

# **Near-Term Climate Mitigation Side Event, Cop-16**

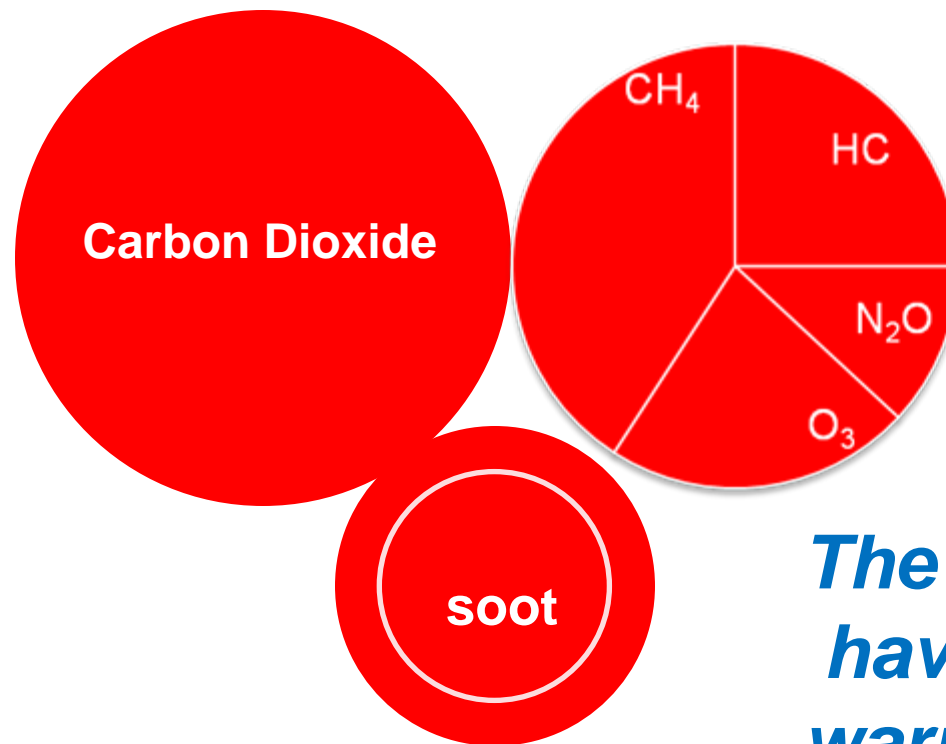
**7 December 2010**

**Room Pitaya, Cancun Messe, Mexico**

**V Ramanathan**



# Heat Trapped by Carbon Dioxide and Other Climate Pollutants as of 2005



*The other pollutants  
have almost the same  
warming effect as  
Carbon Dioxide*

