

Replacing Cooling Equipment Early, Stopping
Dumping, Narrowing the Feedstocks
Exemption, and Embracing Fluorocarbon Life
Cycle Management Protects Life on Earth!

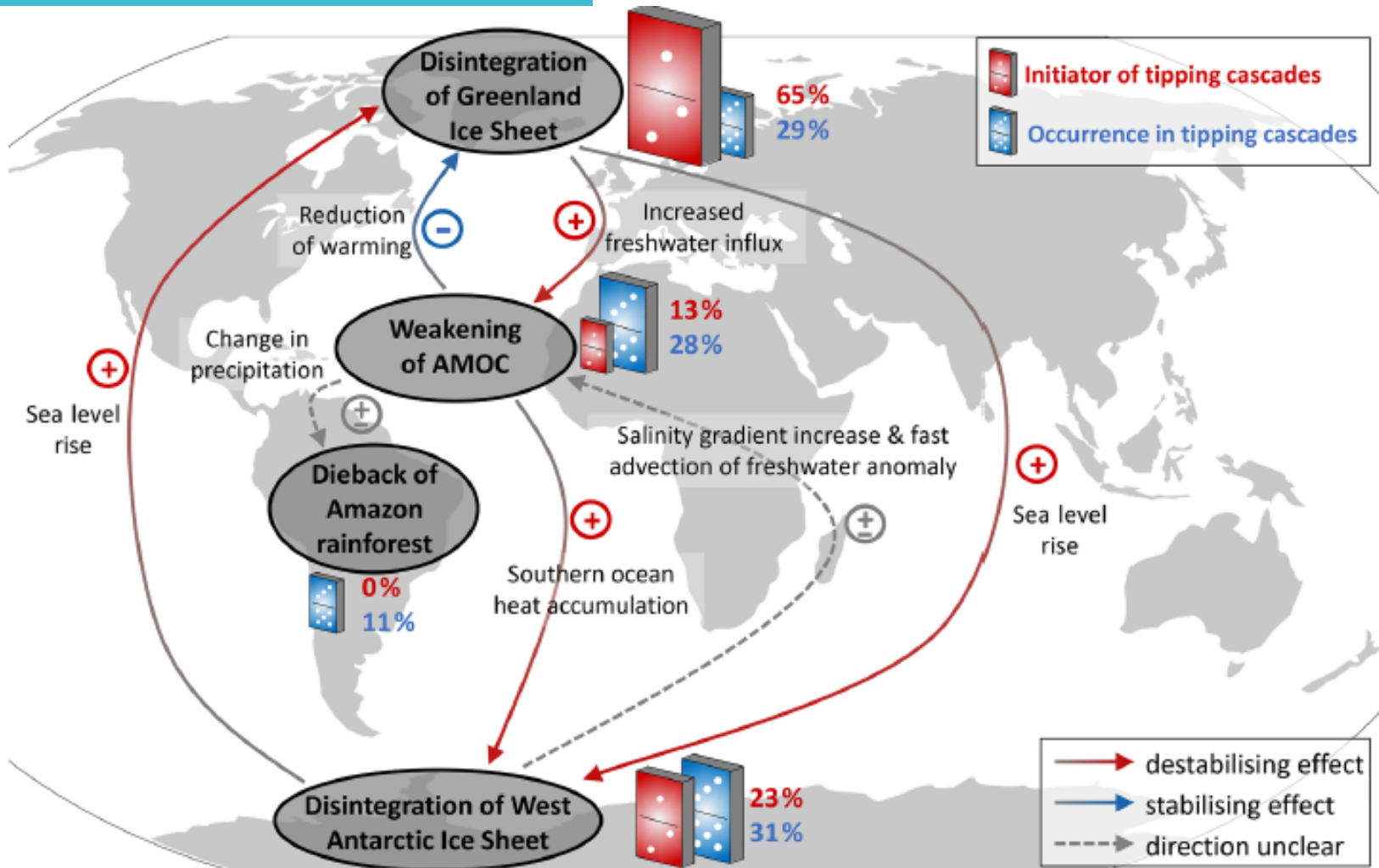
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Montreal Protocol on Substances that Deplete the Ozone Layer
(Montreal Protocol) Bangkok OEWG 7 July 2023



Arctic warming risks tipping cascade



- Arctic warming 4X faster than global average
- Half of summer sea ice cover lost
- Greenland tipping point circa 1.6 °C
- Atlantic meridional overturning circulation (AMOC) is slowing
- By mid-century could lose sea ice over summer months = 1000 GtCO₂
- **Plus** suffer land snow and ice albedo feedback
- **Plus** abrupt methane release from permafrost and seabed hydrates

SLCP Climate Benefits

Avoided global warming

Rapid implementation of SLCP mitigation measures, together with measures to reduce CO₂ emissions, would greatly improve the chances of keeping the Earth's temperature increase to less than 2°C relative to pre-industrial levels.

