

A R T I C L E S

The Case for the Carbon Tax: How to Overcome Politics and Find Our Green Destiny

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Editors' Summary

Economists generally consider pollution taxes to be the gold standard of market-based instruments, while cap-and-trade systems are less effective and more complex to implement than pollution taxes. Therefore, following an economics argument, implementing a carbon tax in the United States will afford the best protection against climate change. However, significant impediments to introduction of a carbon tax in the United States exist. The most problematic of these, perhaps, is the United States' cultural aversion to taxes. Opportunities such as expiring tax provisions and recycling carbon tax revenues offer incentive to overcome such impediments to carbon tax implementation.

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The things we touch have no permanence.

My master would say, there is nothing we can hold onto in this world. Only by letting go can we truly possess what is real.¹

In the movie *Crouching Tiger, Hidden Dragon*, martial arts warrior Li Mu Bai (Li) decides to give up his legendary sword, Green Destiny, because of truths revealed to him during meditation. He asks Yu Shu Lien (Yu) to deliver the sword to Sir Te in Beijing. After Yu delivers the sword to Sir Te, a thief breaks in to steal Green Destiny. The thief is Jen Yu (Jen), who is a student of Jade Fox, the murderer of Li's master. After many adventures, Jen is caught by Li, who takes Green Destiny from Jen and throws it into a waterfall.

Green Destiny could be a metaphor for the health of the earth, where Jen and Jade Fox represent those who want to make use of it, Li and Yu represent those who want to protect it, and Sir Te represents those charged with regulating it. The earth suffers from climate change. There are ways to restore the earth's health: regulations and economic solutions including cap-and-trade systems and carbon taxes. But those ways threaten the thieves of Green Destiny. The thieves seek to pursue profits without restriction from those who would protect Green Destiny. The thieves are masters of persuasive arts and have deep influence with those who have the duty of protecting Green Destiny.

This Article will argue that the carbon taxes afford the best protection for Green Destiny. It will first compare a federal carbon tax with a federal cap-and-trade system for greenhouse gas (GHG) emissions. Then it will explore barriers to implementation of a carbon tax. Finally, the Article will propose methods for overcoming those barriers, taking into account likely opportunities posed by expiring tax provisions. The conclusion will introduce the concept of recycling carbon tax revenues, which can be applied to meet urban environmental challenges.

I. Global Climate Change Update

Atmospheric carbon has increased much more quickly than anticipated. In 2007, total atmospheric carbon reached 384 parts per million (ppm).² The most recent Intergovernmental Panel on Climate Change (IPCC) assessment noted that the global atmospheric concentration of carbon dioxide (CO₂) increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005.³ Since the drafting of the United Nations

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1. *CROUCHING TIGER, HIDDEN DRAGON* (Sony Pictures Classics 2000), directed by Ang Lee, based on the book by Wang Du Lu (no English translation).
 2. CARBON DIOXIDE INFORMATION ANALYSIS CTR., OAK RIDGE NAT'L LAB. (ORNL), RECENT GREENHOUSE GAS CONCENTRATIONS (2008), available at <http://cdiac.ornl.gov>.
 3. IPCC, CLIMATE CHANGE 2007: SYNTHESIS REPORT 37 (2008), available at www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [hereinafter IPCC 2007].

Framework Convention on Climate Change (UNFCCC), annual CO₂ emissions from burning fossil fuels and manufacturing cement have grown by 38%, from 6.1 billion tons of carbon to 8.5 billion tons in 2007.⁴ From 1970 to 2004, global annual CO₂ emissions grew by 80%.⁵ China has overtaken the United States as the top GHG emitter, spewing an estimated 1.8 billion tons of carbon into the atmosphere, versus the U.S. 1.6 billion tons.⁶ In 1992, the 38 developed countries included in Annex I of the UNFCCC accounted for 62% of global CO₂ emissions.⁷ In 2007, those countries accounted for 47% of global CO₂ emissions.⁸ The main drivers of increasing CO₂ emissions are global economic growth and global population growth.⁹ From 1970 to 2000, CO₂ emissions per unit of energy decreased, but that trend reversed after 2000.¹⁰ One possible explanation for the reversal is the developing world's reliance on inefficient, dirty coal plants for energy generation. China accounted for more than one-half of the increase in global CO₂ emissions over the last year, mostly due to a surge in construction of new coal-fired plants.¹¹ In arguing against joining the Kyoto Protocol, the U.S. government objected to the lack of emissions limitations for developing countries.¹² China and other rapidly industrializing countries cannot be expected to curtail emissions unless the United States leads the way.¹³ The U.S. failure to take action to reduce carbon emissions could be viewed as a hidden subsidy to energy-intensive U.S. industries, in violation of international trade rules.¹⁴ The

U.S. presidential election in 2008 may result in the United States having a more realistic view of its role in stemming global CO₂ emissions, as President-Elect Barack Obama has advocated climate change legislation.¹⁵

II. Comparing Carbon Cap and Trade With Carbon Taxes

*We should tax what we burn, not what we earn. This is the single most important policy change we can make.*¹⁶

Scientists worldwide share the view that climate change is real, and a real problem.¹⁷ Last year, former Vice President Al Gore and the scientists for the IPCC shared the Nobel Prize for their work “in creating greater worldwide understanding of the measures that need to be adopted [to curb climate change].”¹⁸ Commenting on the award, John Ashton, Britain's special representative for climate change, said that the award showed that “the international community now understands that [climate change] is not only an environmental challenge . . . it is a fundamental challenge to international peace and security.”¹⁹ Congress has expressed concern about climate change, and the most popular proposed solution involved a cap-and-trade system.²⁰ It appears inevitable that Congress will enact some sort of federal climate change legislation in the next few years.²¹ Two assump-

4. Press Release, Oak Ridge Nat'l Lab., CO₂ Emissions Booming, Shifting East, Researchers Report (Sept. 24, 2008) [hereinafter ORNL Press Release Sept. 2008].

5. IPCC 2007, *supra* note 3, at 36.

6. Data available through the ORNL's Carbon Dioxide Information Analysis Center, *see supra* note 2.

7. ORNL Press Release Sept. 2008, *supra* note 4.

8. *Id.*

9. IPCC 2007, *supra* note 3, at 37.

10. *Id.*

11. CENTER FOR GLOBAL DEV., CHINA PASSES U.S., LEADS WORLD IN POWER SECTOR CARBON EMISSIONS (2008), available at <http://www.cgdev.org/content/article/detail/16578/>.

