°C

national average temperature in 2025, versus the 1991–2020 average

The skills gap

- Technicians with decades of experience often meet natural refrigerants for the first time
- Many manufacturers and service staff are not yet aware of the phase-down calendar
- CO_2 (R744) and propane (R290) bring new safety needs: high pressure and flammability

Our entry point: Cool Up

- Scaling Up Sustainable Cooling, funded by Germany's IKI; active in Türkiye, Egypt, Jordan and Lebanon
- UNDP Türkiye leads delivery in Türkiye, working with associations, industry and public institutions
- Training is designed around real on-the-ground needs of the sector

A three-step pathway: trainers, technicians, national programme

How training capacity was built in Türkiye

1 Train the trainers

- 5-day regional ToT in Istanbul (June 2023), with SOSIAD
- 15 trainers, 5 from Türkiye; hands-on with CO_2 (R744) and flammable natural refrigerants
- Certified by exam; supported to join Real Alternatives 4 Life (RA4L) in Poland

2 Reach technicians

- One-day hands-on courses led by the certified trainers
- Safe handling, energy efficiency and regulatory compliance
- Run in several regions of Türkiye; 9 technical trainings to date

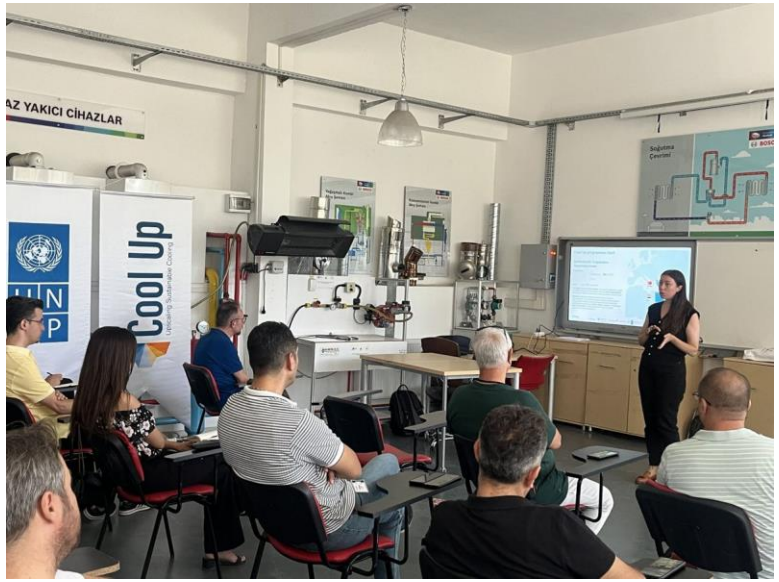
3 National certification

- Main goal: a national certificate programme for refrigeration and air-conditioning (RAC) technicians
- Next: sector-wide roll-out, identify training gaps, set up a training centre

Multiplier effect: internationally certified Turkish trainers pass knowledge on to technicians and students in the field

Hands-on training in the field

One-day courses on natural refrigerants, delivered since 2023







~170

technicians and field staff reached in the first seven sessions (2023–24); 9 trainings to date

Where we train

At manufacturers' plants

Real hands-on experience in facilities that produce with natural refrigerants and run their own R&D units

In vocational school laboratories

Training in the labs of refrigeration and air-conditioning vocational high schools, where students and technicians practise

Curriculum development: a new course in three universities

A working group is adapting the new course; adoption differs by institution

Düzce University

Public · Vocational school

Spring 2027

Compulsory course

Starts from the Spring 2027 semester

Istanbul Kültür University

Private · Vocational school

Fall 2027

Elective course

Offered from the Fall 2027 semester

Istanbul Cerrahpaşa University

Public

To be decided

Decision pending

Awaiting the university's feedback

Why it matters: a course inside university vocational programmes keeps the skills pipeline running after project training ends

Beyond technicians: building capacity across the system

A skilled workforce also needs informed regulators, lenders and a shared national plan

Policymakers and local authorities

- Provincial directorates of the environment ministry trained on climate policy, f-gas rules, ETS and sustainable cooling (Antalya, 2025)
- Türkiye-specific technical reports shared with all stakeholders

Finance sector

- Training with Frankfurt School and the Directorate of Climate Change: 31 participants from 7 leading banks (2025)
- NCAP action K5 plans bank training on cooling technology and climate risk (2026–29)

National Cooling Action Plan

- Built over three years with 30+ institutions and 110 active participants
- 11 strategic areas, 2026–2040; capacity building is a cross-cutting theme

Inclusion by design: the NCAP treats capacity building, awareness and the participation of women and youth as cross-cutting themes in every area

Key takeaways for training systems and curricula

Lessons from Türkiye

1. **Train the trainers first**
   Certified trainers multiply reach and keep know-how in the country.

2. **Make content hands-on and safety-first**
   Practice with CO_2 and flammable refrigerants builds confidence in new technology.

3. **Co-design with the sector**
   Associations, industry and public bodies shape content around real field needs.

4. **Embed the course in university curricula**
   Compulsory or elective courses in vocational programmes outlast project training.

5. **Link training to policy and finance**
   Align skills with the national plan and equip banks and regulators too.

6. **Move from courses to certification**
   Aim for a national RAC technician programme and training centre that is open to women and youth.

Skills development for climate-friendly refrigerants and evolving regulations

Cool Up Programme

Barbara Gschrey, Öko-Recherche

Why is additional training needed?

- Reducing of leakage and enhancing recovery
- Transition to ODS and HFC alternatives:

Specific properties of ODS and HFC alternatives	Ammonia	HCs	CO_2	HFOs	HFC-32/ HFC-HFO blends
Flammability	✓	✓		✓	✓
Toxicity	✓				
High pressure			✓		

- Extra training required for:
  - Technicians for installation, maintenance, repair and decommissioning of various system
  - Planners for system design and integration with other building technologies and renewable energy

Reducing leakage rates

- Leakage rates could be on average between 22 to 44% annually. (EXCOM document 7242)

Subsector	Estimated annual emission rates in HPMPs		
	Average (%)	Lowest value (%)	Highest value (%)
Residential air-conditioning	29	4	79
Commercial air-conditioning	40	3	70
Industrial air-conditioning	40	8	54
Transport	23	8	40
Chillers	22	14	30
Commercial refrigeration	38	2	82
Industrial refrigeration	44	7	100

Source: A sample of 38 approved HPMPs in which this data is available. The data corresponds to estimations made by each country and the methods may differ between countries.