Source: IPCC-2007;  
Ramanathan and Xu, 2010

# ***How Long Have We known About the other Climate Pollutants?***

Reprinted from  
3 October 1975, Volume 190, pp. 50-52

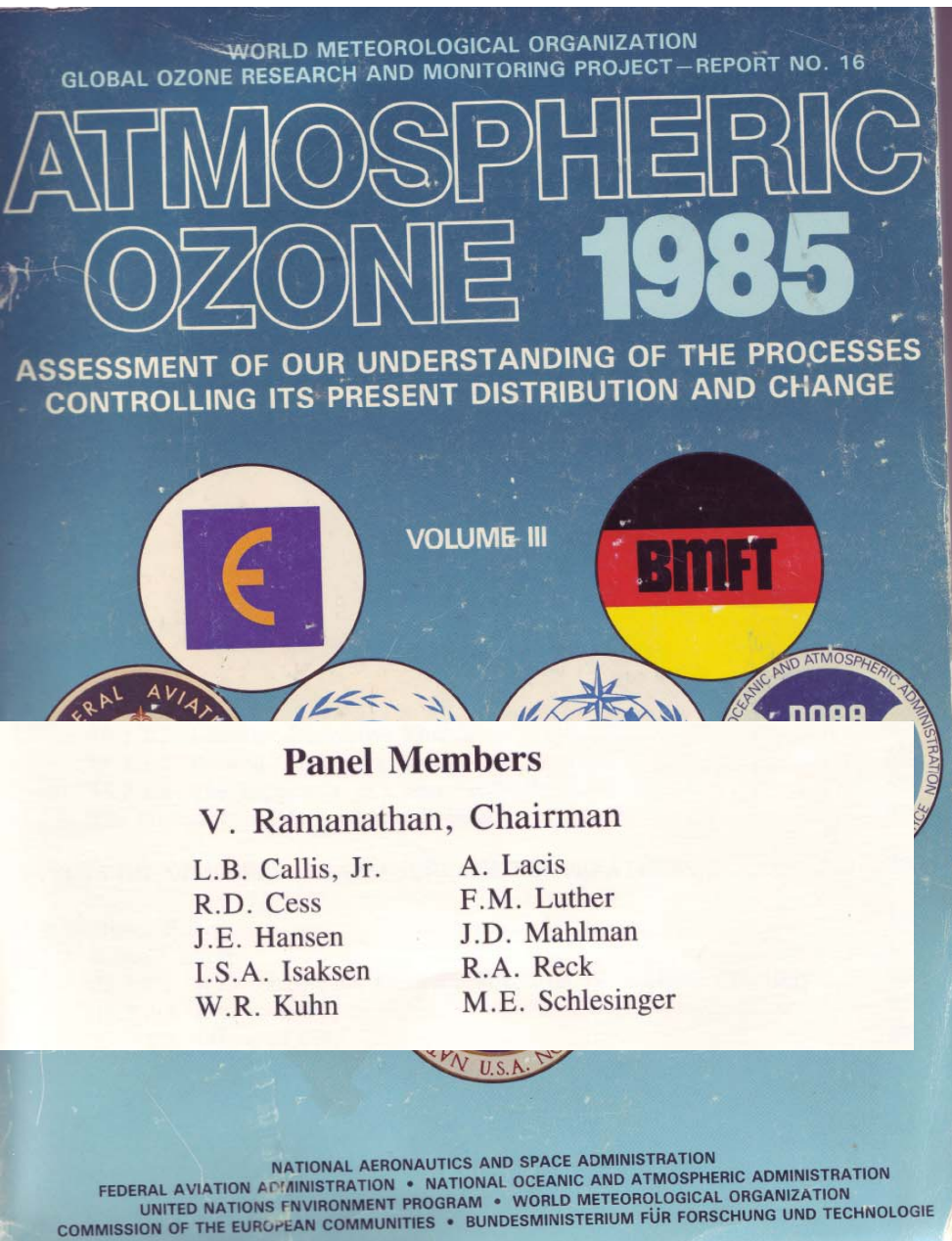
# **SCIENCE** 1975

## **Greenhouse Effect Due to Chlorofluorocarbons: Climatic Implications**

V. Ramanathan

***One molecule of CFC has the same greenhouse effect as the addition of more than 10,000 molecules of Carbon Dioxide to the Atmosphere***

