

# **Reducing Non-CO<sub>2</sub> Climate Forcers: Linking the Montreal Protocol to Climate Protection**

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**Workshop on Science and Policy  
of Short-lived Climate Forcers**

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# THE COPENHAGEN ACCORD

**The Conference of the Parties takes note of the Copenhagen Accord of 18 December 2009.**

- The Heads of State, Heads of Government, Ministers, and other heads ... have agreed on this Copenhagen Accord which is operational immediately.
- We underline that climate change is one of the greatest challenges of our time.
- We agree that deep cuts in global emissions are required ... to reduce global emissions to **hold the increase in global temperature below 2 degrees Celsius ...**

# COP 16 - CANCUN AGREEMENTS

***Hold the increase of global average temperature below 2 °C***

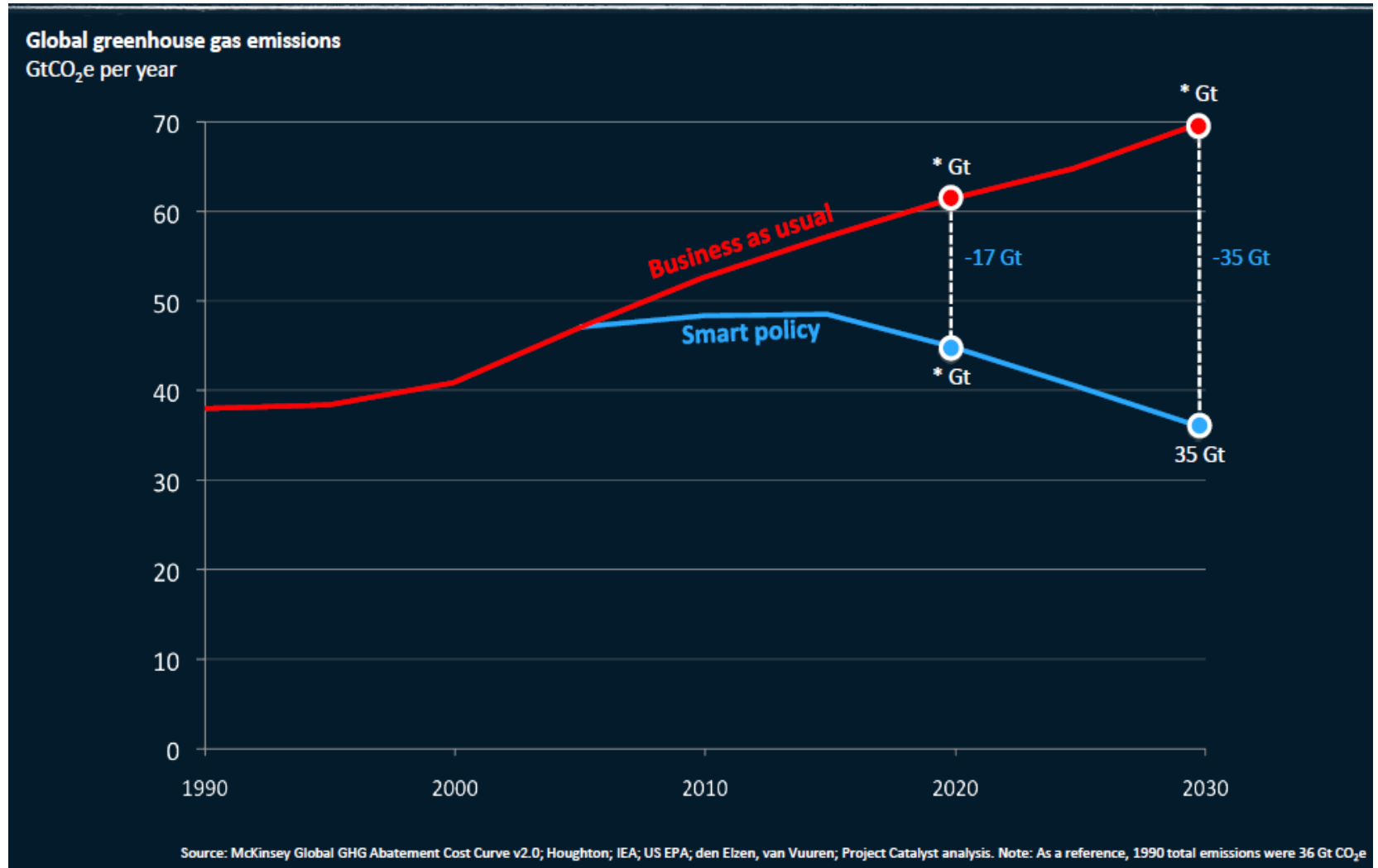
## MITIGATION

- **Annex I Parties - Quantified economy-wide emission reduction targets.**
- **Developing country Parties – Adopting and implementing of Nationally Appropriate Mitigation Actions (NAMAS)**

