Climate policies and development – the role of offsets

Cooling the Climate Debate – Symposium at Collège de France
29 October 2015

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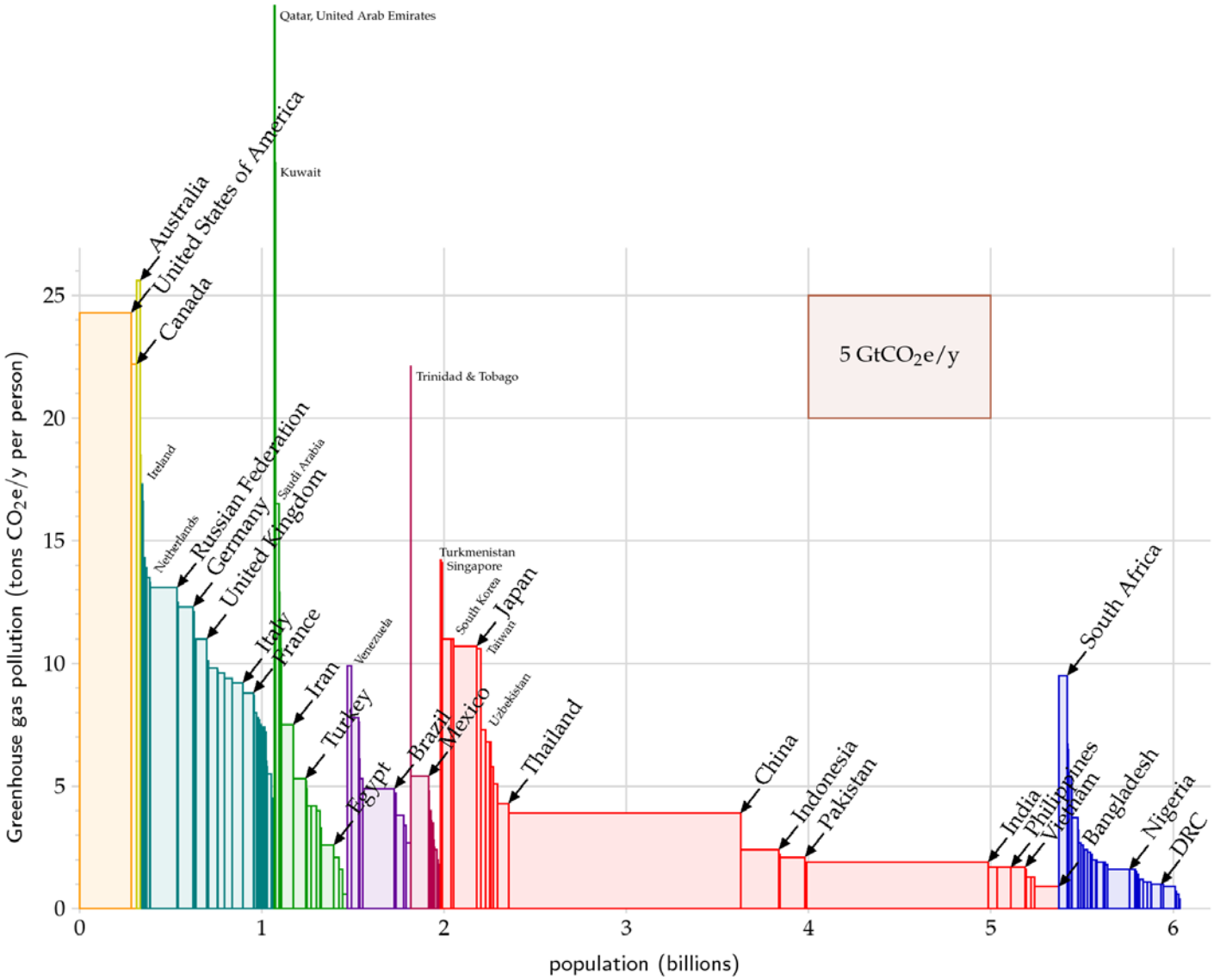
Climate Policy and Development



Source: David McKay (2009), *Sustainable Energy -- without the hot air*

Climate Policy and Development: the problem

- Poor countries are low per-capita emitters and rich countries are high per-capita emitters.
- But poor and not-rich countries have a lot of people and grow faster.
- So emissions will increase in these countries.
- Who don't have the money to pay to slow emissions.
- Ethics and politics both point in the same direction. Those who emit little (because they have little) ***shouldn't*** be and ***can't*** be obliged to pay for emission reduction.

