LOW-CARBON COOLING SOLUTIONS

Dietram Oppelt, Managing Director, HEAT GmbH

HEAT's low-carbon cooling experience

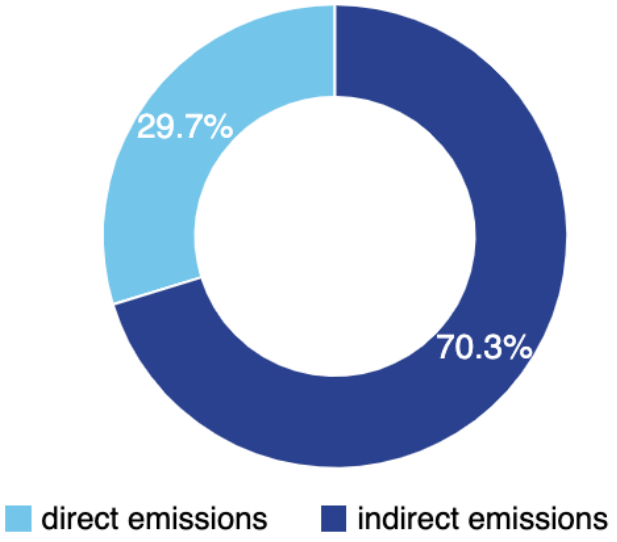
- **MONTREAL PROTOCOL:** More than 30 years of implementations
- **PARIS AGREEMENT:** Supporting countries on their NDC & LTS
- **NAMAs, GCF, GEF, IKI:** Low carbon cooling finance
- **ENERGY EFFICIENCY:** AC and refrigeration policy guides, MEPs and Labels
- **REFRIGERANTS:** Transition to natural refrigerants
- **NATIONAL COOLING ACTION PLANS:** Supporting countries on integrated sector plans