Dual strategy

combine SLCP *sprint* with CO₂ *marathon*

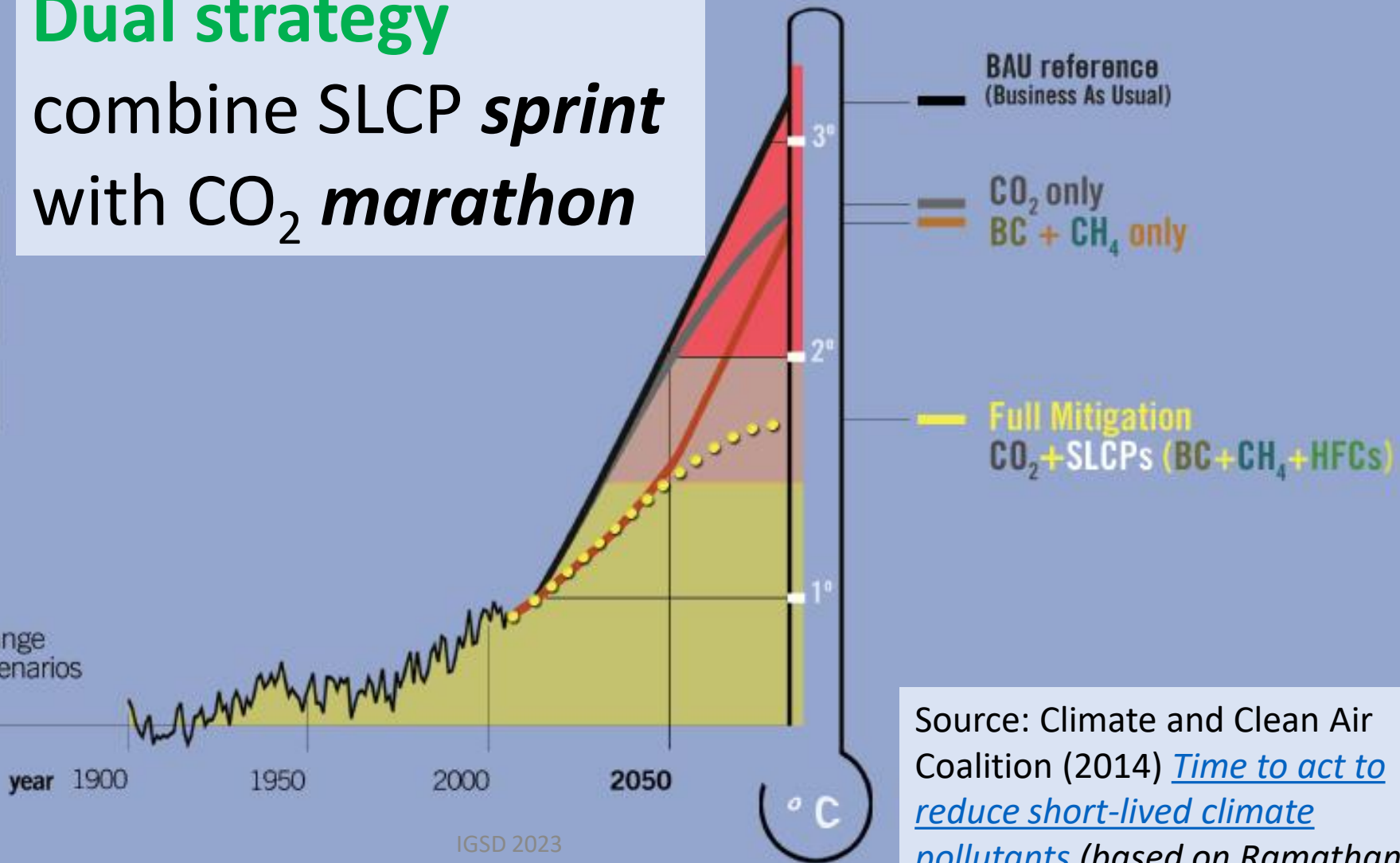
AVOIDED GLOBAL WARMING by 2050

BC + CH₄ 0.5°C

HFCs 0.1°C

SLCPs 0.6°C

Simulated temperature change under various mitigation scenarios
CO₂, BC, CH₄, HFCs



Source: Climate and Clean Air Coalition (2014) [Time to act to reduce short-lived climate pollutants](#) (based on Ramathan)

Montreal Protocol – Benefits Extend Beyond Fixing the Ozone Hole

- Ozone Tipping Points avoided and Stratospheric Ozone Hole is recovering thanks to the 1987 Montreal Protocol and Amendments and Adjustments strengthening and accelerating phase out of ozone-depleting substances (ODSs).
- Avoided 0.5–1.0°C of warming by 2050 by phasing out potent ODS greenhouse gases (GHGs) while protecting terrestrial plants and carbon sink from UV will avoid up to an additional 1.0°C by 2100.
- Avoided hundreds of millions of cases of skin cancer and cataracts, suppression of the human immune system, and damage to agricultural and natural ecosystems.
- 2016 Kigali Amendment phases down production and consumption of hydrofluorocarbons (HFCs); ratified by 150 Parties with Universal Ratification anticipated!

Accelerated Kigali Amendment with energy efficiency, narrow the plastics feedstock exemption, stop dumping, early equipment replacement, and fluorocarbon management with destruction can avoid near-term climate tipping points!

HYDROFLUOROCARBONS (HFCs)

HFCs are powerful man-made greenhouse gases that are rapidly building up in the atmosphere.

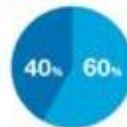
CONSUMPTION

HFCs are a group of industrial chemicals primarily used for air conditioning and refrigeration.

RESIDENTIAL, COMMERCIAL AND INDUSTRIAL AIR CONDITIONING AND REFRIGERATION



HFC consumption today...



- filling new equipment
- topping up leaking equipment

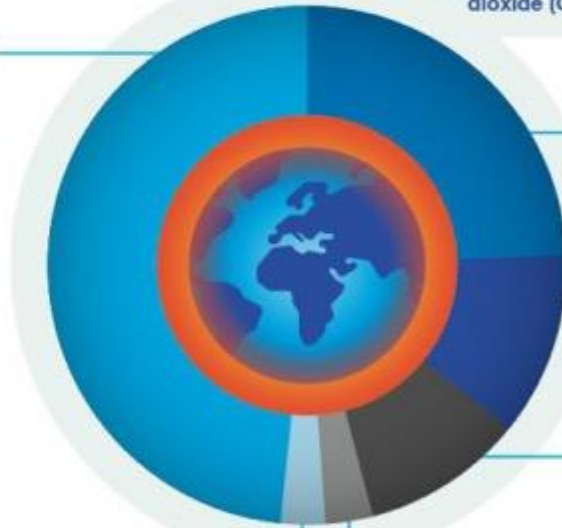
Up to 10 air conditioners will be sold every second over the next 30 years

% = global emissions

LIFETIME IN ATMOSPHERE:

15 YEARS (AVERAGE WEIGHTED BY USE)

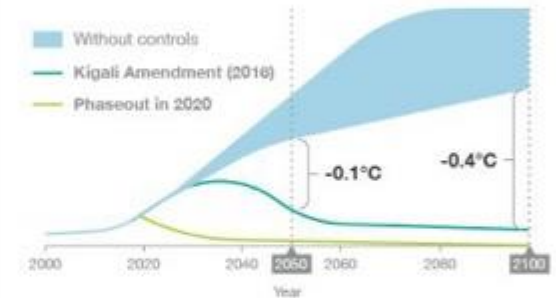
Many HFCs are short-lived climate pollutants. The most abundant of these, HFC-134a, is 3,790 times more damaging to the climate than carbon dioxide (CO₂) over a 20-year period.



AVOIDING FUTURE EMISSIONS

HFC emissions will quickly grow without action. Under the Kigali Amendment, countries have committed to reduce the production and use of these gases by 85% by 2050.

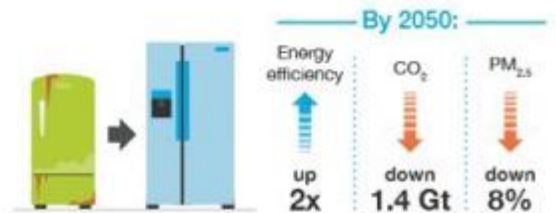
This would avoid up to 0.1°C of warming by 2050 and up to 0.4°C by 2100.



ADDED BENEFITS OF ENERGY EFFICIENCY

Almost 80% of the climate impact from cooling comes from the electricity generated to power the equipment.

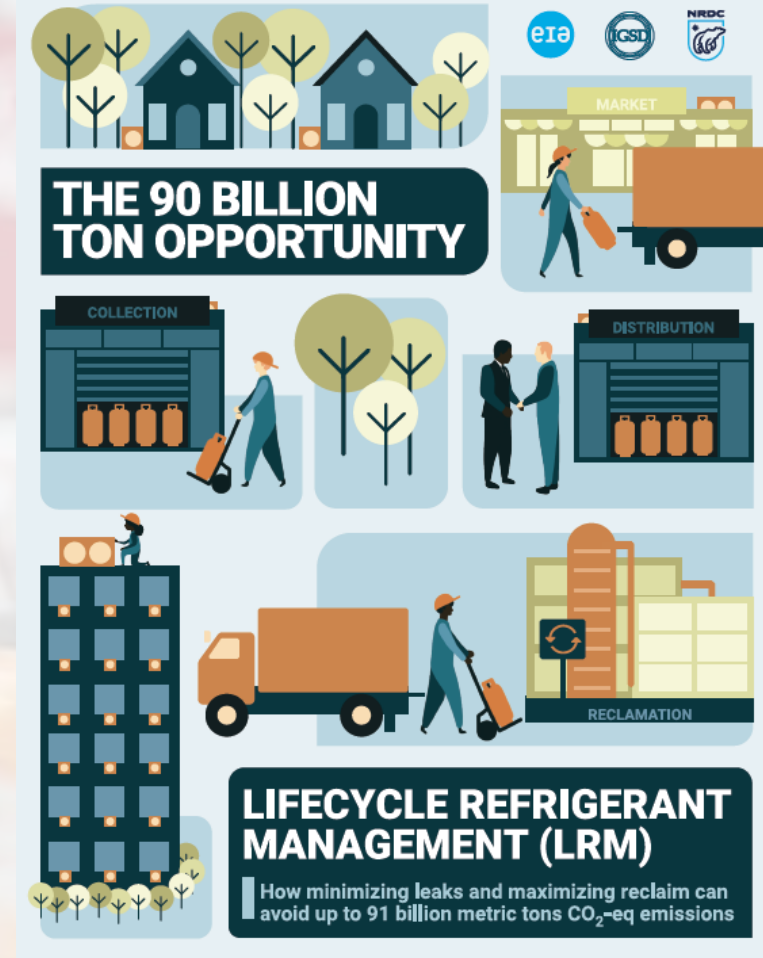
Improving air conditioning efficiency could cut CO₂ and air pollutant emissions from power generation and as much as double the climate benefit of the Kigali Amendment.



Lifecycle Refrigerant Management

- Roughly 100 billion metric tons CO₂e avoidable emissions this century (*additional* to Kigali Amendment)
- Refrigerant and foam banks will continue to grow under the HFC phase-down
- Most emissions are preventable through reducing leaks and end-of-life release
- ~60% consumption for filling existing equipment

ODS & HFC Refrigerants (GtCO ₂ e)	Current	Through 2050	Through 2100
United States	3.6	6.9	9.2
Global	34	61	91



EIA, NRDC, IGSD (2022)

Take Home Messages & Thank You Japan!

- Absolutely accelerate the pace of HFC Phase Down to Avoid Climate Tipping Points!
- Go beyond compliance with early cooling equipment replacement and fluorocarbon life cycle management!
- Redouble efforts to eliminate trifluoroacetic acid (TFA) emissions that may be considered per- and polyfluoroalkyl substances (PFAS)!
- Stop dumping and start profiting from sustainable, energy-efficient, lower-GWP, and TFA- and PFAS-free refrigerants!
- Make the Montreal Protocol part of saving the climate just as the Montreal Protocol has saved the stratospheric ozone layer!

Resources

- Andersen, Stephen O., and Marco Gonzalez. 2022. [35th Anniversary Protecting the Ozone Layer](#), United Nations Environment Programme (UNEP) and IGSD.
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- Zaelke, Durwood, Romina Picolotti, Gabrielle Dreyfus, Trina Chiemi, Kiran Ghosh, Kristin Campbell, Laura Bloomer, Blake Hite, Julie Miller, and Daniel Taillant. 2022. [The Need for Fast Near-Term Climate Mitigation to Slow Feedbacks and Tipping Points](#). IGSD.
- Theodoridi, Christina, Alex Hillbrand, Christina Starr, Avipsa Mahapatra, and Kristen N. Taddonio. 2022. [THE 90 BILLION TON OPPORTUNITY: LIFECYCLE REFRIGERANT MANAGEMENT \(LRM\) - HOW MINIMIZING LEAKS AND MAXIMIZING RECLAIM CAN AVOID UP TO 91 BILLION METRIC TONS CO₂-EQ EMISSIONS](#), EIA, NRDC, and IGSD.
- WMO *et al.* 2022 [Twenty Questions and Answers](#) and [Executive Summary](#), in [SCIENTIFIC ASSESSMENT OF OZONE DEPLETION: 2022](#), Geneva, Switzerland.
- Japan Ministry of the Environment and the Climate and Clean Air Coalition (CCAC). 2022. [Resource Book for Life Cycle Management of Fluorocarbons: Good Practice Portfolio for Policymakers](#).



Thank you!

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