

# COOLING FOR HEALTHY, RESILIENT, STABLE SOCIETIES

## ROLE OF THE MONTREAL PROTOCOL

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Sustainable Cooling  
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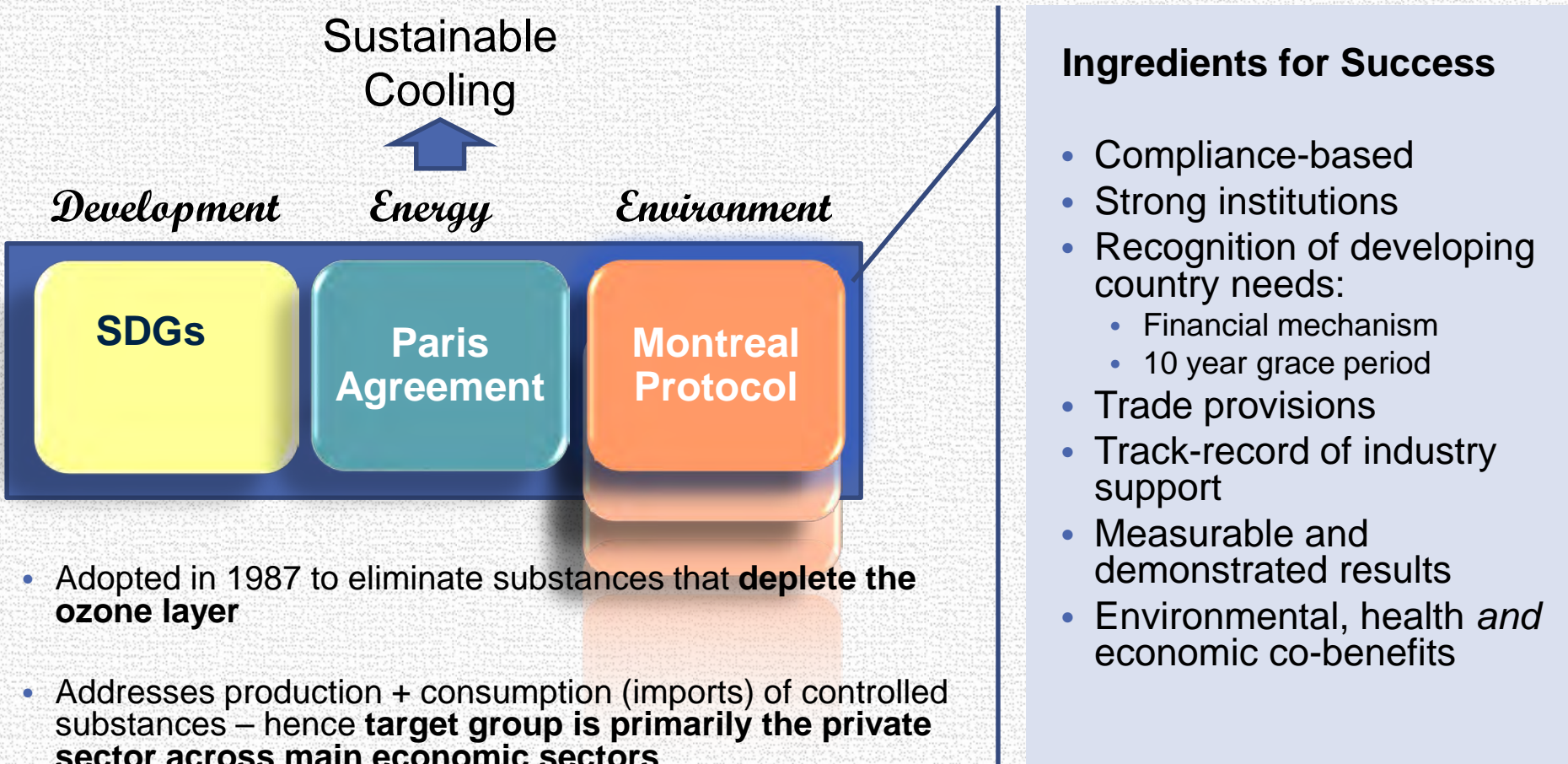