The future of cooling
- the CHALLENGES
CLIMATE
ENVIRONMENT
ENERGY

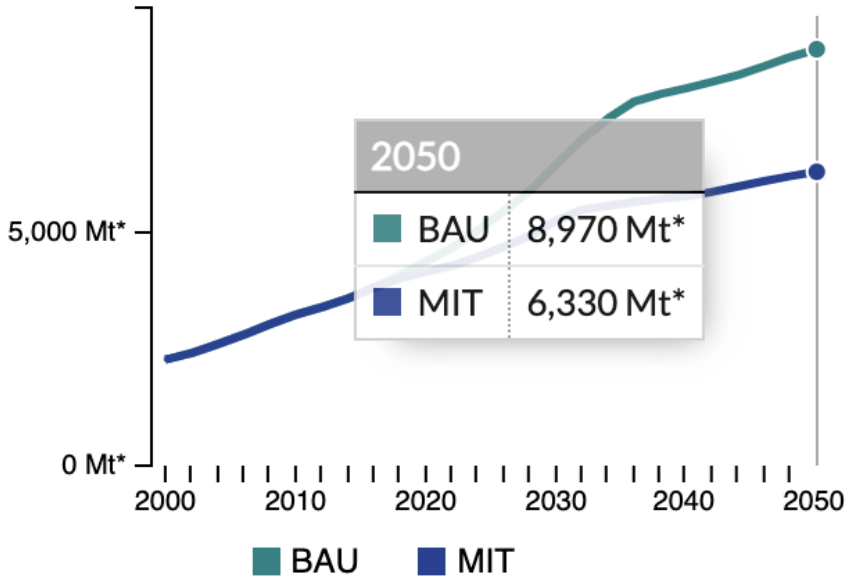
The CLIMATE challenge

Today's emissions

Total emissions
3,830 Mt*

