

***MITIGATE CLIMATE CHANGE & SIMULTANEOUSLY
PROTECT
HEALTH, FOOD AND WATER SECURITY***

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***INDICATORS OF CLIMATE CHANGE IN CALIFORNIA
JUNE 16, 2015 , CALEPA BUILDING, SACRAMENTO***

IS THERE ANOTHER KNOB TO COMPLEMENT CO₂ ?

The Short Lived Climate Pollutants

Methane; Black Carbon; Ozone (Lower Atmosphere); HFCs

Life times are about a decade or less

**OFF-THE-SHELF TECHNOLOGIES EXIST FOR DRASTIC
REDUCTIONS**

**GIVEN THE SHORT LIFE TIMES, THE CLIMATE EFFECTS
OF MITIGATION WILL SHOW UP WITHIN 10 YEARS!!**

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

1975 SCIENCE

Greenhouse Effect Due to Chlorofluorocarbons: Climatic Implications

V. Ramanathan



ATMOSPHERIC OZONE 1985

ASSESSMENT OF OUR UNDERSTANDING OF THE PROCESSES
CONTROLLING ITS PRESENT DISTRIBUTION AND CHANGE



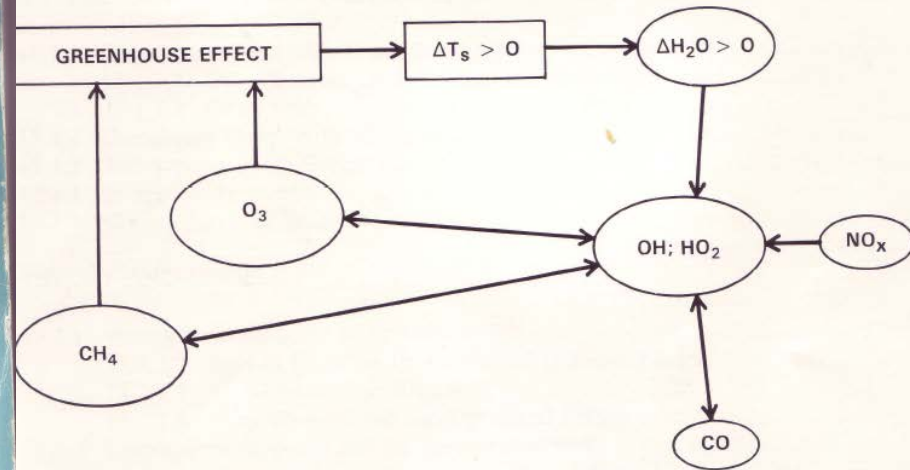
VOLUME III



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TRACE GAS EFFECTS ON CLIMATE

CLIMATE - CHEMISTRY INTERACTIONS



Panel Members

V. Ramanathan, Chairman

L.B. Callis, Jr.