# Role of the Montreal Protocol on Substances that Deplete the Ozone Layer in Cooling

- The Little Treaty that Could: Context and Impact
- Early Experience in Harnessing Climate Co-benefits
- Becoming a Climate Treaty
- Staying COOL in the Montreal Protocol's (MP's) Final Chapter



# Montreal Protocol: Context and Impact



- Adopted in 1987 to eliminate substances that **deplete the ozone layer**
- Addresses production + consumption (imports) of controlled substances – hence **target group is primarily the private sector across main economic sectors**
- Financial mechanism pays the **incremental costs of MP implementation in developing (Article 5) countries**
- **Universal ratification** and enjoys **broad-based buy-in** (NGOs, Government, private sector, etc.)

# Montreal Protocol: Context and Impact

## To slash or to trim

Emission reductions by policies/actions, bn tonnes CO<sub>2</sub> equivalent

Policy/Action	Cumulative emissions	Period	Annual emissions*
Montreal protocol <sup>1</sup>	135.0bn	1989-2013	5.6bn
Hydropower worldwide <sup>2</sup>	2.8bn	2010	2.8bn
Nuclear power worldwide <sup>2</sup>	2.2bn	2010	2.2bn
China one-child policy <sup>3</sup>	1.3bn	2005	1.3bn
Other renewables worldwide <sup>2</sup>	600m	2010	600m
US vehicle emissions & fuel economy standards <sup>†4</sup>	6.0bn	2012-25	460m
Brazil forest preservation <sup>5</sup>	3.2bn	2005-13	400m
India land-use change <sup>6</sup>	177m	2007	177m
Clean Development Mechanism <sup>7</sup>	1.5bn	2004-14	150m
US building & appliances codes <sup>4</sup>	3.0bn	2008-30	136m
China SOE efficiency targets <sup>8</sup>	1.9bn	2005-20	126m
Collapse of USSR <sup>9</sup>	709m	1992-98	118m
Global Environment Facility <sup>10</sup>	2.3bn	1991-2014	100m
EU energy efficiency <sup>11</sup>	230m	2008-12	58m
US vehicle emissions & fuel economy standards <sup>‡4</sup>	270m	2014-18	54m
EU renewables <sup>11</sup>	117m	2008-12	29m
US building codes (2013) <sup>12</sup>	230m	2014-30	10m
US appliances (2013) <sup>12</sup>	158m	2014-30	10m
Clean technology fund <sup>13</sup>	1.7bn	project lifetime	na
EU vehicle emission standards <sup>14</sup>	140m	2020	na

### CATEGORIES:

Energy production  
Transport  
Other regulations  
Global treaties  
Land & forests  
Other

\*Annual emissions are cumulative emissions divided by the relevant period. The estimate for the current emissions avoided under the Montreal protocol is eight billion tonnes of CO<sub>2</sub>e. The annual figure for the collapse of the USSR refers to the years 1992-98. †Cars and light trucks ‡Heavy trucks

See following panel for sources and explanations

- **30 years of success:** Global elimination of 4 major groups of substances: Ozone hole is on the mend
- Montreal Protocol has done **more for the climate than any other treaty because ozone depleting substances (ODS) are high in GWP.**
- From 1989-2013 an estimated **135 billion tons CO<sub>2</sub> eq cumulative emissions avoided.**
- As 1 of 4 Implementing Agencies of the MP Multilateral Fund (MLF), the WBG has provided over \$1 billion in grants since 1991 for the avoidance of **roughly 1.2 billion tons of CO<sub>2</sub> emissions** and phase-out of 68% of all ODS covered by the MLF.

