



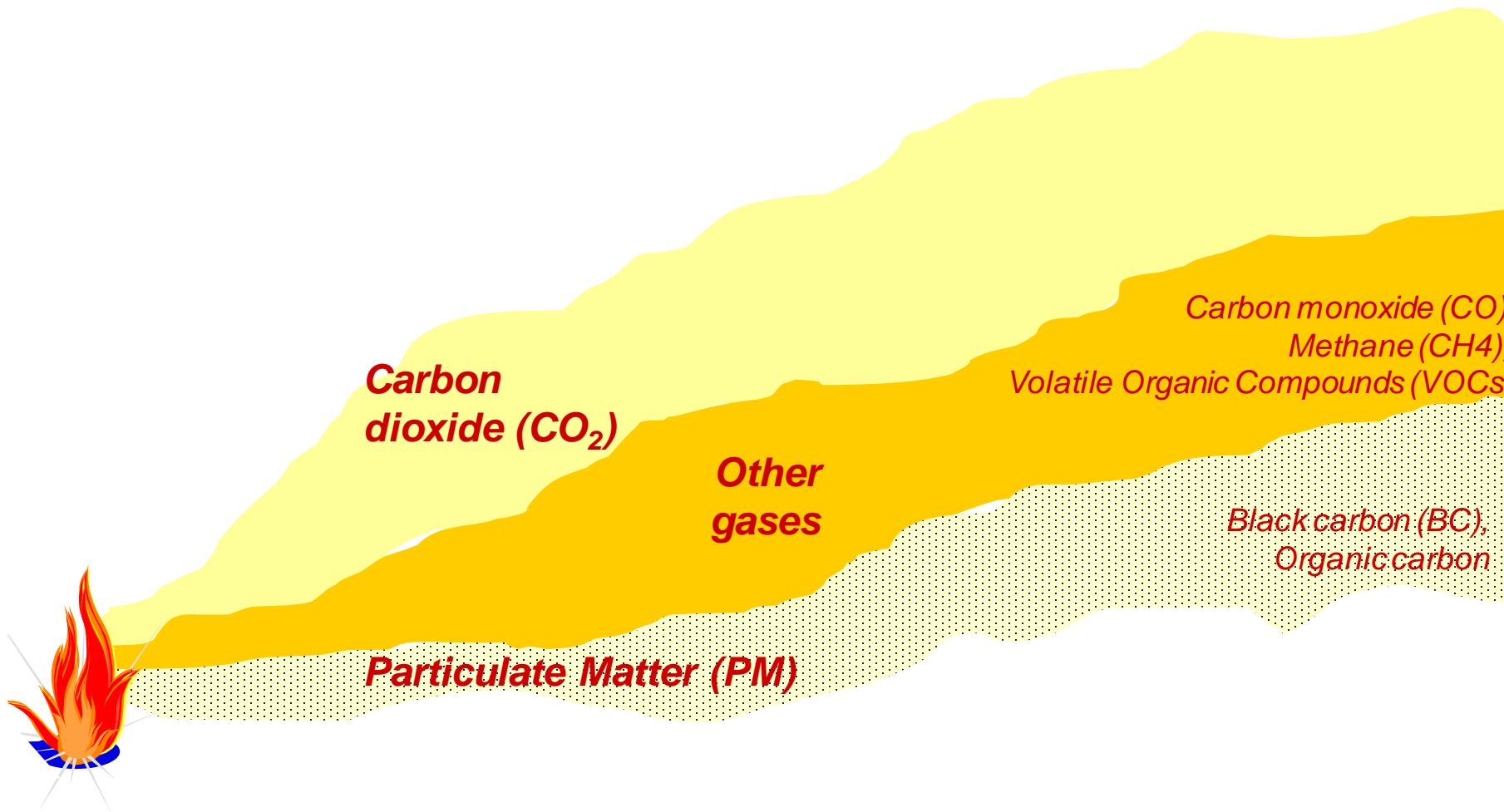
# *Cookstoves in the Global Environment*