12. *See* Sen. Frank H. Murkowski, *The Kyoto Protocol Is Not the Answer to Climate Change*, 37 HARV. J. ON LEGIS. 345, 345-46 (2000) (arguing that growing emissions from developing nations would quickly overshadow any achievements in emissions reductions by the United States and other Annex I countries).

13. Congressional leaders recognize that the United States must be a leader in climate change action. The report to America's Climate Security Act of 2007 states the following:

The rest of the world is waiting to see whether the U.S. will act meaningfully. . . . It is because the U.S. has by far emitted the greatest cumulative amount of greenhouse gas emissions—and will remain the largest cumulative GHG emitter for some time—that U.S. leadership on this issue is crucial. . . . By acting decisively, the U.S. will remove a primary rationalization for inaction by developing countries.

S. REP. NO. 110-337, at 12 (2008).

See also Erik Eckhold, *China Said to Sharply Reduce Emissions of Carbon Dioxide*, N.Y. TIMES, June 15, 2001, at A1 (stating that Chinese officials want a developed country to show them that reduced carbon emissions do not prevent a high standard of living for its citizens).

14. *See* Liana G.T. Wolf, *Countervailing a Hidden Subsidy: The U.S. Failure to Require Greenhouse Gas Emission Reductions*, 19 GEO. INT'L ENVTL. L. REV. 83 (2006).

15. Both candidates in the 2008 presidential election favored a carbon cap-and-trade system. *See* COUNCIL ON FOREIGN RELATIONS ISSUE TRACKER, THE CANDIDATES ON CLIMATE CHANGE (2008), available at <http://www.cfr.org/publication/14765/>. President-elect Barack Obama supports implementation of an economywide carbon cap-and-trade system to reduce carbon emissions by 80% over 1990 levels by 2050. All permits are to be auctioned, and a portion of the proceeds used to develop clean energy projects. *See* Barack Obama & Joe Biden, *New Energy for America*, <http://my.barackobama.com/page/content/newenergy> (last visited Nov. 16, 2008) (on file with author).

16. Al Gore, former Vice President, Speech to the Daughters of the American Revolution: A Generational Challenge to Repower America (July 17, 2008), available at http://blog.algore.com/2008/07/a_generational_challenge_to_re.html.

17. *See* Naomi Oreskes, *The Scientific Consensus on Climate Change*, SCIENCE, Dec. 3, 2004, at 1686 (“In recent years, all major scientific bodies in the United States whose members expertise bears directly on the matter have . . . all issued statements concluding that the evidence for human modification of climate is compelling.”); JOINT SCIENCE ACADEMIES STATEMENT, GLOBAL RESPONSE TO CLIMATE CHANGE (2005), available at <http://www.eesi.org> (statement signed by representatives of scientific academies in Brazil, Canada, China, France, Germany, India, Italy, Japan, Russia, the United Kingdom, and the United States, noting that “[t]he scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action”).

18. Dan Balz & Juliet Eilperin, *Gore and U.N. Panel Share Peace Prize*, WASH. POST, Oct. 13, 2007, at A1. Former Vice President Gore's documentary, *An Inconvenient Truth*, also won an Academy Award.

19. *Id.*

20. *See* Larry Parker & Brent D. Yacobucci, Climate Change: Greenhouse Gas Reduction Bills in the 110th Congress (Cong. Research Serv. Rep. No. RL33846, Apr. 24, 2007) (listing six bills introduced in 2007 that involve a cap-and-trade system). Since the report was updated, two carbon tax bills have been introduced: (1) H.R. 2069 (Save Our Climate Act of 2007); and (2) H.R. 3416 (America's Energy Security Trust Fund Act of 2007).

21. Christine Todd Whitman, former EPA Administrator, predicted that there will be federal legislation after the 2008 election cycle. *See* Zachary Coile, *Enacting*

tions underlie any cap-and-trade system: (1) that emissions below a certain quantity do not cause undue harm to the environment (the cap); and (2) that a market in pollution allowances is the most cost-effective means of reducing pollution to the predetermined level (the trade).²² Both cap-and-trade systems and pollution taxes are market-based instruments. A carbon tax is a pollution tax. Cap-and-trade systems impose quantity restrictions; pollution taxes impose cost restrictions.²³

A. Designing a Cap-and-Trade System

Economists generally consider pollution taxes to be the gold standard of market-based instruments.²⁴ Cap-and-trade systems are not as effective as pollution taxes, particularly in the context of GHG emissions.²⁵ Cap and trade is infinitely more complex to implement. By contrast, to implement pollution taxes, one must decide on the level of the tax, the pollutant to be taxed, and measurement standards for emissions. There already exists a large and effective government structure for the collection of taxes. For a cap-and-trade system, one must (at a minimum) decide also on the size of the cap, the number of initial allowances, and how they will be allocated, and then design a regulatory scheme to create and monitor markets.

A cap-and-trade system, while not optimal from an economic efficiency standpoint, is politically popular for several reasons. First, it is not called a tax. Second, there is some historical experience with cap-and-trade systems. In this country, we have had a sulfur dioxide (SO₂) allowance trading system since 1990.²⁶ Third, from an environmentalist point of view, an absolute quantity restriction on carbon emissions, only available with a cap, may be preferable.²⁷ Finally, the initial allocation of emissions permits allows government officials to pick winners.

