

## Panel question 1

“Can reduced soot emissions counteract the warming effects of reducing sulfates?”

Broad question, broad answer:

“Sure.”

I mean, kinda sorta, y’know?

*But to what extent?*

- v D. Streets projections:                    2030: -30% to +40%  
    2050: -60% to +60%
- v Take “best” case for air quality; “worst” case for climate  
= greatest sulfate reductions.
- v About -0.2 W/m<sup>2</sup> of direct effect?

*(Note: Reduction could “count against” any forcing –  
doesn’t have to be sulfate reduction– could be GHGs)*

## Panel question 1

“Can reduced soot emissions counteract the warming effects of reducing sulfates?”

Uncertainties prevent *precise* answers.  
(But not *any* answers!)

- v ~4000 Gg/year BC reduction required to “offset” 0.2 W/m<sup>2</sup>
  - v if you can reduce BC by itself (which you can't)
  - v and if you can ignore indirect effect (which you can't)
- v **4000 Gg** ~ *half* of 1996 BC inventory
  - v but *half* of inventory is open biomass burning (which we're not discussing here, and is difficult to deal with)
  - v so, eliminate 85% of energy-related BC, and no other aerosols?
  - v Impossible. ◇ But what *is* achievable?

# Panel question 2

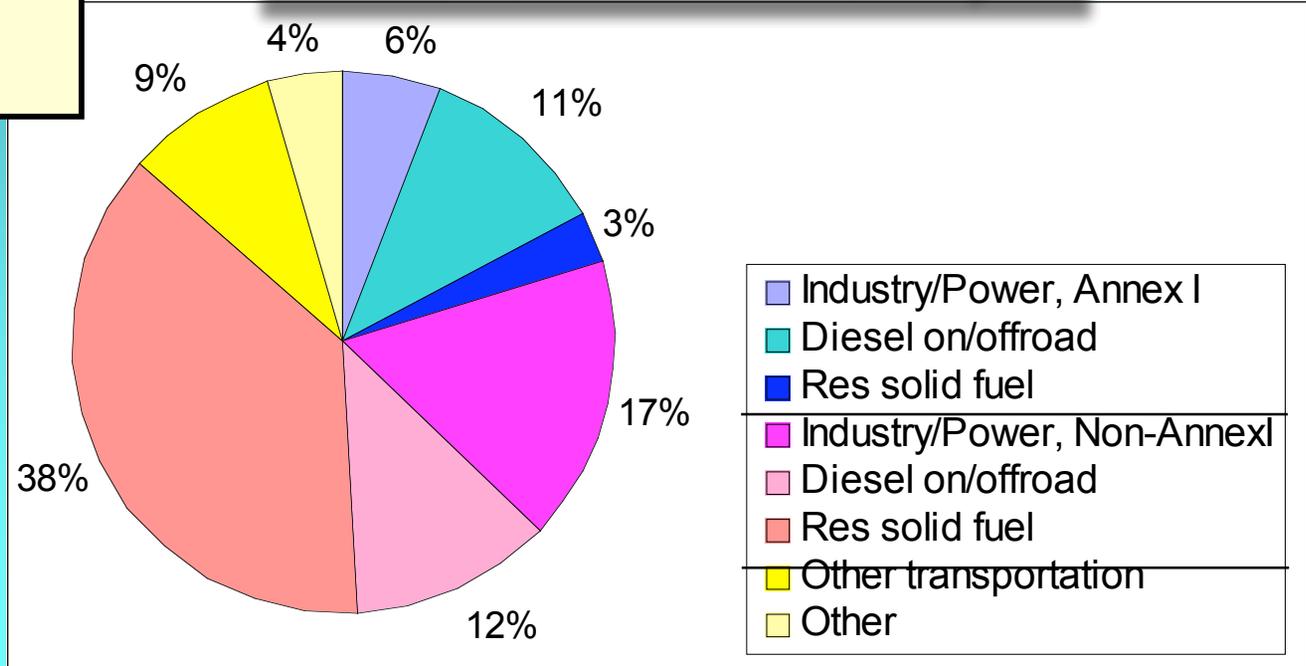
4000 Gg?

“What are the most effective actions in that direction?”

What fraction of the “4000 Gg solution” is achievable?  
Where can we get

it?