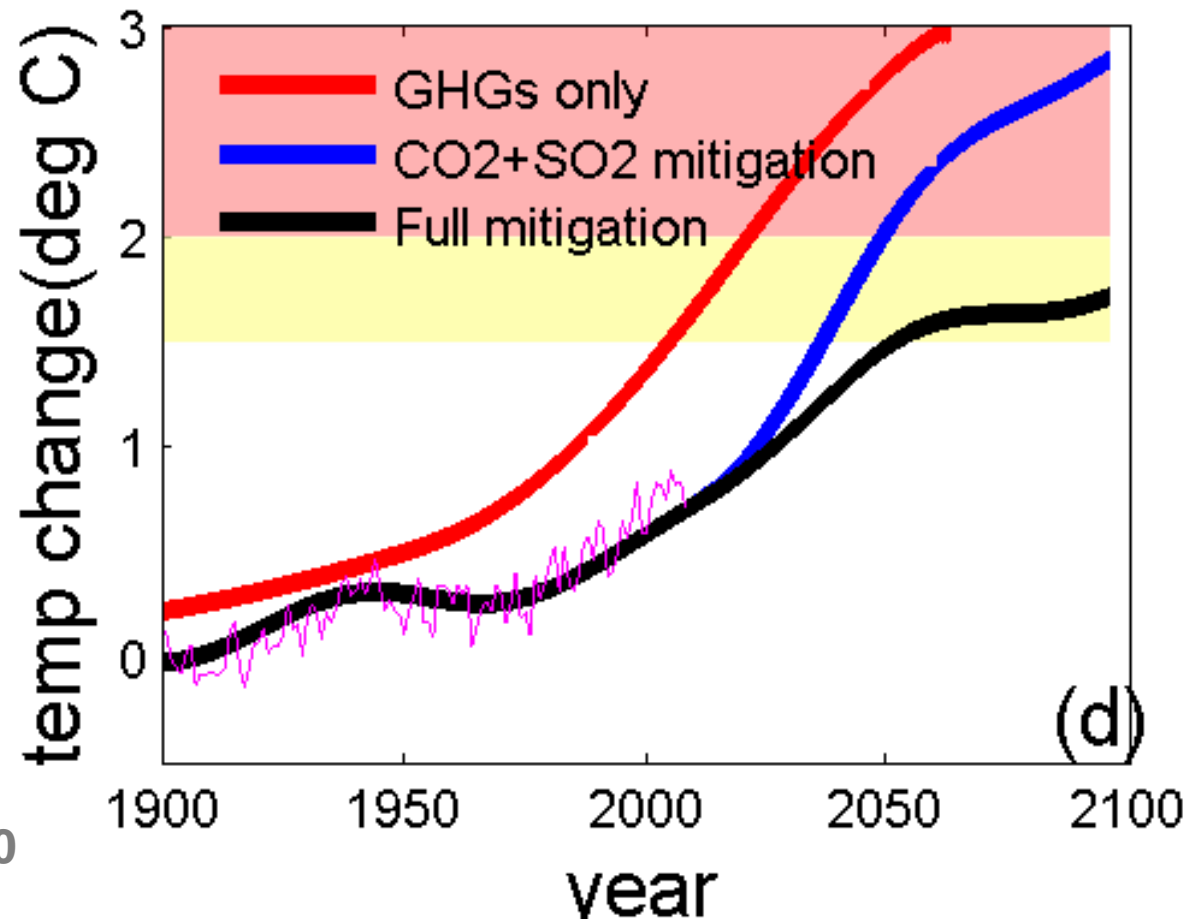
# When was the First International Assessment of the Other Pollutants?