The first step in designing a cap-and-trade system is setting the level of emissions permitted under the cap. The cap represents the maximum allowable emissions. The cap

can be fixed or come with a variety of adjustable features.²⁸ While the quantity of emissions is determined under the cap, the price of allowances will fluctuate with the market. However, the initial setting of the cap will also influence the price of the allowances. If the cap is set too low, then the cost of meeting the emissions reduction will rise rapidly, as it will make carbon allowances more valuable on the market. High prices will cause economic pain, and will endanger the system. In 1994, California launched an emissions trading program called RECLAIM (Regional Clean Air Initiatives Market), which targeted SO₂ and nitrogen oxides (NO_x), the precursors to smog.²⁹ Due to California's energy crisis in 2000, there was extreme price volatility in allowances, which ranged from a low of \$1,000 per ton in 1994 to a high of over \$100,000 per ton in 2000.³⁰ In the face of this unsustainable economic turmoil, the program was abandoned.³¹

Volatile markets in allowances can result in uncertainty about the cost of the GHG abatement. Existing pollution permit markets have experienced extreme volatility. The U.S. SO₂ trading prices have varied from a low of \$70 per ton in 1996 to \$1,500 in late 2005, with an average annual volatility of 43%.³² The European Union's (EU's) Emissions Trading Scheme (ETS) has also experienced significant volatility.³³

Setting the cap too high also causes problems. If the emissions cap is set too high, it will not accomplish emissions reductions. In the view of some researchers, the EU issued too many permits at the start of its ETS.³⁴ They noted "[b]ecause emissions permits were over-allocated, the price of emissions permits plummeted, and little—if any—emissions reductions have taken place because of the ETS."³⁵

Who receives the allowances and how they get the allowances also influences the outcome of the cap-and-trade program. In an "upstream" program, importers or producers of fossil fuels would acquire the allowances.³⁶ An upstream cap is more efficient, as there are fewer producers than there are emitters.³⁷ A downstream cap would allocate allowances to emitters.³⁸ Emitters such as electric utilities can be large, but end users of energy, like automobile drivers, are also emitters. Whether the cap is placed upstream or downstream, the cost impact would be felt throughout the carbon supply chain.³⁹

Allowances can be given away, initially sold at a fixed price, or auctioned off at market prices. After the initial allocation, any trading profits would accrue to the allowance holders rather than to the government. Free allowances ease the transition for existing emitters, but could raise the cost

Federal Climate Legislation Ends Up Being Long, Hard Slog, S.F. CHRON., Sept. 24, 2007, <http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/09/24/MN-JBSB0HA.DTL>.

22. Parker & Yacobucci, *supra* note 20, at 15.

23. Roberta F. Mann, *Waiting to Exhale: Global Warming and Tax Policy*, 51 AM. U. L. REV. 1135, 1209 (2002).

24. Jonathan Baert Wiener, *Global Environmental Regulations*, 108 YALE L.J. 677, 682 (1999) (noting that "the standard analysis crowns taxes as the presumptive first choice for optimal environmental regulation"). See also Louis Kaplow & Steven Shavell, *On the Superiority of Corrective Taxes to Quantity Regulation*, 4 AM. L. & ECON. REV. 1-17 (2002).

25. RICHARD D. MORGENSTERN, REDUCING CARBON EMISSIONS AND LIMITING COSTS 3-4 (Resources for the Future (RFF) 2002), available at <http://www.rff.org> (explaining how price instruments such as carbon taxes are superior to quantity targets for the abatement of GHG emissions).

26. 42 U.S.C. §7651 et seq., Pub. L. No. 101-549, 104 Stat. 2584 (1990).

27. See MORGENSTERN, *supra* note 25:

In the United States, environmentalists' desire for fixed emissions targets have combined with a broad political aversion to energy taxes to give the rhetorical edge to pure quantity-based instruments are the leading method for implementing climate policies.

Id. at 3.

28. Cong. Budget Office, *Issues in the Design of a Cap-and-Trade Program for Carbon Emissions*, ECON. & BUDGET ISSUE BRIEF, Nov. 25, 2003, at 4.

29. Kenneth P. Green et al., *Climate Change: Caps Versus Taxes*, ENVTL. POL'Y OUTLOOK, June 2007, at 3, available at <http://www.aei.org/publication26286>.

30. *Id.* at 4.

31. *Id.*

32. *Id.* at 3.

33. *Id.*

34. *Id.*

35. *Id.*

36. Cong. Budget Office, *supra* note 28, at 2.

37. *Id.* at 4.

38. *Id.*

39. *Id.*

of reducing carbon emissions.⁴⁰ They also have the anomalous result of rewarding existing emitters with valuable allowances. This allocation forms the main “winner-picking” mechanism in cap-and-trade. Finally, once the cap-and-trade system has been created, it must be monitored to deter cheating. This duty must either be placed on existing agencies such as the U.S. Environmental Protection Agency (EPA) or the U.S. Department of Energy (DOE), or a new agency created for this purpose. In any case, the enforcement function must be funded.

Concerned about excessive costs, some industries argue that a cap-and-trade system should include a safety valve—when costs of carbon allowances exceed a certain amount, the government will release additional allowances at a specified safety valve price.⁴¹ A safety valve sets a ceiling on carbon emission prices, just like a carbon tax. A safety valve also allows additional carbon emissions over the cap, just like a carbon tax. Opponents to safety valves argue that they would provide an “easy out” from the pressure to innovate and reduce the incentive to rapidly reduce emissions.⁴² The safety valve approach, “born from the collision between the theoretical desirability of using price instruments . . . and political reality,”⁴³ has all the complexity disadvantages of a cap-and-trade system without the advantages of a quantity cap.

The availability of banking, borrowing, offsets, and international credits can further complicate a cap-and-trade system. Banking provides timing flexibility by allowing an allowance holder to save its allowances to use in future years. Borrowing entails emitting now and “paying back” later, at a specified “interest rate.” Borrowing acts like a safety valve, except that at some point the emitter is supposed to pay back the extra emissions. Offsets can be investments in projects that absorb GHGs, such as forest conservation. Offsets represent projects that absorb carbon, so for cap-and-trade purposes, the offset acts as a negative emission. It can be challenging to accurately measure the amount of carbon absorbed by an offset project, and the projects must be monitored. For example, if a tropical forest in Brazil qualified as an offset, what would be the result if it was burned down? International credits extend the cap-and-trade system beyond the sovereign boundaries of the United States. In particular, offsets and international credits pose significant compliance issues.⁴⁴

40. *Id.*

41. *Issues in Designing a Cap-and-Trade Program for Carbon Dioxide Emissions: Testimony Before the H. Comm. on Ways and Means*, 110th Cong. 11 (Sept. 18, 2008) (statement of Peter R. Orszag, Congressional Budget Dir.)

42. Henry D. Jacoby & A. Denny Ellerman, *The “Safety Valve” and Climate Policy* 9 (MIT Joint Program on Science and Policy of Global Change Rep. No. 83, 2002).

43. *Id.* at 5.