R.D. Cess

J.E. Hansen

I.S.A. Isaksen

W.R. Kuhn

A. Lacis

F.M. Luther

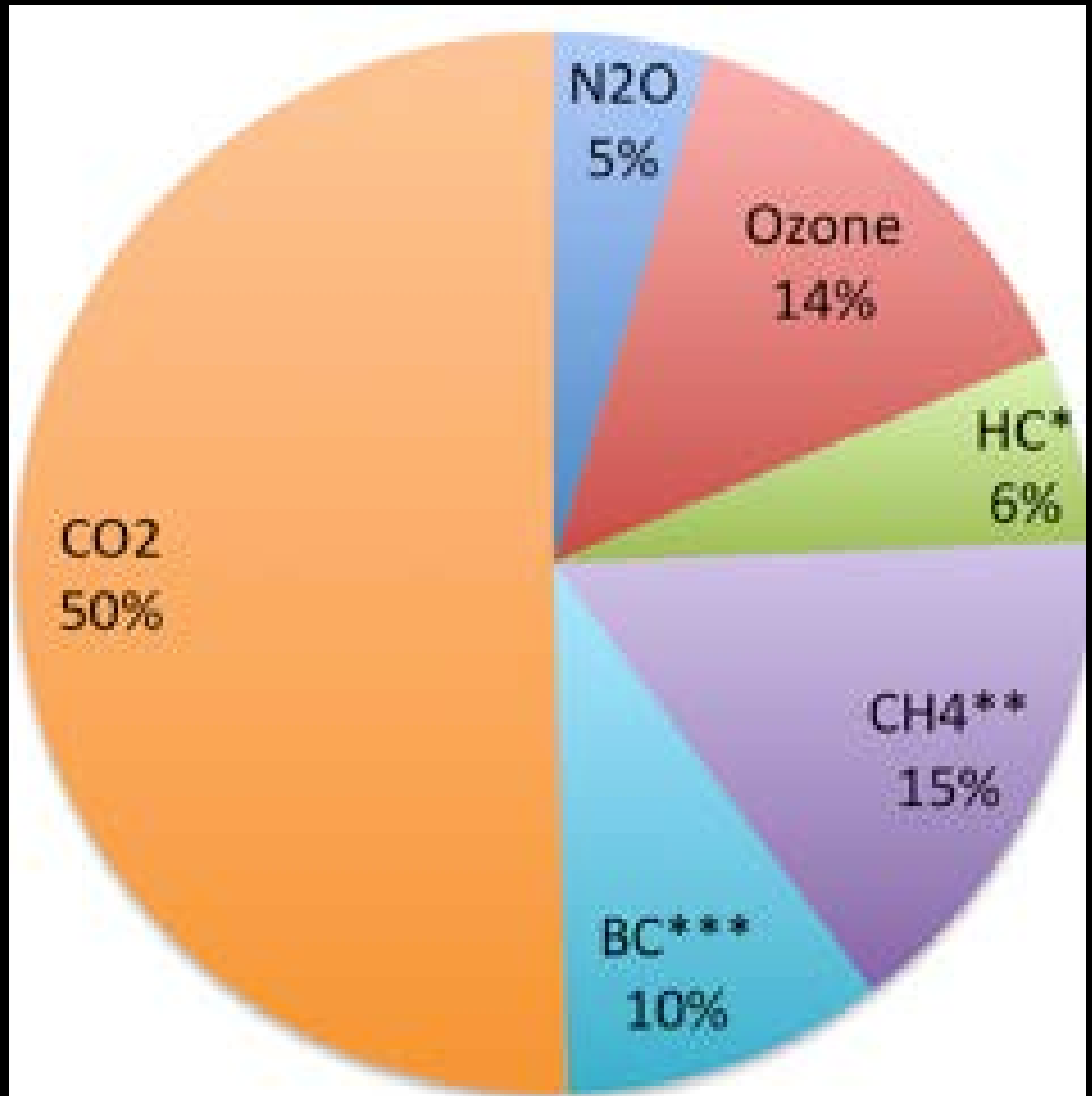
J.D. Mahlman

R.A. Reck

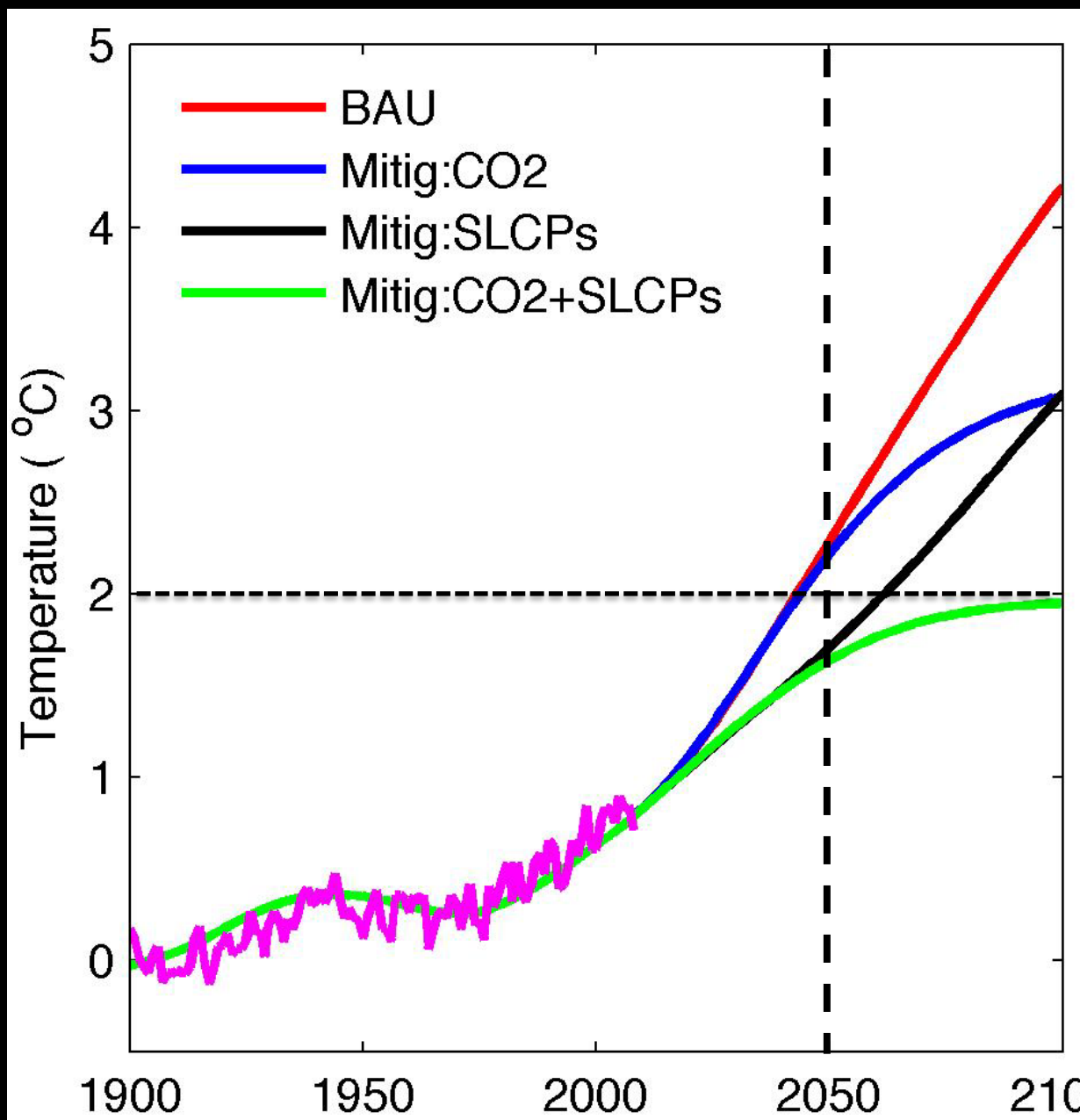
M.E. Schlesinger

