

## ENDNOTES

### Chapter 1

1. There have been many scientists deeply involved with the development of global climate change theory, but perhaps none as influential as the late climatologist Stephen H. Schneider, who wrote *The Genesis Strategy: Climate and Global Survival* in 1976 and *Global Warming* in 1989.

2. Traditional economic modeling would predict that the world will, as it has for centuries, continue to grow richer. This is an assumption as well as an explicit part of economic modeling, including the three dozen or so *integrated assessment models*, combined climate and economy models that have played a prominent role in climate debate and policy. They include the PAGE2002 model that was heavily relied upon by Nicholas Stern and his modeling team in producing the *The Stern Review on the Economics of Climate Change* (Cambridge Press, 2007), as well as models that call for much more modest action, such as the RICE and DICE models created by economist William Nordhaus and his associates. On the other hand, some economists warn that future generations will not necessarily be richer, either because natural and environmental capital will be depleted, undermining economic growth (Cameron Hepburn and Nicholas Stern, “The Global Deal on Climate Change” Ch. 3 in *The Economics and Politics of Climate Change* [D. Helm and C. Hepburn, eds., Oxford Press, 2009]), or because traditional economic models do not accurately model large changes in marginal values of environmental goods, which will become much more scarce in a climate-changed future (Thomas Sterner and U. Martin Persson, “An Even Sterner Review: Introducing Relative Prices into the Discounting Debate,” *2 Review of Environmental Law and Policy*, 61, 63 [2008]).

3. World Resources Institute, “Climate Analysis Indicators Tool, Yearly Emissions,” online at <http://cait.wri.org/cait.php?p>. (accessed March 18, 2010, on file with author). Carbon dioxide is not the only greenhouse gas, but it is by far the most abundant.

4. World Resources Institute, “Climate Analysis Indicators Tool, Yearly Emissions,” online at <http://cait.wri.org/cait.php?p>. (accessed March 18, 2010, on file with author).

5. National Development and Reform Commission, "People's Republic of China, China's National Climate Change Program" (2007), online at <http://en.ndrc.gov.cn/newsrelease/P020070604561191006823.pdf>.
6. World Resources Institute, "Climate Analysis Indicators Tool, Yearly Emissions," online at <http://cait.wri.org/cait.php?p>. (accessed March 18, 2010, on file with author).
7. World Resources Institute, "Climate Analysis Indicators Tool, Yearly Emissions," online at <http://cait.wri.org/cait.php?p>. (accessed March 18, 2010, on file with author).
8. See, e.g., Evan Lehman, "Eight House Republicans, after Carrying Climate Effort Last Year, Fend off Attacks" *ClimateWire*, August 5, 2010 ("I would not vote for it again in its current form because of the lack of progress in Copenhagen," [Representative Leonard] Lance of New Jersey said of the cap-and-trade bill. "I don't think we can do this alone. China and India have to come aboard."); "GOP: US Should Reject Climate Pact," *Seattle Times*, December 12, 2009, online at [http://seattletimes.nwsourc.com/html/politics/2010488118\\_apclimaterepublicans.html](http://seattletimes.nwsourc.com/html/politics/2010488118_apclimaterepublicans.html) (accessed August 10, 2010).
9. US Department of Defense (2008) "National Defense Strategy," at 4-5.
10. Department of Defense, "Quadrennial Defense Review Report," February 2010.
11. This argument was first and most eloquently made by Nobel Laureate economist Thomas Schelling, in "Intergenerational Discounting," 23 *Energy Policy* 395 (1995).

## Chapter 2

1. Nicholas Stern, *The Stern Review on the Economics of Climate Change* (2007).
2. Shi-Ling Hsu, "A Game-theoretic Model of International Climate Negotiations." 19 NYU. *Environmental Law Journal*, in publication.
3. Carolyn Kousky, Olga Rostapshova, Michael Toman, and Richard Zeckhauser, *Responding to Threats of Climate Change Mega-Catastrophes*, Resources for the Future Discussion Paper 09-45 (November 2009).
4. US Environmental Protection Agency, 2010. "US Greenhouse Gas Inventory Report," available online: [www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010\\_Report.pdf](http://www.epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010_Report.pdf) (accessed February 10, 2011).
5. Gilbert Metcalf and David Weisbach, "The Design of a Carbon Tax," (January 8, 2009). University of Chicago Law & Economics, Olin Working Paper No. 447. Available at SSRN: <http://ssrn.com/abstract=1324854>.
6. US Department of the Interior, National Park Service, *Spanning the Gap: Newsletter of the Delaware Water Gap National Recreation Area*, Summer

1998 (reporting that the average pH of the Delaware Water Gap, between New Jersey and Pennsylvania, was 4.5, the same as for Coca Cola).

7. A 1997 cost-benefit analysis of the first twenty years of the Clean Air Act found that benefits outweighed the costs to industry and consumers by almost two orders of magnitude. While compliance costs over the years 1970 to 1990 totaled \$523 billion, the benefits totaled \$22.2 trillion. *United States Environmental Protection Agency, Executive Summary, Final Report to Congress on Benefits and Costs of the Clean Air Act 1970 to 1990*, ES-2 to ES-8 (1997), available online at [www.epa.gov/air/sect812/812exec2.pdf](http://www.epa.gov/air/sect812/812exec2.pdf). Since this estimate was a measure of just the benefits of reduced air pollution over twenty years, it is clear that the total damages of pollution over longer time scales would well exceed \$22.2 trillion dollars. And since the largest component of damages from air pollution comes from sulfur dioxide, it is not an adventurous guess to say that the damages from sulfur dioxide over the nearly century of coal-fired power plant operations is very easily into the trillions of dollars.

8. It is now widely recognized that earlier estimates of damages from sulfur dioxide pollution were likely underestimates as they did not take full account of the effect of sulfur dioxide as particulate matter pollution, which has now emerged as the greatest threat to human health. See, e.g., Francine Laden et al., “Reduction in Fine Particulate Air Pollution and Mortality: Extended Follow-up of the Harvard Six Cities Study,” 173 *American Journal of Respiratory and Critical Care Medicine* 667 (2006); C. Arden Pope III et al., “Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution,” 287 *Journal of the American Medical Association* 1132 (2002); C. Arden Pope III et al., “Particulate Air Pollution as a Predictor of Mortality in a Prospective Study of US Adults,” 151 *American Journal of Respiratory and Critical Care Medicine* 669 (1995); Douglas W. Dockery et al., “An Association Between Air Pollution and Mortality in Six US Cities,” 329 *New England Journal of Medicine* 1753 (1993); “Health Effects Institute, Special Report: Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Mortality,” available at <http://pubs.healtheffects.org/view.php?id=6> (July 2000).

9. The century-old case *Georgia v. Tennessee Copper* 237 US 474 (1907), involved a dispute between the two states over sulfur dioxide pollution that resulted in massive destruction of tree and plant life on the Georgia side. It was alleged in the complaint, and not disputed, that “great quantities of sulphur dioxid [sic] are formed; if allowed to escape into the air this becomes sulphurous acid, a poisonous gas destructive of plant life.”

10. 40 C.F.R. §76.6 & §76.7 (1996).

11. Ontario Regulation 419/05—Local Air Quality (December 22, 2009).

12. Clean Air Act §§ 401–416; 42 U.S.C. §§ 7651a–7651o (1990).

13. In its initial phase, the program imposed a somewhat hard nationwide “cap” of 8.90 tons of SO<sub>2</sub> per year. Subsequent years have incorporated more facilities and also raised the cap. Clean Air Act § 403, 42 U.S.C. § 7651b (1990).

14. US Environmental Protection Agency, National Emissions Inventory, Air Pollutant Emission Trends Data, online at [www.epa.gov/ttn/chief/trends/trends06/nationaltier1upto2006basedon2002finalv2.1.xls](http://www.epa.gov/ttn/chief/trends/trends06/nationaltier1upto2006basedon2002finalv2.1.xls) (Excel spreadsheet format, tabbed SO<sub>2</sub> Nat'l) (2003).

15. Kyoto Protocol, Article 12.

16. Kyoto Protocol, Article 6.

17. Internal Revenue Code §45 (2009).

18. I.R.C. § 45(c)(7) (2009).

### Chapter 3

1. Alfred C. Pigou, *The Economics of Welfare*, 131–135 (1928). Taxes that reflected the extent of negative externality thus became known as “Pigouvian” taxes. William J. Baumol and Wallace E. Oates, *The Theory of Environmental Policy* 21–23 (2d ed., 1988).

2. A tax on carbon dioxide and a tax on carbon accomplish the same thing, but they are keyed, respectively, to the entire carbon dioxide molecule and to only the carbon atom, the weight ratio being 44/12. A tax on carbon of \$12/ton thus has the same effect of a tax on carbon dioxide of \$44/ton.

3. Richard S. J. Tol, “The Marginal Damage Costs of Carbon Dioxide Emissions: An Assessment of the Uncertainties,” 33 *Energy Policy* 2064, 2068–69 (table 2) (2005). Based on his evaluations of the studies, Tol declared that “it is unlikely that the marginal damage costs of carbon dioxide emissions exceed \$50/tC and are likely to be substantially smaller than that.”

4. William D. Nordhaus, *A Question of Balance* 90 (Table 5-4) (2008).

5. Nicholas Stern, *The Stern Review on the Economics of Climate Change* 287 (2007).

6. Nicholas Stern, *The Stern Review on the Economics of Climate Change* 143 (2007).

7. Nicholas Stern, *The Stern Review on the Economics of Climate Change* 287 (2007).

8. William D. Nordhaus, *A Question of Balance* 95 (2008).

9. Nicholas Stern, *The Stern Review on the Economics of Climate Change* (2007).

10. William D. Nordhaus, *A Question of Balance* 95 (2008).

11. William D. Nordhaus, “A Review of the Stern Review on the Economics of Climate Change,” 45 *Journal of Economic Literature* 686, 688 (2007).

12. Simon Cox and Richard Vadon, "Running the Rule Over Stern's Numbers," BBC News, January 26, 2007, online at <http://news.bbc.co.uk/2/hi/science/nature/6295021.stm>.
13. Martin Weitzman "A Review of the Stern Review on the Economics of Climate Change," 45 *Journal of Economic Literature* 703, 710 (2007).
14. Thomas Sterner and U. Martin Persson, "An Even Sterner Review: Introducing Relative Prices into the Discounting Debate," 2 *Review of Environmental Economics and Policy*, 61–76 (2008).
15. US Department of Agriculture, Natural Resources Conservation Service, Energy Estimator, online at: <http://nfat.sc.egov.usda.gov/>.
16. US Environmental Protection Agency, EPA Lifecycle Analysis of Greenhouse Gas Emissions from Renewable Fuels (May, 2009).
17. Allison Winter, "Peer review of EPA lifecycle rules fails to quell debate," E&E News PM, August 7, 2009.
18. 74 Fed. Reg. 66496 (December 15, 2009).
19. 139 *Canada Gazette* No. 36, Order Adding Toxic Substances to Schedule 1 to the Canadian Environmental Protection Act, 1999 (September 3, 2005) (citing section 64 of the Canadian Environmental Protection Act).
20. McKinsey & Co., *Unlocking Energy Efficiency in the US Economy* iii (2009).
21. McKinsey & Co., *Pathways to a Low-Carbon Economy* 7 (2009).
22. Henry Chu, "Carbon Tax is Sensible, and Perhaps Inevitable," *L.A. Times*, November 21, 2009.
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25. Martin L. Weitzman, "Prices vs. Quantities," 41 *Review of Economic Studies* 477 (1974).
26. World Resources Institute, Climate Analysis Indicators Tool, Yearly Emissions, online at <http://cait.wri.org/cait.php?p>. (accessed April 7, 2010, on file with author).
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30. 26 I.R.C. § 1031 (2010).

31. American Council for Capital Formation, online at: [www.accf.org/home.php](http://www.accf.org/home.php).

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37. Elisabeth Rosenthal, "Solar Industry Learns Lessons Under the Spanish Sun," *New York Times*, March 8, 2010, at A1.

38. Wind Turbines UK, About Wind Energy, online at: [www.windturbinesuk.co.uk/aboutwindenergy.htm#17](http://www.windturbinesuk.co.uk/aboutwindenergy.htm#17).

39. Sergio Pacca, Deepak, Sivaraman, Gregory A. Keoleian, "Parameters Affecting the Lifecycle Performance of PV Technologies and Systems," 35 *Energy Policy* 3316 (2007).

40. Concentrating solar power plants could potentially generate electricity at between 3.5 and 6.2 cents per kilowatt hour by 2020, US Department of Energy, Report to Congress on Assessment of Potential Impact of Concentrating Solar Power for Electricity generation, (February 2007) online <<http://www.nrel.gov/csp/troughnet/pdfs/41233.pdf>>

41. Settlement Agmt (on file with author); Darren Samuelson, "Court Settlement Fails to Still Debate over IGCC in Permitting," *Greenwire*, October 13, 2006 (on file with author).

42. A number of recent cases in the US Supreme Court have curtailed federal jurisdiction to regulate water pollution. See, e.g., *Rapanos v. United*

*States*, 547 US 715 (2006), and *Solid Waste Agency of Northern Cook County v. Army Corps of Engineers*, 531 US 159 (2001).

43. It would be an open question as to whether a cap-and-trade program with auctioned allowances would be similar enough to a carbon tax to be deemed a revenue-raising mechanism, and therefore within the ambit of the revenue-raising powers of a state, province or national government. Since taxes do not *tend* to vary in amount, there would be significant legal obstacles to overcome in characterizing such a cap-and-trade program as a *tax*.

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45. Western Climate Initiative: [www.westernclimateinitiative.org/ewebeditpro/items/O104F19871.PDF](http://www.westernclimateinitiative.org/ewebeditpro/items/O104F19871.PDF).

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47. Canadian Environmental Protection Act, Part 5, R.S.C. (1999), section 64(a).

48. Canadian Environmental Protection Act, Part 5, R.S.C. (1999), section 64(b).

49. Canadian Environmental Protection Act, Part 5, R.S.C. (1999), section 64(c).

50. Shi-Ling Hsu and Robin Elliot, "Regulating Greenhouse Gas Emissions in Canada: Constitutional and Policy Dimensions," 54 McGill Law Journal 463 (2009).

51. Western Climate Initiative, WCI Design Recommendations for the Cap-and-Trade Program Summary, online at [www.usclimatepolicy.com/documents//CPIS/WCI/WCI\\_Design\\_Recommendations\\_Summary.pdf](http://www.usclimatepolicy.com/documents//CPIS/WCI/WCI_Design_Recommendations_Summary.pdf) (accessed August 1, 2010).

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53. California Global Warming Solutions Act, AB 32 (Ch. 488, Statutes of 2006).

54. B.C. Carbon Tax Act, S.B.C., 2008.

55. California Global Warming Solutions Act, AB 32 (Ch. 488, Statutes of 2006).

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59. McKinsey & Co., *Pathways to a Low-Carbon Economy* 96 (2009).

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Budget Highlights 14 (2009), online at [www.cfo.doe.gov/budget/10budget/Content/Highlights/FY2010Highlights.pdf](http://www.cfo.doe.gov/budget/10budget/Content/Highlights/FY2010Highlights.pdf).

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63. US Senator Lamar Alexander, Floor Statements, April 22, 2009, online at [http://alexander.senate.gov/public/index.cfm?FuseAction=Speeches.Detail&Speech\\_id=6e0de357-4757-49bb-adb1-3b5e795a81d4&Month=4&Year=2009](http://alexander.senate.gov/public/index.cfm?FuseAction=Speeches.Detail&Speech_id=6e0de357-4757-49bb-adb1-3b5e795a81d4&Month=4&Year=2009) (also on file with author).

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