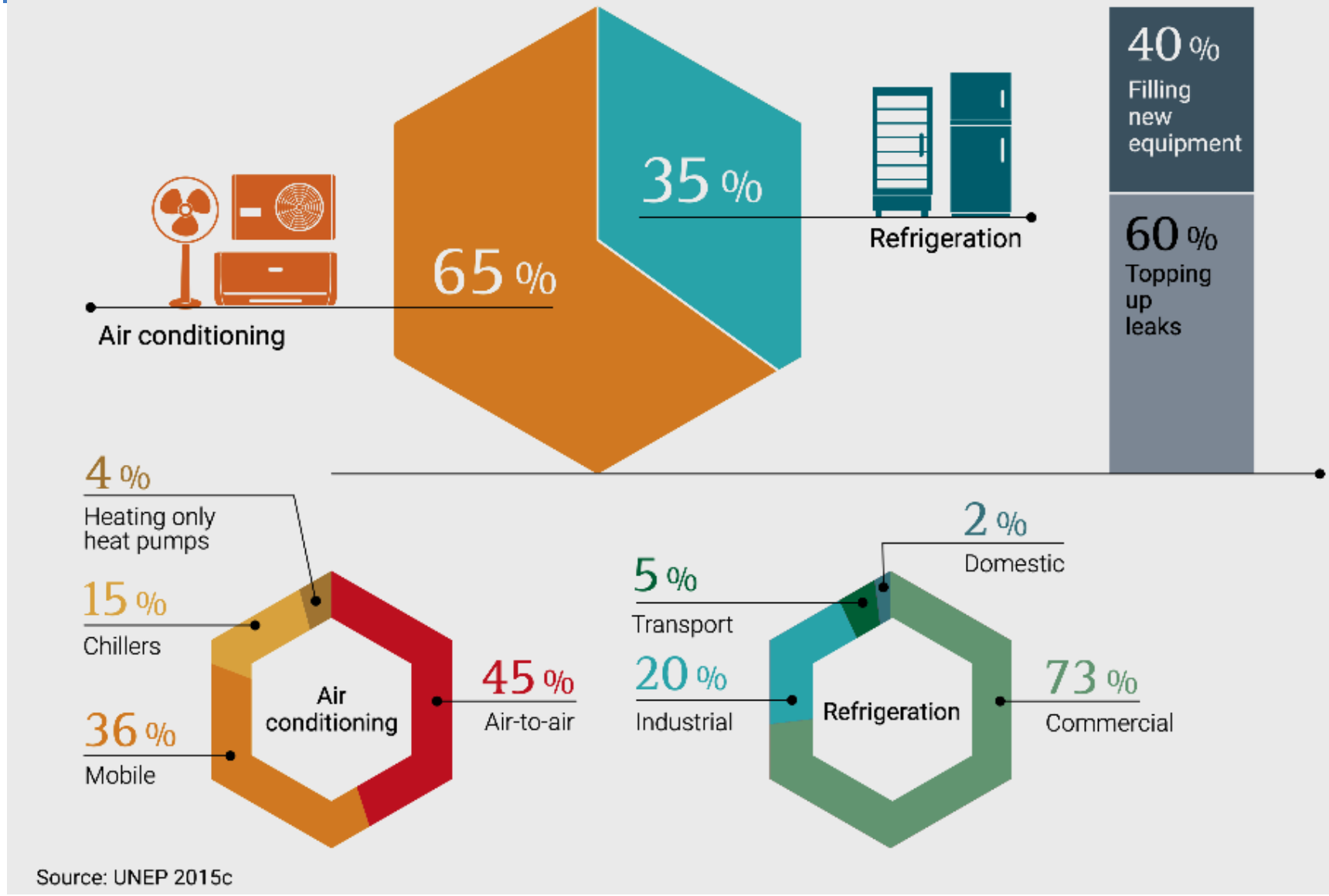


2050 emissions



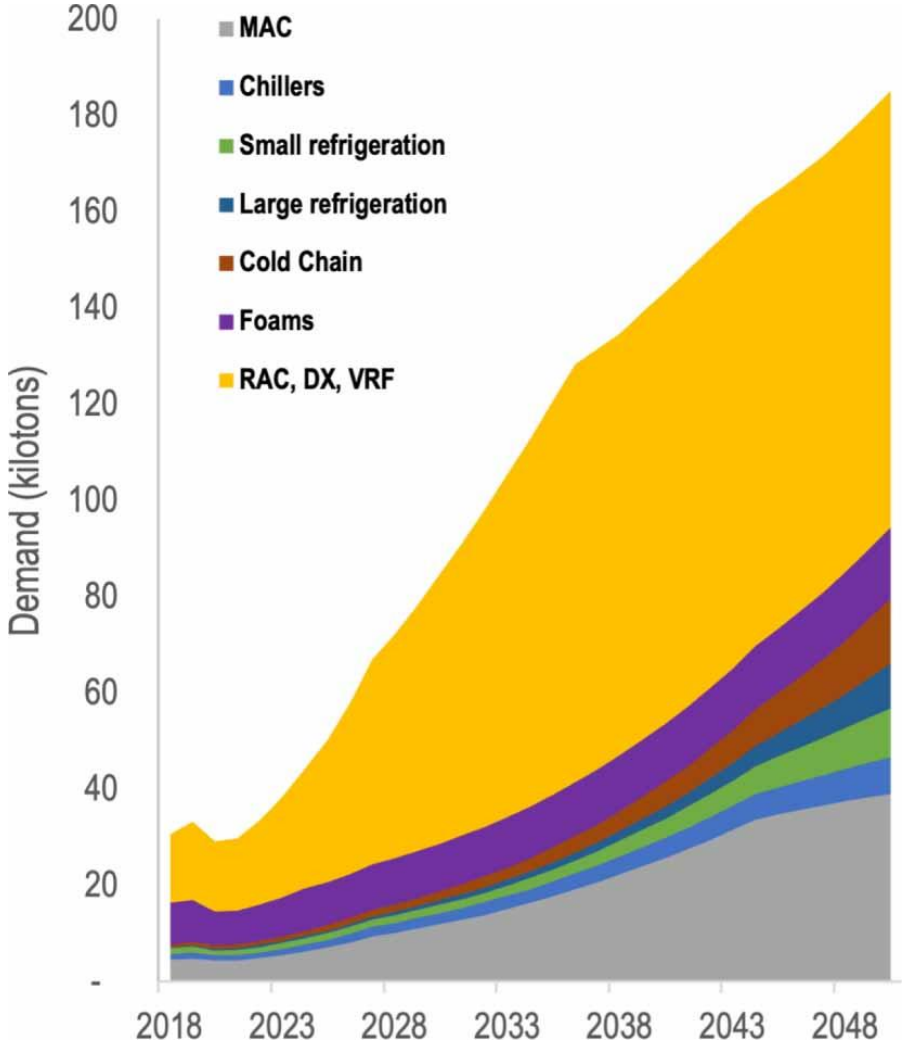
Source: GIZ www.green-cooling-initiative.org; Emissions in tCO2e