## FINANCE

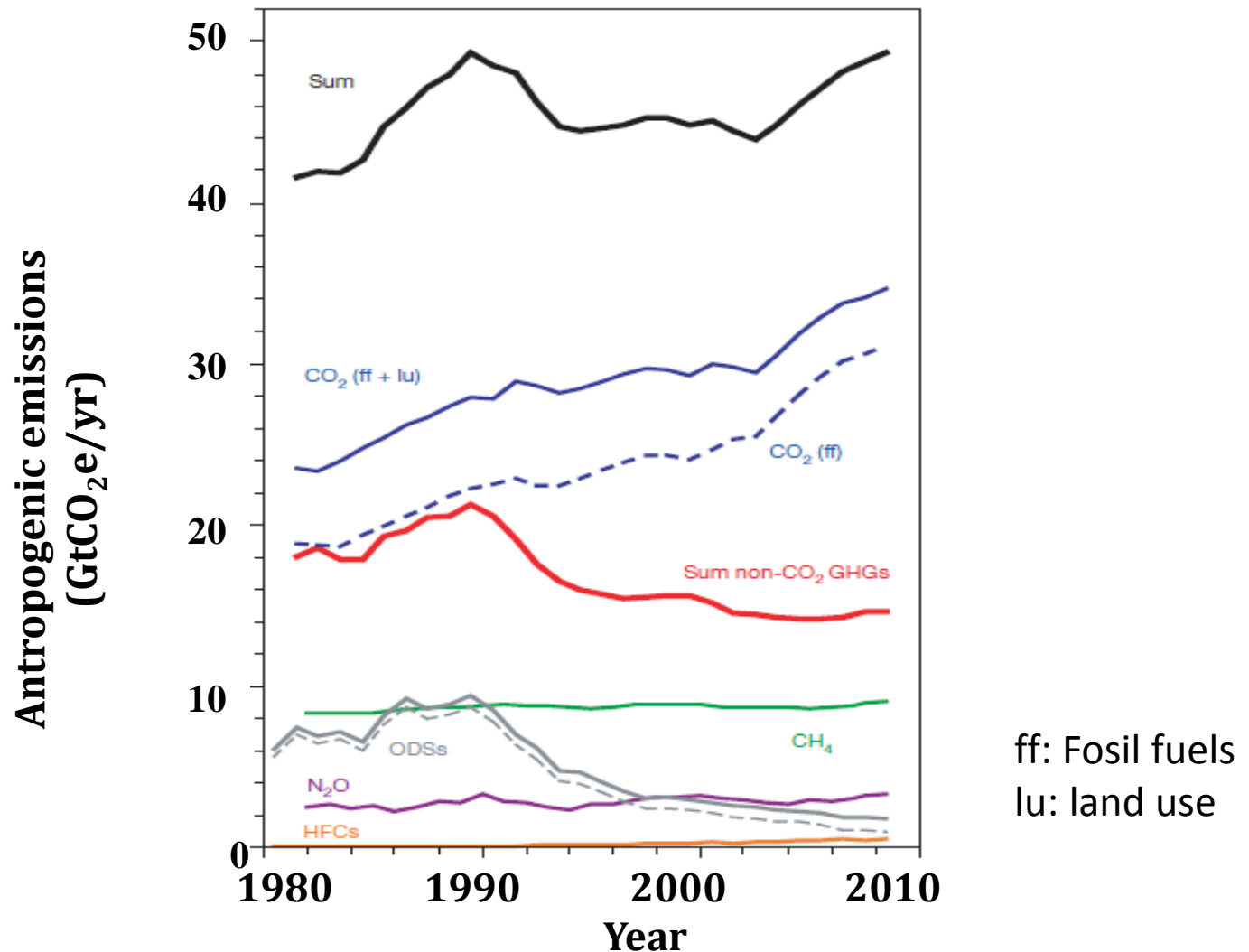
- **The establishment of the Green Climate Fund.**
- **Developed countries will provide US\$30 billion for 2010-2012 and will mobilize US\$100 billion per 2020.**

