New Opportunities for Global Partnerships in Climate Protection

JICOP PATH FINDING
26 November 2008

Stephen O. Andersen
US Environmental Protection Agency

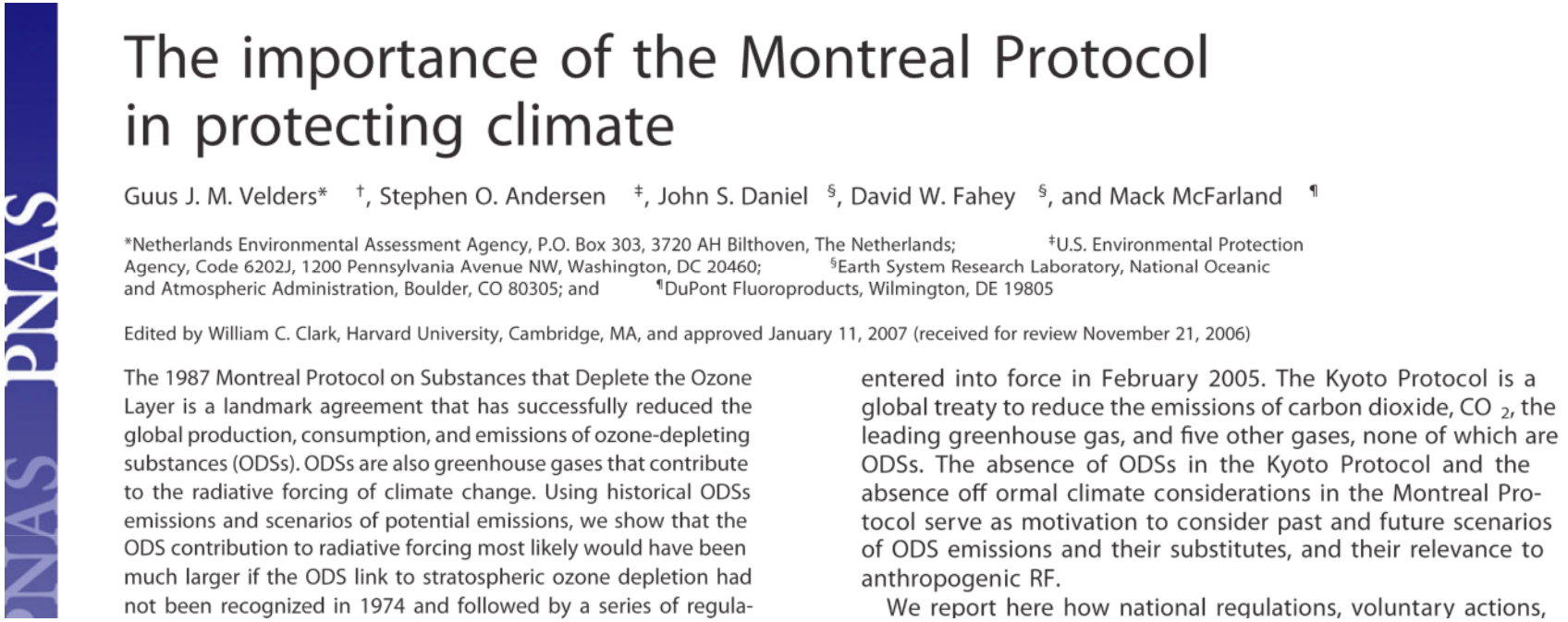
EPA Congratulates JICOP

- Japanese company phaseout in Thailand
- Technology cooperation worldwide
  - Making a big difference in so many countries
- Ozone officer training
  - Dozens of influential environmental authorities
- Fast ODS phaseout in Japan
- New bilateral project in south east Asia
  - Recover and destroy ozone-depleting greenhouse gases

Thank You JICOP
For Saving the World!

- Japanese Government Agreed Montreal
- Japanese Companies Pledged Fast Action
- Japanese People Demanded Safe World
- JICOP & ICOLP Partners Were Path Finders
- JICOP was the Focal Point in Japan
  - What to do, How to do it, Incentives & Rewards
- JICOLP was the Catalyst in so Many Places
  - China, Indonesia, Malaysia, Philippines, Thailand, Vietnam…and world-wide

Ozone-Depleting Greenhouse Gases



PNAS

The importance of the Montreal Protocol in protecting climate

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The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer is a landmark agreement that has successfully reduced the global production, consumption, and emissions of ozone-depleting substances (ODSs). ODSs are also greenhouse gases that contribute to the radiative forcing of climate change. Using historical ODSs emissions and scenarios of potential emissions, we show that the ODS contribution to radiative forcing most likely would have been much larger if the ODS link to stratospheric ozone depletion had not been recognized in 1974 and followed by a series of regula-

entered into force in February 2005. The Kyoto Protocol is a global treaty to reduce the emissions of carbon dioxide, CO_2, the leading greenhouse gas, and five other gases, none of which are ODSs. The absence of ODSs in the Kyoto Protocol and the absence off ormal climate considerations in the Montreal Protocol serve as motivation to consider past and future scenarios of ODS emissions and their substitutes, and their relevance to anthropogenic RF.