***Non-CO<sub>2</sub> Gases contribute as much as CO<sub>2</sub> to climate Change***

# *What do we mean by Near-Term ?*

***With just carbon-dioxide mitigation, the warming is likely to exceed 1.5 C to 2 C during the next 30 to 60 years***

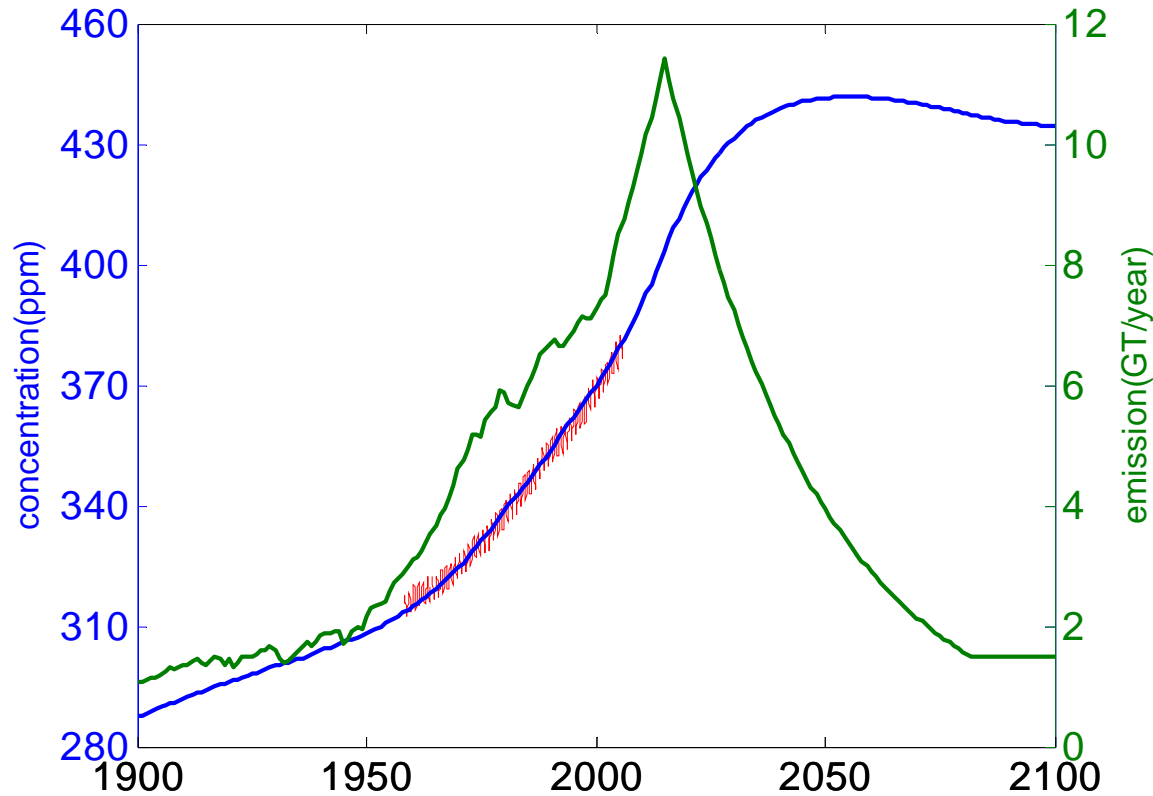


Ref: Ramanathan and Xu, 2010

Raes and Seinfeld, 2009

Mcracken, .....