# Business as usual emissions vs emissions required to meet 450 ppm – 2° goal



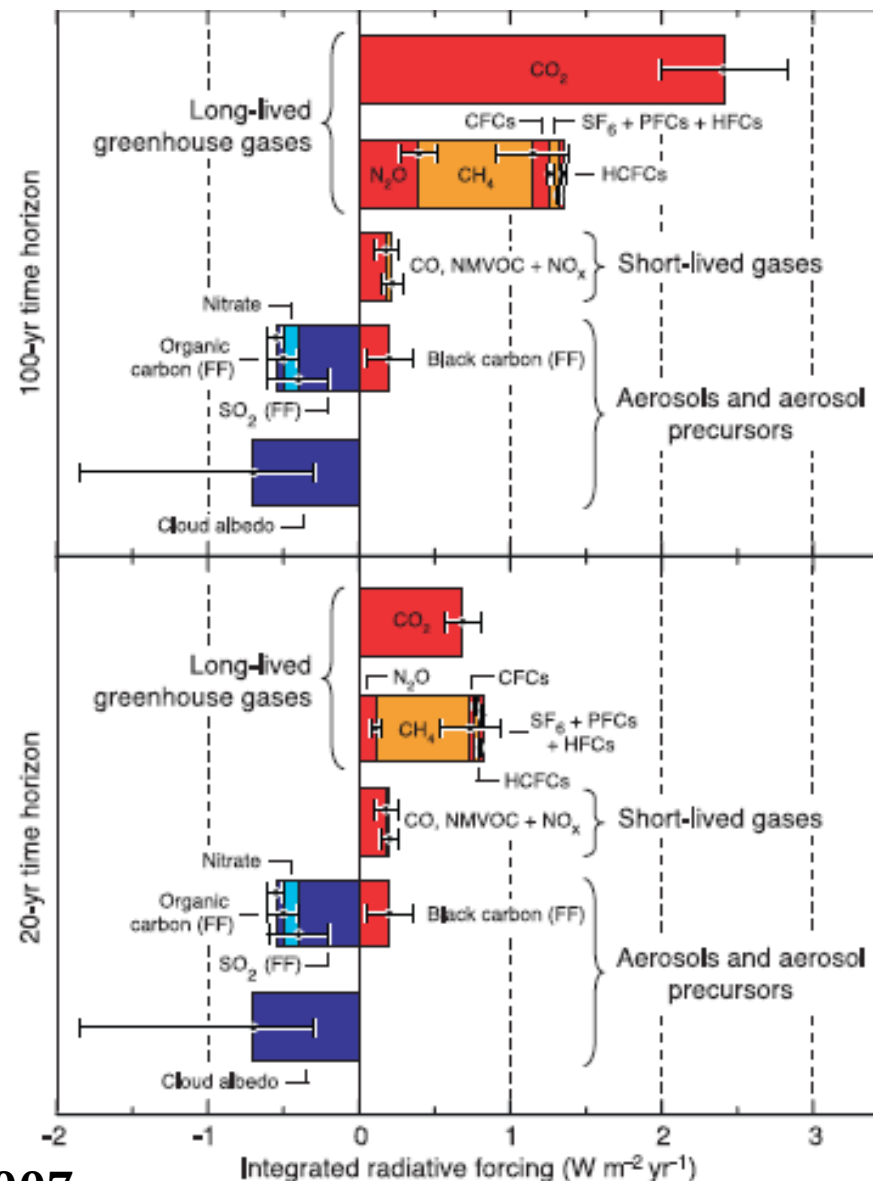
Source: ClimateWorks analysis

# Anthropogenic Emissions of Non-CO<sub>2</sub> GHGs and CO<sub>2</sub>

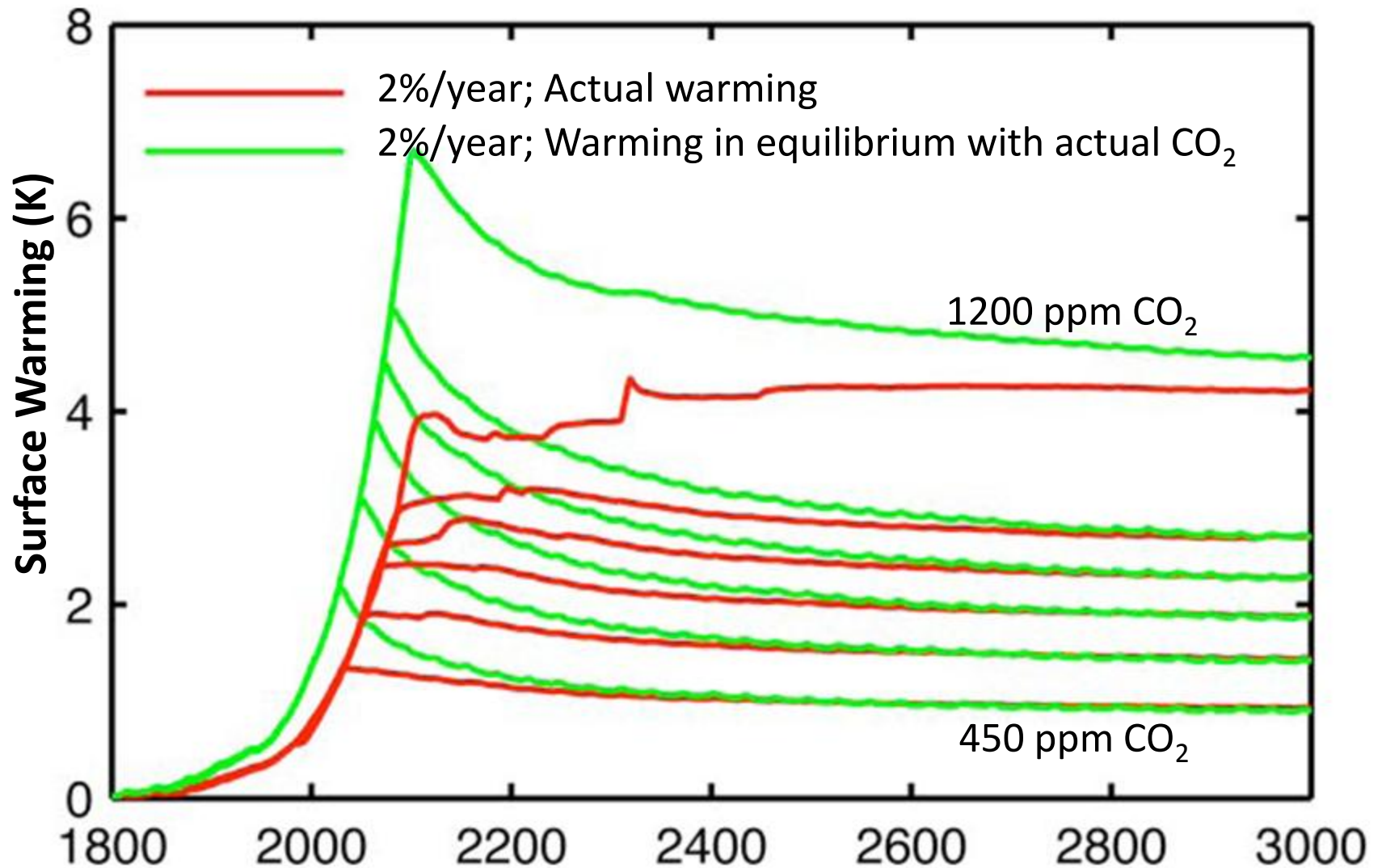


Source: Montzka et al., *Non-CO<sub>2</sub> greenhouse gases and climate change*, Review, Nature 476, 758 (2011).

# Integrated Radiative Forcing for Year 2000 Global Emissions Weighted by 100-yr and 20-yr time horizons

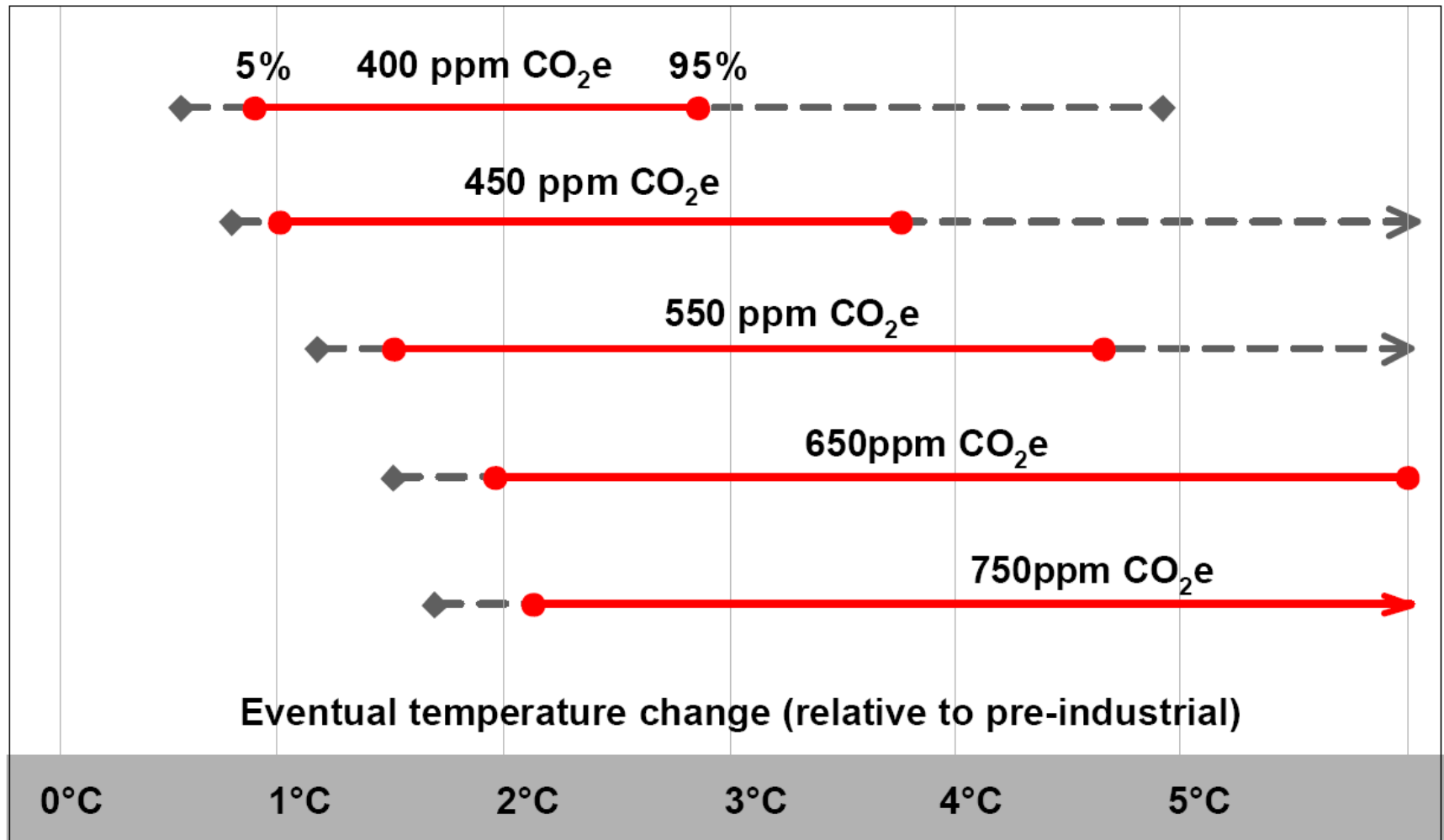


Source:  
IPCC AR4, WG1 SPM, 2007



**Source: S. Solomon et al. Irreversible climate change due to carbon dioxide emissions. Proceedings of the National Academy of Sciences, 2008**

# Climate Sensitivity



Source: Stern Review: The Economics of Climate Change

Wigley, T.M.L. and S.C.B. Raper (2001): , Science 293:451-454

Murphy, J.M., D.M.H. Sexton D.N. Barnett et al. (2004): Nature 430: 768 – 772



# Relationship of atmospheric concentrations of CO<sub>2</sub>e to temperature

Stabilization CO <sub>2</sub> -equivalent concentration (ppmv): range and best estimate				Equilibrium global average warming (°C)
320	←	340	→ 380	1
370	←	430	→ 540	2
440	←	540	→ 760	3
530	←	670	→ 1060	4
620	←	840	→ 1490	5

Source: Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia, Board on Atmospheric Sciences and Climate, The National Academies Press, 2010.

# **Reducing Abrupt Climate Change Risk Using The Montreal Protocol and other Regulatory Actions to Complement Cuts in CO<sub>2</sub> Emissions**