CO₂ HAS MANY OTHER ROGUE COMPANIONS

IPCC-AR5
2013



NEED TO MITIGATE BOTH CO₂ AND SLCPs



RAMANATHAN & XU, 2010



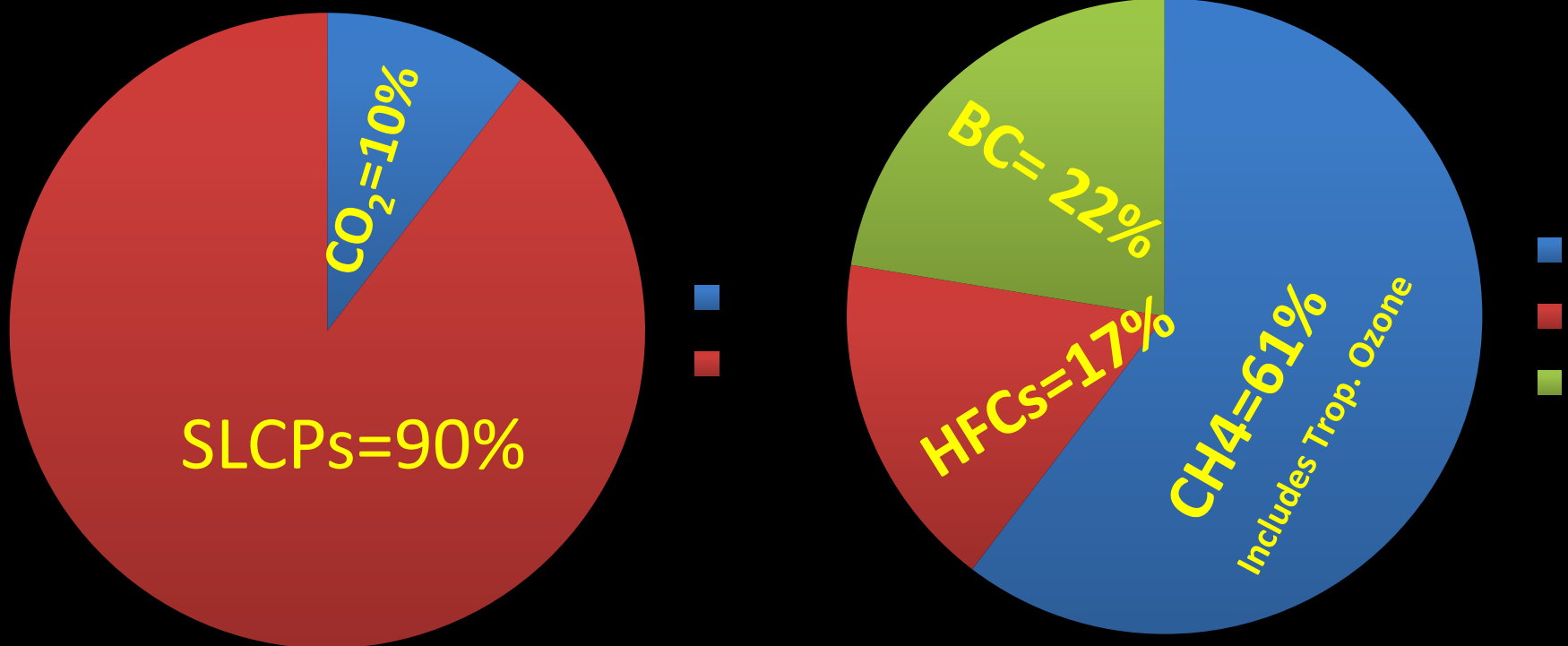
Effect of CO₂ and SLCPs Mitigation on Global Temperatures