***Even with 50% reductions by 2050, CO<sub>2</sub> will Increase to 440 PPM; Commit More warming***



***CO<sub>2</sub> reductions have to be complemented with Reductions in short-lived non-CO<sub>2</sub> warming agents***

# Mitigation

## Long-Term

### Build-up of Carbon Dioxide

Results from burning fossil fuels – essential to modern life

Remains in air for centuries

Main contributor to warming

Cutting down this emission is the permanent solution

## Near -Term

### Short-lived Gases & Dark Soot Particles

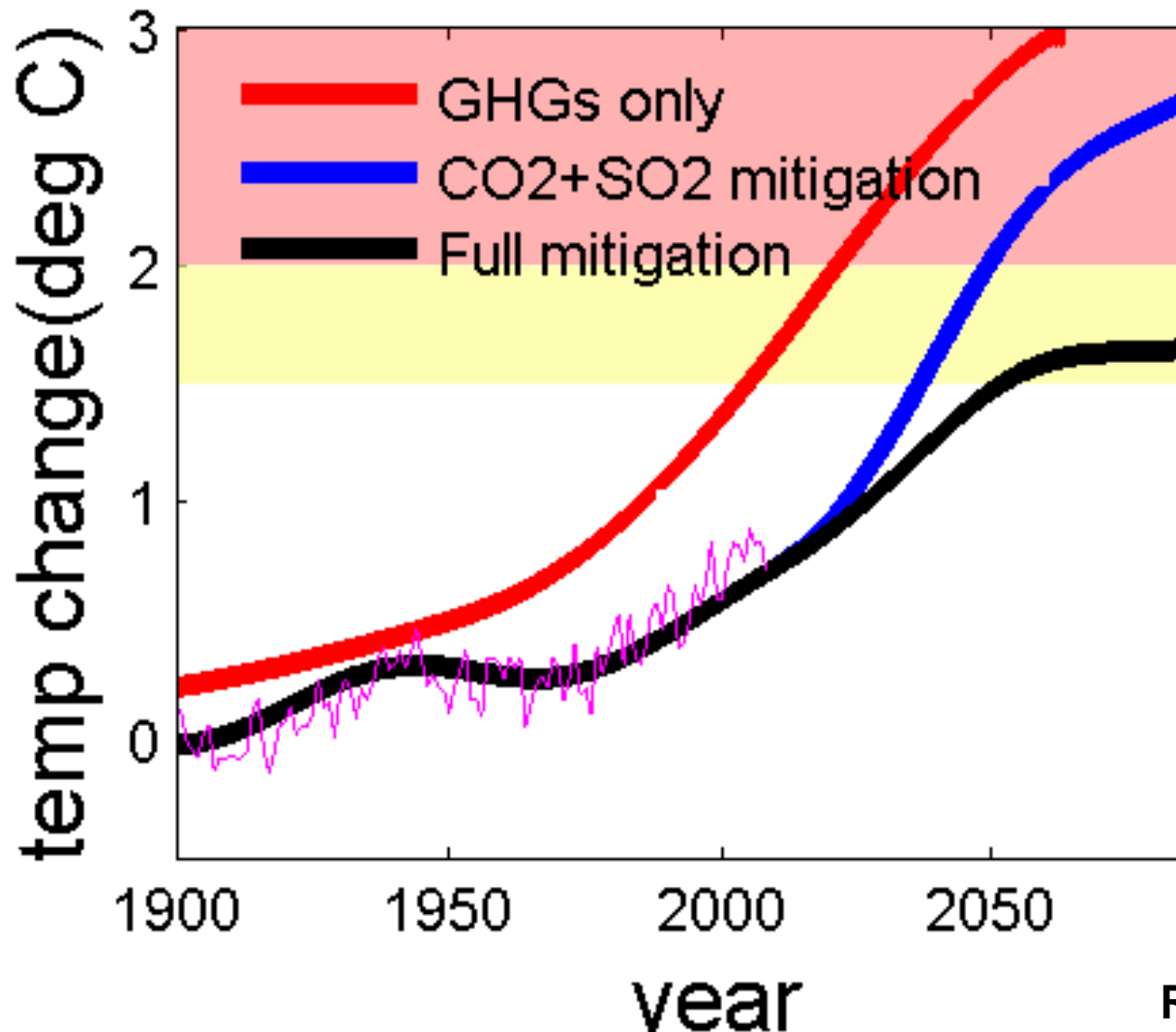
3 Gases – *Methane, HFC* [Hydro Fluorocarbons] and lower atmospheric *ozone*

Pollutants last several days to few decades in air

Current Warming effect – 80% of that of Carbon Dioxide

Cutting down will buy time till permanent solution is in place

*By Mitigating emissions of short-term climate pollutants  
Can Delay large warming by few decades:*





# *Primary Mitigation Advantages of Near-Term Climate Pollutants*

*Easier to reduce. People can  
see immediate benefit*

Technology and regulatory  
systems are available

Can be done locally and  
Nationally

Need proper incentives

***Why the delays?***

Poor Incentives –  
cumbersome accounting  
systems in climate  
diplomacy

# Some Visible Effects of Pollutants

## Ozone; Methane; Soot

**Regional: Melting of arctic snow and ice; Large warming of the Himalayan-Tibetan Region ; Disrupting Monsoonal circulation**