**Mario Molina, Durwood Zaelke, Madhava Sarma, Stephen Andersen, Veerabhadran Ramanathan, and Donald Kaniaru**

**PROCEEDINGS OF  
THE NATIONAL ACADEMY OF SCIENCES  
2009**

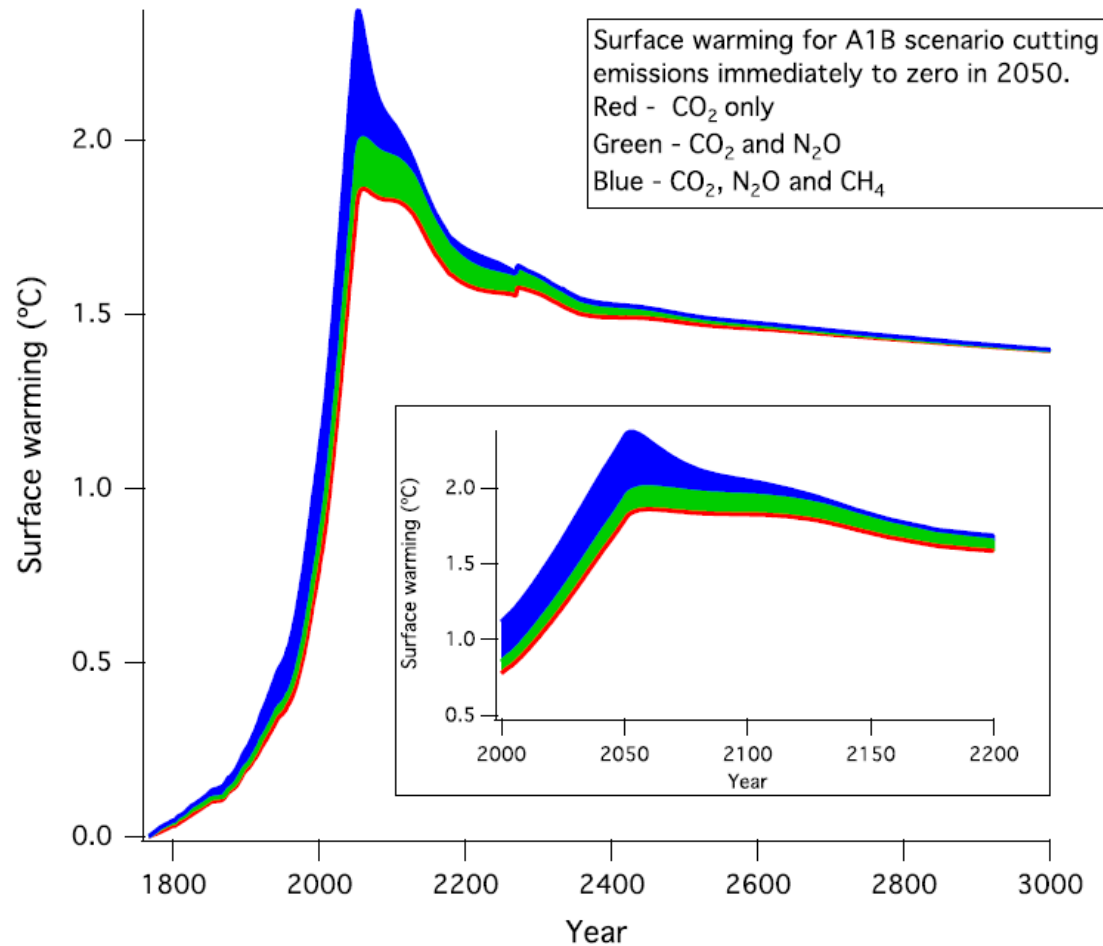
- **Soot**
- **Tropospheric Ozone**
- **Hydrofluorocarbons (HFCs)**

# Timescale for “irreversible changes” on earth’s system

<b>Tipping elements</b>	<b>Critical value (Temperature increase, °C)</b>	<b>Transition timescale</b>
<b>Arctic sea-ice</b>	<b>0.5 - 2 °C</b>	<b>~ 10 yr</b>
<b>Greenland ice sheet</b>	<b>1 - 2 °C</b>	<b>&gt; 300 yr</b>
<b>West Antarctic ice sheet</b>	<b>3 - 5 °C</b>	<b>&gt; 300 yr</b>
<b>Atlantic thermohaline circulation</b>	<b>4 - 5 °C</b>	<b>~ 100 yr</b>
<b>Indian summer monsoon</b>	<b>N/A</b>	<b>~ 1 yr</b>
<b>Amazon forest</b>	<b>3 - 4 °C</b>	<b>~ 50 yr</b>
<b>Boreal forest</b>	<b>3 - 5 °C</b>	<b>~ 50 yr</b>