44. See Dan Mitchell, *How Clean Is Your Carbon Credit*, N.Y. TIMES, May 5, 2007; Fiona Harvey, *Beware the Carbon Offsetting Cowboys*, FINANCIAL TIMES, Apr. 27, 2007. See also FRIENDS OF THE EARTH, INC., SUBPRIME CARBON: OFFSETS AND LESSONS FROM THE CREDIT CRISIS (2008) (drawing parallels between the subprime mortgage market and the market in carbon offsets, stating that “analyzing the quality of underlying carbon offset projects [traded on secondary carbon markets] will be as difficult, if not more so, than analyzing mortgages, and may be even less suited to modeling”).

In designing its climate change policy, the federal government will not be writing on a blank slate. In the absence of federal guidance, the states have taken the lead in implementing GHG reduction strategies. Twenty-three states have entered into regional climate change partnerships. The Western Climate Initiative sets a regional GHG reduction target and plans to implement a trading program for Arizona, California, Montana, New Mexico, Oregon, Utah, and Washington.⁴⁵ The Midwestern Regional Greenhouse Gas Reduction Accord will establish a similar program for Illinois, Iowa, Kansas, Michigan, Minnesota, and Wisconsin.⁴⁶ The first regional program, the Regional Greenhouse Gas Initiative (RGGI), formed in 2003, held its first auction of 12.5 million carbon allowances on September 25, 2008, raising nearly \$40 million.⁴⁷ The proceeds will be used for energy efficiency programs.⁴⁸ RGGI caps emissions for 233 power generating plants.⁴⁹ Connecticut, Maine, Maryland, Massachusetts, Rhode Island, and Vermont participated in the auction.⁵⁰ The other members of the initiative—Delaware, New Hampshire, New Jersey, and New York—did not participate but plan to join in future auctions.⁵¹ In 2004, energy experts set the first RGGI cap at 188 million tons of carbon emissions, anticipating that by 2008, emissions would exceed that amount.⁵² However, a slowing economy and milder weather caused carbon emissions to decrease from 184.5 million tons in 2005 to an estimated 172.4 million tons in 2007.⁵³ Critics note that setting the cap too high will limit the effectiveness of the program—emissions will not decrease.⁵⁴ On the other hand, if a cap is set too low, industry will complain that costs are excessive.

In June 2008, the first major federal carbon cap-and-trade bill to make it out of committee was defeated by a U.S. Senate filibuster.⁵⁵ While this bill would have allowed the states to continue regulating GHG emissions, concerns may grow that state or regional cap-and-trade programs may interfere with the efficient functioning of the federal cap-and-trade program and increase demands on both governmental and nongovernmental resources. Industries may complain about being required to comply with multiple cap-and-trade programs. For example, a utility might have to buy both state and federal allowances to cover the same ton of GHG emissions. As the U.S. House of Representatives’ Committee on Energy and Commerce noted in its white paper on climate change design, “different points of regulation or allocation methodologies between State and Federal programs would

45. See Western Climate Initiative, *Homepage*, <http://www.westernclimateinitiative.org> (last visited Dec. 26, 2008).

46. See <http://www.wisgov.state.wi.us/docview.asp?docid=12497>.

47. Robin Shulman, *Carbon Sale Raises \$40 Million*, WASH. POST., Sept. 30, 2008, at A4.

48. Felicity Barringer & Kate Galbraith, *States Aim to Cut Gases by Making Polluters Pay*, N.Y. TIMES, Sept. 16, 2008, at A17.

49. *Id.*

50. Shulman, *supra* note 47.

51. *Id.*

52. Barringer & Galbraith, *supra* note 48.

53. *Id.*

54. *Id.*

55. David M. Herszenhorn, *After Verbal Fire, Senate Effectively Kills Climate Change Bill*, N.Y. TIMES, June 7, 2008.

also cause complications and increase resources necessary for compliance.”⁵⁶ Jonas Monast, co-director of the Climate Change Policy Partnership, believes that allowing state and federal carbon markets to co-exist will have significant (negative) economic impact and would result in little or no cumulative environmental benefit.⁵⁷ Monast advocates integration of the regional markets into the federal scheme, while acknowledging the considerable difficulty in accomplishing that goal.⁵⁸

Economists have not addressed the issue of efficiently integrating a federal carbon tax with existing state or regional carbon trading schemes. It may be easier to integrate a federal carbon tax with state and regional cap-and-trade programs than it would be to integrate a federal cap-and-trade program with the state and regional programs. State and regional carbon allowance holders could use purchased allowances as credits against the federal carbon tax—based on the carbon allowed to be emitted, not on the purchase price. Allowing free allowances to be used against the federal carbon tax would create a windfall for the holder of the free allowances. If a federal carbon tax works to reduce emissions below the state and regional targets, the state and regional authorities may be encouraged to dismantle their systems. In the meantime, the states can keep the pressure on the federal government to create a strong carbon tax that will lead to significant emissions reductions, and industry will have an incentive to accept a strong federal carbon tax so as to avoid the patchwork of state and regional initiatives.⁵⁹

B. Why a Carbon Tax Is Better Than a Cap-and-Trade System

*We are running an uncontrolled experiment on the only home we have.*⁶⁰

A carbon tax is better than a cap-and-trade system because of its simplicity, transparency, efficiency, and certainty (of cost).

Reducing the amount of GHG emissions is critical for our continued survival on earth. The 2007 IPCC assessment notes that “unmitigated climate change would, in the long term, be *likely* to exceed the capacity of natural, managed, and human systems to adapt.”⁶¹ With current climate change mitigation policies, CO₂ emissions from energy use are projected to grow 40-110% between 2000 and 2030.⁶² To stabilize atmospheric GHG concentrations at close to current levels, we must reduce global CO₂ emissions by up

to 60% by 2050.⁶³ The arguments against taking action can be summarized simply: it will cost too much. “The fear that carbon mitigation policies will be costly has become a deterrent to action.”⁶⁴ If the cost of limiting emissions and the benefits of reduced emissions are known with certainty, a carbon cap-and-trade system is economically equivalent to a carbon tax.⁶⁵ The type of uncertainty that exists with a particular type of emission predicts the best economic instrument.⁶⁶ When environmental damages are not very sensitive to short-term emission levels or where concerns about excessive costs exist, a cost restriction works better than a quantity restriction.⁶⁷ The environmental damage from GHG emissions is cumulative—short-term emission levels are not critical as long as overall reductions occur.⁶⁸ “The real goal of [pollution] taxes is to gradually correct market forces even when the negative externalities cannot be properly valued. From this perspective, it is better to install modest environmental taxes now than to wait several decades before the optimal tax level can be determined with certainty.”⁶⁹ Carbon taxes are better for consumers and businesses alike, assuming a level playing field. Consumers get predictable prices, and businesses get a stable environment for planning and investment. Unfortunately, in the U.S. political system, we cannot assume a level playing field.