- Training of technicians significantly decreases leakage and allows for recovery as EU experience shows

EU legislation on training and certification of technicians

- **General requirement for trainings and certification:** EU F-gas Regulation 2024/573 **(but also in earlier versions from 2006 onwards)**
- **Sector-specific minimum requirements** are detailed in Implementing Regulations
  - Commission Implementing Decision (EU) 2024/2215: Updates minimum requirements for certification in **refrigeration, air conditioning, and heat pumps** (member states have a 1-year implementation window).
  - Commission Implementing Regulation (EU) 2025/1893 & (EU) 2025/1907: Cover training attestations for **mobile equipment** and notification formats for national training programs.
  - Commission Implementing Regulation (EU) 2025/623, (EU) 2025/625, & (EU) 2025/627: Personnel certification rules on **recovery of F-gas-based solvents**, **fire protection equipment**, and **stationary electrical switchgear** (applicable from April 20, 2025).
- **Training requirements not only on F-gases but also focus on alternatives**
- **Mutual recognition of certificates by all EU Member States (regional certification scheme)**

EU legislation on training and certification of technicians

Focus on RACHP

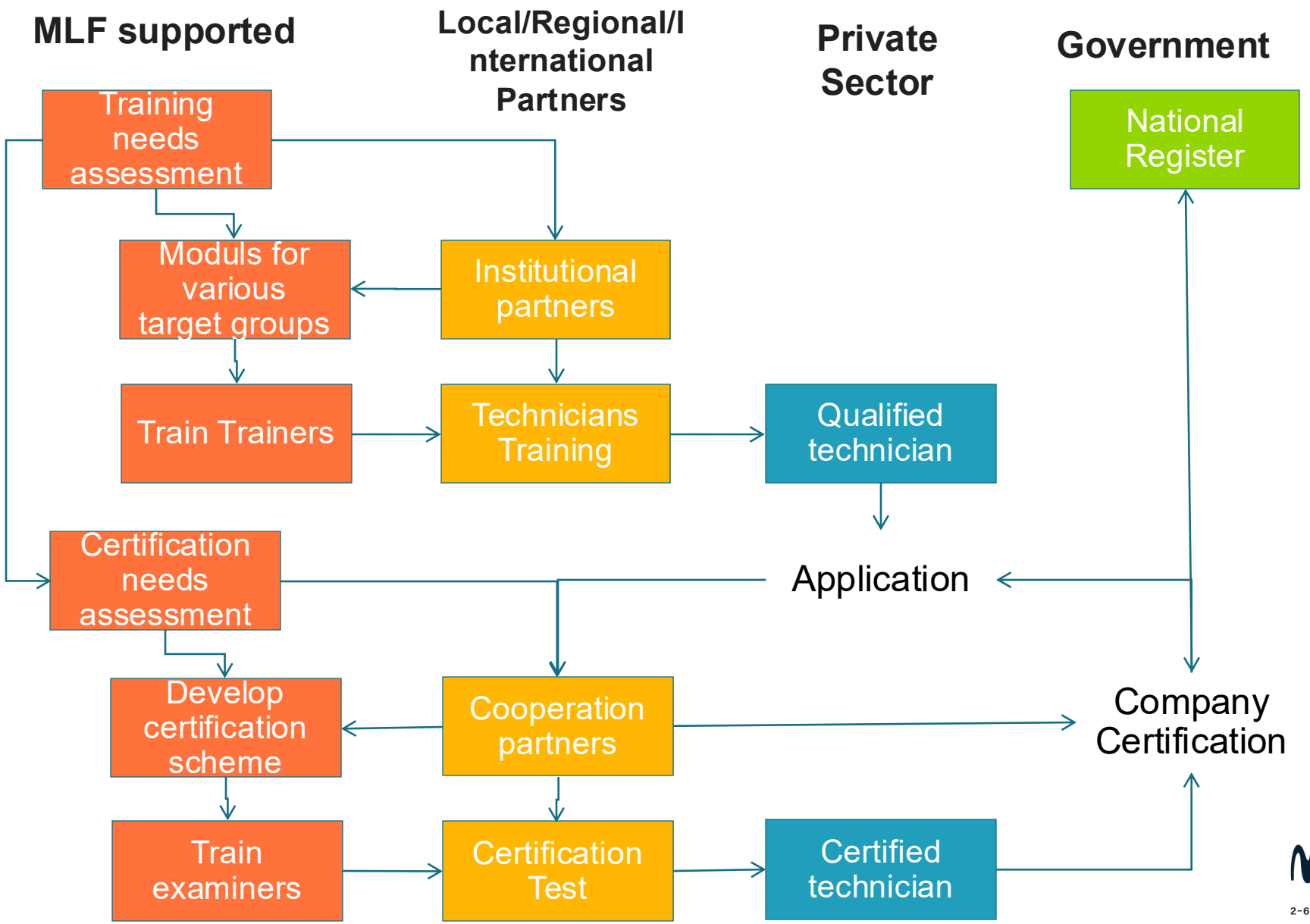
Updated implementing decision on RACHP (2024/2215)

- In scope: stationary refrigeration, stationary air conditioning and heat pump equipment, stationary organic Rankine cycles, refrigeration units of refrigerated trucks and refrigerated trailers, refrigeration units of refrigerated light-duty vehicles, intermodal containers and train wagons.
- Certification of natural and legal persons
- Examination includes both theoretical knowledge and practical skills
- Refresher trainings needed for certificate holders to update skills and knowledge
- Specific requirements concerning F-gases, hydrocarbons, CO2 (R744) and NH3 (R517)

Updated implementing Regulation on F-gas containing mobile equipment (2025/1893)

- In scope: air-conditioning equipment and heat pumps in heavy duty vehicles, vans, non-road mobile machinery used in agriculture, mining and construction operations, trains, metros and trams containing fluorinated greenhouse gases or the alternative substances hydrocarbons or carbon dioxide (CO2)
- Leak checks and recovery
- Training attestations for natural persons
- Examination includes both theoretical knowledge and practical skills

Steps and processes from training to certification



Approach to enhancing national training and certification

Identify and assess relevant existing national standards and legislation

Assess the training material already available

Assess existing initiatives and level of training through national educational bodies and private sector

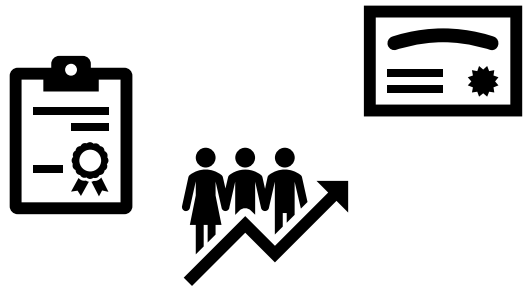
Assess needs for certified training and develop strategies to fill in training gaps

Develop training and certification schemes and respective curricula

Build institutional support through national bodies and private sector, integrate with existing networks

Identify complementary regional or international certification options

Design training in view of requirements of legislation, standards and certification



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National experience from Jordan: Natural Refrigerants Training Lab