# Surface Warming

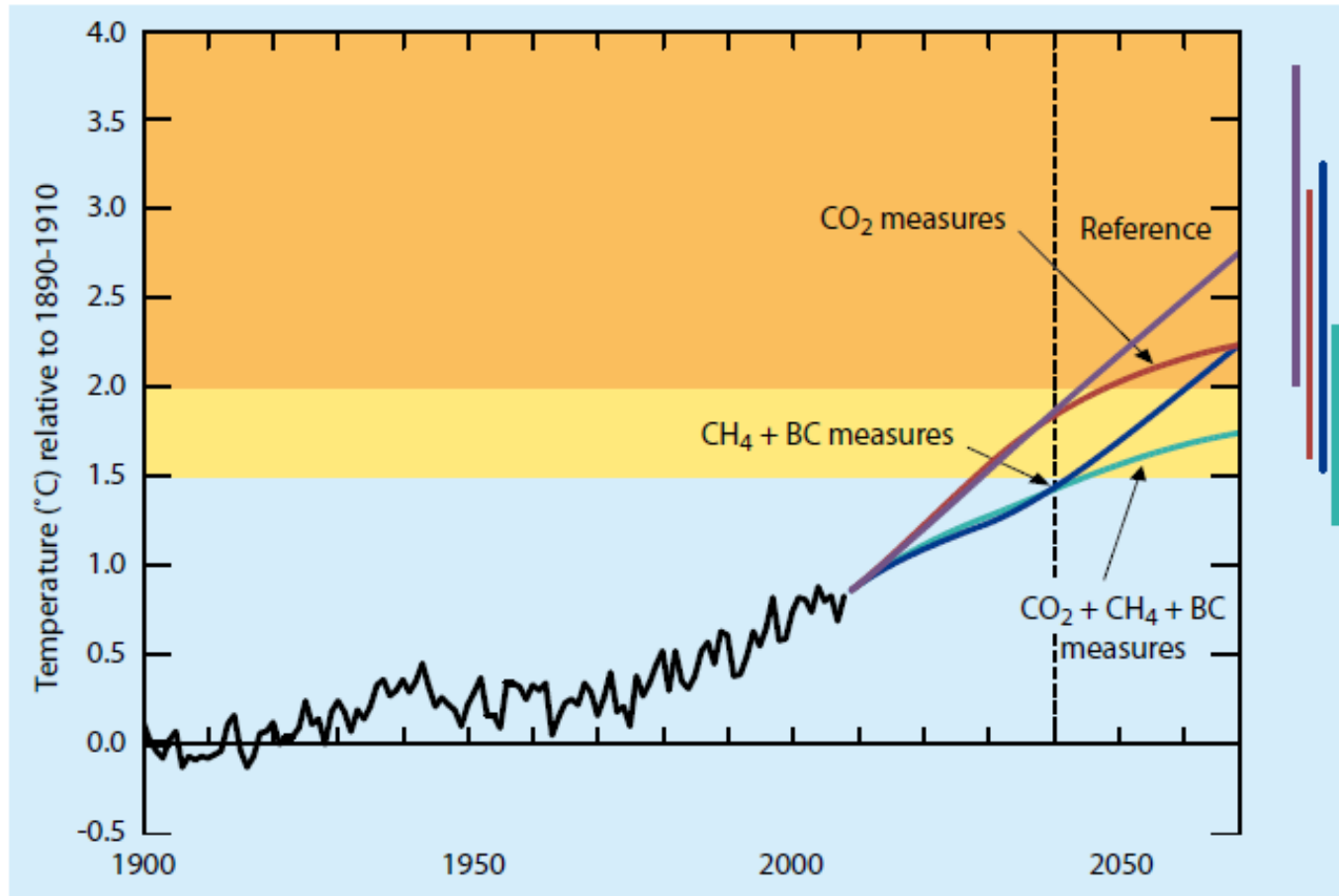
Computed surface warming due to CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emission increases to 2050 (“midrange” scenario) followed by zero anthropogenic emissions thereafter.



Source: Solomon et al., *Persistence of climate changes due to a range of greenhouse gases*, PNAS 107, 43 (2010).