Based on Ramanathan and Xu, 2010; Hu, Xu, Tibaldi, Washington and Ramanathan, 2013

Pre-to 2050:

Warming Avoided = 0.7 C

Warming Avoided by SLCPs = 0.6 C



UNEP-WMO ASSESSMENT, 2011

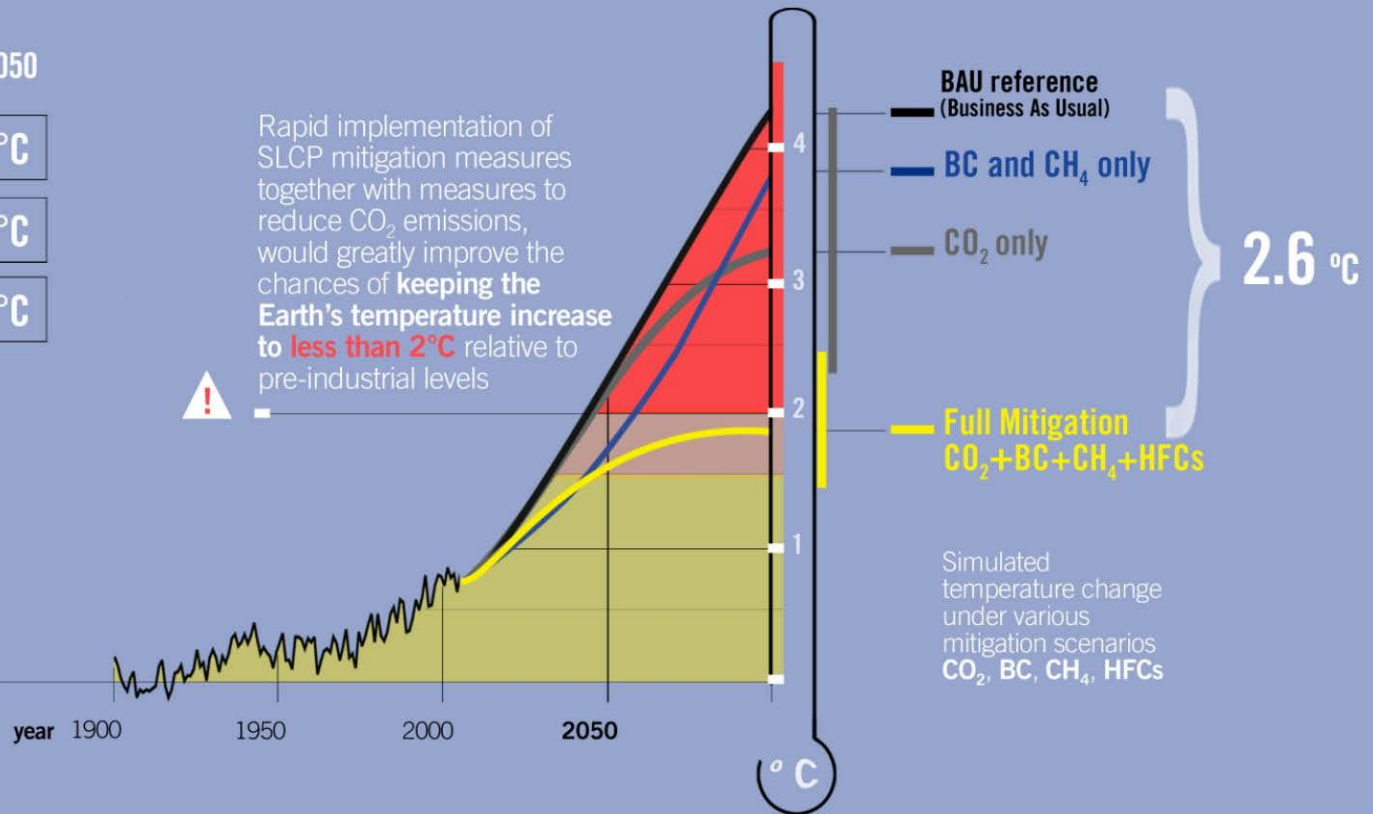
Benefits of SLCP Mitigation