## *(Climate Change: The Long and the Short)*

Tami Bond

University of Illinois at Urbana-Champaign

# All combustion products affect climate



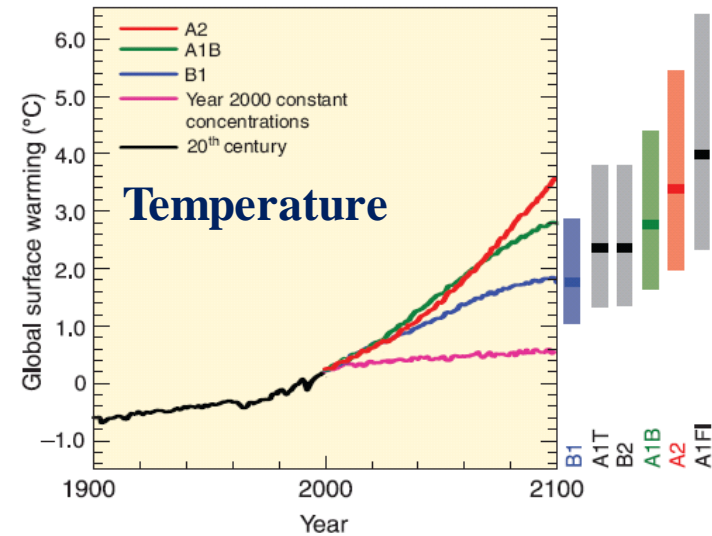
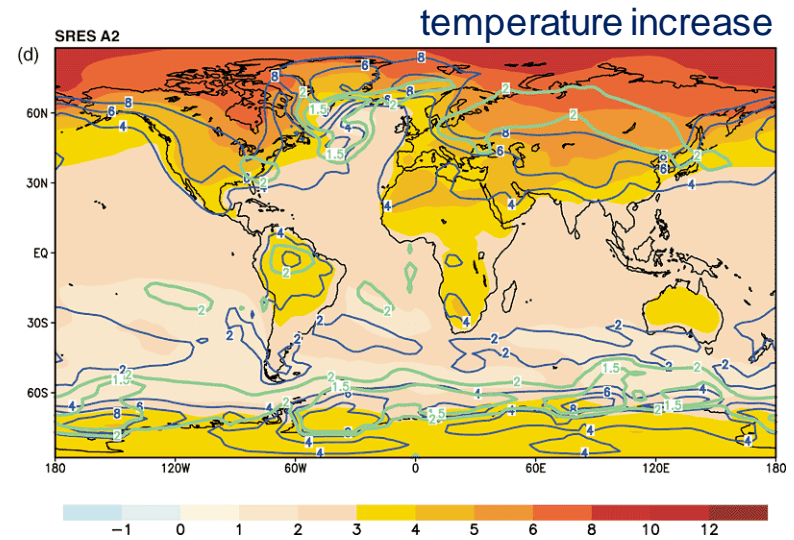
# Carbon dioxide (CO<sub>2</sub>)



Atmospheric Lifetime:  
Many decades

Why manage it?