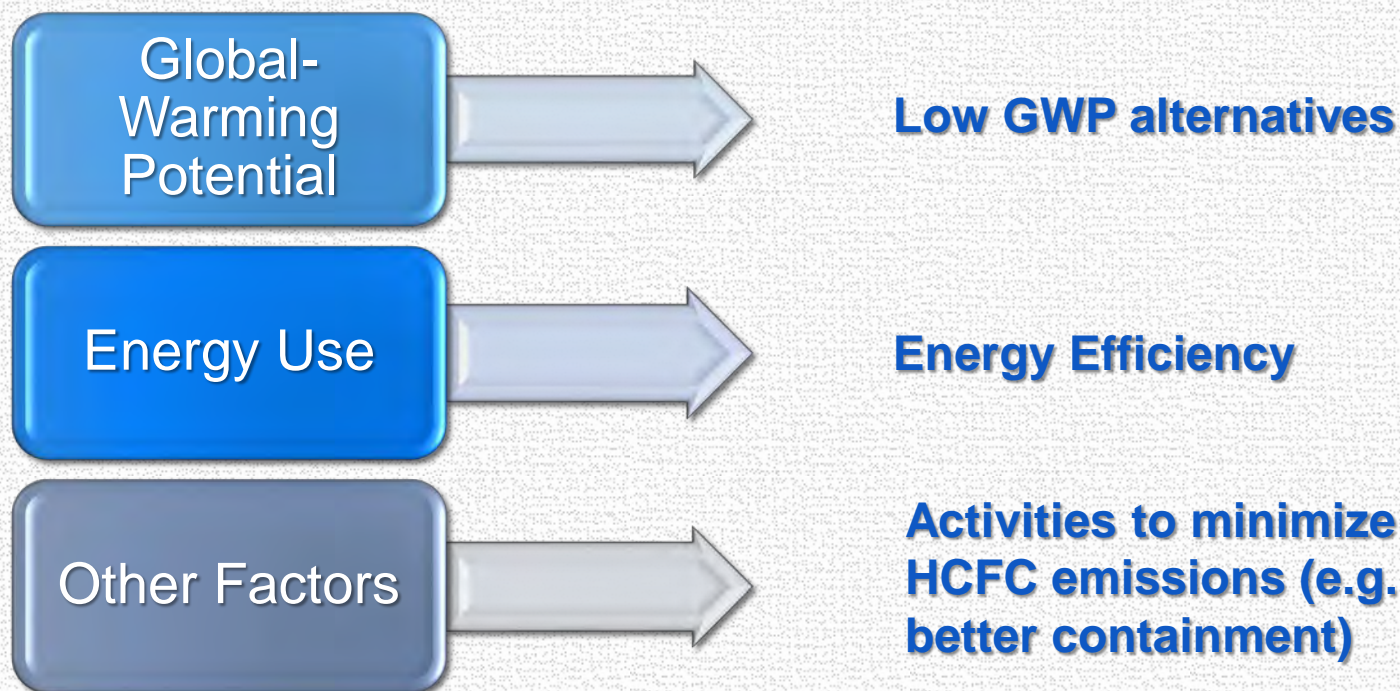
# Early MP Experiences in Harnessing Climate Co-benefits

- MP Implementation with MLF Assistance
  - A need for additional funding of MP-related action (this is where it all started) – Resource mobilization efforts led the WB and others to explore ways to leverage finance through generation of co-benefits.
  - Analyses/proof of concept/demos for ozone-climate-energy action and benefits (business models, financial instruments, sector plans, co-financing)
  - World Bank and Partner Countries' role
    - Innovative delivery approaches (Sector and National ODS Phase-out Plans – performance based, Voucher Schemes, Reverse Auctions)
    - Chiller Replacement Projects (MP + GEF + Carbon Finance)

