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Is CO2 mitigation cost-effective?

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Australia's carbon tax: This note, originally presented before distinguished delegates at the 2012 annual seminars on planetary emergencies of the World Federation of Scientists, summarizes and updates Monckton of Brenchley (2013), which applies a simplified but robust method of climate-mitigation investment appraisal to the recently-introduced Australian carbon dioxide tax (Parliament of Australia, 2011). For the first time, mainstream climatological and inter-temporal-appraisal approaches are combined. The cost of the tax 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 cut in Australia's emissions. A zero inter-temporal discount rate is assumed. The minimum market rate would be 5% (Murphy *et al.*, 2008).

Fraction of global CO2 emissions abated: Over ten years, Australia's carbon tax cannot now abate more than 5% of otherwise-predicted emissions. Australia represents 1.2% of world emissions (derived from Boden *et al.*, 2010ab). Thus, the tax will abate only 5% x 1.2% = **0.06%** of global CO2 emissions.

CO2 concentration abated: Without the carbon dioxide tax, CO2 concentration after ten years would be 410 ppmv compared with 390 ppmv (Conway & Tans, 2011) at the outset. With the tax, CO2 concentration would be 410 minus 0.06% of (410 – 390) = **409.988 ppmv.**

CO2 forcing abated (IPCC, 2007; Myhre, 1998), would be 5.35 ln(410/409.988) = **0.00016 W m–2.**

A climate sensitivity parameter is multiplied by this forcing to determine warming over the ten-year term. Garnaut (2008) talks of keeping greenhouse-gas rises to 450 ppmv CO2-equivalent above the 280 ppmv prevalent in 1750, to hold 21st-century warming since then to 2 K. His implicit climate sensitivity parameter is thus 2 K / {5.35 ln[(280 + 450)/280] W m–2} = **0.39 K W–1 m2.** The instantaneous or Planck (zero-feedback) climate sensitivity parameter is **0.31 K W–1 m2** (IPCC, 2007, p. 631 fn.). Accordingly, an appropriate ten-year parameter would be approximately 0.31 + 10(0.39 – 0.31)/100 = **0.32 K W–1 m2.**

Global warming abated by the tax over ten years would be an undetectable 0.32(0.00016) = **0.00005 K,** or **1/1000** of the measurement uncertainty in global temperature measurement of 0.05 K.

The 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. Conservatively, the total cost over the ten-year term is thus **$162.3 bn.**

The mitigation cost-effectiveness of the tax, which is the cost of abating 1 K warming by global measures as cost-effective as the tax, is $162.3 bn / 0.00005 = **$3.2 quadrillion per Kelvin abated.**

Projected warming over the term: CO2 forcing represents 70% of all manmade forcing (IPCC, 2001). Thus, warming officially projected for the ten-year term is **0.17 K** (IPCC, 2007, p. 803, Table 10.2).

Global abatement cost: The cash cost of abating this projected 0.17 K warming over the term, again by measures as cost-effective as the tax, is 0.17($3.2 quadrillion) = **$550 trillion,** which, divided by the global population of 7 bn, is **$80,000 per capita.** Divided by $670 trillion global GDP over the term (determined from World Bank, 2011), it is equivalent to **80% of global GDP** over the ten-year term.

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 expected by the IPCC will be 0-3% of 21st-century global GDP. Since warming of 0.14 K/decade in the 22 years since 1990 (the least-squares trend on the monthly anomalies in HadCRUt3gl, 2011) is half the IPCC's then central estimate, a **1.5%-of-GDP** benefit is reasonable.

The cost-benefit ratio is thus 80/1.5 = **50.** Accordingly, at a zero discount rate it is **50 times costlier** to mitigate CO2 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 the minimum market discount rate of 5%, the benefit would be **1.23% of GDP** and the cost-benefit ratio would be **65.** Focused adaptation (rather than inaction) would be likely to increase the cost-benefit ratio still further.

Conclusion: This analysis is deliberately simple, but complexity would be unlikely to change the outcome sufficiently to render any policy to mitigate CO2 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-day mitigation is not.

References

Boden and Marland, 2010a. Global CO2 Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring, 1751-2007. Carbon Dioxide Information and Analysis Center, Oak Ridge, Tennessee, USA.

Boden et al., 2010b. Ranking of the world's countries by 2007 total CO2 emissions from fossil-fuel burning, cement production, and gas flaring. Carbon Dioxide Information and Analysis Center, Oak Ridge, Tennessee, USA.

Conway, T., & P. Tans, 2011, Recent trends in globally-averaged CO2 concentration, NOAA/ESRL, http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html#global.

Garnaut, 2008. The Garnaut Climate Change Review: Final Report. Cambridge University Press, Port Melbourne, Australia, 680 pp, ISBN 9780521744447.

HadCRUt3gl, 2011. Monthly global mean surface temperature anomalies, 1850-2011. http://www.cru.uea.ac.uk/cru/data/temperature/hadcrut3gl.txt.

IPCC, 2001. Climate Change 2001: The Scientific Basis: Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell and C.A. Johnson (eds.)]. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA.

IPCC, 2007. Climate Change 2007: the Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007 [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA.

Monckton of Brenchley, C.W., 2013. Is CO2 mitigation cost-effective? Proceedings of the 45th (2012) Seminars on Planetary Emergencies, World Federation of Scientists, Geneva, Switzerland, and Erice, Sicily, 2013.

Murphy, 2008. Some Simple Economics of Climate Changes. Paper presented to the MPS General Meeting, Tokyo, September 8.

Myhre et al., 1998. New estimates of radiative forcing due to well mixed greenhouse gases. Geophysical Research Letters 25:14, 2715–2718, doi:10.1029/98GL01908
.

Parliament of Australia, 2011, Exposure Draft of the Clean Energy Bill.
http://www.climatechange.gov.au/government/submissions/clean-energy-legislative-package/~/media/publications/clean-energy-legislation/exposure-draft-clean-energy-bill-2011-pdf.pdf.

Stern, N., 2006, The Economics of Climate Change: The Stern Review. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA.

Wong, 2010. Portfolio Budget Statements 2010-11: Budget-Related Paper No. 1.4. Climate Change and Energy Efficiency Portfolio, Commonwealth of Australia, Canberra, Australia
.

World Bank, 2011. Gross Domestic Product 2009, World Development Indicators.
http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP.pdf.