Is CO_2 Mitigation Cost-Effective?

by Christopher Monckton of Brenchley

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Australia's Carbon Tax:

This note, prepared for distinguished scientific delegates at the 2012 annual seminars on planetary emergencies of the World Federation of Scientists, demonstrates the application of a much-simplified method of climate-mitigation investment appraisal to the recently-introduced Australian carbon dioxide tax. For the first time, mainstream climatological and economic-appraisal approaches are combined in a simple but robust appraisal method. The \$130 bn cost of the Australian carbon tax (Parliament of Australia, 2011) over the intended ten-year term is compared with its benefit in the cost of warming-related damage avoided by successful implementation and the consequent intended 5% cut in Australia's emissions. A zero inter-temporal discount rate is assumed. The minimum market rate would be 5% (Murphy *et al.,* 2008). The calculations are made explicit.

Cost of the Tax:

Carbon trading in Australia, as enacted in the Clean Energy Act 2011, costs \$10.1 bn/year, plus \$1.6 bn/year for administration (Wong, 2010, p. 5), plus \$1.2 bn/year for renewables and other costs, a total of \$13 bn/year, escalated under the Act at 2% yr^{-1}, with a further 2% yr^{-1} to allow for economic growth. The total cost of \$162 bn by 2020 is intended to abate 5% of current emissions, which represent 1.2% of world emissions (derived from Boden *et al.,* 2010ab), so that only 0.06% of global emissions will be abated if the tax fully succeeds as its framers intended. Without the tax, CO_2 concentration after the ten-year term would be 410 ppmv, compared with 390 ppmv (Conway & Tans, 2011) at the outset. With the tax, CO_2 concentration would be 410 – 0.0006(410 – 390) = 409.988 ppmv. Radiative forcing avoided, adopting the CO_2 forcing function in IPCC (2001 & 2007, citing Myhre *et al.,* 1998) would thus be 5.35 ln(410/409.988) = 0.00016 W m^{-2}.

This forcing is multiplied by a suitable climate-sensitivity parameter to determine warming over the ten-year term. Garnaut (2008) talks of keeping greenhouse-gas rises to 450 ppmv CO_2-equivalent above the 280 ppmv prevalent in 1750, so as to hold 21^{st}-century global warming since then to 2 K. His implicit sensitivity parameter is thus 2 K / {5.35 ln[(280 + 450)/280] W m^{-2}} = 0.39 K W^{-1} m^2, which, though applied over a 262-year period and consequently too great for a ten-year term, will be adopted here, so that the tax would abate 0.39(0.00016) = 0.00006 K global warming over the term.

The mitigation cost-effectiveness of the tax, which is the cost of abating 1 K global warming by global measures as cost-effective as the tax, is \$162 bn / 0.0006 = \$2.7 quadrillion per Kelvin abated.

CO_2 forcing represents 70% of all manmade forcing (IPCC, 2001). Thus, warming officially projected for the ten-year term is 0.39[5.35 ln(410/390)] / 0.7 = 0.15 K. The cost of abating this warming, again by measures as cost-effective as the tax, is 0.15($2.7 quadrillion) = $400 trillion, which, divided by the global population of 7 bn, is $57,000 per capita, or, divided by $670 trillion global GDP over the term (determined from World Bank, 2011), is equivalent to 59% of GDP.

Benefit in Avoided Cost of Warming-related Damage:

Stern (2006, p. vi), estimates that the cost of abating the 3 K 21st-century global warming the IPCC expects will be 0-3% of 21st-century GDP. Given that global warming of 0.14 K/decade in the 22 years since 1990 (taken as the least-squares trend on the monthly temperature anomalies in HadCRUt3gl, 2011) is half of the IPCC's then central estimate, Stern's mean estimate of 1.5% of GDP is assumed. On the basis that he determined it using a 1.4% discount rate, and adjusting for a zero rate, the benefit in climate-damage cost avoided rises to 1.6% of GDP.

The Cost-Benefit Ratio is:

59/1.6 = 36. Accordingly, at a zero discount rate it is 36 times costlier to mitigate CO_2 emissions by typical abatement measures such as Australia's carbon tax than to take no action at all and to endure the later cost of climate-related damage arising from the resultant warming. At a 5% discount rate, the cost-benefit ratio would be 48. Focused adaptation instead of inaction would also be likely to increase the cost-benefit ratio.

Conclusion:

This analysis is deliberately simple, but complexity would be unlikely to change the outcome sufficiently to render any policy to mitigate CO_2 emissions at all cost-effective. Removal of some of the simplifying assumptions would tend to worsen the cost-benefit ratio still further, for most of them lead to understatement of it. Results from other case studies broadly confirm the outcome in the Australian case. Therefore, future adaptation at need is recommended, but present mitigation is not.

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