- So if emissions in the developing world, and, therefore, ***the*** world are to be reduced, there are only three possibilities –
  1. Emission reduction is done as a by-product of domestic development policy, or
  2. It becomes free, or
  3. Rich countries pay for it.

Mitigation as a by-product or co-benefit of domestic development policy

- There are subsidies to fossil fuel industries and local pollution externalities from fossil fuel combustion that have not been internalized.
- Parry, Veung, and Heine (2014) suggest that these can be large with an implied carbon price of $30/tCO2 in India and $60/tCO2 in China.
- But this analysis ignores the fact that there are cheaper ways to deal with some of these externalities than to tax fuels. For example, particle emissions from diesel in India could be reduced by 90% by adopting Euro-6 and Euro-7 fuel and automobile standards. This would raise the cost of diesel by < 1%.

Mitigation as a by-product or co-benefit of domestic development policy

- Environmental concerns are not high on the list of priorities in low-income countries.
- They are *starting* to become important in China.
- If India were to reach China's emission level when these concerns got to the point of action being taken, emissions would already have increased by a factor of 3.
- So while we can hope that this mechanism will become important, realism suggests that it is unlikely to happen any time soon.

Emission reduction becomes free

- This could happen via progress in renewables and other fossil-free technologies.
- Support for solar PV in Germany has contributed to large cost reductions.
- Market creation via stronger carbon pricing and/or other policies would accelerate this process.
- Government support for R&D on renewables is modest, and **should be expanded greatly**. The US spends $2 billion/year on civilian renewable R&D, but $5 billion/year on other energy R&D out of a total federal R&D budget of $140 billion.

Transfers from developed to developing countries

Possible ways of making transfers:

1. Inter-governmental transfers -- politically difficult.
2. Linking carbon markets – but this requires carbon market creation in developing countries, difficult especially in low-income countries.
3. Offsets from developed-country carbon markets to low-income countries.

Offsets

- Have well-known problems.
- Additionality is an issue.
- Gaming can be a problem.
- But this does not mean that there are no good possibilities for offsets. I illustrate with two examples.

Biogas for reducing black carbon and deforestation

- Black carbon is now believed to be the second-most important radiative forcer (1.1 W/m^2) after CO2 (1.56 W/m^2), ahead of methane (0.86 W/m^2). (Bond et al 2013).
- An important source of black carbon is the burning of wood and other solid fuels for cooking in low and lower-middle-income countries.
- Since the science is relatively recent, there has not been much attention paid to this in official communications.
- Reducing these emissions is difficult because the problem is essentially one of affordability of modern fuels.

- Attempts to reduce emissions from cooking fires have been motivated in the past by efforts to prevent forest degradation and deforestation, and more recently, to prevent household air pollution.
- Household air pollution is estimated to have killed 3.5 million people since 2010. It is the 4th largest risk factor in the global burden of disease, and the largest in South Asia.
- Improved solid fuel stoves do not reduce particle emissions by much and adoption has been slow and limited.
- Biogas eliminates nearly all particulate emissions if it replaces solid fuels.

- Somanathan and Bluffstone (2015) examine the potential for using carbon market offets to finance biogas as a replacement for firewood and other solid fuels in Nepal.
- Existing subsidies for biogas depend on direct transfers from foreign aid programs. The limited appetite for such transfers has meant that biogas is used by just 3% of households in Nepal.
- The potential reach of biogas is much larger. The principal feedstock for biogas is cow dung and one or two cows are sufficient to operate a household biogas plant. More than 50% of Nepal households had two or more cows in 2010-11.

Main cooking fuel	Percent of households
Firewood	62
Cylinder gas	23
Dung	8
Biogas	3
Leaves, straw, etc	3
Kerosene	1
Other	1

Nepal Living Standards Survey 2010-11

- To examine the potential of offsets, we need to find the CO2-equivalent emissions reduced per biogas plant.
- First, estimate the reduction in firewood use per biogas plant.
- Second, calculate the resulting CO2e reduction.

