

## ***No Proof Required***

### **Climate change: Promises, Promises**

By

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*Blurb: When it comes to climate, change and promise may only be in the eye of the beholder.*

This has been a hot week for climate talks. The two laggards, China and the US, both departed from their no commitment stand to boldly announce the following: the US to reduce its carbon emissions by 17 % over 2005 levels, and China to reduce the intensity (CO2 emissions per unit of output) by 40-45 percent. Europe has already promised a 40 percent cut in per capita terms. (The terminal date for these promises is 2020 or 2025). The US promise is not as little as it seems, and the China promise not as large. In per capita terms, the US is promising about a 30 percent reduction (population will increase by 15 percent or so between now and 2025), and 50 percent reduction in intensity of output (output expected to increase by 50 percent or so over the next 18 years).

The headlines are suggesting that it is India's turn to act. India has consistently avoided making any commitments on CO2 reduction. Its' belief, and argument, is that the first commitment of India is towards poverty reduction; such poverty reduction can only come about through sustained economic growth; and sustained economic growth means that carbon emissions have to go up. Hence, India's promise to keep its per capita emissions below the level of the developed world.

In the previous article, (*India: Need for Change in Climate*, Business Standard, Nov 7<sup>th</sup>), I had argued that the per capita promise was not in our best interests. Indeed, a better negotiating position for India would be to say that the intensity of our output will not exceed some norm that all countries agree to. Countries whose intensity of output is worse than this benchmark should be required to cut emissions first; those with intensity less should follow in a pro-rata fashion until the world target of total emissions is achieved. Such a stance would be consistent with the negotiating position of both the big polluters China and the US. And it would protect India's

growth prospects more. (This is pursued in the next and final part of this three part series on climate policy).

Various countries have promised various targets for various years – absolute cuts, per capita cuts, intensity cuts etc. How can these different efforts or different burdens or different promises or different sacrifices be compared? For that, one needs to have a metric of “sacrifice”. For example, assume I belong to a heavily developed economy which is in the post-industrialization phase. This economy will have lower energy needs than an economy that is in the early stages of industrialization (LDC). The former will be naturally reducing the intensity of its emissions (energy used per unit of income or output); the LDC is likely to go through a phase of first increasing this intensity. Analysis of over 130 countries for the period 1990 to 2007 suggests the following pattern: emissions per capita increase by 1.5 percent for each 1 percent increase in income for income levels up to 2007 PPP\$ 2700 per capita; by 1.3 percent for the income range 2700 to 20000, and by only 0.7 percent for incomes above PPP \$ 20,000 per capita. These response coefficients are higher for countries whose share of industry in GDP is higher than average e.g. China, and lower for those whose industrialization, *ceteris paribus*, is below average, e.g. India. (For comparison purposes, the per capita 2007 income levels for India, China and the US were PPP \$ 4800, 9800 and 47000, respectively).

There is another stylized fact about emissions intensity – *they have been falling over time and for countries at all ranges of income*. This is on-going technical change. For the last twenty years, the average worldwide fall in intensity has been around 1.5 percent per annum. The table reports these intensities, and related data, for selected regions and countries of the world.

Two business-as-usual (BAU) scenarios are reported. Given a set of per capita growth rates, and a traditional growth with emissions model, one can compute the expected use of CO<sub>2</sub> emissions in 2025 – this is BAU. This level is computed *without* allowance for technical change as has already occurred, for different countries at different rates, over the period 1990 to 2007. This technical change is computed simply as the weighted average of the (log) percent change in intensity, with a higher weight (.65) for the more recent period (2000 to 2007) and a lower weight (.35) for the 1990 to 1999 period. If this trend increase in technological change is assumed to continue for the period 2007 to 2025 (a conservative assumption) one arrives at an estimate of BAU\* i.e. the best that can be expected from each country given its level of development. BAU\* can also be considered as a “no sacrifice” level. (Note that the total CO<sub>2</sub>

output with the technical change assumption is 48.3 b tons – still considerably higher than the 30 billion tons target – again, a matter explored in the next article).

The intensity of output for each of the three years 1990, 2007 and 2025 is also reported. The final column reports on the reduction in intensity from 2007 levels. The following three conclusions are immediately apparent. First, India's intensity of CO<sub>2</sub> use is among the lowest in the world (and equal to that of Europe in 2007), and China among the highest. Second, India's trend decline in intensity is comparable to the world average. Third, China's promise to cut the intensity of emissions by 40 percent is good, but really, it is just what would have been expected given the nature of technical change; actually, it is a few percentage points lower! There isn't any "sacrifice" or any extra effort. The implications of the results on intensity for country targets, technology transfer, and climate aid will be explored in the next article.

**Table: CO2 Emissions and Intensity: 1990 - 2025**

	Emissions (bil tons)				Intensity of emissions (CO2/GDP)			
	Actual		Forecasts(2025)					% change in intensity 2025 vs 2007
	1990	2007	BAU	BAU*	1990	2007	2025	
<i>Regions</i>								
Developed	9.8	11.3	16.5	11.5	0.44	0.34	0.24	-30
Europe	3.2	3.3	4.6	3.2	0.35	0.26	0.18	-31
FSU and EE	4.7	3.2	11.5	5.2	1.06	0.58	0.25	-57
Developing	5.9	13.4	45.8	31.7	0.43	0.37	0.25	-31
World	20.4	27.9	73.8	48.3	0.51	0.37	0.25	-33
<i>Countries</i>								
<i>Developing</i>								
China	2.2	6.1	23.6	13.4	0.86	0.47	0.27	-43
India	0.6	1.3	6.9	4.7	0.33	0.25	0.17	-31
Brazil	0.2	0.3	0.7	0.7	0.16	0.17	0.16	-8
<i>Developed</i>								
Japan	1.1	1.2	1.7	1.3	0.30	0.28	0.21	-26
Germany	1	0.8	1.1	0.7	0.48	0.31	0.20	-36
UK	0.6	0.5	0.8	0.5	0.41	0.26	0.17	-36
USA	4.9	5.8	8.6	5.9	0.58	0.41	0.28	-31

Notes: (1) Intensity is defined as CO2 emissions per unit of GDP; the final column is the change in intensity in percentage terms and corresponds to the commitment made by China (40 percent reduction).

(2)BAU and BAU\* are 2 business as usual forecasts for 2025; BAU is a straight extrapolation based on the historical relationship of per capita CO2 emissions and per capita income (measured in 2007 PPP \$). BAU\* incorporates the effects of technological change (decline in intensity of emissions per unit of output) that have taken place across most countries over the last two decades; a weighted average (65 % weight for the 2000-2007 period and 35 % for the 1990-1999 period) of this annual technical change is assumed to continue for the period 2008 to 2025. Population extrapolations are from UN and income forecasts are based on expected income growth rates in different countries.

*This article is part of a paper “Climate Change – What’s it all about and what is to be done” , forthcoming and available, with past articles, at [www.oxusinvestments.com](http://www.oxusinvestments.com).*