Global Sources of Pollutants, in detail

Contributions of Future Emissions to Year 20 Forcing
(as % of gross positive forcing)

Legend
As percentage of gross positive forcing:

2 to 5%		-2 to -5%	
5 to 10%		-5 to -10%	
over 10%		below -10%	

	Carbon Dioxide (CO2)	Nitrous Oxide (N2O)	Methane (CH4)	Ozone (O3)	Black Carbon (BC)	Total (Gross)	Sulfur Dioxide (SO2)	Organic Carbon (OC)	Total (Net)
Fossil Fuel Combustion									
Industry FF combustion	4%	0%	0%	0%	3%	8%	-7%	0%	0%
Power generation (FF)	9%	0%	0%	0%	0%	9%	-16%	0%	-7%
Resid. & Comm'l FF combustion	3%	0%	0%	0%	3%	6%	-2%	0%	4%
Road transport (FF)	4%	0%	0%	1%	4%	10%	-1%	0%	9%
Non-road land transport (FF)	0%	0%	0%	0%	3%	3%	-1%	0%	3%
Other FF use	2%	0%	0%	0%	0%	2%	-2%	0%	0%
Fossil Fuel Production									
FF production (gas, coal, oil, gasoline)	2%	0%	6%	1%	0%	9%	-4%	0%	4%
Land Use & Food Production									
Deforestation	3%	0%	1%	1%	6%	10%	0%	-3%	6%
Savannah burning	0%	0%	1%	1%	8%	10%	-1%	-4%	5%
Residential biofuel combust.	0%	0%	1%	1%	5%	8%	-1%	-1%	5%
Other fires	0%	0%	0%	0%	3%	4%	0%	-1%	3%
Livestock	0%	2%	5%	0%	0%	7%	0%	0%	7%
Agriculture	0%	4%	2%	0%	0%	6%	0%	0%	6%
Human Waste Management									
Human waste management	0%	0%	3%	0%	0%	4%	0%	0%	4%
Industrial Processes									
Industrial processes (cement, chemicals)	1%	0%	0%	1%	0%	2%	-9%	0%	-7%
Other	0%	0%	0%	0%	2%	2%	0%	0%	2%
Total	30%	6%	19%	8%	38%	100%	-46%	-10%	44%

as % of gross:

47% Fossil fuel

45% Land and food

8% Other

data underlying poster pie chart

Policy Implications of Findings

***Separate* policies for CO_2, methane, black carbon, and ozone precursors are essential:**

- **Large near-term contribution** of each pollutant
- **Unique impacts** of short-lived (black carbon, ozone): regional, seasonal
- **Unique roles** of methane as a *near-term* lever and carbon dioxide as a *long-term* lever: linking them in trade reduces ability to independently manage the levers
- **Wide variation in measurability**: different policy instrument types are appropriate
- **Urgency of near-term climate change**: need maximum reduction of each pollutant

Offsets that trade a capped pollutant for a non-capped pollutant should be *avoided*:

- **Mismatched trade** of well- and poorly-measured emissions
- **Disincentive for regulation of "offset-eligible activities":** regulation requires forfeiture of the offset revenue stream
- **Dilution of environmental outcome** resulting from diminished reductions of capped pollutant and lack of regulations on non-capped pollutants