Reduction in firewood use per biogas plant

- Data are from the Nepal Living Standards Survey of about 6000 households in 2010-11.

Biogas reduces firewood consumption by 40%

Table 2: OLS Models of Reported Annual Firewood Collection (kilograms) in 2010-11, with Ward Fixed Effects

	Model_1	Model_2
Main cooking fuel- Bio-gas	-1,123***	-1,048***
	(108.4)	(143.6)
Main cooking fuel- dung	-703.5***	-312.2*
	(119.4)	(179.0)
Main cooking fuel- leaves/straw	-450.2***	361.9
	(160.3)	(264.8)
Main cooking fuel- LPG	-1,138***	-1,078***
	(107.5)	(209.9)
Main cooking fuel- Kerosene	-978.1***	876.8*
	(131.7)	(447.6)
Main cooking fuel- other	-834.6***	-265.6
	(176.9)	(454.1)
Household size	168.5***	147.5***

Extensive set of household-level controls including powers of per capita consumption expenditure, land, livestock, education, unemployment, health status. Similar results for the 2003 survey, rural and hill subsamples. Omitted variable bias bounded.

Pollutant	Emission Factor (g of Pollutant/Kg of wood)	100-year Global Warming Potential (tCO2e)	Tonnes of CO2e saved per Kg of wood	Annual tCO2e saved per biogas plant	Annual value of CO2e/biogas plant (USD)	Discounted value of savings at 2% discount rate over 15-year life in USD.
CO2	1358	0.5	0.000679	0.679	6.79	87.24649917
BC	0.7	900	0.00063	0.63	6.3	80.95036005
OC	1.9	-46	-0.0000874	-0.0874	-0.874	-11.2302563
SO2	0.1	-76	-0.0000076	-0.0076	-0.076	-0.976544026
CO	76	1.8	0.0001368	0.1368	1.368	17.57779247
NMVOC	6.9	8.8	0.00006072	0.06072	0.6072	7.802072798
CH4	4.9	28	0.0001372	0.1372	1.372	17.62918952
N2O	0.1	265	0.0000265	0.0265	0.265	3.405054828
TOTAL			**0.00157522**	**1.57522**	**15.7522**	**202.4041685**

- Additionality not much of a concern here because very little is happening without a big financial push.

2nd example: Solar PV installation in India

- Very large increases in coal-fired generating capacity expected with economic growth (tripling by 2030).
- Existing government program to procure electricity from utility-scale solar PV is very limited in scale by budget constraints.
- Reverse auctions with guaranteed purchase prices by state-owned utilities over 25 years.
- Latest solar auction bids (summer 2015) are in the range of 5 to 6 Rs/KWh while for coal-fired power, bids are in the range 4.25 – 6 Rs/KWh.
- 1 KWh in India given its generation mix results in emission of 1 Kg CO2e, so at a carbon price of $10/tCO2e, replacing 1 KWh of the standard Indian electricity mix with solar is worth about $0.01 = Rs 0.65.

- If an offset were allowed, this could result in solar PV becoming a better deal for Indian utilities than buying coal, even if there were no government mandates.
- This could greatly reduce the construction of new coal-fired plants, perhaps bring them to a halt for a while.
- The daytime-only nature of solar PV will not be a constraint for a long time to come because 20% of Indian electricity demand is for irrigation pumps that can be run at any time of day.
- Auction prices would reveal whether solar is competitive without the offset – so additionality concerns can be monitored on an ongoing basis and the offset program ended if subsidies are no longer needed.

The value of offsets in stabilization

- Regulators in Europe, California, and elsewhere have been conservative in setting caps resulting in un-ambitious caps and low prices.
- An offset program can serve as a safety valve. It can be limited to a fraction of the market size, but this limit can be quickly raised if prices spike.
- This will reassure regulators that they can control price spikes.
- That in turn can allow for more ambitious emission reduction.

Conclusion

- Offset programs can be significant.
- Transaction costs can be limited by piggy-backing on existing programs in low-income countries.
- Well-chosen programs can be monitored on an ongoing basis to avoid buying non-negligible quantities of hot air.