Cool Up programme

Antoun Darakjian, Royal Scientific Society

INSIDE THE LAB

Natural Refrigerants Training Lab

RSS campus, Amman · co-funded by Cool Up & RSS

1. **R290 split ACs**
   Install, charge and service with real refrigerant

2. **R600a fridges & freezers**
   The units found in people's homes

3. **Recovery & leak detection**
   No gas released, including high-GWP from old systems

4. **CO_2 cylinders**
   Safe handling of high-pressure refrigerant

First of its kind in Jordan

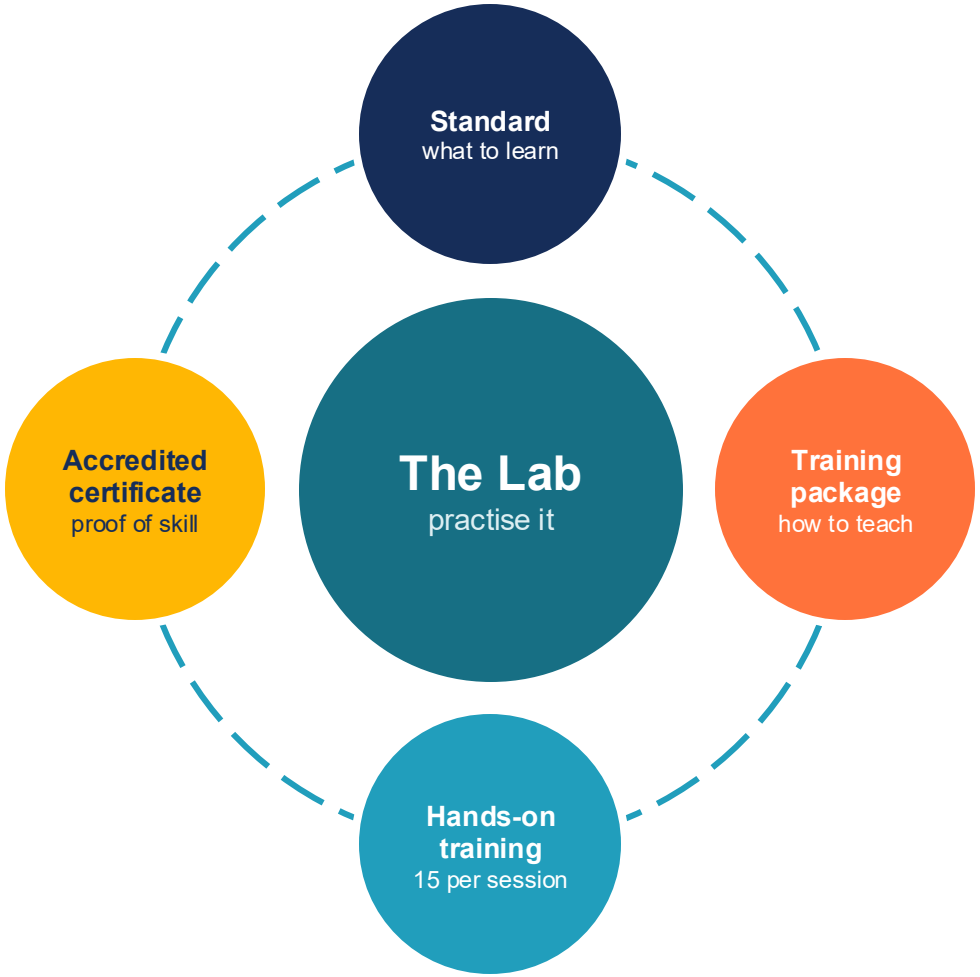
15 trainees per session

Opened Dec 2025 · official Aug 2026



A complete skills ecosystem

Equipment without a standard is just equipment



National occupational standard
Residential AC & Refrigeration Systems Mechanic – Skilled Level

Training package
Modules · practical tests · trainer guide

Accredited certification
Certificates accredited by Jordan's Accreditation and Quality Assurance Commission

Developed under Cool Up
Approved August 2026

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Impact so far

Under the Cool Up programme

7
training sessions

150+
trainees

15
trainees per session

Who we trained

- Technicians
- Vocational trainers
- Company staff
- ToT trainees

From training to the market

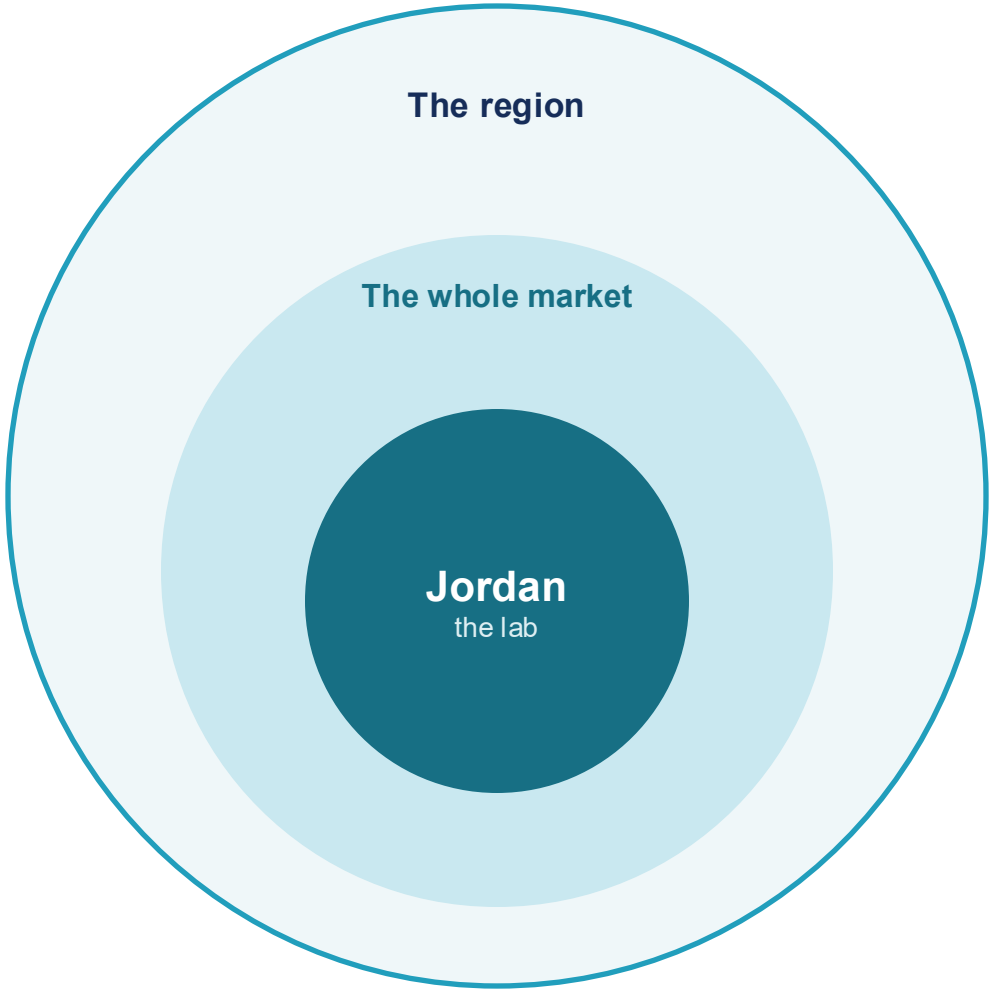
After we trained their staff, a local company started supplying R290 heat pumps to the market.