As the saying goes, the devil is in the details. A cap-and-trade system has a lot more details than a carbon tax. The recently failed Lieberman-Warner Climate Security Act of 2007 ran to 548 pages.⁷⁰ In a cap-and-trade system, the design battles are fought on two fronts: (1) whether carbon allowances should be auctioned or given away, and who gets them; and (2) whether the cost of carbon mitigation should be limited, as with a safety valve provision.⁷¹ The issue of carbon allowances is remote to ordinary citizens—we will not be privy to the negotiations between the industries and our government.⁷² Ordinary citizens may be pleased to support non-auctioned allowances, under a mistaken impression

63. *Id.* at 67.

64. Morgenstern, *supra* note 25 at 3.

65. *Id.*

66. *Id.*

67. *Id.*

68. *Id.*

69. Johan Albrecht, *The Use of Consumption Taxes to Re-Launch Green Tax Reforms*, 26 INT’L REV. L. & ECON. 88, 93 (2006).

70. S. 2191, 110th Cong. (2008). Admittedly, the first 215 pages were crossed out because the bill was an amendment in the nature of a substitute offered by Sen. Barbara Boxer (D-Cal.), the Chairman of the Senate Committee on Environment and Public Works. See 154 CONG. REC. S5344 (daily ed. June 6, 2008).

71. See Jad Mouawad, *Industries Allied to Cap Carbon Differ on the Details*, N.Y. TIMES, June 2, 2008.

72. At least, we cannot be assured of having that information. In 2001, Vice President Dick Cheney produced an energy policy report with the assistance of an energy task force. NAT’L ENERGY POLICY DEV. GROUP, NATIONAL ENERGY POLICY: REPORT OF THE NATIONAL ENERGY POLICY GROUP (2001) (on file with author). When requested by Congress to disclose the identity of the task force members, Vice President Cheney refused and a lawsuit ensued. See Dana Milbank, *Cheney Refuses Records’ Release: Energy Showdown with GAO Looms*, WASH. POST, Jan. 28, 2002, at A1, A12 and Dana Milbank, *GAO Sues Administration Over Task Force Records*, WASH. POST, Feb. 23, 2002, at A7. Ultimately, the U.S. Department of Energy released over 11,000 heavily redacted pages after receiving a court order. See Dana Milbank & Mike Allen, *Energy Contacts Disclosed: Consumer Groups Left Out, Data Show*, WASH. POST, Mar. 26, 2002, at A1, A8.

56. Comm. on Energy & Commerce, U.S. House of Representatives, Climate Change Legislation Design White Paper: Appropriate Roles for Different Levels of Government 18-19 (Feb. 2008) [hereinafter White Paper]. See James Kanter, *Banks Urging U.S. to Adopt the Trading of Emissions*, N.Y. TIMES, Sept. 26, 2007.

57. Jonas Monast, *Integrating State, Regional, and Federal Greenhouse Gas Markets: Options and Tradeoffs*, 18 DUKE ENVTL. L. & POL’Y F. 329, 334 (2008).

58. *Id.* at 343.

59. White Paper, *supra* note 56, at 23.

60. Quoted in THOMAS L. FRIEDMAN, HOT, FLAT, AND CROWDED: WHY WE NEED A GREEN REVOLUTION—AND HOW IT CAN RENEW AMERICA 49 (2008) (the quote is by Bill Collins of the Lawrence Berkeley National Laboratory).

61. IPCC 2007, *supra* note 3, at 73 (emphasis in the original).

62. *Id.* at 44.

that it will reduce energy costs. Center on Budget and Policy Priorities Director Robert Greenstein explains the following:

That belief [that energy prices will not rise if the allowances are given away] is not correct; it flies in the face of the basic law of supply and demand. A cap on emissions will limit the amount of energy produced from fossil fuels. Regardless of whether the government gives away or sells the allowances, market forces will raise the price of fossil-fuel energy to the point where the amount demanded will fall to the amount supplied. Either way, energy companies will be able to sell their products at the higher price. The increase in prices is the source of windfall profits for the companies that receive allowances for free but are able to charge the higher price.⁷³

Industries, on the other hand, understand precisely how allocation of allowances will affect their bottom line. A carbon tax minimizes rent-seeking behavior by industries. “Without the profit potential of amassing tradable carbon permits, industry groups would have less incentive to try to get credits for their favored but non-competitive energy sources.”⁷⁴

The complexity of a cap-and-trade system makes it difficult for taxpayers and consumers to determine who will be paying the costs, and how much those costs will be. The complexity allows affected industries to jockey for advantage and exemptions without the general public understanding what is going on. From an end-user cost perspective, a carbon cap-and-trade system is opaque, not transparent. This may be viewed as a political advantage—if consumers don’t understand that some industries are getting off without paying their fair share, it is unlikely that consumers will raise objections. Political compromises can then be made among the industries without fear of public uproar. In short, a cap-and-trade system provides cover for the government’s decision as to who “wins” and who “loses.” Friends of the Earth, Inc. analyzed the Lieberman-Warner Climate Security Act, and identified its “winners”: the fossil fuels industry.⁷⁵ The report notes that “the way in which the federal government hands out these valuable permits will determine whether companies receive a windfall or if the money benefits the public at large.”⁷⁶ The bill would have given away (for free) 38% of the allocated permits to the fossil fuels industry over the lifetime of the program, from 2012 to 2050.⁷⁷ These permits would be worth \$436 billion at EPA’s estimated cost of carbon.⁷⁸ Of course, a federal cap-and-trade program could be structured to provide public benefits, a level playing field, and fairness and cost containment for all industries and

consumers.⁷⁹ The odds are just overwhelmingly against that result. A federal carbon tax, with its simplicity, transparency, efficiency and cost containment, gives us the best chance of fairly allocating the cost of carbon reduction.