- Builds up in atmosphere
- Future temperature rise gets worse as time goes on



# Carbon dioxide (CO<sub>2</sub>)

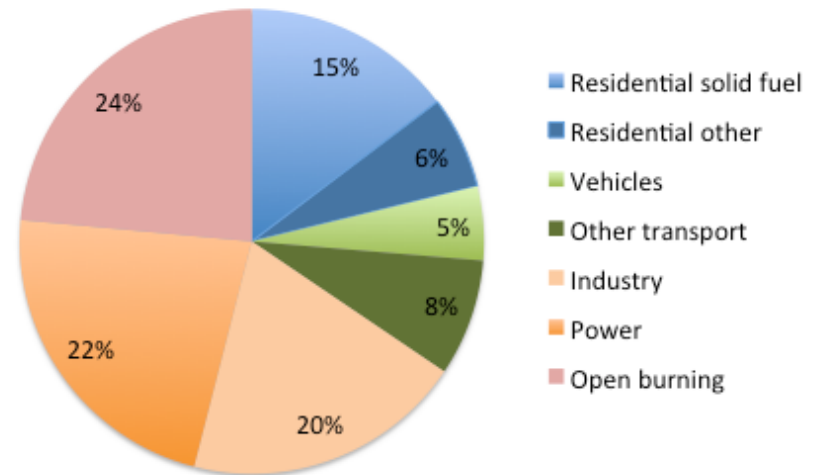


Relevant standard:  
Efficiency

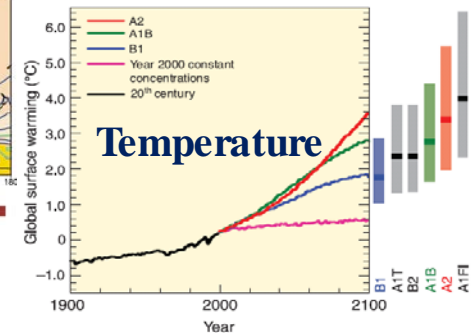
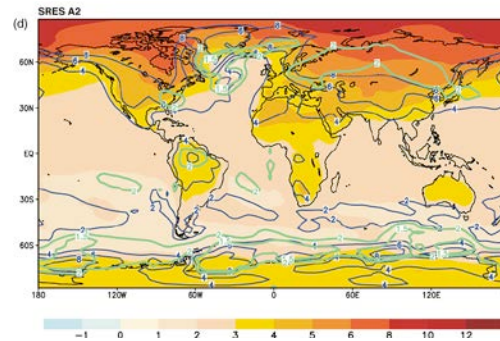
## Considerations:

- Carbon finance has particular requirements
- Connection between efficiency & CO<sub>2</sub> emission also depends on biomass regrowth

## CO<sub>2</sub> emission contribution – year 2000 (Biomass regrowth not subtracted)



Source: IIASA-GAINS values for CO<sub>2</sub> emission and energy consumption; own analysis





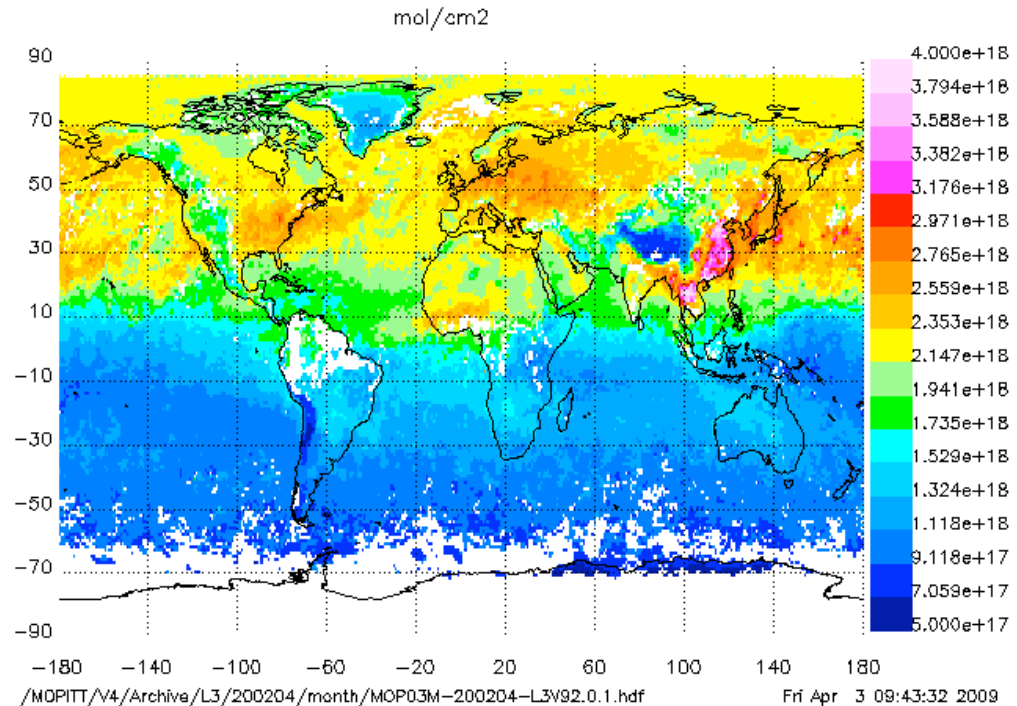
**Other gases**  
**CO, CH<sub>4</sub>, VOCs**

*Atmospheric Lifetime:*  
*4 mo – 12 yr*

Why manage them?

- Increase ozone formation
- Change energy budget of Earth (like CO<sub>2</sub> does)
  - Either direct or indirect (via ozone, methane)