Avoided global warming

TEMPERATURE PREVENTION by 2050

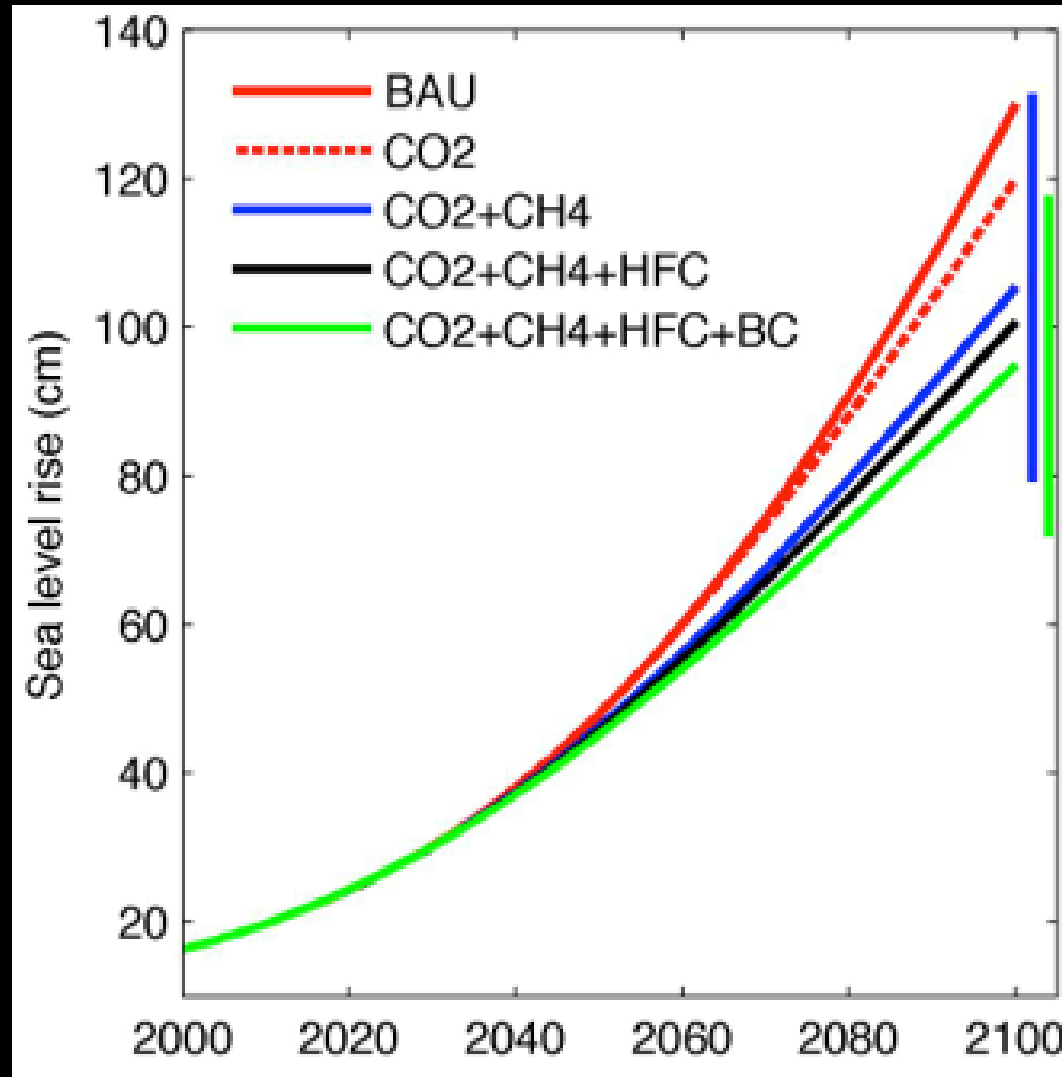
SLCPs	0.6°C
BC + CH ₄	0.5°C
HFCs	0.1°C

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



Effect of CO₂ and SLCPs Mitigation on Sea Level Rise (SLR)