In 1927, U.S. Supreme Court Justice Oliver Wendell Holmes said: “Taxes are what we pay for civilized society.”⁸⁰ In the years since, paying taxes has not enjoyed such respect.⁸¹ But not paying taxes has its disadvantages as well. Tom Friedman writes that “the motto of the petroliar authoritarian state is “no taxation, so no representation either.”⁸² Freedom thrives when citizens pay taxes, and is repressed where citizens receive payment from the government, as in the petrodollar regimes.⁸³ Consumers who pay a transparent carbon tax will be in a position to demand less carbon-intensive goods and services. In paying a carbon tax, we will be paying for our continued existence on earth.

III. Barriers to Implementing Carbon Taxes: Lessons From the British Thermal Unit Tax⁸⁴

If you drive a car I'll tax the street.

If you try to sit I'll tax your seat.

If you get too cold I'll tax the heat.

*If you take a walk I'll tax your feet.*⁸⁵

Last year I wrote an article about the tax treatment of coal.⁸⁶ I presented this paper at an American Bar Association Tax Section Conference before the Energy and Environmental Tax Committee. In my conclusion, I noted that a carbon tax would create an incentive for cleaner fuels.⁸⁷ An audience member asked how a carbon tax was different from the British thermal unit (BTU) tax that failed so dismally during the Clinton Administration. Now I have an answer. A BTU⁸⁸ tax taxes goods. A carbon tax taxes bads. Nobel Prize-winning economist Joseph Stiglitz says that it makes much

73. *Fiscal Impacts of Controlling Carbon Emissions: Hearing Before the H. Comm. on Budget*, 110th Cong. 4 (Nov. 1, 2007) (statement of Robert Greenstein, Exec. Dir., Center on Budget and Policy Priorities), available at <http://www.cbpp.org>.

74. Green et al., *supra* note 29, at 6.

75. KATE MCMAHON & ERICH PICA, WINDFALLS IN LIEBERMAN-WARNER GLOBAL WARMING BILL: QUANTIFYING THE FOSSIL FUEL INDUSTRY GIVEAWAYS (Friends of the Earth, Inc. 2007) (on file with author). Friends of the Earth, Inc. is a tax-exempt §501(c)(3) organization that has sponsored environmental activism for 39 years.

76. *Id.* at 4.

77. *Id.*

78. *Id.*

79. Peter Dorman, professor of economics at Evergreen College, sets forth four requirements for a fair carbon cap-and-trade system: (1) upstream coverage incorporating the entire economy; (2) 100% auction of carbon permits; (3) no offsets allowed; and (4) equal distribution of auction revenues on a per capita basis. Peter Dorman, *The Coming Economic Showdown Over Climate Change* (unpublished manuscript) (on file with author).

80. *Compania General de Tabacos de Filipinas v. Collector of Internal Revenue*, 275 U.S. 87, 100 (1927) (Holmes, J. dissenting).

81. See Roberta F. Mann, *Beyond Enforcement: Top 10 Strategies for Encouraging Tax Compliance*, 111 TAX NOTES 919, 922 (2006).

82. FRIEDMAN, *supra* note 60, at 101.

83. *Id.*

84. U.S. DEPARTMENT OF THE TREASURY, SUMMARY OF THE ADMINISTRATION’S REVENUE PROPOSALS 64 (1993).

85. THE BEATLES, *Taxman*, on REVOLVER (Capitol Records 1966). Prof. Paul Caron notes that The Beatles were unusually prescient in anticipating the Clinton Administration’s proposed BTU tax. Paul Caron, *Tax Myopia, or Mamas Don’t Let Your Babies Grow Up to Be Tax Lawyers*, 13 VA. TAX REV. 517, 527 n.35 (1994).

86. Roberta F. Mann, *Another Day Older and Deeper in Debt: How Tax Incentives Encourage Burning Coal and the Consequences for Global Warming*, 20 PAC. MCGEORGE GLOBAL BUS. & DEV. J. 111 (2007).

87. *Id.* at 136-41.

88. BTU is the amount of heat required to raise the temperature of one pound of liquid water by one degree.

more sense to tax bads, not goods.⁸⁹ Stiglitz is a member of the “Pigou Club,” a group of economists and policymakers that advocate implementation of Pigouvian taxation.⁹⁰ A.C. Pigou, an early 20th-century scholar, explained that taxes could serve to control externalities by creating either incentives to encourage behavior with positive social benefits, or disincentives to increase the costs of an activity when market costs do not reflect the negative impacts of the externalities associated with it.⁹¹ Gilbert Metcalf, another distinguished member of the Pigou Club, wrote “a central tenet of economics is that market prices do not reflect the social cost of resource use when economic activities result in pollution.”⁹²

In 1993, President William J. Clinton proposed a “broad-based energy tax” in his State of the Union Address.⁹³ The Clinton Administration considered a carbon tax, but ultimately moved to a BTU tax because of the objections of Sen. Robert Byrd (D-W. Va.).⁹⁴ The BTU tax was based on the heat content of fuels. The heat or energy content of a fuel is what is good about it. A BTU tax is not a Pigouvian tax because it is not focused on controlling externalities, although the BTU tax was embraced by the environmental community as encouraging cleaner forms of energy.⁹⁵

Of course, a BTU tax is an energy tax, and thus is similar to a carbon tax in its impact. Advocates of a carbon tax would be wise to learn from the demise of the BTU tax. First, the BTU tax was designed to raise revenue for deficit reduction as well as to reduce pollution.⁹⁶ A significant portion of its political support was based on its deficit reduction capability, but so was a significant portion of its political opposition.⁹⁷ Second, the Clinton Administration proved overly flexible in allowing compromise in its efforts to gain additional support. When it altered the proposal to exempt ethanol from the tax under pressure from the Corn Belt senators, the opposition sensed that the Clinton Administration commitment to the bill was weak.⁹⁸ As more exemptions and changes invaded the bill, environmentalists began to lose enthusiasm.⁹⁹

The first political lesson from the BTU tax is to focus on a single goal. The carbon tax should reduce carbon emissions, and be revenue-neutral. Second, no industry should be exempt from the tax. Of course, there will be hard-

ship claims from various groups. But once one industry is exempted, the other industries will rush in with their arguments, and at that point, fairness would be one of them. As I write, the world is gripped by a global economic crisis. Industry will argue that it cannot incur additional costs associated with emissions reductions. But as French President Nicolas Sarkozy recently said: “[C]limate change is so important that we cannot use the financial and economic crisis as a pretext for dropping it.”¹⁰⁰ President Sarkozy sets an excellent example. Political compromise should be limited to the selection and distribution of other taxes to be reduced by the carbon tax revenues. Decisions about recycling carbon tax revenues puts politicians in their favorite position: giving away tax cuts.