*Global carbon monoxide (NASA Aura)*



**Other gases**  
**CO, CH<sub>4</sub>, VOCs**

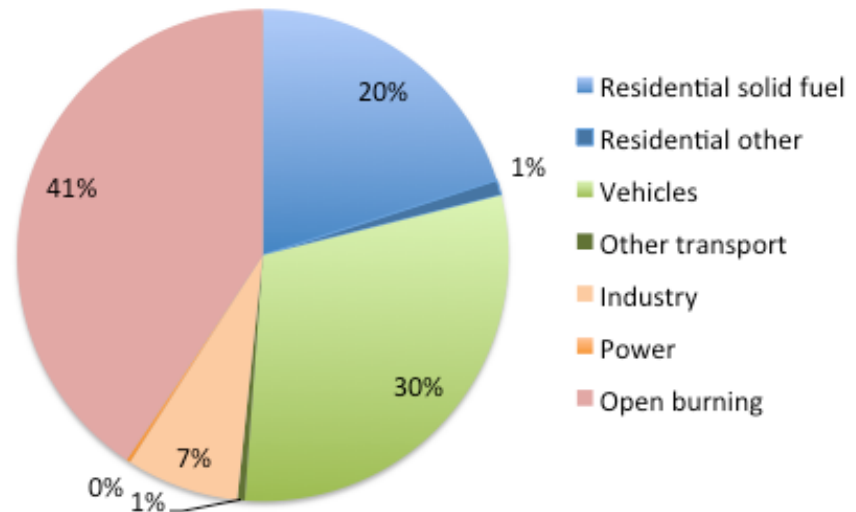


*Relevant Standard:  
Emissions (for CO)  
None yet for others*

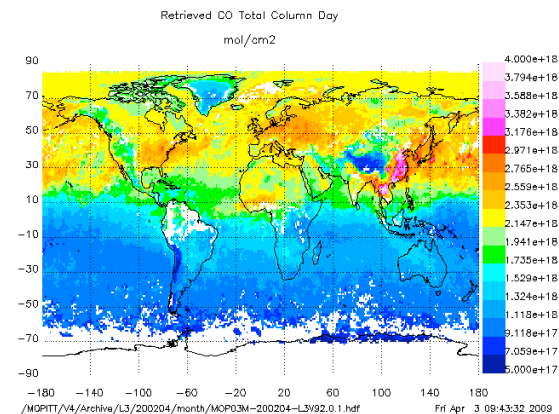
## Considerations:

- Methane subject to Kyoto Protocol
- CO and VOCs are regulated for outdoor air quality, but no agreements for climate purposes

## CO emission contribution – year 2000



Source: IIASA-GAINS and RETRO values for CO emission; own tabulation





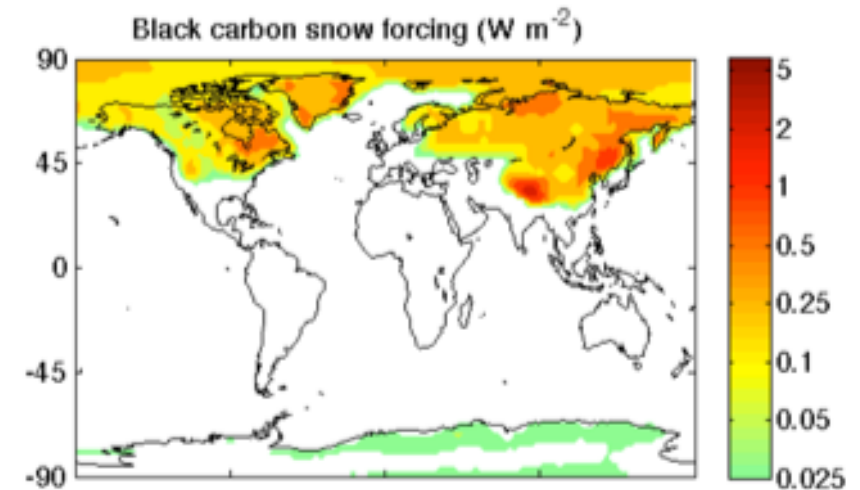
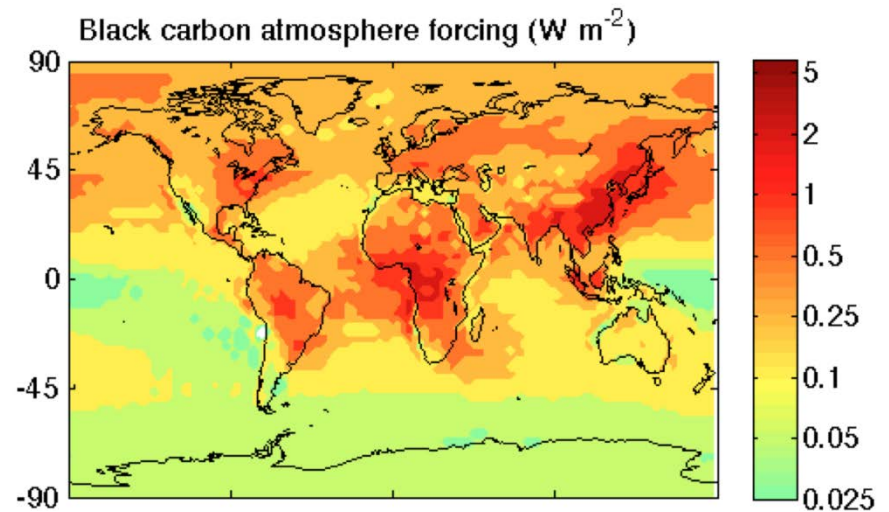