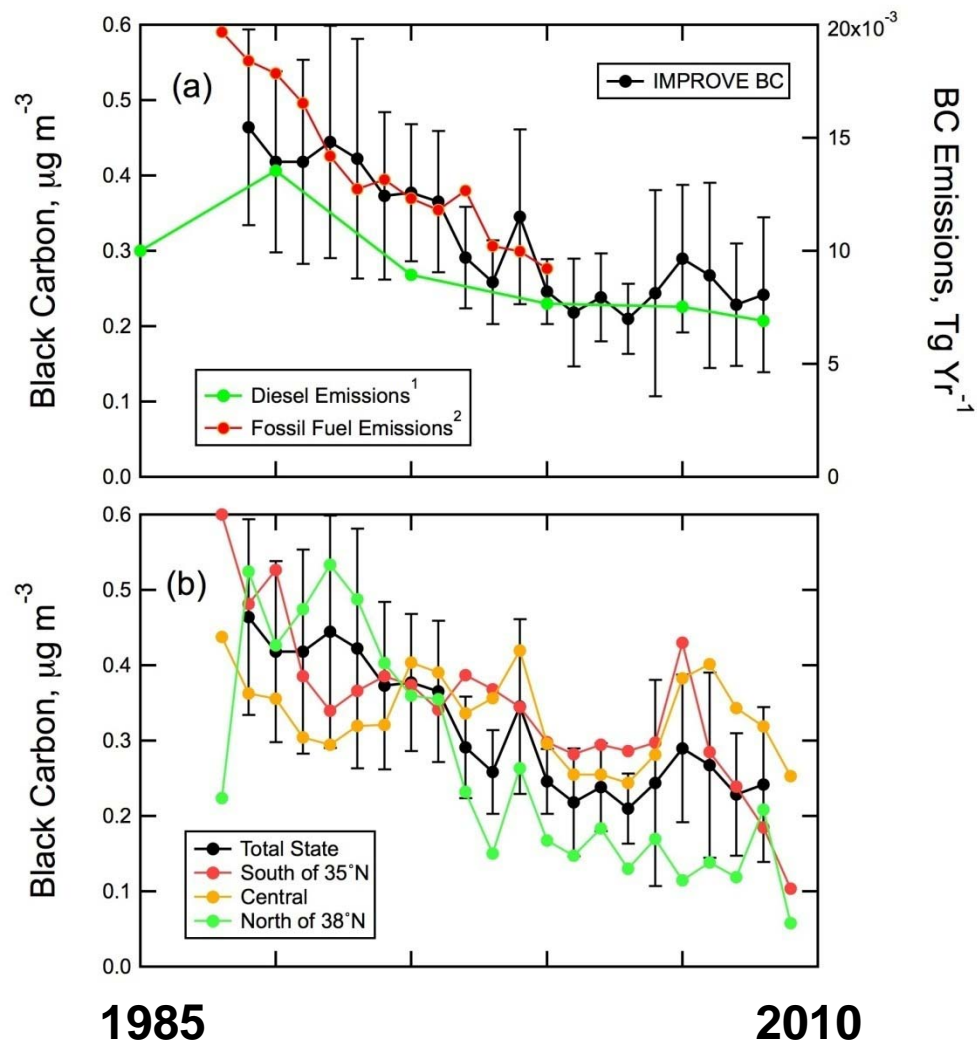
**Air pollution – unhealthy air  
Over 1.5 million deaths  
annually**