IV. Overcoming Barriers to Carbon Tax Implementation

Implementation of a federal carbon tax faces many challenges. Environmentalists may fear excessive emissions. Proponents of progressive taxation may object to a carbon tax because it is a consumption tax, and has a regressive effect, impacting those at the lower end of the economic spectrum more severely than those at the top. Businesses may fear the loss of the opportunity for advantage under a less transparent system such as a cap-and-trade program, although some companies have expressed a preference for a federal carbon tax.¹⁰¹ Politicians undoubtedly fear charges of supporting higher taxes.¹⁰²

As seen in the demise of the BTU tax, any combination of these challenges could easily be enough to defeat a carbon tax. Indeed, the political consensus behind a carbon cap-and-trade system reflects the strength of these challenges. However, these challenges can and should be met, because of the clear policy superiority of the carbon tax and the insidious dangers of a carbon cap-and-trade system.

The technical arguments that a carbon tax is a more efficient and effective way of reducing carbon emissions than a quantity restriction should allay environmental concerns. Theoretically, it would be simple to change the rate on a carbon tax if the initial rate did not reduce emissions enough.

A carbon tax would certainly have a regressive effect if the revenues were not recycled. Lower income citizens spend a higher proportion of their income on energy: gas for transportation and electricity, and gas or fuel oil for heating. A carbon tax also has an indirectly regressive effect, by increasing the costs of goods and services for which energy

89. Joseph E. Stiglitz, *A New Agenda for Global Warming*, ECONOMISTS' VOICE, July 2006.

90. Greg Mankiw, a Harvard economist, keeps the membership list of the Pigou Club. See <http://gregmankiw.blogspot.com/2006/09/rogoff-joins-pigou-club.html>.

91. See Maureen Cavanaugh, *On the Road to Incoherence: Congress, Economics, and Taxes*, 49 UCLA L. REV. 685, 687 (2002) (citing A.C. PIGOU, WEALTH AND WELFARE 164 (1912)).

92. Gilbert E. Metcalf, *A Green Employment Tax Swap: Using a Carbon Tax to Finance Payroll Tax Relief*, BROOKINGS-WRI POL'Y BRIEF, June 2007, at 1.

93. President William J. Clinton, State of the Union Address (Feb. 17, 1993), in *The State of the Union: President Clinton's Address*, WASH. POST, Feb. 18, 1993, at A24.

94. *Clinton to Propose Corporate Tax Hikes; Energy Tax Expected, Sources Confirm*, 28 Daily Tax Rep. (BNA) G-7, 8 (Feb. 12, 1993).

95. See Dawn Erlandson, *The Btu Tax Experience: What Happened and Why It Happened*, 12 PACE ENVTL. L. REV. 173, 176 (1994).

96. *Id.* at 177.

97. *Id.*

98. *Id.*

99. *Id.* at 183.

100. CNN.com, *EU Green Goals Stay Despite Economic Gloom*, <http://www.cnn.com/2008/TECH/science/10/16/eu.climate/index.html> (last visited Oct. 16, 2008).

101. See Richard Osborne, Submission of Duke Energy Corporation to the Federal Tax Reform Panel (Apr. 29, 2005).

102. Presidential candidate Sen. John McCain (R-Ariz.) accused rival candidate Sen. Barack Obama (D-Ill.) of planning to raise taxes in order to “spread the wealth around,” pejoratively calling the plan “socialist.” Foon Rhee, *McCain: Joe the Plumber Right About Obama's Socialist Tax Plan*, BOSTON GLOBE, boston.com (Oct. 18, 2008), available at http://www.boston.com/news/politics/political-intelligence/2008/10/mccain_joe_the.html.

is a component.¹⁰³ However, a carbon cap-and-trade system would also increase the cost of energy in a regressive way.¹⁰⁴ Increasing the cost of carbon-intensive fossil energy is the point of either a carbon tax or a carbon cap-and-trade system—to encourage conservation, efficiency, and development of low or no carbon energy resources. Revenue recycling is the key to avoiding regressivity, and the key to building political support for the carbon tax.¹⁰⁵ A portion of the carbon tax revenue could be recycled to reduce the very regressive payroll tax.¹⁰⁶

Businesses seek competitive advantage, to be sure, but more importantly, they seek to avoid disadvantage. The business community understands that carbon regulation in some form is coming. They would prefer a federal regime to the growing patchwork of state initiatives. If a federal carbon tax gained political traction, the business community would probably go along.¹⁰⁷ Business community support could be encouraged by recycling a portion of the carbon tax revenue to reduce corporate tax rates.¹⁰⁸

The last factor, political fear of raising taxes, is the most significant barrier. The first step in overcoming this challenge is structuring the carbon tax to be revenue-neutral by recycling revenue and cutting other taxes. Revenue neutrality defuses charges of raising taxes,¹⁰⁹ and succeeded in the last big tax reform effort culminating in the Tax Reform Act of 1986.

The stars aligned in 1986, allowing a significant tax reform package that reduced income tax rates and broadened the tax base by ending many tax preferences, such as the differential capital gains rate.¹¹⁰ President Ronald Reagan, who was a

very popular president, was able to put together a bipartisan coalition to achieve his goals of simplifying the tax code and reducing the rate structure.¹¹¹ The stars may be coming into alignment again next year. Congress will need to address the fallout from the 2001 tax cuts, which were shoehorned into a 10-year budget window via a sunset provision.¹¹² Addressing climate change may have popular support among concerned citizenry, and additional support may be garnered by revenue recycling. Last year, former Secretary of State George P. Shultz (under President Reagan) drew a parallel between the current global climate change issue and the ozone depletion issue of the 1980s.¹¹³ He emphasized that the successful conclusion of the ozone treaty benefitted from strong U.S. leadership.¹¹⁴ He advised not to expect developing countries like India to accept a cap. He noted that the use of economic incentives is essential, and that “a straight-out carbon tax is simpler and likelier to produce the desired result. If the tax were offset by cuts elsewhere to make it revenue-neutral, acceptability would be enhanced.”¹¹⁵