Training that changes what the market actually does.



From a national lab to a regional resource

What comes next



1

In Jordan

Move from training individuals to preparing the whole market: continued training and awareness, so the shift to natural refrigerants happens safely and at scale.

2

Across the region

Many countries face the same transition at the same time. The lab can serve as a shared resource for trainer capacity and practical skills.

RSS is ready to contribute, together with our partners.

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National experience from Lebanon: Inclusive workforce participation and entrepreneurship initiatives

Cool Up programme

Mohamed Hijazi, Lebanese Center for Energy Conservation

Capacity Building Activities in Lebanon

Technical Trainings

- Engineers
- Technicians
- Managers

Financial Training

- Banking Sector
- Financial Institutes

Policy Training

- Policy Stakeholders

Technical Trainings

Theoretical and Practical

- **Efficient Cooling Systems Training**

  Delivered by experts from RCREEE, the training aimed to enhance participants' knowledge and skills in energy management, heating and cooling systems, and energy efficient cooling



- **R290 Safety**

  The training focused on the safe handling and application of R-290 (propane), a natural refrigerant featuring a very low global warming potential.



Financial Trainings

For Banking Sector and MFIs

- **Financial Training for the Banking Sector**

  Delivered by financial experts from Frankfurt School of finance and Management. The training focused on financing sustainable cooling in Lebanon, which attracted the Finance Stakeholders leading to an open discussion in the end.



- **Financial Training for MFIs**

  Participants explored the vital role of low-GWP refrigerants in meeting national climate goals. A core focus was placed on the **Business Opportunity for MFIs**, demonstrating how financing sustainable cooling reduces borrower default risk through significant energy savings



Policy Training

For Policy Stakeholders

- The Policy training covered:
  - An overview on the Lebanese Cooling Sector
  - An overview on the Prospect Study Report
  - An overview on the updated National Cooling Action Plan
  - And a discussion between the Stakeholders



National experience from Rwanda: Strengthening capacity for sustainable cooling and refrigeration



Climate and Clean Air Coalition

Dr. Maurizio Casarci, Institute for University Cooperation (ICU)

maurizio.casarci@icu.it

The problem to solve

Why Rwanda needed more than a change of refrigerants

Technical skills

Safe handling of low-GWP and flammable refrigerants requires practical competencies.

Training capacity

Local laboratories lacked sufficient equipment for hands-on learning.

National systems

Mandatory RAC certification was not yet fully operational; legacy equipment still needs safe servicing and end-of-life management.



What we did

Practical training supported by institutions and industry

Engaged stakeholders

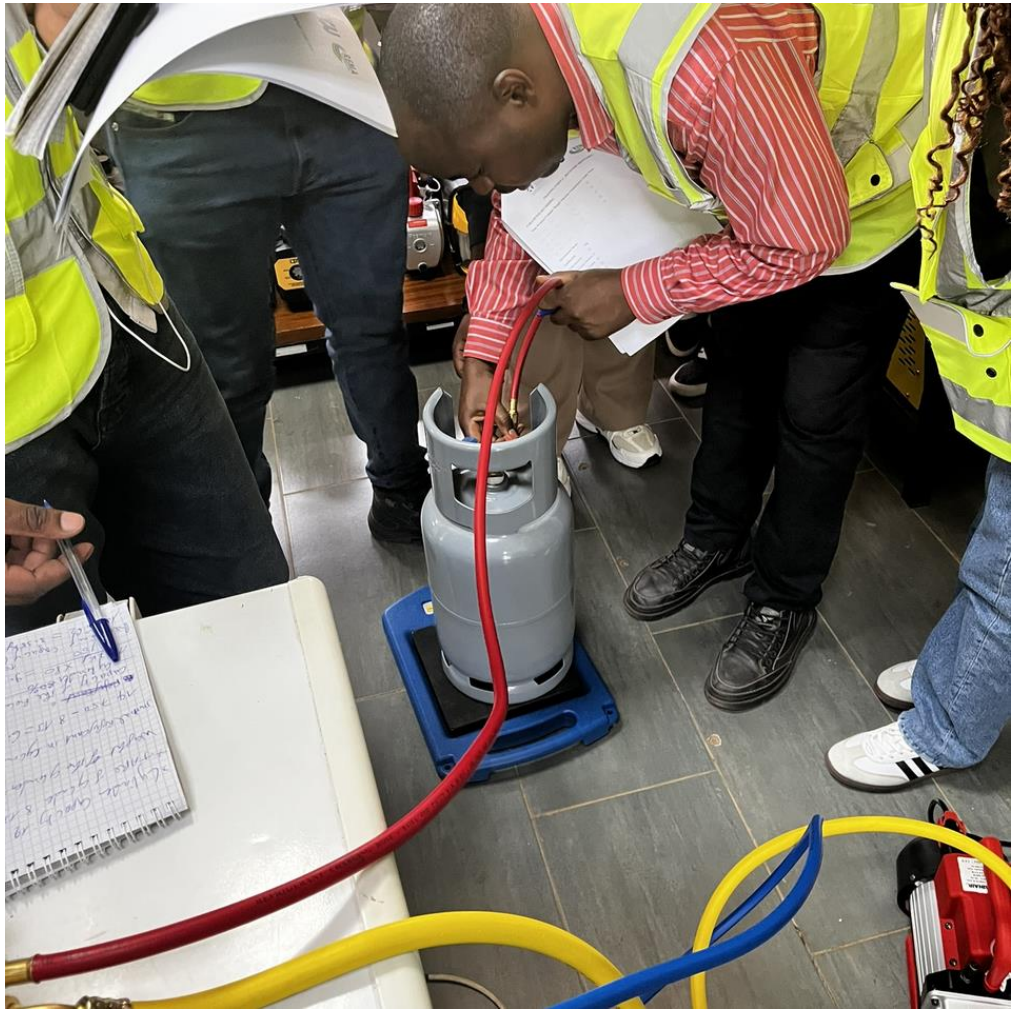
Four workshops with REMA, public institutions and private cooling companies.

Equipped and trained

Procured practical equipment; delivered theory and hands-on exercises on refrigerators, freezers and air conditioners.