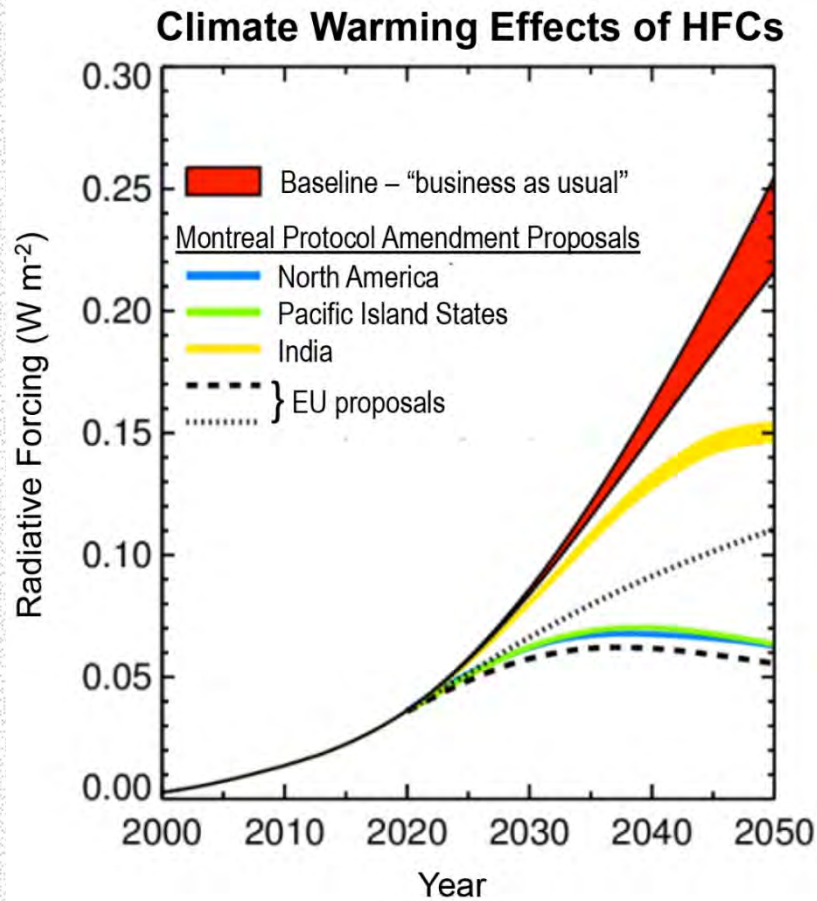


# Becoming a Climate Treaty: Accelerated HCFC Phase-out (2007)

- ✱ **Faster HCFC phase-out benefitted the ozone layer but had even *larger* benefits for the climate**
- ✱ **Dec. XIX/6 (j) – when selecting HCFC substitutes and alternatives, the following should be taken into account:**



# Becoming a Climate Treaty: HFC Phase-down



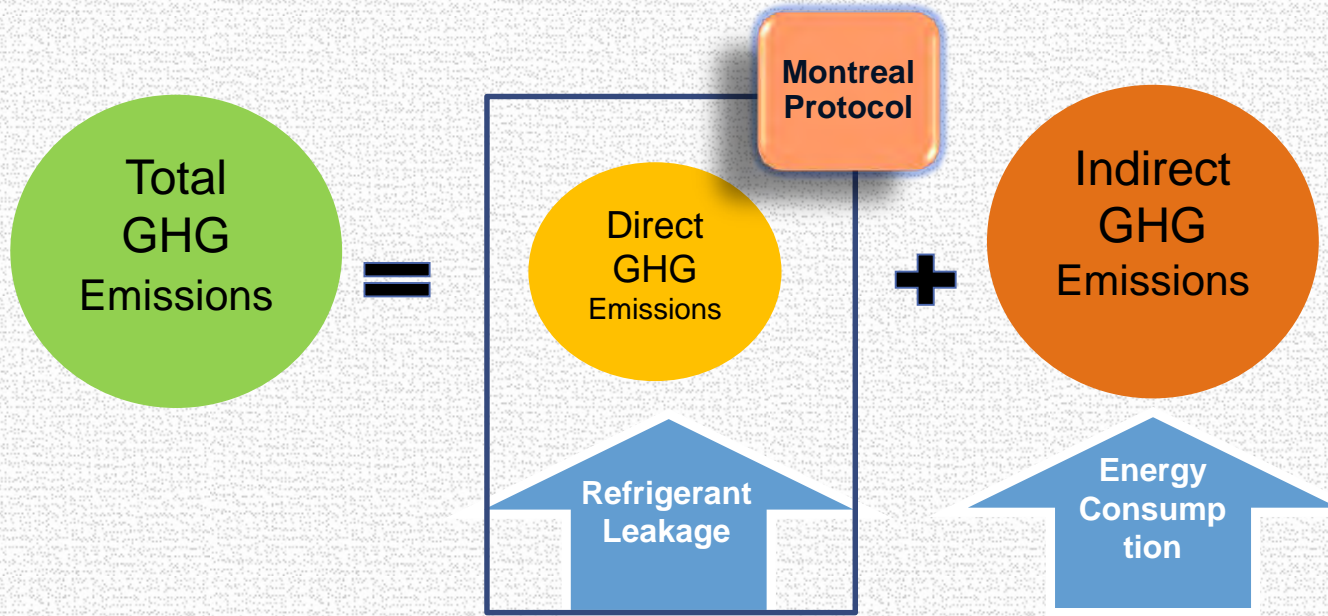
Velder's et. al: BAU shows that the benefits of the Montreal Protocol will be quickly offset.

- In global ODS elimination, HFCs were introduced – **non-ozone depleting but potent GHGs, with GWP values thousands of times more than  $CO_2$ .**
- **HFCs are used mostly as refrigerants.** With economic development primarily in developing countries, their growth is booming. Similar to HCFCs, **the future HFC market will be in developing countries.**
- HFCs were on track to represent 10% of all GHG emissions by 2050. **Growth is coupled with energy consumption due to use in A/C and refrigeration** – A/C energy consumption could quadruple by 2050 from 2010 levels.
- Benefits of HFC phase-down: **avoidance of global temperature rise by up to  $0.5^\circ C$  by 2100** – if combined with EE improvement benefits can double.

# Becoming a Climate Treaty: Parties agree on the Kigali Amendment on HFC Phase-down (2016)

- Importance of cooling for the MP: **Refrigerants...**
  - are controlled substances or replacements
  - can impact the performance of cooling equipment
  - can be costly (patent protected – including technology in which they are used)
  - can introduce management and use challenges (environmental, safety)
- Two Art.5 country groupings; *phase-down* not a phase-out; & high ambient temperature country exemptions in the air-conditioning sector
- MLF is requested to develop **cost guidance on maintaining and/or enhancing the EE** of low to zero-GWP replacement technologies when phasing down HFCs

HFC phase-down negotiations were largely about the right to appropriate AC/ref. technologies to meet development goals



↓  
A recognition that there are still challenges with low-GWP cooling technologies for some areas