EMISSION PRIORITIES:
AC SPLIT AND MACS AND REFRIGERATION COMMERICAL



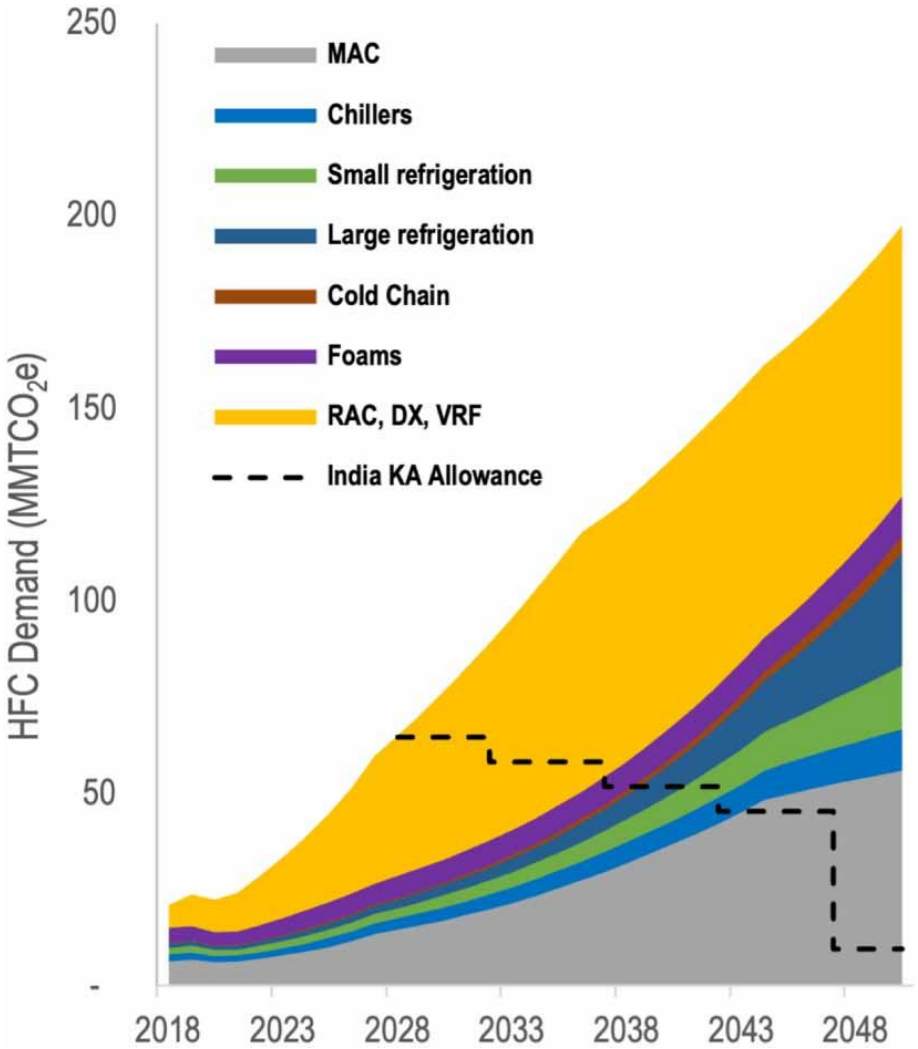
Source: UNEP 2015c

REFRIGERANT DEMAND IN INDIA



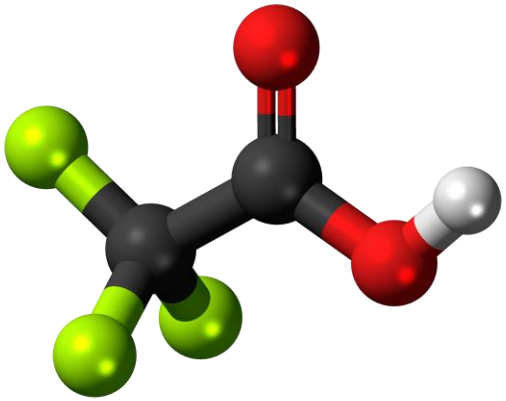
ACs MAC dominate the demand and will grow > 8 x

REFRIGERANT DEMAND IN INDIA

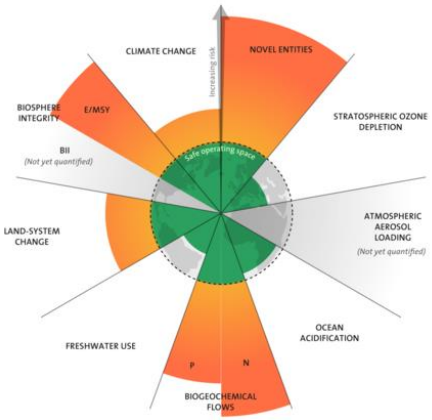


The Kigali Agreement under the Montreal Protocol will require the transition away from HFCs

The ENVIRONMENTAL challenge



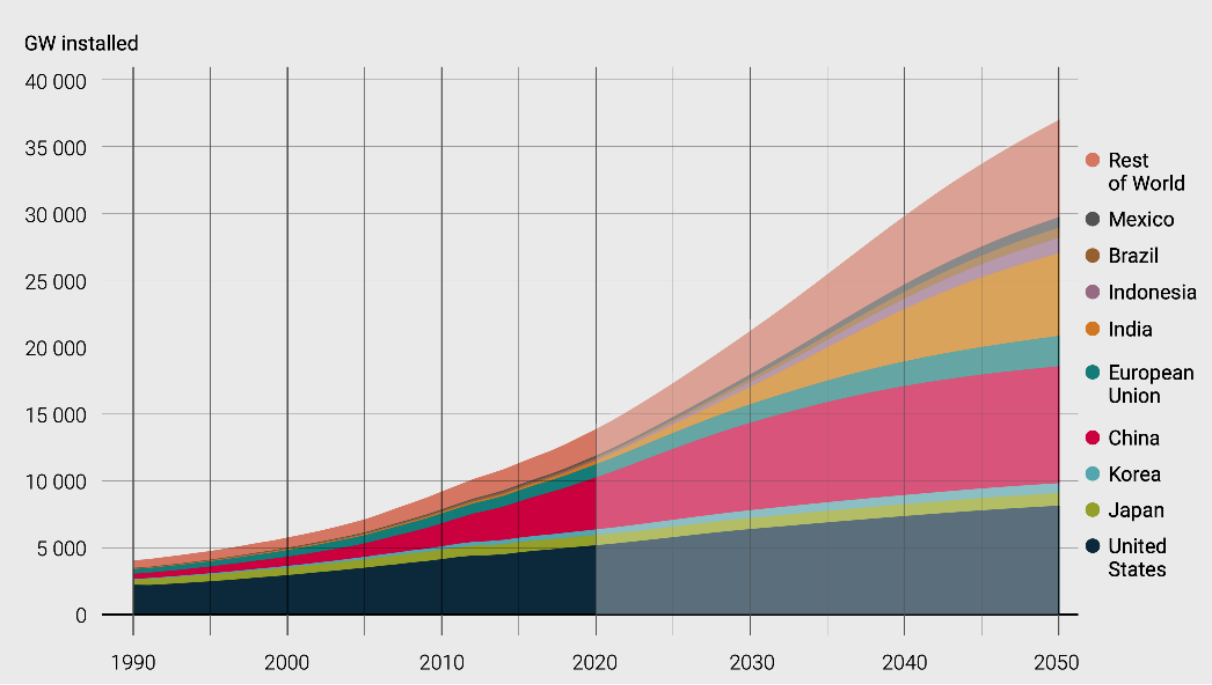
(Trifluoroacetic acid as decay product of many HFOs)