We report here how national regulations, voluntary actions,

Velders *et al.*, *Proc. Nat. Acad. Sci.,* March 2007

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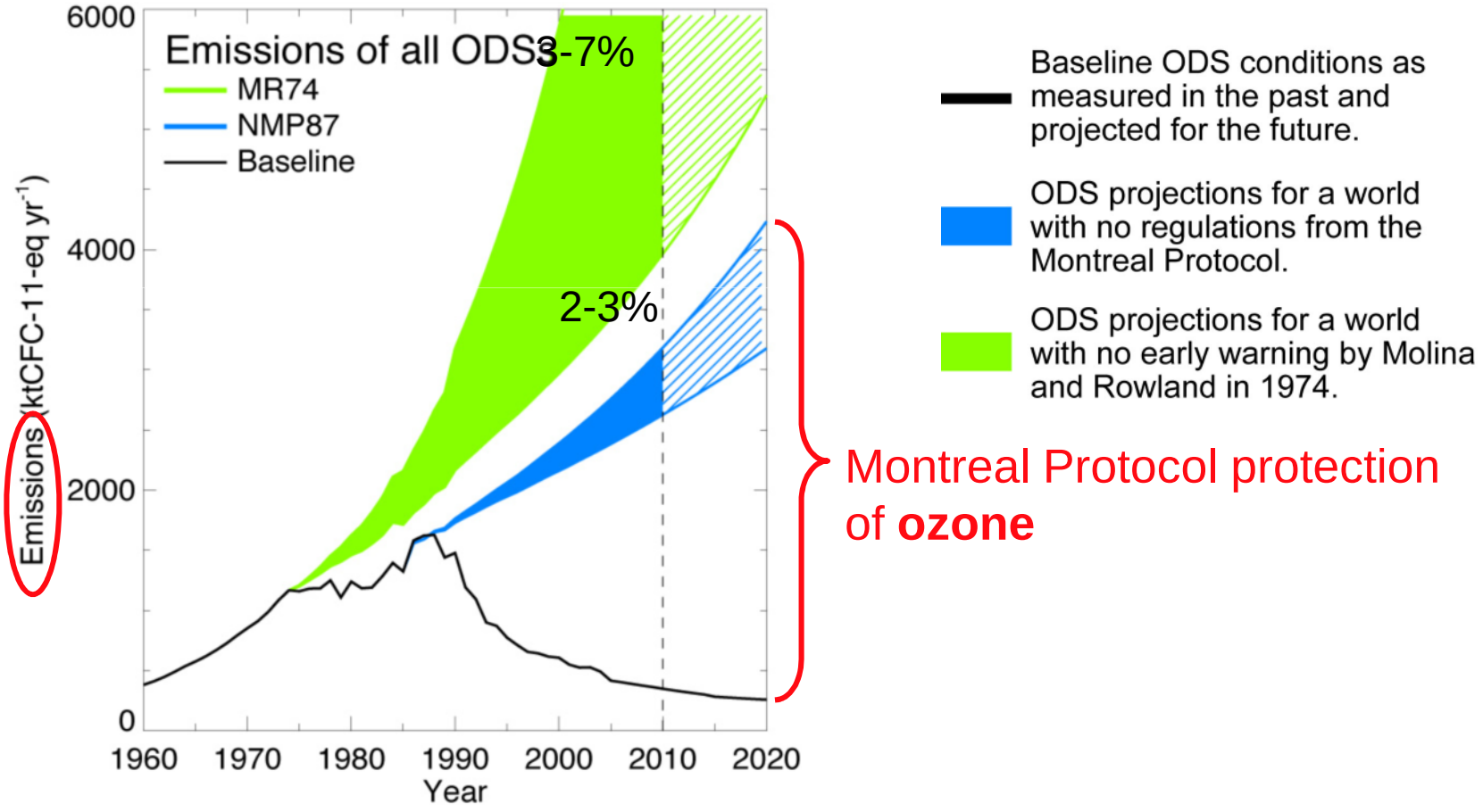
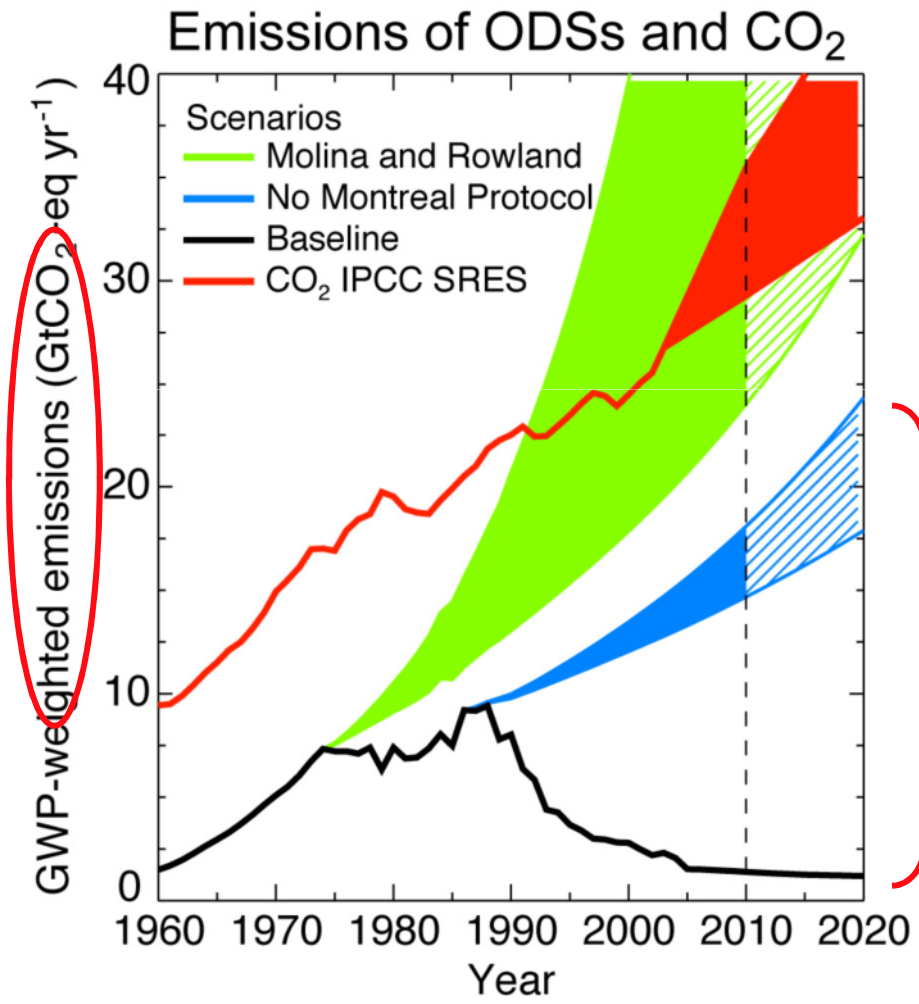
Molina & Rowland & Montreal Protocol Saved the Earth From Ozone Depletion!



G. Velders *et al.*, PNAS, 2007

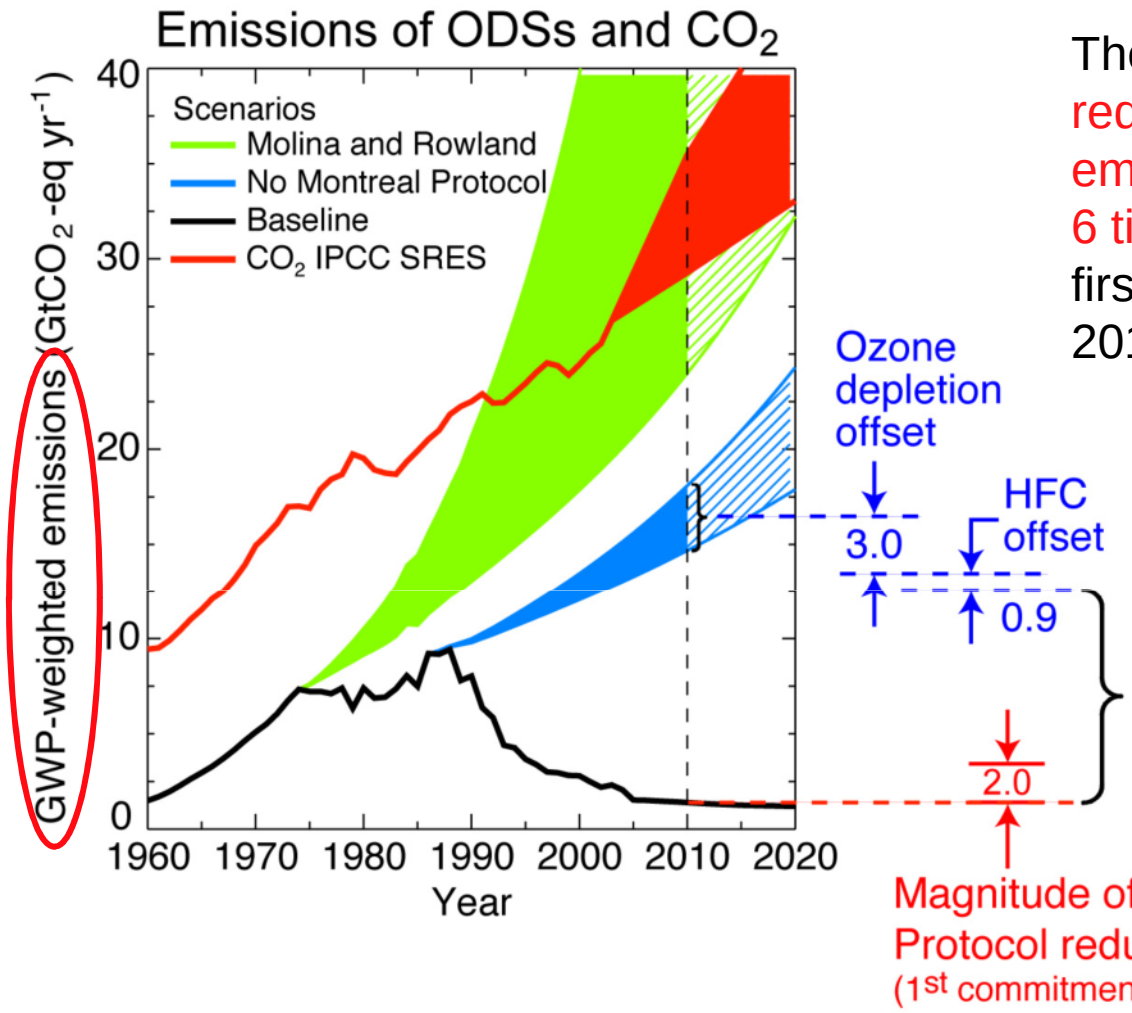
Molina & Rowland & Montreal Protocol Saved the Earth From Climate Change!



Montreal Protocol protection of **climate**

G. Velders *et al.*, PNAS, 2007

Global Warming Potential of ODS Emissions



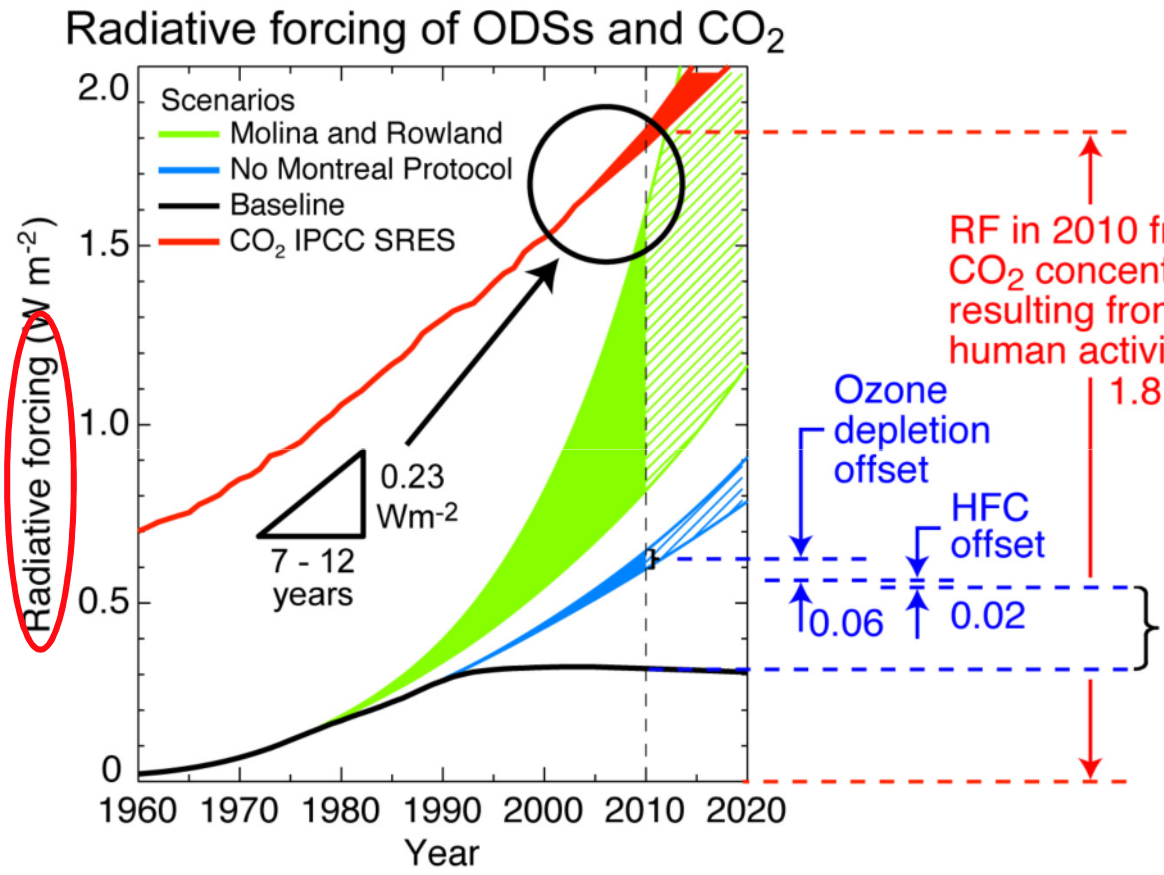
The Montreal Protocol will have reduced net GWP-weighted emissions from ODSs in 2010 by 5-6 times the reduction target of the first commitment period (2008-2012) of the Kyoto Protocol.

The Montreal Protocol will have reduced net GWP-weighted emissions from ODSs in 2010 by about 11 Gt CO_2-eq yr^{-1}.

- Greenhouse gases: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
- Target Annex-1 parties for 2008-2012 (cf 1990):
  - -0.97 $GtCO_2$-eq/yr about -5.8%
- Projections for 1990-2010 (UNFCCC):
  - +1.06 $GtCO_2$-eq/yr

G. Velders *et al.*, PNAS, 2007

Radiative forcing of ODS Emissions



The Montreal Protocol net reduction in ODS radiative forcing in 2010 will be equivalent to about 7-12 years of growth in radiative forcing of CO_2 from human activities.

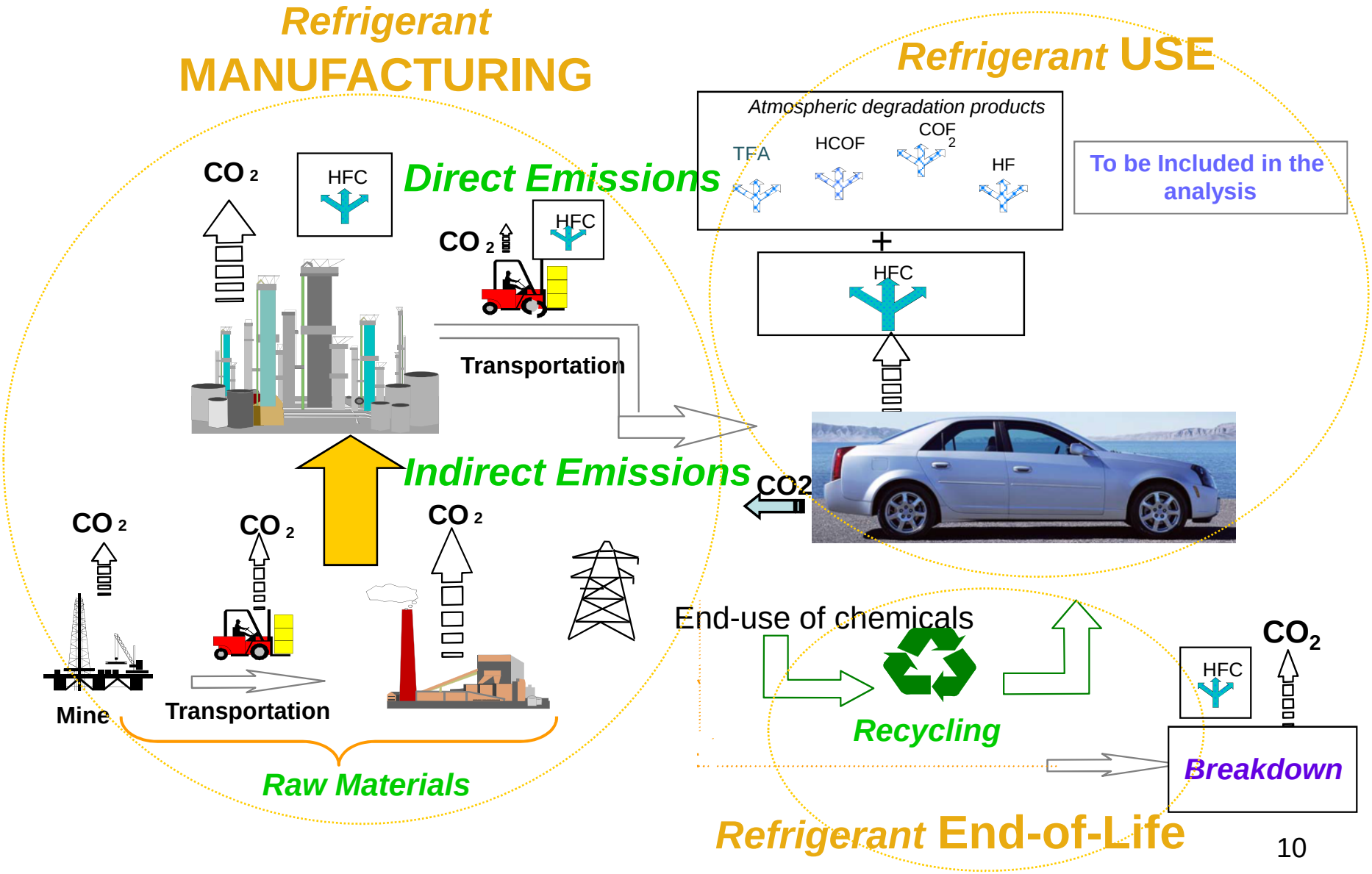
The Montreal Protocol will have reduced net radiative forcing from ODSs in 2010 by about 0.23 Wm^{-2}, which is about 13% of that due to the accumulated emissions of CO_2 from human activities.

G. Velders *et al.*, PNAS, 2007

Lifecycle Climate Change Performance

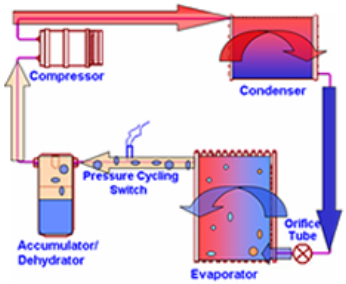
- Lifecycle Climate Change Performance (LCCP) is ***the metric for environmental acceptability***
- Incorporating direct and indirect emissions
- Tailored to climate and consumer preference
- Appropriate for stationary & mobile applications
- ***Environmental authorities worldwide will regulate until best LCCP is achieved – reducing the cost of refrigeration and A/C while protecting the Earth for future generations***