**Threat to Agriculture; Billions of  
dollars lost due to crop damages**

# California Has Reduced its Black carbon Reductions By 50% from 1989 to 2008

Bahadur , Feng, Russell, Ramanathan, 2010



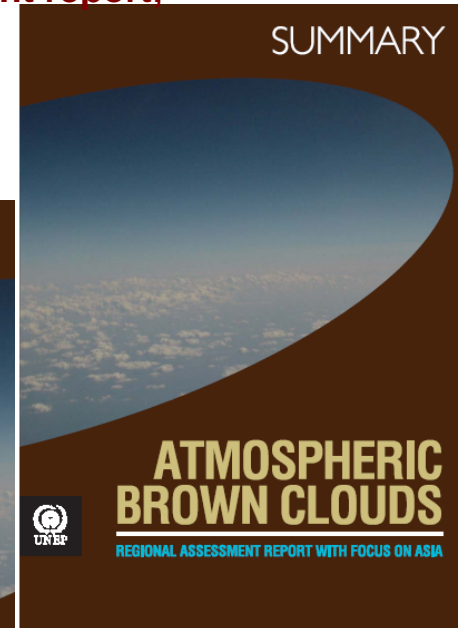
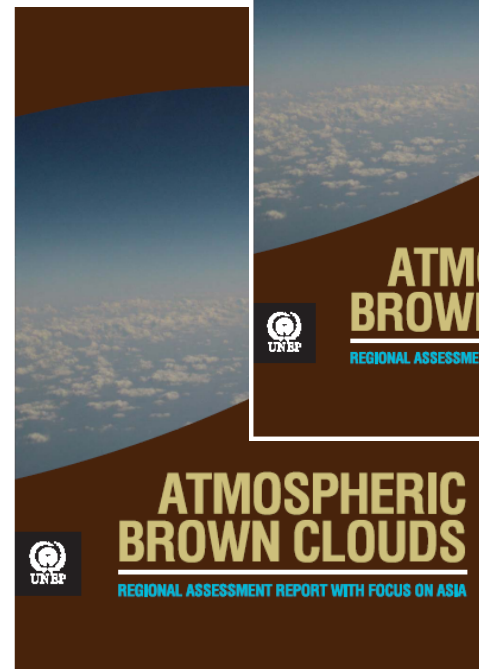
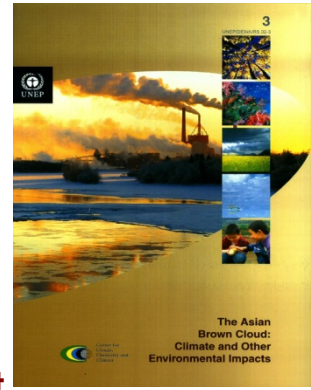
# UNEP's ABC PROJECT

**Think Globally**

**Assess Regionally**

**Preliminary  
Assessment  
Report, Aug 2002**

**The first impact  
assessment report,  
Nov 2008**



# ***UNEP integrated assessment of tropospheric ozone and black carbon (Preview)***

**Assessment Chair:**        **Drew Shindell** (NASA Goddard Institute for Space Studies, USA)

**Assessment Vice Chairs:** **Frank Raes** (EU Joint Research Centre, Ispra, Italy)  
                                     **V. Ramanathan** (Scripps, Univ. of California, USA)  
                                     **Kim Oanh** (Asian Institute of Technology (AIT), Thailand)  
                                     **Luis Cifuentes** (Pontificia Universidad Católica ,Chile)

**Assessment Scientific  
Secretariat:**                **Johan Kuylenstierna, Kevin Hicks, SEI / Global  
                                     Atmospheric Pollution Forum**

**UNEP Coordinator:**        **Volodymyr Demkine, UNEP DEWA**

**Coordinating Lead Authors:** **Emissions: David Streets; Atmospheric processes: David Fowler; Impacts:**  
**Lisa Emberson; Measures: Martin Williams**

**Modelling:**                **Emissions - Markus Amann, IIASA (GAINS)**  
                                     **GCMs: Drew Shindell et al – NASA GISS,**  
                                     **Elisabetta Vignati et al - ECHAM and FASST Tool at     JRC**  
                                     **Health: Susan Anenberg, US EPA**  
                                     **Crops: Rita van Dingenen – JRC Ispra**  
                                     **Economic Valuation – Nicholas Muller, Middlebury College**