Planetary boundaries

- **HFOs:**
  Replacment fluorocarbons for HFCs
  +++ Low GWP
  - - - Environmental impact
- **PFAS restriction proposal** under **REACH** prepared by Germany, Netherlands, Denmark, Sweden & Norway
- REACH as EU regulation on chemical substances which are harmful to **human health and the environment**
- **F-gases** and their applications in cooling appliances constitute a part of the **PFAS** restriction proposal as many F-gases fall within the PFAS scope definition.

The ENERGY challenge



- **GLOBAL ENERGY DEMAND (2018):**
  RAC ~ 3,900 TWh/a
  AC ~ 2,000 TWh/a
- **SHARE OF GLOBAL ELECTRICY:**
  ~ 17% (2018)

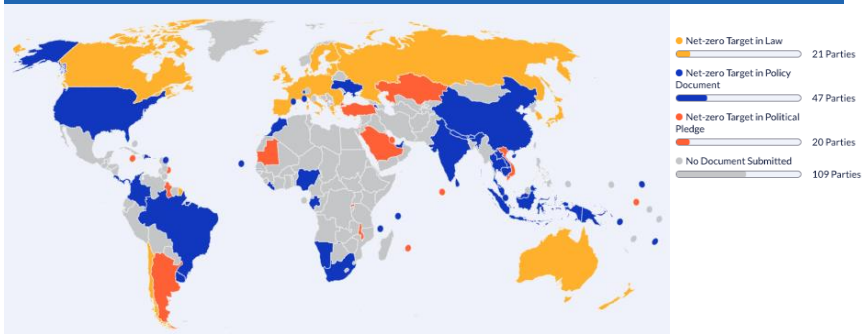
Cooling capacity growth 2x (much more in India)

Needs to be matched by the growth in renewables and energy efficiency, limiting cooling demand (building codes)