Life Cycle Greenhouse Gas Emissions of Refrigerants



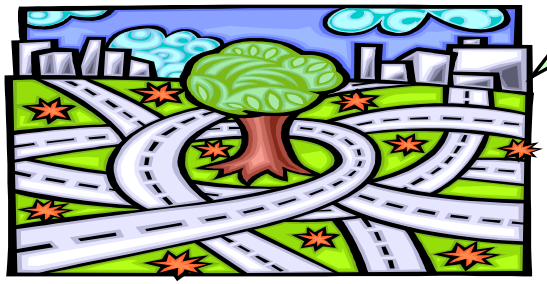
GREEN-MAC-LCCP©

Model Input Assumptions



- Vehicle Assumptions
  - Car Size
    - Compact [current]
    - Midsize [current]
    - SUV [current]
  - Engine type
    - L4 [current]
    - V6 [current]
    - V8 [current]

- Refrigerant System Assumptions:
  - Leakages
  - System Mass
  - Temperature at Evaporator Outlet
  - COP, Qe (from Bench or Vehicle tests)
  - Condenser/Gas Cooler Air Inlet air at idle conditions
  - Front End Air Flow
  - Engine Cooling Fan



Model

- Vehicle Usage & Climate Assumptions:
  - Distance based on region
  - % Drive Time in Ambient during 6AM - 24PM Different for Each City
  - Cabin Comfort -% Time with A/C ON
  - Driving cycle based on region

- Environmental Assumptions:
  - CO_2-eq from refrigerant production
  - Transportation, End-of-Life and By-Product Emissions
  - Ambient Temperature Operation
  - Humidity effects

(GREEN-MAC-LCCP)©

- Master-Minded by GM's Dr. Stella Papasavva
- Supported by Japan Automobile Manufacturers Association, SAE International, US. EPA, General Motors and dozens of global experts
- The Global Refrigerants Energy & Environmental Mobile Air Conditioning Lifecycle Climate Change Performance (GREEN-MAC-LCCP)© Model
  - Globally peer reviewed, sophisticated and transparent
  - Endorsed by environmental authorities and NGOs
  - Available on the US EPA website: http://epa.gov/cppd/mac/compare.htm

Fuel efficiency is the key to LCCP of systems using low-GWP refrigerants like HFC-1234yf

Lessons of JICOP Success for Climate Protection

- Japanese experts on technology assessments
  - Taking best Japanese technology worldwide
  - Bringing best ideas back to Japan
  - Knowing what to do, when, and how
- Japanese leadership at overseas factories
  - Thailand CFC refrigerator phaseout
  - Vietnam leadership pledge
- Japanese influence on Montreal Protocol
  - Amendments & Adjustments, Essential Use Exemptions, HCFCs as transition substitutes, Accelerated HCFC phaseout, collect & destroy

Japanese Financing of Japanese Leadership by JICOP

- Japanese companies supported experts
- MITI, ME, & companies supported JICOP
- Japanese bilateral projects financed under the Multilateral Fund from Japanese Contributions
- Japanese companies move ahead on phaseout of high-GWP HFCs

Lessons for Climate

- Billions of dollars pledged by Japan to developing countries for climate protection or paid for carbon off-sets would be better spent if managed by Japanese company experts transforming markets where Japan has global technology leadership.
- JICOP can be financed to organize Japanese companies to provide this essential contribution to making the world safe for future generations

Imagine a Better World

- The most energy-efficient Japanese products
- Simulated by “top runner” incentives
- Capturing and keeping global markets
- Rewarding continuous improvement and a passion for excellence
- Earning global appreciation for Japanese engineering, quality, ownership affordability, and environmental sustainability

The Devil in the Details

- Government and Corporate Finance JICOP to expand climate activities
- Concentrate first on HFCs
  - Small charge with near-zero emissions
  - Proper service, recovery & recycle & destruction
  - Transition to low-GWP HFCs & natural refrigerants
  - Not-in-kind thermal insulation
- Use ozone champions to train new cadre of Japanese experts to protect the climate
- Do amazing things to put JICOP in the news

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