Built a pathway

Produced a refrigerant guidebook and a competency-based certification roadmap for REMA.



Results achieved

Documented outcomes of the CCAC-funded project

16 companies

Private companies in the refrigeration sector participated in the project's activities with their own technicians, completing the training program and the pilot project dedicated to them.

Tools for continuity

Four workshops, a technical guidebook and a proposed certification framework. National mandatory certification remains a next step.



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Proposed follow-up

From a successful pilot to lasting national capacity

2027 | Certification

Support national adoption of practical, competency-based RAC certification and recurrent upskilling.

2027–2028 | Inclusion

Expand accessible industry-linked training and career pathways for women and young professionals.

2027–2030 | Circular recovery system

Decentralised collection centres + tracking app(QR-coded cylinders, gas type and mass) + central hub for testing, purification and compliant reuse of reclaimed refrigerants.



Women in cooling & leadership pathways

Insitut International du Froid (IIF) |
International Institute of Refrigeration (IIR)

Souhir Al-Hammami, IIF/IIR

Women in North America in the Refrigeration, Air Conditioning, and Heat Pump Industry

Souhir Al-Hammami
Director of Scientific and Technical Information

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Learning objectives

- Explain the Educational Pathways to Careers in the RACHP Industry.

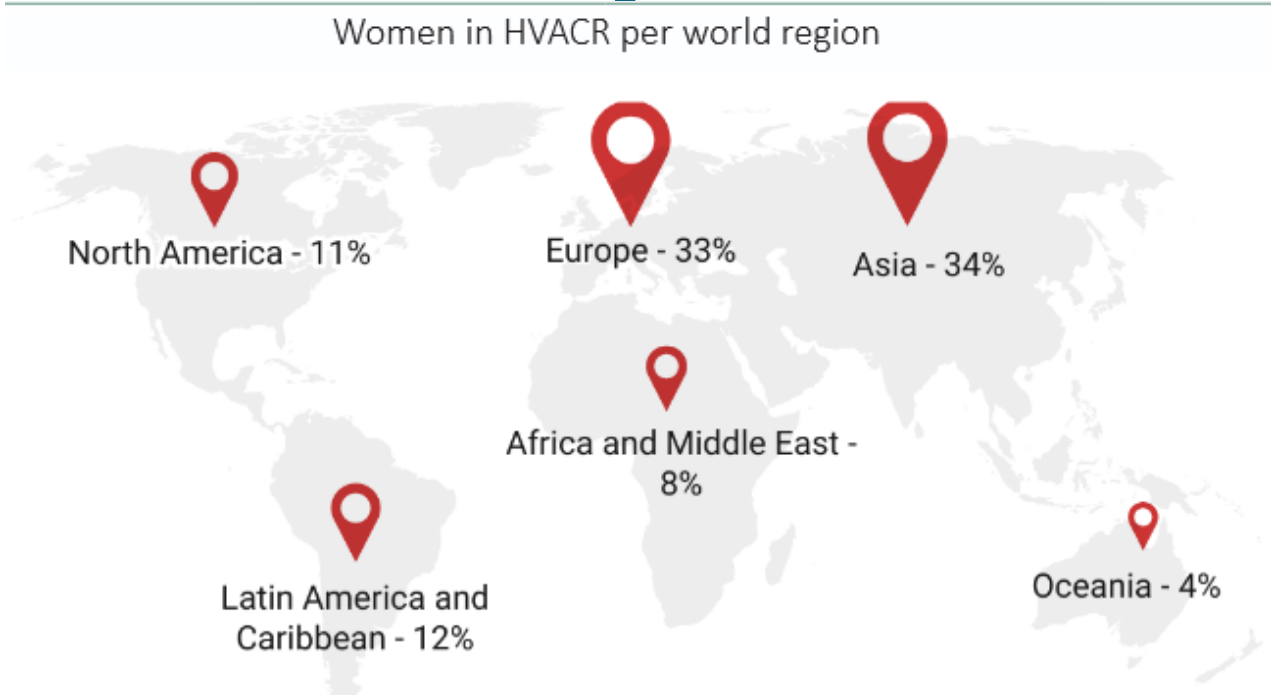
- Understand Women and Minorities Difficulties in the Workplace.

Significance of the RACHP Industry

- 15 million people globally employed in RACHP as of 2019.
- Global market worth 206 billion in 2023
- North American market valued at USD 33.26 billion, over 15% of the global market.

Women in RACHP a worldwide survey

- Survey undertaken in 2022 by IIR, UNEP and several national RACHP associations
- In total 810 women responded to this survey.
- Updated with 2 regional surveys: conducted in North and Latin America



Women in RACHP Industry

Women represent only 1.8% in Canada and 2.3% in the USA of RACHP technicians.

Table 1. Percentage of women employed in an RACHP occupation for USA and Canada

Occupation	% of women employed USA (Bureau of Labor Statistics, 2022a)	% of women employed Canada (Statistics Canada, 2022)
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	2.3%	1.8%
Industrial and manufacturing engineers	25.0%	22.6%
Mechanical Engineers	8.5%	10.8%
Construction Managers	8.5%	15.6%
Plumbers, pipe fitters and gas fitters	1.1%	1.9%
Drivers/Sales workers and truck drivers	8.1%	9.8%
Engineering Managers	13.3%	18.4%
First Line supervisors of mechanics, installers and repairers	5.3%	7.2%

Represented above are several careers in RACHP, varying in required education, whether or not the role is managerial, and universally women are underrepresented.

This underrepresentation spans across both technical and managerial roles despite above-average salaries and job growth.

Measures of Gender Equality in the Workplace

- Gender Equality Index (GEI) a metric to measure gender equality in companies or countries.
- In Europe: Mandatory GEI reporting since 2013. i.e in France mandatory for companies over 50 employees.
- Global indices are existing: North America lacks mandatory reporting on GEI, leading to incomplete data and less transparency.
- Gender disparity in leadership roles: 7% women CEOs (USA) and Canada only 6 CEO nationwide
- In Canada and USA no RACHP companies in the top rankings.

Educational Paths in the RACHP Industry

Two main pathways: Technical route via apprenticeships and Academic route via universities.