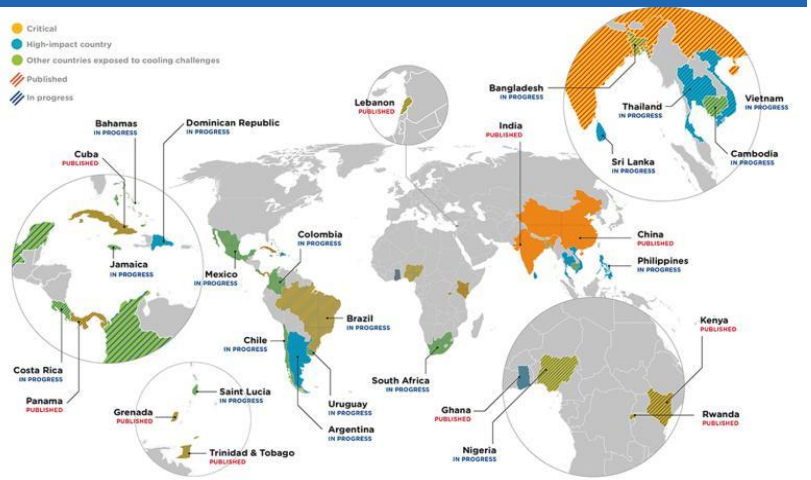

The future of cooling
- the SOLUTIONS
CLIMATE
ENERGY
ENVIRONMENT

The CLIMATE action potential through an integrated policy approch

Transition to zero emissions



National cooling plans

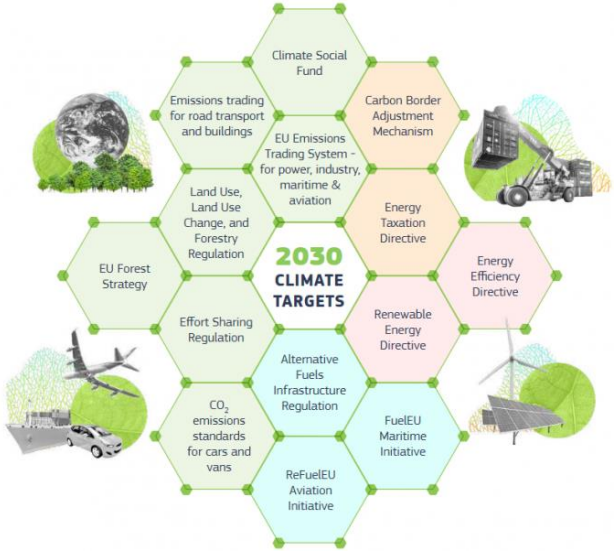


Source: https://www.seforall.org/chilling-prospects-2022/
https://www.climatewatchdata.org/net-zero-tracker

- **NetZero Target**
  88 countries
  ~79% of global emissions
- **NCAP:**
  > 20 countries with NCAPs

- Integration of **NDC**, Net Zero Low Emission Development Strategies **LEDS** & **NCAPs**
- More **AMBITION** (Milestones)
- Integration of low-emission strategies covering **energy efficiency & refrigerants & buildings** → Kigali Implementation Plans **KIPs, NDCs & LEDS → Building code standards**

Increased AMBITION under the planned revision of the EU F-gas regulation (regulating HFCs)



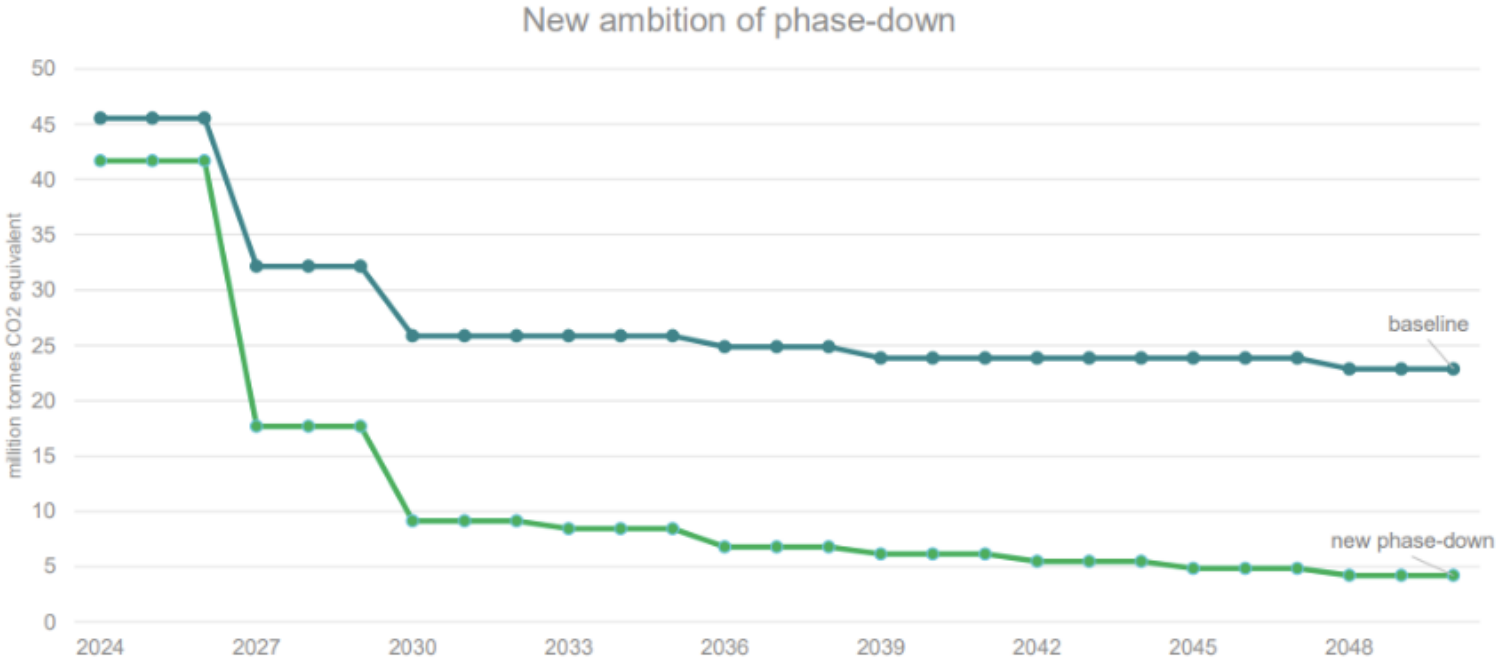
- **REFRIGERATORS AND FREEZERS, SELF-CONTAINED REFRIGERATION APPLIANCES: GWP 150 (2024)**
- **SELF CONTAINED AC AND HP: GWP 150 (2025)**
- **SPLIT AC UP TO 12 KW GWP 150 (2027)**