## Group 1:

# ‘Methane Only’: Technical measures for methane emissions

UNEP: Shindell et al, 2011

1. Extended recovery of **coal mine** gas
2. Extended recovery and flaring (instead of venting) of associated gas from **production of crude oil and natural gas**
3. Reduced **gas leakage** at compressor stations in long-distance gas transmission pipelines
4. Separation and treatment of biodegradable **municipal waste** through recycling, composting and anaerobic digestion
5. Upgrading primary **wastewater treatment** to secondary/tertiary treatment with gas recovery and overflow control
6. Control of methane emissions from **livestock**, mainly through farm-scale **anaerobic digestion** of manure from cattle and pigs with liquid manure management
7. Intermittent aeration of continuously flooded **rice paddies**

## ‘BC Tech’: Technical measures for black carbon

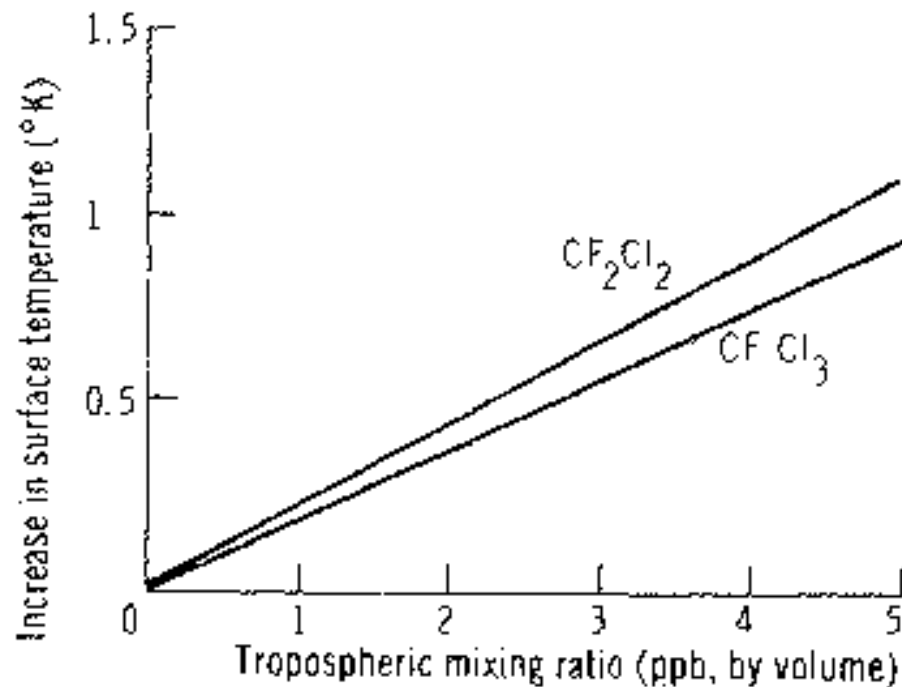
1. Replacing **traditional coke ovens** with modern recovery ovens, including the improvement of end-of-pipe abatement measures (in developing countries)
2. Replacing **traditional brick kilns** with vertical shaft kilns and Hoffman kilns where considered feasible (in developing countries)
3. **Diesel particle filters** for road vehicles and off-road mobile sources (excluding shipping)
4. Particle control at **stationary engines**
5. **Improved stoves** in developing countries in residential sector

### *Additional measures considered*

- [6. Wide-scale introduction of **pellets stoves and boilers** in the residential sector (in industrialized countries)
- [7. Use of **coal briquettes** in residential sector]

# We have mitigated Climate Change Already We can do it again

## Ramanathan, 1975



## Zaelke, 2009

### Kyoto's mouse

8

Greenhouse-gas reductions, Gt  $\text{CO}_2$  equivalent  
100-year global-warming potential

Range

Montreal Protocol  
phase-out of ozone-  
depleting substances  
1990-2010

Kyoto Protocol  
2008-2012

Estimated potential  
HFC mitigation  
2012-2050

Source: to come