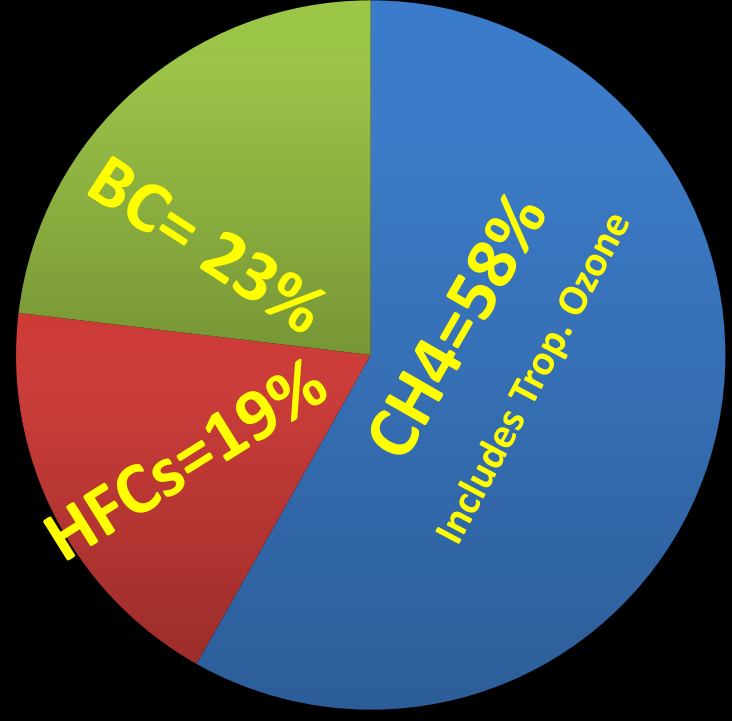
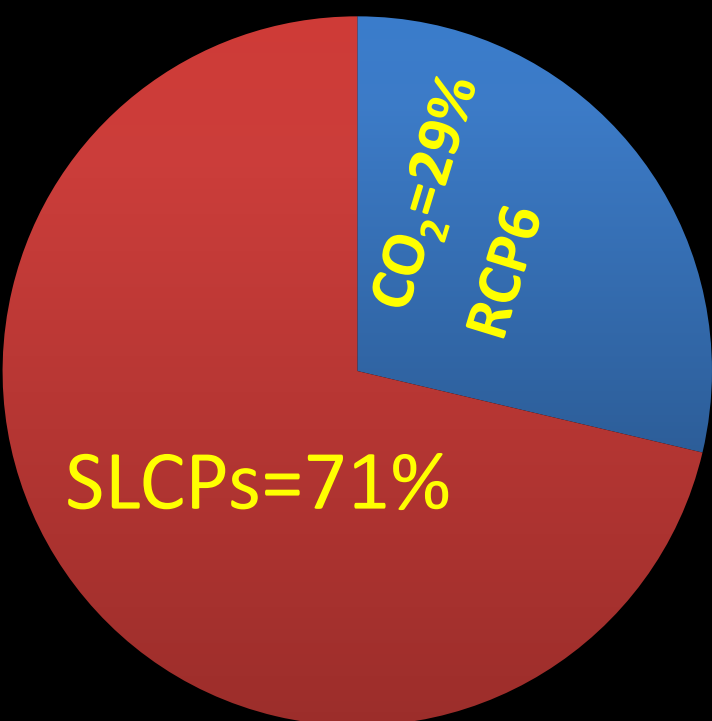
Based on Ramanathan and Xu, 2010; Hu, Xu, Tibaldi, Washington and Ramanathan, 2013



Effect of CO₂ and SLCPs Mitigation on Sea Level Rise (SLR)

Based on Ramanathan and Xu, 2010; Hu, Xu, Tibaldi, Washington and Ramanathan, 2013

Pre-Industrial to 2100: 97 cm (50 to 190 cm)
Avoided SLR = 35 cm Avoided SLR by SLCPs = 25 cm (71%)



Effects on Public Health

Air pollution, a preventable risk

Some SLCPs are harmful to human health. Fast implementation of measures to reduce these pollutants could deliver significant public health benefits.

DEATHS

GLOBALLY AIR POLLUTION responsible for over

7,000.000

PREMATURE DEATHS PER YEAR (2010)

Indoor pollution 3.5 mill.

Outdoor pollution 3.1 mill.

Ozone pollution 0.2 mill.

DISEASES

● DUE TO BC AND CO-POLLUTANTS

● DUE TO O₃



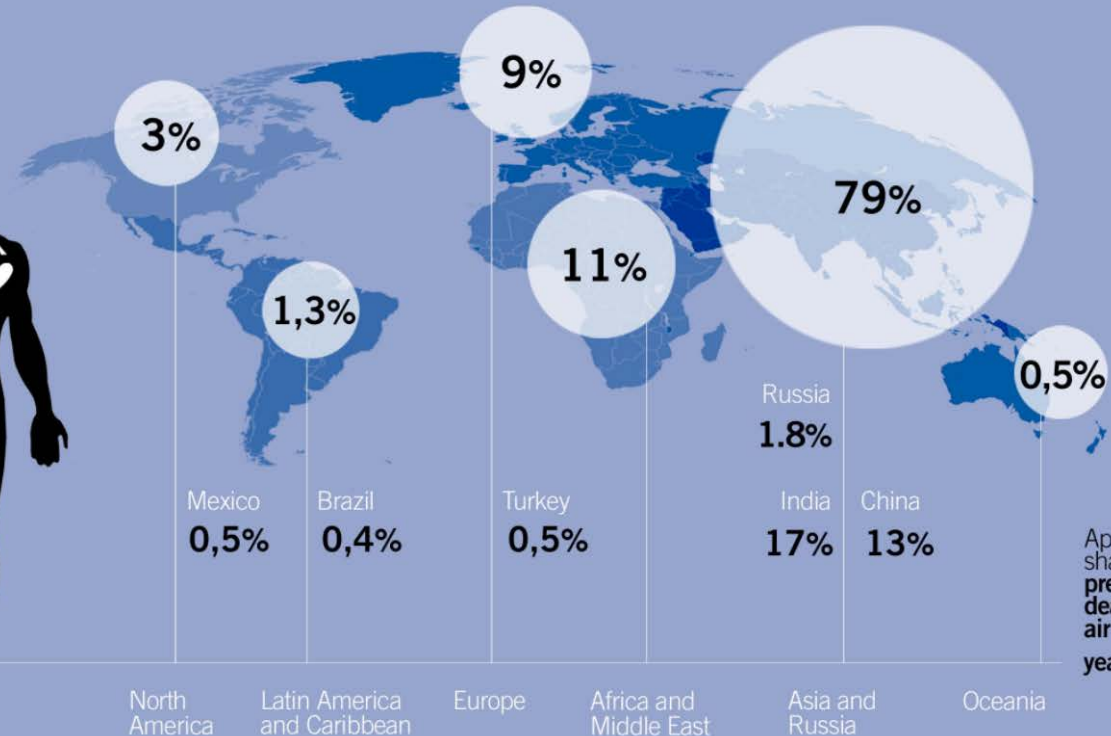
- Heart attacks
- Strokes, heart disease
- Congesive heart failure



- Lung cancer
- Chronic bronchitis ...
- Asthma
- Emphysema
- Scarred lung tissue



- Low birth weight



Approx. share of premature death from air pollution year 2010

Globally, **air pollution** is the **2nd leading risk factor** for the global burden of disease in 2010, behind high blood pressure, and together with **tobacco smoking**, including second hand smoking.

Effects on Agriculture

SLCPs a threat to agricultural productivity

Some SLCPs have detrimental impact on ecosystems including crop yields. Fast implementation of measures to reduce these pollutants could deliver important food security benefits.