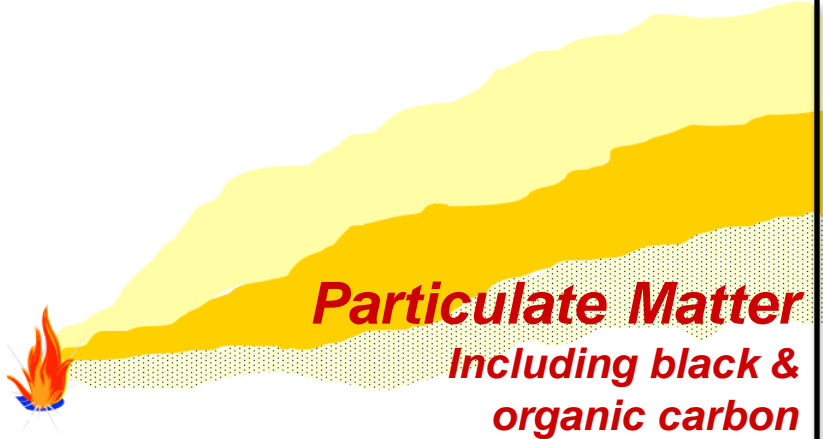
## **Particulate Matter** *Including black & organic carbon*

*Atmospheric Lifetime:  
Less than 2 weeks*

### Why manage it?

- Changes energy budget of Earth
- Black carbon – warming
- Organic carbon, sulfates - cooling



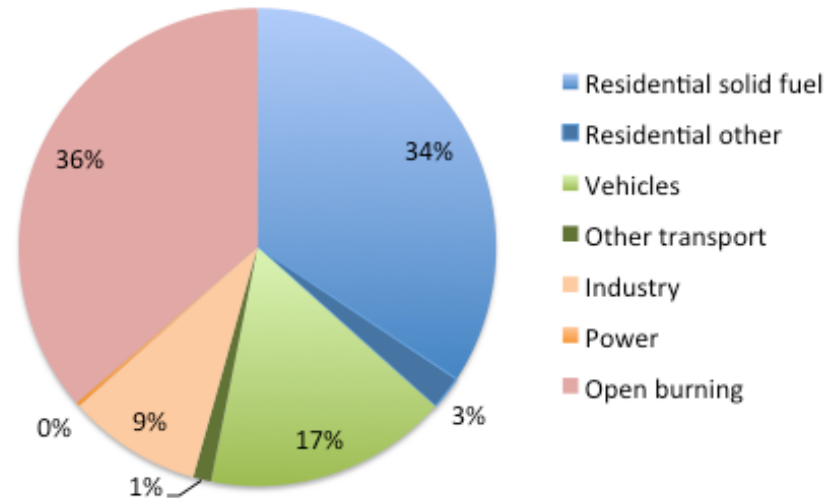


**Relevant Standard:  
Emissions (for total PM)**

**Considerations:**

- Chemical composition affects warming vs cooling
- No regulations for climate purposes

