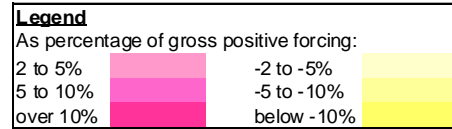


Global Sources of Pollutants, in detail

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



	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										} as % of gross: 47% Fossil fuel
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										} 45% Land and food
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										} 8% Other
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										}
Other	0%	0%	0%	0%	2%	2%	0%	0%	2%	
Total	30%	6%	19%	8%	38%	100%	-46%	-10%	44%	

↑
data underlying poster pie chart

Policy Implications of Findings

Separate policies for CO₂, 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