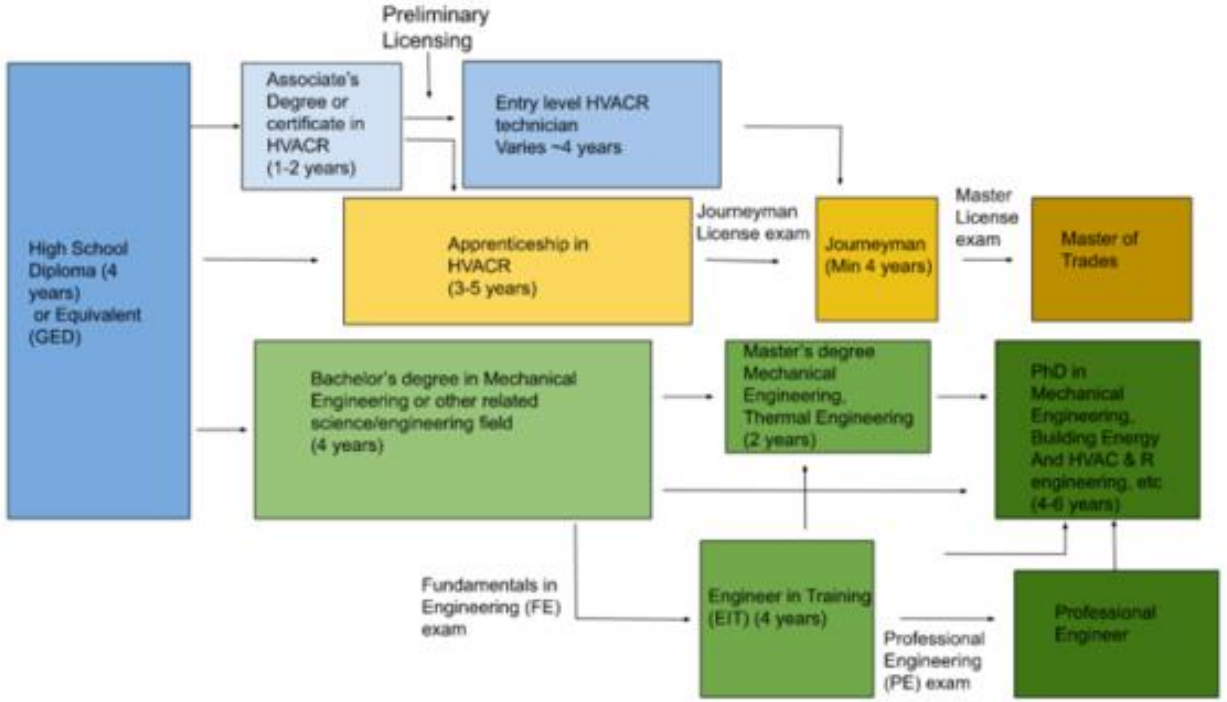


Figure 1 A visualisation of the educational road map to careers in RACHP in the USA.

No easy transition between technical and academic routes, hindering career flexibility.

Survey Among Women in the RACHP Industry

Survey conducted with 400 responses from women in the sector.

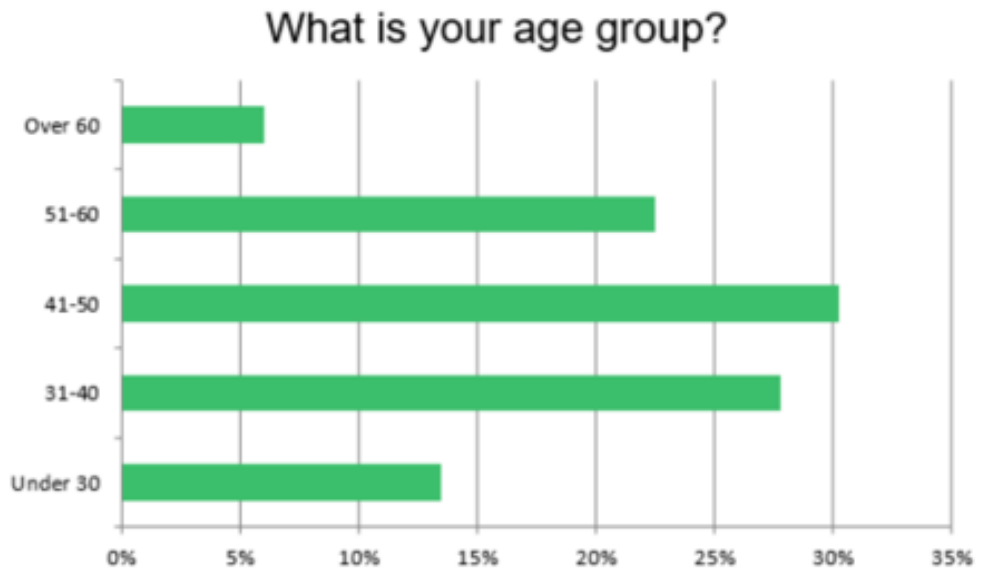


Figure 2 Percentage of Women in the HVACR sector by age group.



Figure 3 Percentage of Women in the HVACR sector by years worked in the sector.

Majority have been in the industry for over 15 years, indicating high retention but low influx of new talent.

Current Job Roles of Women in RACHP

The majority of women in RACHP occupy roles in sales and marketing (28%), with senior management (22.5%) and business ownership (14.5%) also being prominent.



Figure 4 Percentage of respondents for a given occupation.

Technical positions are markedly less common, reflecting the broader trend of underrepresentation in hands-on roles.

Education Level of Women in RACHP

Educational levels among women in RACHP are high, with nearly half holding a bachelor's degree and over 20% possessing postgraduate qualifications.

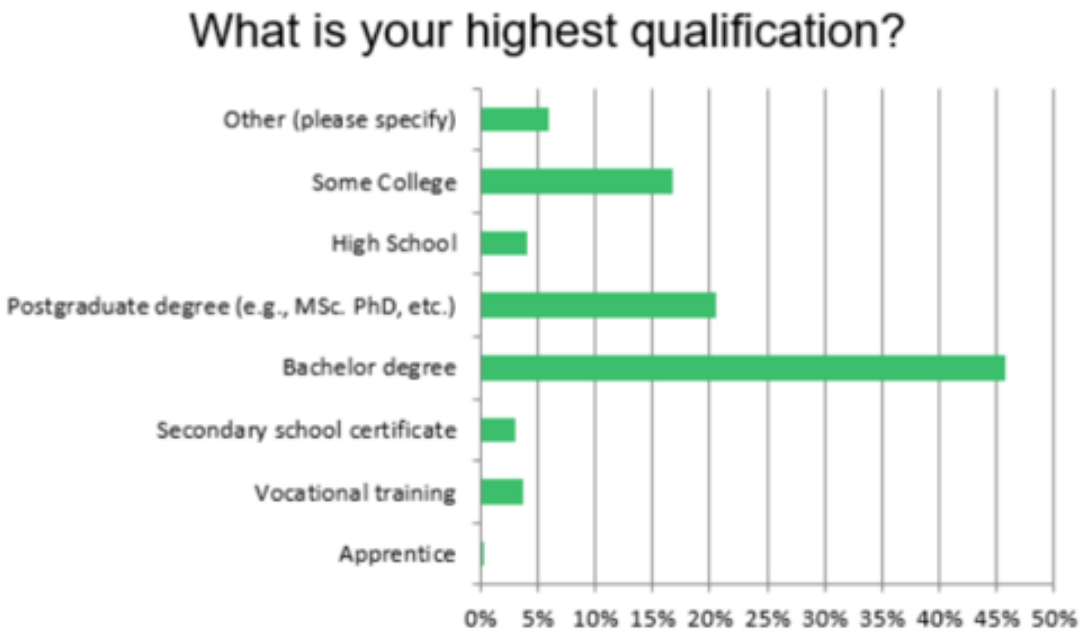


Figure 5 Percentage of women surveyed by education level attained.