**CROP LOSSES
DUE TO AIR POLLUTION**
WHEAT+RICE+SOYBEAN+MAIZE

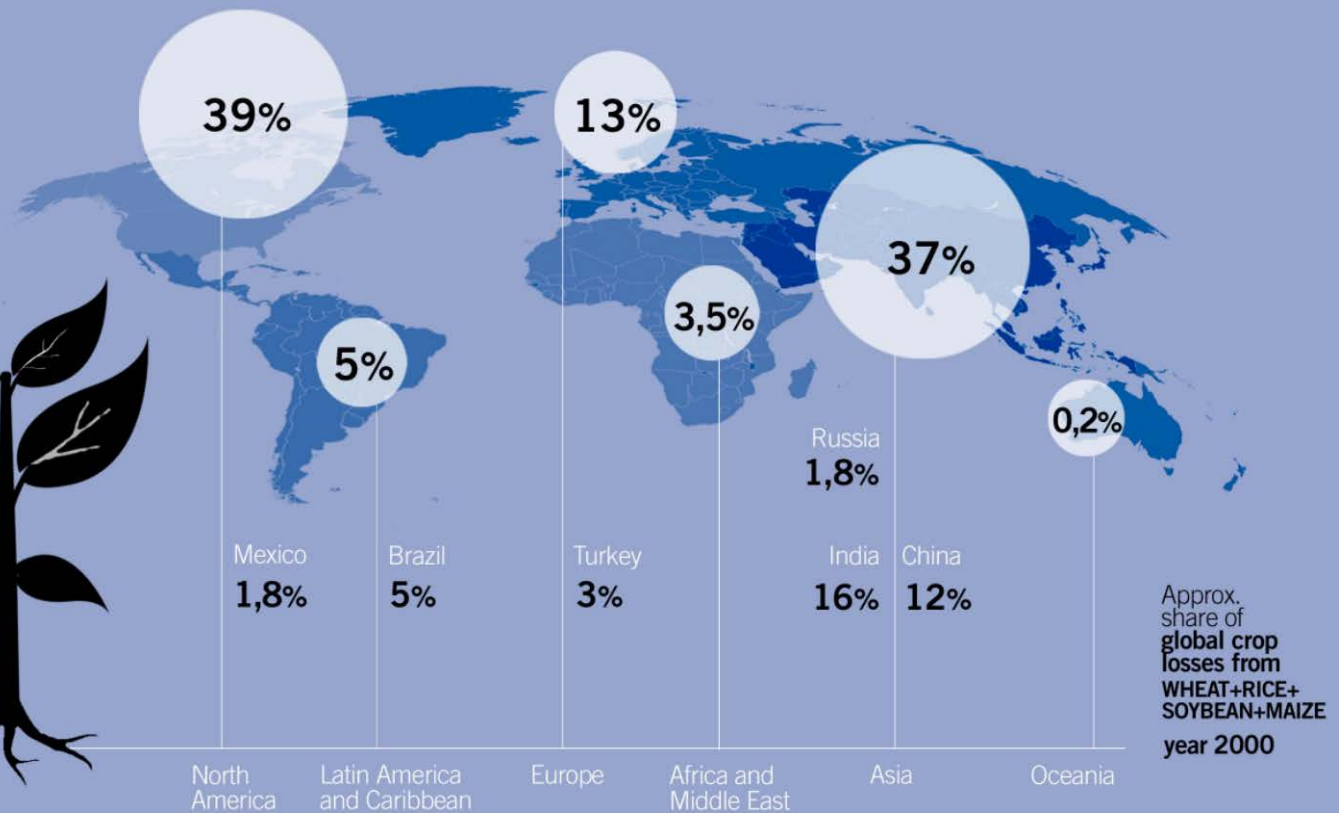
110.000.000 

SLCPs EFFECTS ON PLANTS

- DUE TO O₃
- DUE TO BC AND CO-POLLUTANTS

- Impedes photosynthesis
- Reduces ability to sequester carbon
- Damages plants
- Can reduce crop production
- Can reduce quality and nutritive value of food and feed

- Increases leaf temperature
- Can reduce sunlight reaching plants affecting photosynthesis



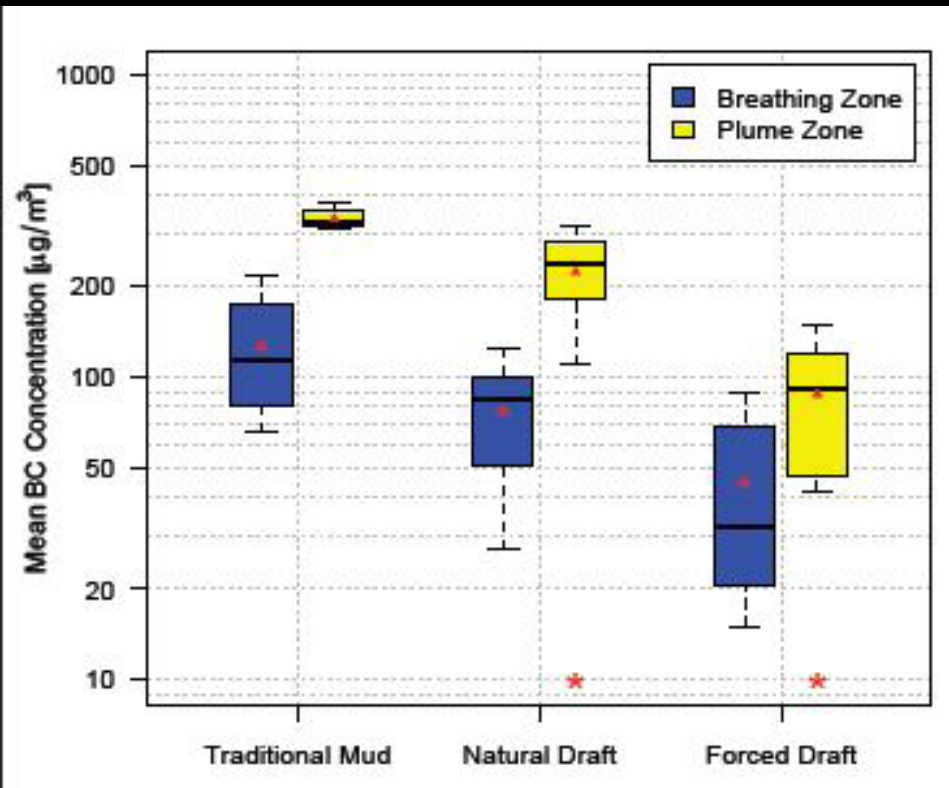
THE BOTTOM THREE BILLION WORLD

4 million die every year from smoke pollution





project surya
Fighting Climate Change Now



Why is the California Experience Relevant?

Report To CARB: Ramanathan et al, 2013