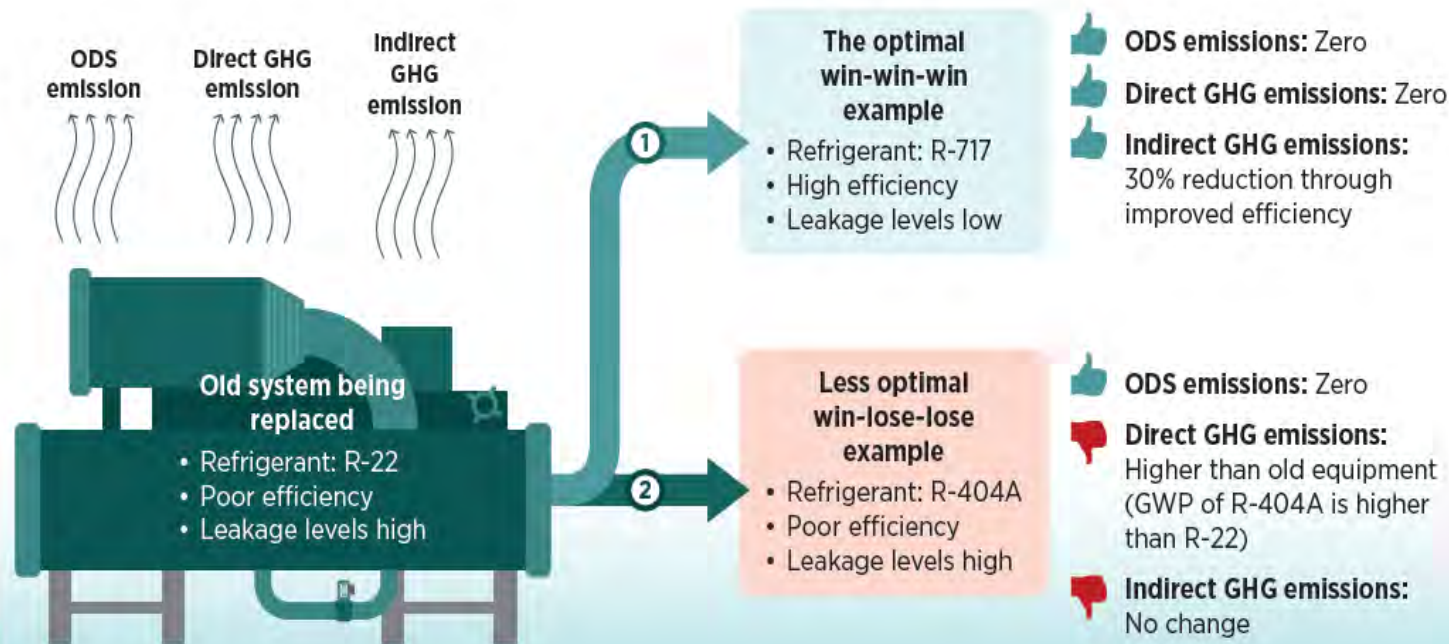




# Staying COOL during the MP's Final Chapter

- HFC amendment process galvanized the global “cooling” agenda: Kigali Cooling Efficiency Program – first to explicitly link MP and EE
- In parallel, climate and energy communities have narrowed in on refrigeration and A/C in developing economies as a potential area for achieving climate commitments and controlling booming energy demand, for the very reason of high growth in cooling.. paradoxically in part due to climate change.
- Opportunities for greater climate impact.

With Kigali, the first time MP deals directly with a GHG for the purpose of safeguarding the climate



Tapping into the “Triple Win” to meet international commitments (HCFC and HFC phase-out) while tackling country development and environmental challenges..



# WBG & Linked Agendas of Energy, Climate, Ozone

## SDGs 7, 9, 11, 13

- Upgrade technological capabilities of industrial sectors support domestic technology development and innovation
- Make cities inclusive, safe, resilient and sustainable
- Take urgent action to combat climate change and its impacts
- Double global rate of improvement in energy efficiency (EE)

Paris Agreement

Montreal Protocol

## Country Challenges

Energy Security and Affordability

Barriers to Access EE  
Low Hanging Fruit

Rapid Urbanization  
Demand for Cooling

Scale-up and Crowd-in Private Sector

Cold Chain: Food Safety and Security, Health

HCFC Phase-out  
HFC Phase Down

## Country Support

### WBG EE New Commitments

- India EE Scale-up Program: US\$220 m
- Vietnam Energy Efficiency for Industrial Enterprises: US\$100 m WB loan
- Metropolitan Buenos Aires: Efficient & Sustainable Urban Settlements: US\$200m

### WBG Commitment

- Invest US\$1 billion in funding for EE in urban areas by 2020 that can include support for the development and deployment of high efficiency cooling technologies that also use climate-friendly refrigerants.

MLF  
GEF

*WBG EE commitments  
FY10-18: US \$14.45 b*

# Staying COOL during the MP's Final Chapter

- Window of opportunity is upon us:
  - Countries will be required to phase-down HFCs based on agreed schedules.
  - With no action, there is risk of technology lock-in
  - It has started in developed countries.... refrigerant and equipment supply will change
  - This is leverage for demand-side interventions and scale-up
  - Can use the MP as a platform to vet solutions with the broader climate and energy communities and avoid lost opportunities of the past.
- What is needed
  - Clarity on what MP will finance
  - More information on sources of EE finance to complement HFC reductions in cooling sectors (comfort cooling, food cold chain, etc.)
  - More information and case studies to develop business models, possibly a programmatic approach with several projects under one national platform (NDC, cooling plan, etc.)