This contrasts with lower representation in technical training and apprenticeships, indicating potential barriers at the entry-level technical education.

Motivations and Challenges of Women in RACHP

Top motivations: Job security and contributing to society.

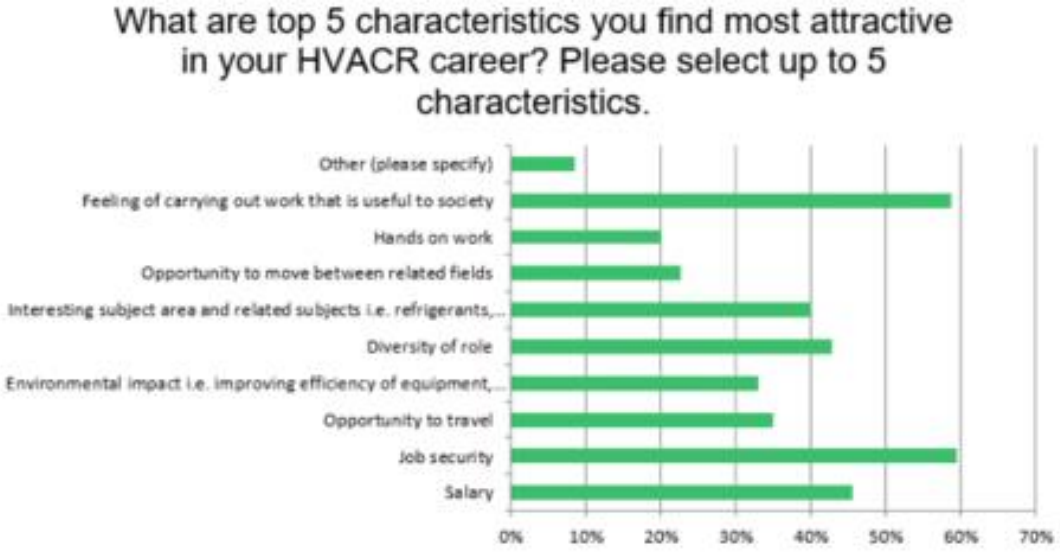


Figure 7 Percentage of women by characteristics that are attractive to a career in HVACR.



Figure 6 Percentage of women surveyed that experience a given issue.

Significant challenges: Work-life balance and stereotypes from clients.

The Environmental Aspect of RACHP Work

81% of women in the RACHP sector regard the environmental impact of their work as important, reflecting a strong commitment to sustainability.