*Black carbon emission contribution – year 2000*

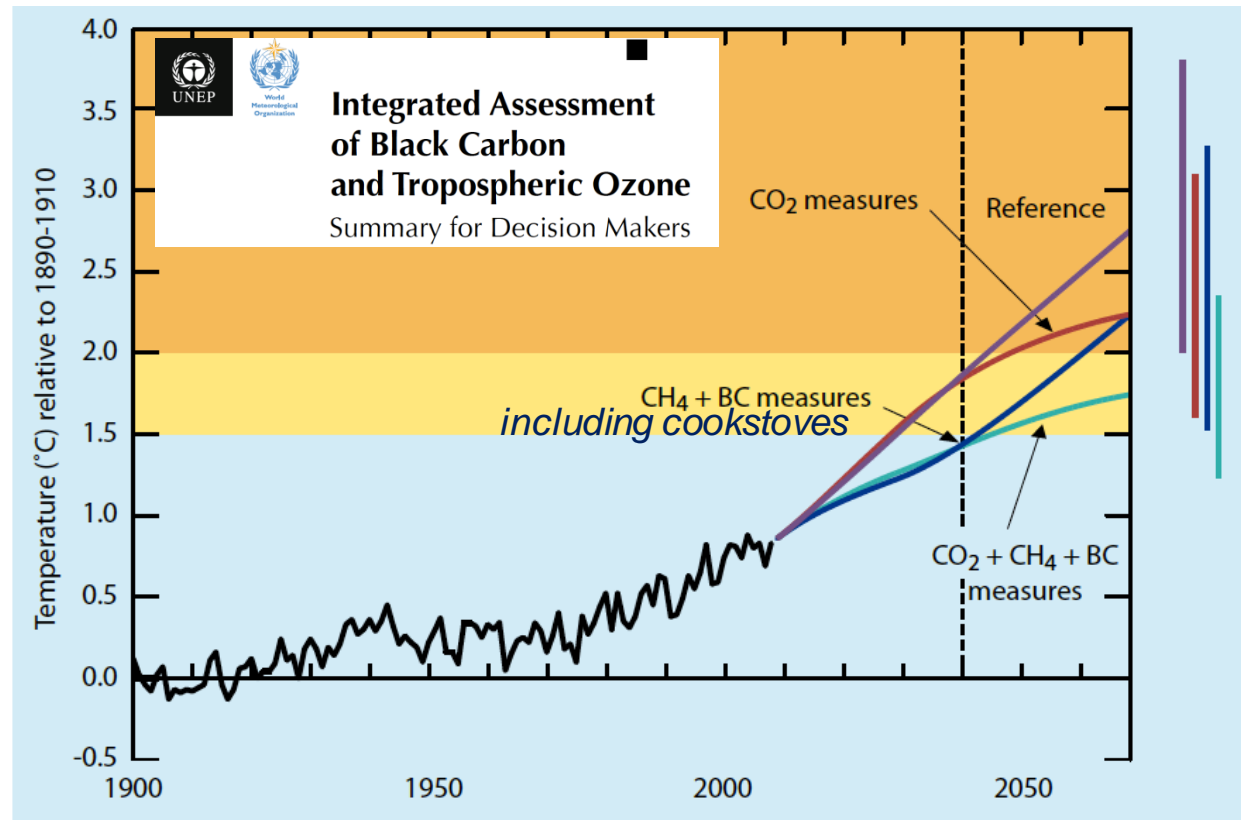
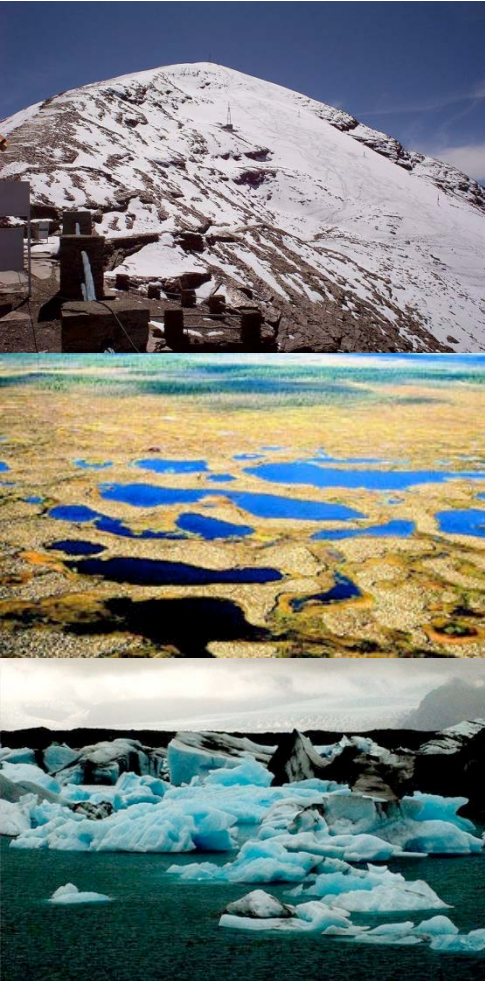