- **EFFECTIVE BAN OF HFC-32 FROM 2027**

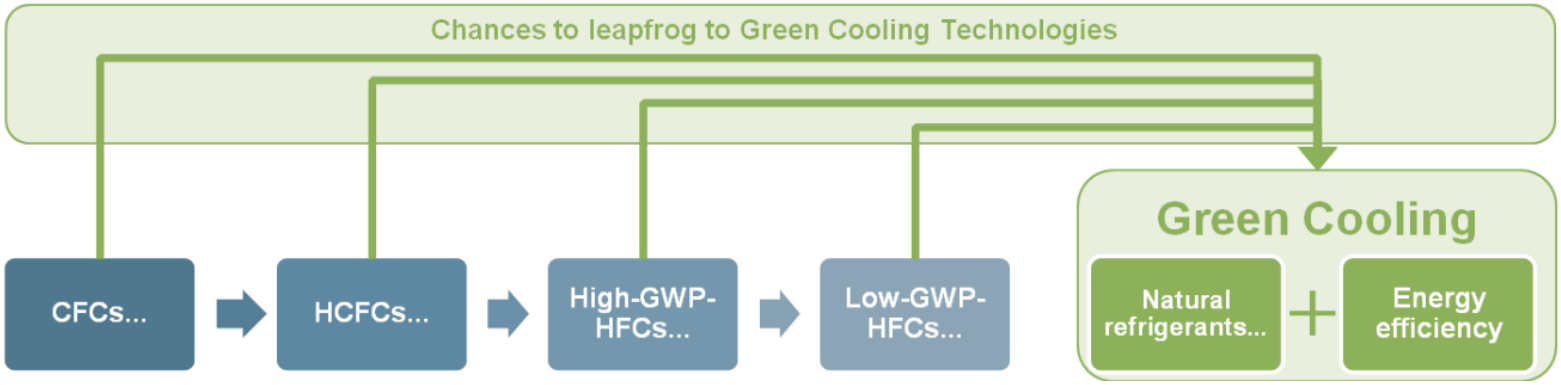
→ **TRANSITION TO HFOs or R-290**

Increased AMBITION under the planned revision of the EU F-gas regulation (regulating HFCs)

- Transition to a zero-emission pathway
- Low transition costs with natural refrigerants
- Benefits for energy efficiency