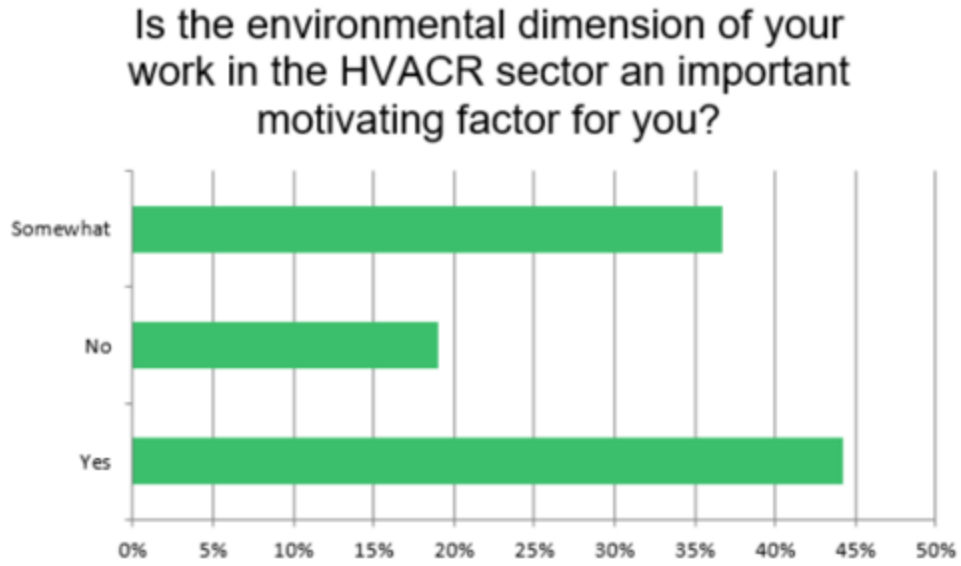


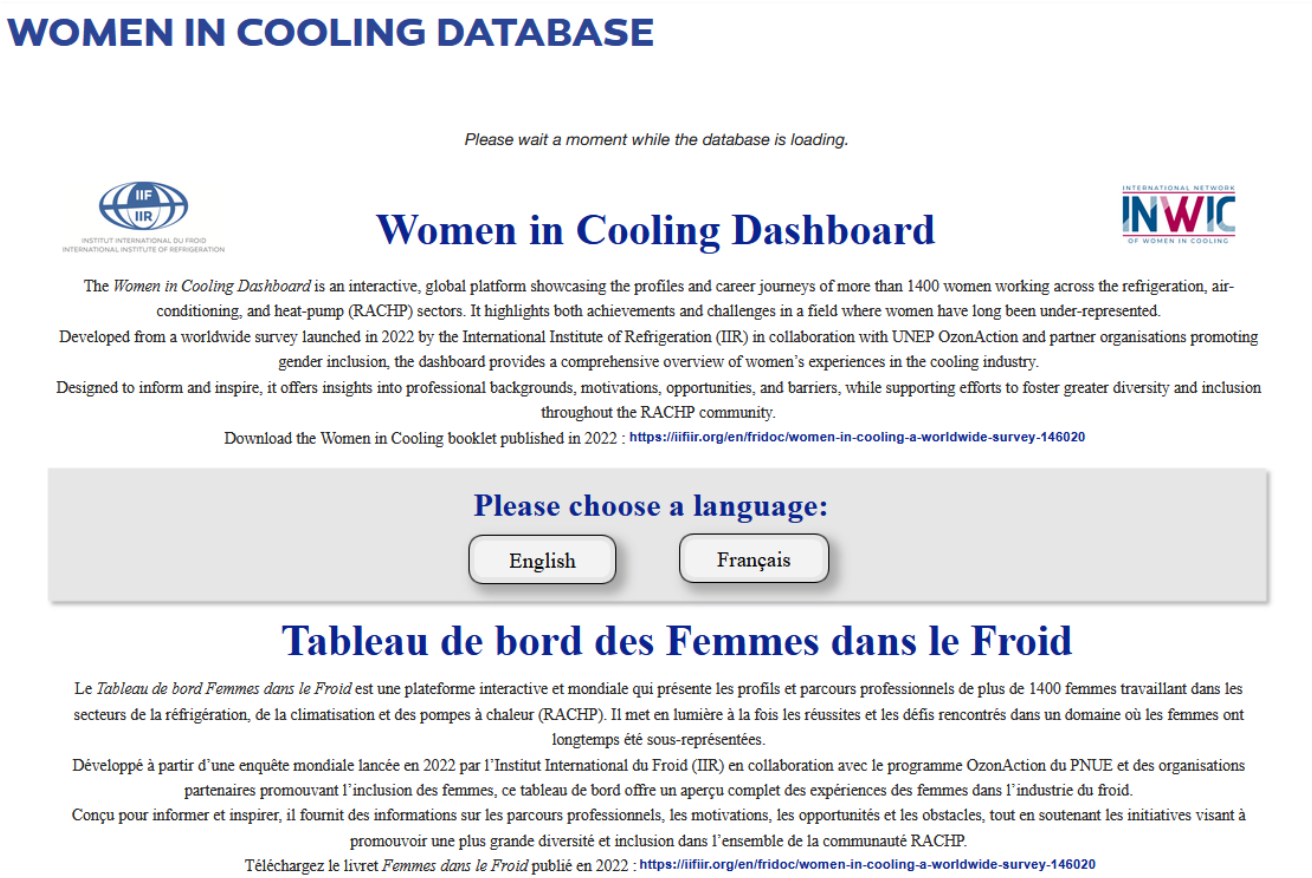
Figure 8 Percentage of women by whether or not the environmental aspect of the HVACR sector was important.

This concern underscores the potential for attracting more women to the industry by emphasizing the environmental benefits and contributions of RACHP careers.

IIR Women in Cooling Database

- Database is accessible from the IIR CaRe webpage
- Gather 1306 responses





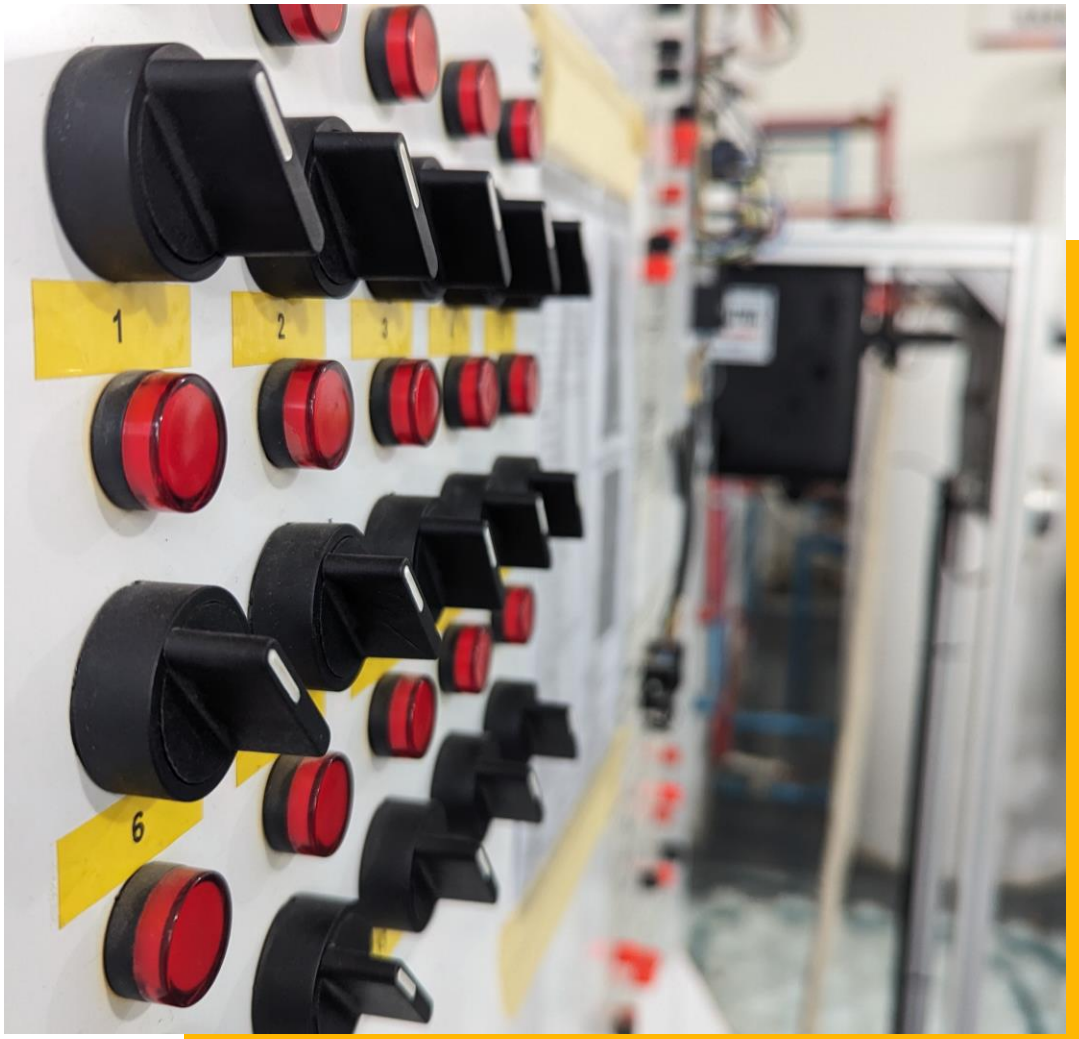
Thank You

Moderated Panel Discussion

Moderated by Cool Up Programme

Sinisa Prodanovic, Öko-Recherche

Where do you see potential workforce shortages and future skills requirements for Kigali Amendment implementation?



How to attract and retain the next generation of RAC professionals?



What challenges do you face in expanding opportunities for women and underrepresented groups across technical and leadership roles?



What's a critical feature of certification, upskilling, and lifelong learning that supports the transition to climate-friendly technologies?



What is the role of governments, industry, training institutions, international organisations, and development partners in scaling impact?



What is the biggest challenge in moving from pilot initiatives to systemic change across the cooling sector?



Audience Q&A

Moderated by Cool Up Programme

Sinisa Prodanovic, Öko-Recherche

Key Takeaways and Closing Remarks

Cool Up Programme

Eslam Mohamed Mahdy, Guidehouse





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