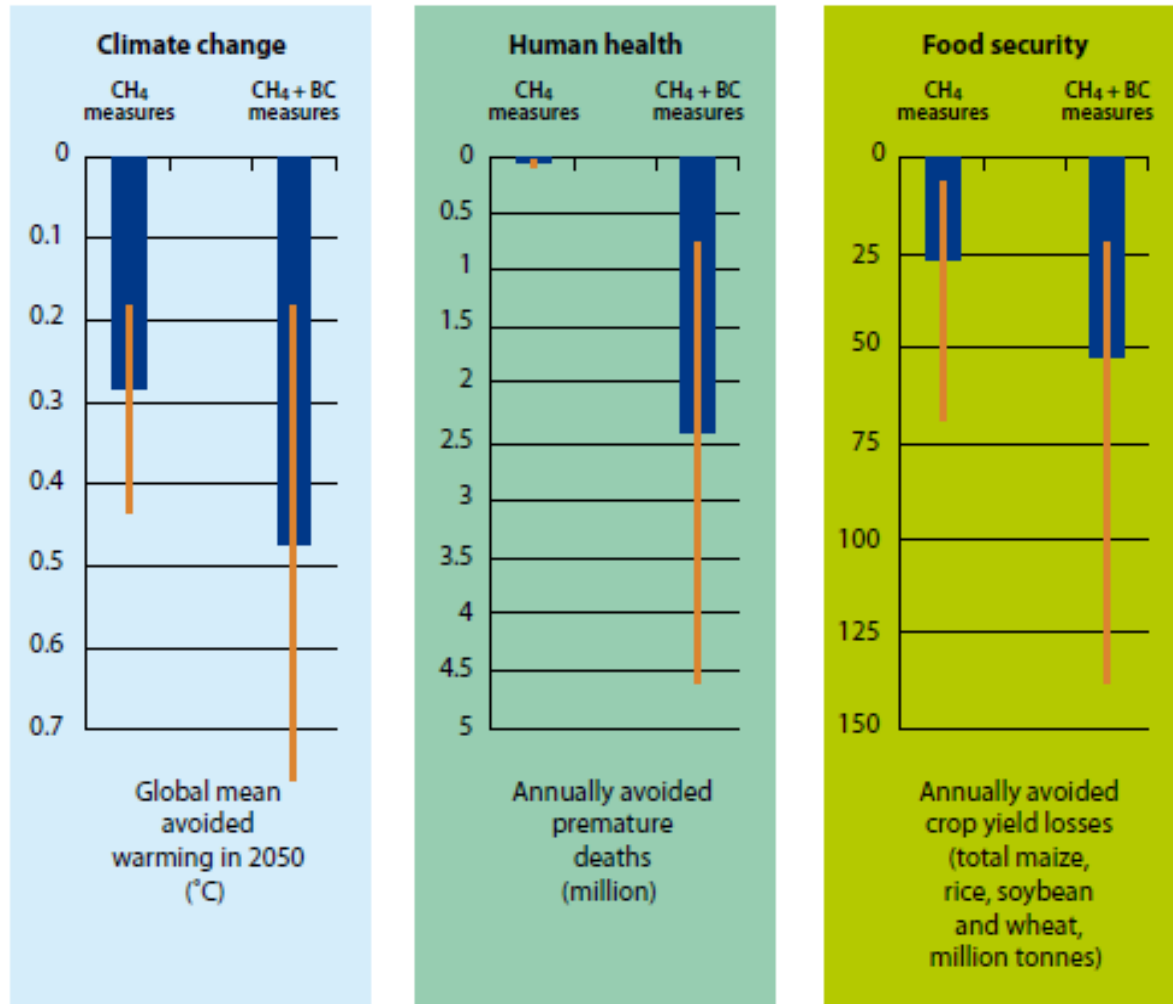


# Predicted Warming Under CO<sub>2</sub> and SLCF Mitigation Scenarios



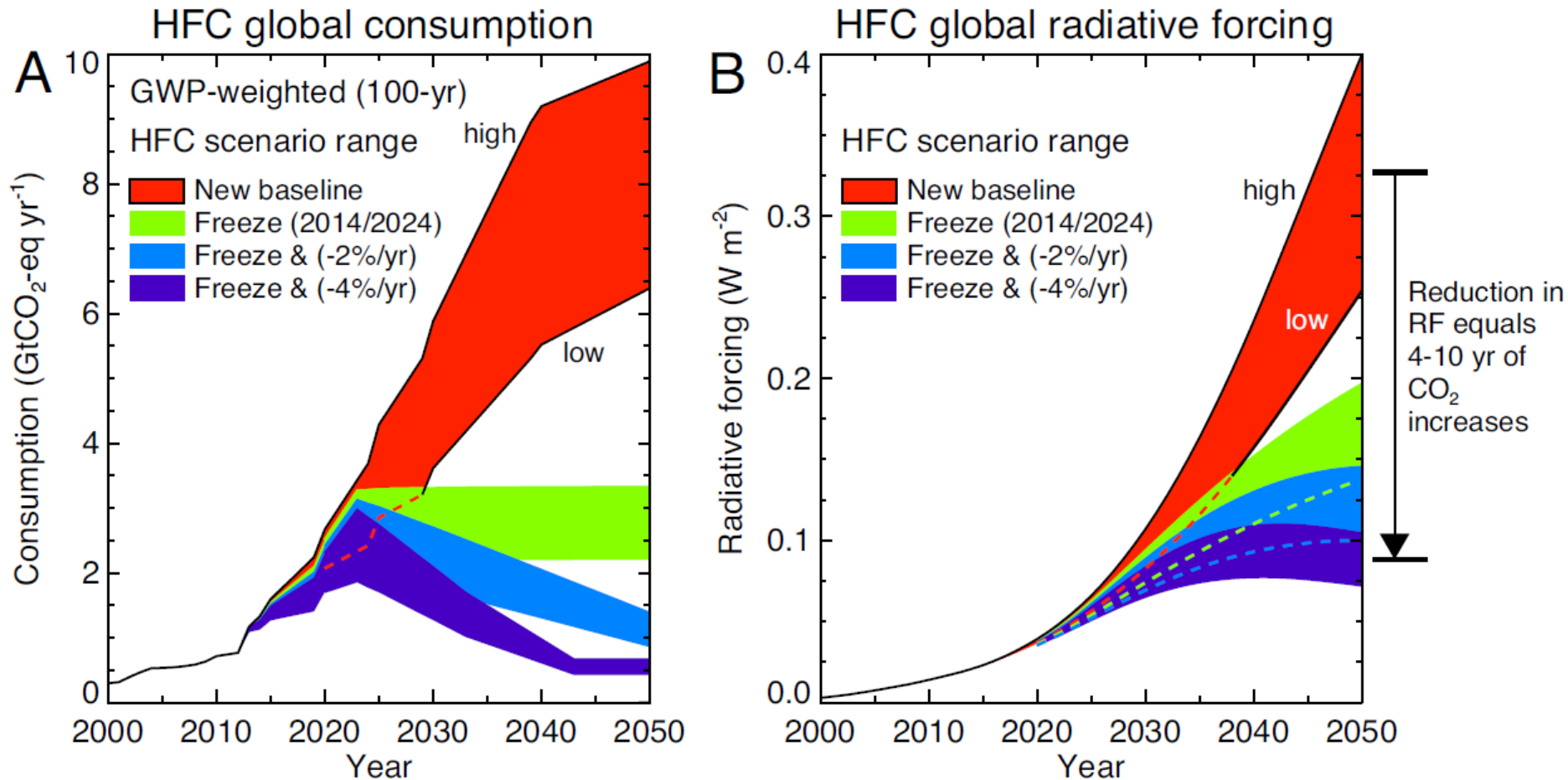
Source: UNEP and WMO (2011)– *Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers.*

# Global benefits from full implementation of the identified measures in 2030



Source: UNEP and WMO (2011)– *Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers.*