V. Conclusion

A federal carbon tax is the best choice for controlling GHG emissions. A carbon tax is simpler, more transparent, and more effective than a carbon cap-and-trade system. Australian tax expert David Russell favors a carbon tax, claiming that it is predictable, gradual, and could be easily implemented.¹¹⁶ Russell also asserts that GHG emissions trading could turn out to be the costliest public mistake in human history.¹¹⁷ I hope, for the sake of those countries and regions that have already invested in GHG trading programs, that he is incorrect in his latter assumption. The United States has the opportunity to make the right decision first. It's time that we unlearn the lesson of the former senator (Democrat) from Minnesota, Walter Mondale, who famously said: “Mr. Reagan will raise taxes; and so will I. He won't tell you. I just did.”¹¹⁸ Former Senator Mondale lost to Ronald Reagan in a landslide, and no other U.S. politician has ever dared to admit that he or she would raise taxes.¹¹⁹ His words are still the truth: a carbon cap-and-

103. See JOSEPH E. ALDY ET AL., A TAX-BASED APPROACH TO SLOWING GLOBAL CLIMATE CHANGE 14 (RFF IDEAS Discussion Paper No. 08-26, 2008).

104. See DALLAS BURTRAW ET AL., THE INCIDENCE OF U.S. CLIMATE POLICY: WHERE YOU STAND DEPENDS ON WHERE YOU SIT 4 (RFF Discussion Paper No. 08-28, 2008).

105. See Richard Westin, *What to Do With Proceeds of a Carbon Tax*, TAX NOTES, July 16, 2007, at 191 (“A carbon tax that is not returned will never be enacted.”).

106. Gilbert E. Metcalf, *A Green Employment Tax Swap: Using a Carbon Tax to Finance Payroll Tax Relief*, BROOKINGS-WRI POLICY BRIEF, June 2007, at 6 (a rebate of the employer and employee payroll tax contribution on the first \$3,660 of earnings per worker would make a \$15 per ton carbon tax distributionally neutral).

107. Martin Sullivan imagined the future support of the business community for a carbon tax in his article drafted in the form of a “confidential memorandum” to “member companies” from “Association for Corporate America.” See Martin A. Sullivan, *Will Business Learn to Love the Carbon Tax?*, TAX NOTES TODAY, May 27, 2008, at 102-11. He notes that “for business there are two major advantages of a carbon tax over a cap-and-trade system: 1) reduction in uncertainty and 2) trade advantages.” *Id.* Paul Anderson, Chairman and Chief Executive Officer (CEO) of Duke Energy, stated that “an economy-wide carbon tax is the least prescriptive policy approach as it does not mandate reductions in any one sector.” PAUL ANDERSON, GRABBING THE CARBON ELEPHANT, ENERGY MARKETS (2006). More recently, James E. Rogers, President and CEO of Duke Energy, supported a federal cap-and-trade system with a safety valve in his testimony before the House Subcommittee on Energy and Air Quality (Mar. 2007).

108. Green et al., *supra* note 29, at 9 (noting that a \$15 per ton CO₂ tax raises enough revenue to reduce the corporate income tax by over 25%).

109. It must be conceded that revenue recycling does not always remove the political taint of “new taxes.” Canada's recent election is a case in point. Liberal leader Stephane Dion proposed a national carbon tax with revenue recycling. The Liberals suffered a severe defeat in the election, resulting in Mr. Dion's resignation as leader. His opponents argued that a carbon tax would harm the economy in a time of global crisis. See Ian Austen, *Canada's Liberal Party Leader Says He Will Step Down*, N.Y. TIMES, Oct. 21, 2008, at A12.

110. Tax Reform Act of 1986, Pub. L. No. 99-514, 99th Cong. (1986).

111. See JEFFREY H. BIRNBAUM & ALAN S. MURRAY, SHOWDOWN AT GUCCI GULCH: LAWMAKERS, LOBBYISTS, AND THE UNLIKELY TRIUMPH OF TAX REFORM 285 (1987).

112. Economic Growth and Tax Relief Reconciliation Act of 2001, Pub. L. No. 107-16, 107th Cong. (2001). Section 901 of the Act provides

(a) In general—All provisions of, and amendments made by, this Act shall not apply—

(1) to taxable years . . . beginning after December 31, 2010.

113. George P. Shultz, *How to Gain a Climate Consensus*, WASH. POST, Sept. 5, 2007, at A21.

114. *Id.*

115. *Id.*

116. John Wiseman, *Top Conservative in Favour of Carbon Tax*, AUSTRALIAN, Mar. 13, 2008, at 6.

117. *Id.*

118. Former Senator Mondale's acceptance speech at Democratic Convention in San Francisco (July 19, 1983), <http://www.cnn.com/ALLPOLITICS/1996/conventions/chicago/facts/famous.speeches/mondale.84.shtml>; see also George H.W. Bush, 1988 Republican Convention “read my lips—no new taxes.”

119. Rep. John Dingell (D-Mich.) favored a carbon tax (John D. Dingell, *The Power in the Carbon Tax*, WASH. POST, Aug. 2, 2007, at A21), and now has issued a discussion draft of a carbon cap-and-trade program. See Executive Summary of Discussion Draft (on file with author).

trade system would increase energy costs—like a tax—the advocates just won't tell you so.¹²⁰

A carbon tax doesn't need to increase overall taxes, because it can be recycled. Choosing a carbon tax will level the playing field and send a clear price signal throughout the economy without picking winners. It limits the opportunities for rent-seeking and fraud that lurk in the complexity of a cap-and-trade system. A carbon tax taxes bads, not goods. It creates incentives to try various means of GHG reductions: conservation; efficiency; and renewable energy. It creates incentives to buy sustainably produced local goods. It discourages the global market from using cheap labor (by making transport of goods more expensive), and encourages a global market in ideas. In a recent column, Friedman wrote the following:

Many people will tell [President-elect] Obama that taxing carbon . . . now is a "non-starter." Wrong. It is the only starter. It is the game-changer.¹²¹

A carbon tax can best help us achieve our green destiny. We should do it, now.

120. See ROBERT SHAPIRO ET AL., THE U.S. CLIMATE CHANGE TASK FORCE, ADDRESSING CLIMATE CHANGE WITHOUT IMPAIRING THE U.S. ECONOMY 3 (2008), available at <http://www.climatechange.org> (noting that every approach to climate change ultimately involves higher energy prices for households and businesses.)

121. Thomas L. Friedman, *The Real Generation X*, NY TIMES (Dec. 7, 2008).