The ENVIRONMENTAL challenge
Leapfrogging to Green Cooling Technologies

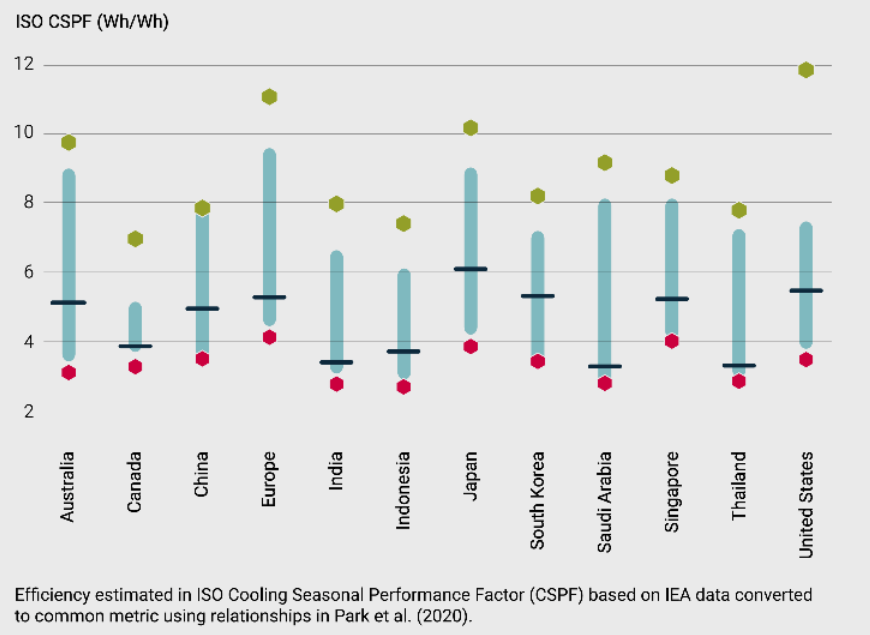


Source: GIZ Proklima/ HEAT (Green Cooling Technologies, 2015)

- **NATURAL REFRIGERANTS:**
  +++ Zero ODP
  +++ Environmental friendlier
  +++ Zero/ very low GWP
  +++ Highly efficient

- **Synergies between**
  - required refrigerant change under the Kigali Agreement →
  Technical Economic Assessment Panel of the Montreal Protocol: transition to low GWP refrigerants and improved energy efficiency possible for all subsector

The ENERGY & emissions savings potential



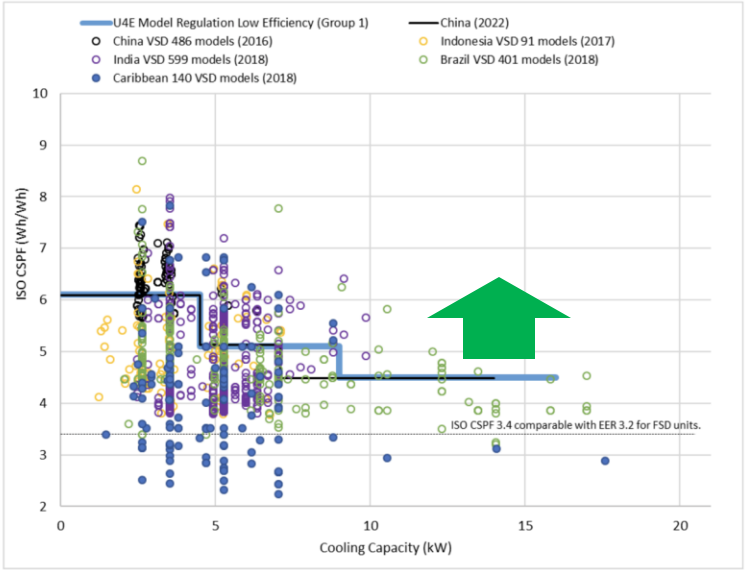
Source: IEA/UNEP, Cooling Emissions, 2020

AC

- life cycle cost savings with MEPS > 5

- energy and cost savings

- high market availability



Source: U4E Model Regulation, LBN analysis

The ENERGY savings potential for supermarkets and MACs

MINIMIZING COOLING LOAD (30–60%)
Building design
Shading
Insulation
Doors on retail displays

EQUIPMENT AND CONTROL (30–70%)
High efficiency heat exchangers
High efficiency compressors
Optimized refrigeration cycle
Good controls (e.g. variable speed drives)

OPERATION AND SERVICING (15–30%)
Managing existing stock
Timely servicing
Performance measurement / fault diagnosis

REFRIGERANT SELECTION (5–10%)
Choice of most appropriate refrigerant

Source: UNEP
The Importance of Energy Efficiency in the Refrigeration, Air-conditioning and Heat Pump Sectors, 2018

- **SUPERMARKETS**
  Savings potential **15-77%**
- **MACs**
  Savings potential **20-77% --> low GWP refrigerants & electric mobility**

Key takeways

- **All countries** need to significantly increase their ambition to meeting the **targets of the Paris Agreement → zero emission solutions**
- Transition to low GWP refrigerants required under the **Kigali Amendment**
- **Leapfrogging** to low GWP**, natural refrigerants** and **improved energy efficiency** as the best solution for the climate and with costs benefits
- **Ambitions MEPS will save costs**
- **Best practices policy: integrated approaches NDC, LTS, NCAP, KIP and building codes**
- **Direct actions:**
  - **MEPS > 5**
  - **Bans on high GWP refrigerants for ACs and refrigerators**

Thank you for your attention!

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