Source: IIASA-GAINS and RETRO database for BC emission; own tabulation (IIASA-GAINS has more BC from residential than Bond emission totals)



# New view of climate change:

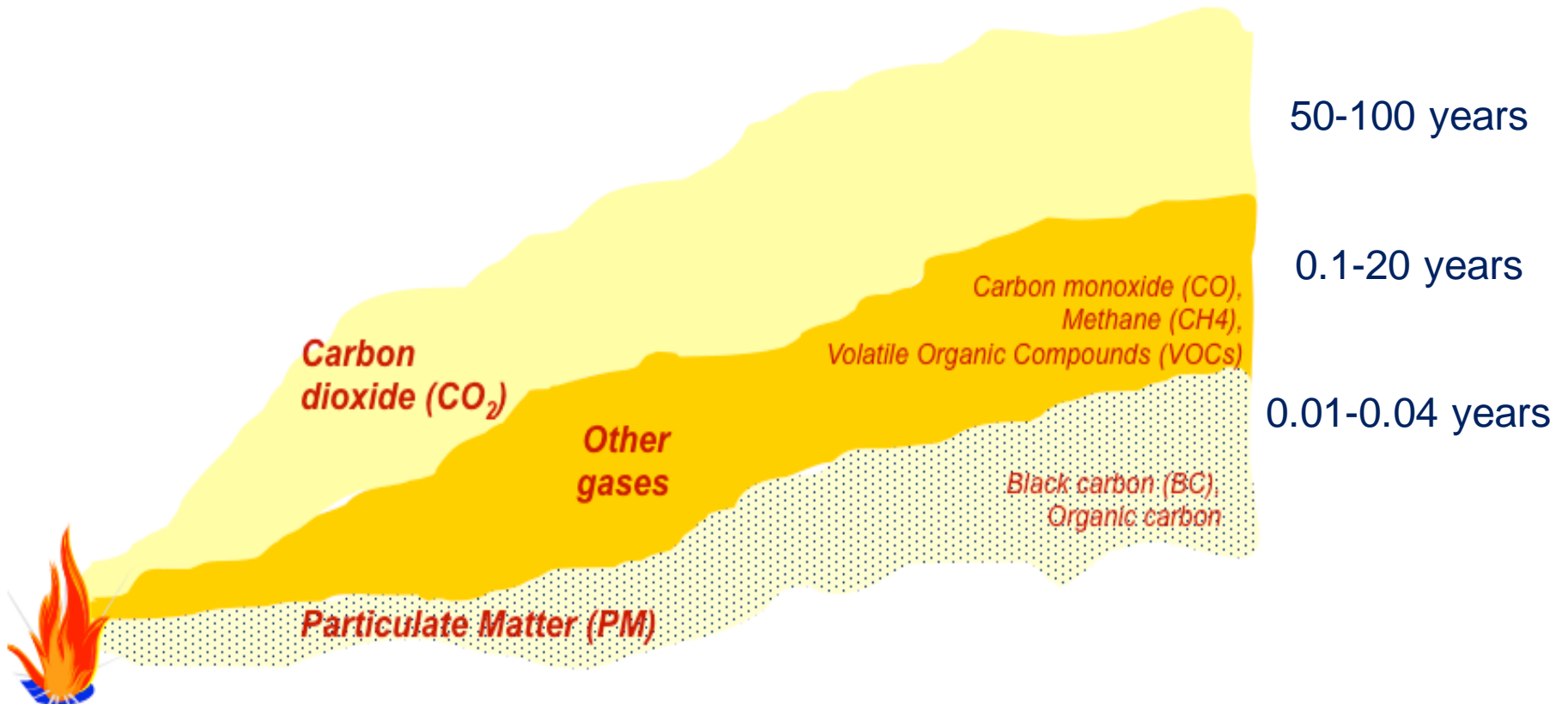
*The temperature path during the next 10-20-50 years is important, too.*



**Figure 3.** Observed deviation of temperature to 2009 and projections under various scenarios. Immediate implementation of the identified BC and CH<sub>4</sub> measures, together with measures to reduce CO<sub>2</sub> emissions, would greatly improve the chances of keeping Earth's temperature increase to less than 2 $^{\circ}\text{C}$  relative to pre-industrial levels. The bulk of the benefits of CH<sub>4</sub> and BC measure are realized by 2040 (dashed line).

# SUMMARY:

All combustion products affect climate,  
but on different time scales.



Expect *more comprehensive* analyses  
and standards in the coming years.