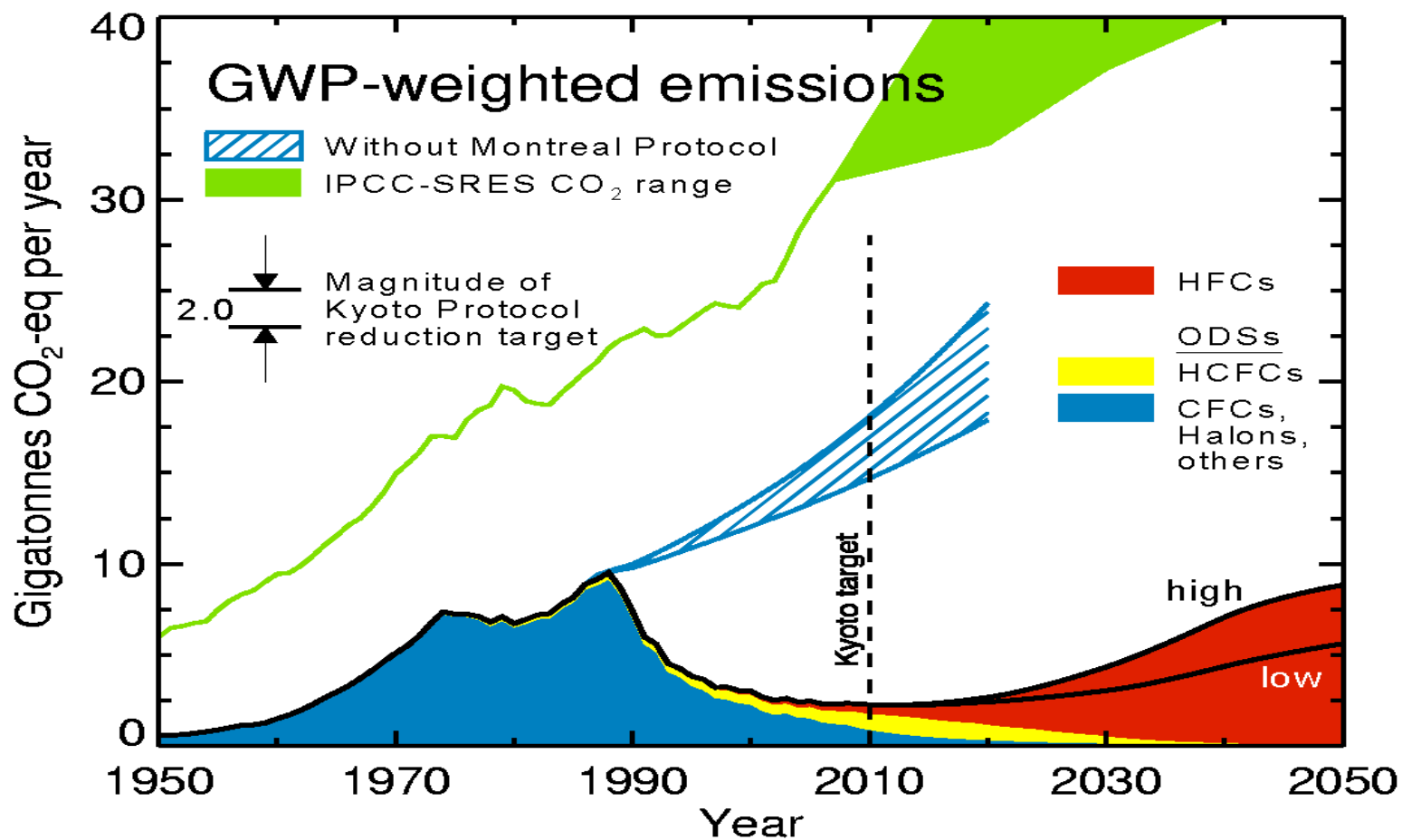
# Global HFC consumption



Source: Velders et al., *The large contribution of projected HFC emissions to future climate forcing*, PNAS 106, 27 (2009).



# Potential growth in HFC emissions



# **International Agreement to Control CFC Emissions**

**UNITED NATIONS ENVIRONMENT PROGRAM (UNEP)**



## **MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE OZONE LAYER**

**FINAL ACT**

**1987**

# HFCs and the Montreal Protocol

- **The Montreal Protocol has a long history of considering climate impacts, and has achieved significant GHG reductions**
- **HFCs are used as replacements to commonly used ODS**
- **In some instances The Montreal Protocol, has led to increased use of GHGs including HFCs.**
- **Proposed Amendments to the Montreal Protocol by Canada, Mexico, the United States and Micronesia to phase down the production and consumption of HFCs**

# Methane Blue Ribbon Panel: Global Methane Fund (GMF)

- Methane projects had stalled in recent years due to lack of financing, given the uncertainty in carbon prices.
- At COP 15, the Methane Blue Ribbon Panel proposes a public-private financing mechanism (Global Methane Fund – GMF) to fill that gap, and at the same time uphold UNFCCC processes by supporting projects under Clean Development Mechanism (CDM), as well as emerging carbon markets.
  - **Goal:** Addresses “logjam” in methane projects by providing guaranteed “floor price” for methane Certified Emissions Reductions (CERs), resulting in greater abatement
- During COP 16 in Cancun, the Panel, together with Mexico, UN Foundation and UNEP, as well as other interested parties, agreed to explore a **prototype methane financing facility (PMFF)**
  - **Goal:** to prove the “floor price guarantee” model of GMF through streamlined 2011 mechanism.

# **Methane Blue Ribbon Panel:**

## **Prototype Methane Financing Facility (PMFF)**

- A public-private financing mechanism aimed at accelerating methane abatement by supporting projects under the Clean Development Mechanism (CDM) as well as emerging carbon markets through provision of a price floor for carbon credits (Certified Emissions Reductions or CERs).
- The PMFF agrees to cover any shortfall by paying the difference between the guaranteed price, and the actual market price when credits are issued. If the price is higher than the guaranteed price, the PMFF would be paid some portion of that profit, to use for future guarantees or other methane reduction activities.
- Credits eligible for this guarantee would be those under the CDM, and certain other well-developed voluntary and compliance markets, as approved by the Board of the PMFF.
- Government support for price guarantees only, requiring pledges not direct funding (except for secretariat functions)
- Analysis by carbon market specialists indicates that PMFF should be self-supporting within 1-3 years.