*Where does it come from now?  
Bond/Streets 1996 inventory*

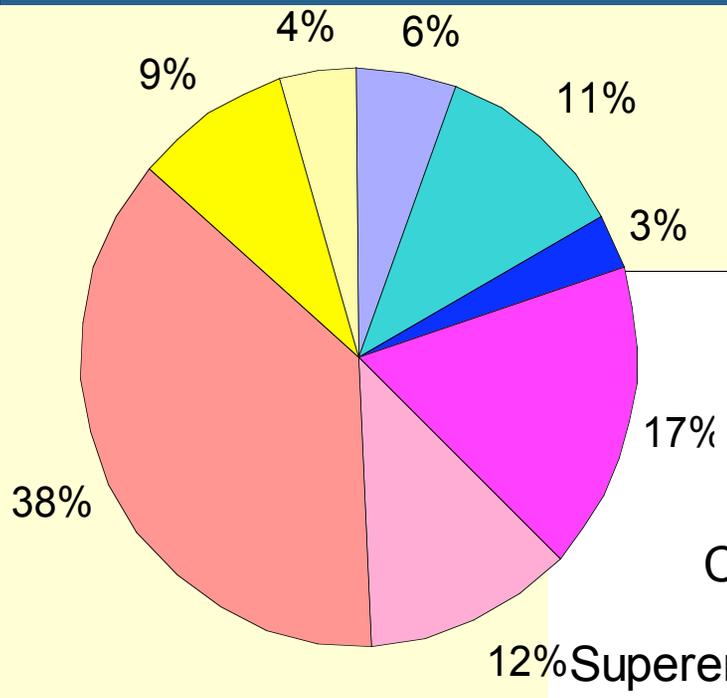


# Panel question 2

4000 Gg?

“What are the most effective actions in that direction?”

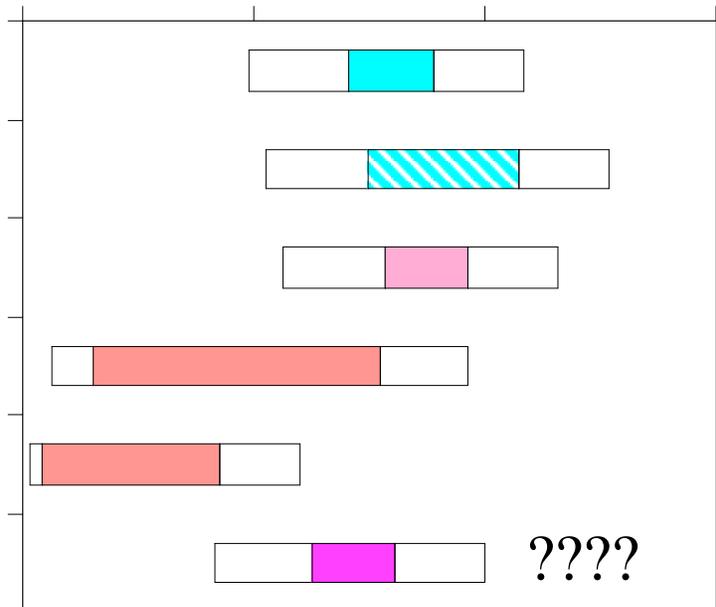
*T. C. Bond & H. Sun, “Can reducing soot emissions save us from global warming?” submitted to Environ. Sci. Tech.*



\$cap cost/tonneCO2equivalent

1                    10                    100                    1000

- Current LD vehicle
- Superemitting LD vehicle
- Truck without regulation
- Wood cookstove
- Coal cookstove
- Low-tech industry



????

## Panel question 2

4000 Gg?

“What are the most effective actions in that direction?”

- v Even if you *do* incorporate “uncertain metrics”, BC is *not* a cost-effective method of reducing positive forcing in Annex-I countries.
- v (That’s why I use GWP– as a “go/no-go” or “have we got a red herring here” answer)
- v This is not an Annex-I solution. Isn’t cheap enough to make “Kyoto basket” attractive anyway, and doesn’t fit for a number of reasons.

4000 Gg?

## Panel question 2

“What are the most effective actions in that direction?”

- v In Annex-I countries, BC is not the cheapest climate action.  
◇ *and that's considering maximum warming potential.*
- v Considering that positive forcing is offset due to (1) organic carbon, (2) indirect effect...  
Cost per MJ of warming avoided becomes even more expensive
- v Good news: Projected reductions in Annex I Transport sector
  - v 10-40% (2030), 50-70% (2050)
  - v BC dominates over OC
- v Bad news: Only 60-260 Gg by 2030, 300-450 Gg by 2050
  - v ~10% of the solution

## Panel question 2

4000 Gg?

“What are the most effective actions in that direction?”

Non-Annex I countries: **Major** opportunities for (potentially climate-cost-effective) reduction

v Transportation:

At stake, *i.e.* today's emissions: ~800 Gg

Incoming Euro standards ↓; rapid growth ↑

Projected to *increase*. Possible to accelerate reductions?

Diesels: BC dominates over OC (probably)

*Potential unclear.*

v Industry: AQ standards (sulfate offset)

Projected to decrease by about ~50%

Another 10% of the “target”; 20% if aggressive?

At stake:  
~800 Gg

## Panel question 2

4000 Gg?

“What are the most effective actions in that direction?”

Non-Annex I countries: **Major** opportunities for (potentially climate-cost-effective) reduction

v Residential solid fuels: Definite health driver!!

Coal: BC dominates over OC

Wood: Unclear; recent evidence suggests high BC from some types of combustion

At stake:  
~2000 Gg

*A few challenges:*

Who pays? What's the financial mechanism?

How to implement/disseminate/verify?

Do “we” have the right to call for change?

*But:* Consistent with Millennium Development Goals and local benefits

# UNFCCC (which the U.S. did ratify) SEZ:

v Article II: GHG stabilization *is* the target;  
but

v Article III, Principles

The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.

...Policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors