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Climate Change Law: An Introduction

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CLIMATE CHANGE LAW: AN INTRODUCTION

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Synopsis: Climate change law is a new and rapidly developing area of law. This article explains the basic elements of climate change law, with a particular focus on those issues that promise to be important for a considerable time as well as the major factors that are driving the development of this law. The law of climate change is being constructed at the intersection of several areas of law, including environmental law, energy law, business law, and international law. Any effort to address climate change also raises issues about the proper role of state, local, and federal governments, as well as their relationship to one another. This article is intended to serve as an introduction to this complex and rapidly changing subject.

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It is increasingly obvious that climate change will be a significant and permanent issue for the United States and the rest of the world. The translation of that issue into law is evidenced by the American Bar Association's recent publication of *Global Climate Change and U.S. Law*.¹ The purpose of this article is to explain the basic elements of a new and rapidly growing area of law—climate change law—with a particular focus on those issues that promise to be important for a considerable time as well as the major factors that are driving the development of this law. The emerging law of climate change is being constructed at the intersection of several areas of law, including environmental law, energy law, business law, and international law. Any effort to address climate change also raises issues about the proper role of state and federal governments, as well as their relationship to one another. This article is intended to serve as an introduction to this complex and rapidly changing subject.

Part I of this article explains the key aspects of climate change science as reported by the Intergovernmental Panel on Climate Change (IPCC), describes U.S. greenhouse gas emissions, and outlines the basic policy choices for addressing climate change. Part II describes the most salient international laws related to climate change, including the Framework Convention on Climate Change, the Kyoto Protocol, and the European Union Emissions Trading System. The article then turns, in Part III, to state efforts on climate change, including regional efforts, as well as such legal tools as state renewable portfolio standards, net metering programs, and tax incentives for energy efficiency. Part IV discusses ways in which federal laws already address climate change, both directly and indirectly. Part V provides an overview of potential national climate change legislation.

I. FOUNDATION: SCIENCE, EMISSIONS, AND POLICY OPTIONS

Although the climate change issue has often led to polarizing debates, it is premised on a basic question: what do we do with the information in front of us? This section provides an overview of that information as well as the options we have.

1. AMERICAN BAR ASSOCIATION, SECTION OF ENVIRONMENT, ENERGY, AND RESOURCES, *GLOBAL CLIMATE CHANGE AND U.S. LAW* (Michael Gerrard ed. 2007).

A. Climate Change Science

The Intergovernmental Panel on Climate Change (IPCC or Panel) was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) to provide “decision-makers and others interested in climate change with an objective source of information about climate change.”² The complexity, global scale, and importance of the climate issue could be authoritatively addressed only by an international body that could effectively and credibly ascertain what we know and do not know. The IPCC’s role is to “assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature produced worldwide” concerning human-induced climate change.³ The Panel comprises several thousand climate scientists and other experts from around the world. The IPCC does not conduct independent research or recommend policies. The IPCC produces climate change assessments and technical papers that are regularly cited in legislation, judicial decisions, and other studies. In 2007, the IPCC was awarded the Nobel Peace Prize (with former U.S. Vice President Al Gore) for its work.

The IPCC has produced four climate change assessments since 1990. These assessments have expanded in scope, detail, and sophistication of statistical analysis over time. The first assessment report, published in 1990, covered the science and impacts of climate change. The second assessment report in 1995 incorporated the economic and social dimensions of climate change. The third report, in 2001, included a synthesis of previous IPCC reports and addressed a broad range of policy-relevant questions.⁴ The IPCC’s most recent assessment, in 2007, is comprised of another synthesis report and reports by each of the IPCC’s three Working Groups (WG), which addressed the scientific basis of climate change (WGI), the impacts of climate change, including vulnerability and adaptation to climate change (WGII), and the mitigation of climate change (WGIII).

The 2007 WGI report concludes that warming is unequivocal, based on evidence of global surface temperatures, changes in precipitation patterns, and observations of ocean and arctic temperatures.⁵ Eleven of the last twelve years studied (1995–2006) rank among the twelve warmest years since 1850, with 1998 and 2005 being two of the warmest years on record.⁶ The WGI report also concludes that the rate of warming over the last fifty years is almost double that of the last 100 years.⁷ Average arctic temperatures are also on the rise, with decreases in sea ice thickness in all seasons.⁸ Melting of the ice sheets in

2. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, ABOUT IPCC, <http://195.70.10.65/about/index.htm> (last visited Mar. 1, 2008).

3. *Id.*

4. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SYNTHESIS REPORT 2 (2001), <http://www.ipcc.ch/pdf/climate-changes-2001/synthesis-spm/synthesis-spm-en.pdf>.

5. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WORKING GROUP I REPORT: THE PHYSICAL SCIENCE BASIS OF CLIMATE CHANGE (2007), <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>.

6. *Id.* at ch. 3, 252.

7. *Id.* at 237.

8. *Id.* at 252, 237.

Greenland and Antarctica has very likely (90-99% probability) contributed to rising sea levels in 1993 and 2003.⁹

The WGI report also finds stronger evidence than in previous IPCC reports that warming is due to human activity. As climate science advanced, studies showed that natural forces alone—the nonhuman forces that govern the climate system—cannot provide an adequate explanation for observed global warming.¹⁰ The first IPCC assessment in 1990 reported little observational evidence of human influence on climate.¹¹ The second IPCC assessment found a discernible human influence on climate.¹² The IPCC's third assessment in 2001 reported a likelihood (66-90% probability) that observed increases in global average temperatures are due to increases in anthropogenic (human caused) greenhouse gas emissions. The IPCC's 2007 assessment reports that it is very likely (90-99% probability) that observed temperature increases are due to anthropogenic greenhouse gas emissions.¹³

The second report, from Working Group II, focuses on the impacts of climate change on natural and human systems.¹⁴ The report concludes with high confidence (about an eight in ten chance of being correct) that anthropogenic warming over the last three decades had a discernible influence on many natural systems. Examples include increased ground instability in permafrost regions, rock avalanches in mountain regions, and runoff in glacier and snow-fed rivers.¹⁵ Because of increasing evidence concerning a wider range of species, the WGII report concludes with very high confidence (at least a nine in ten chance of being correct), that recent warming is strongly affecting terrestrial biological systems.¹⁶

The WGII report also describes projected impacts, particular vulnerabilities, and prospects for adaptation. Freshwater availability is expected to increase in wet areas and decrease in dry areas by mid-century, and approximately 20-30% of species are likely to face increased risk of extinction if global average temperatures increase in excess of 1.5-2.5°C.¹⁷ The world's coral, which is vulnerable to warmer ocean temperatures and has little adaptive capacity, is at risk for bleaching and mortality.¹⁸ Certain regions of the world, especially small islands, developing countries (particularly in Africa), and polar regions, are also particularly vulnerable to impacts from climate change due to their location, limited ability to adapt, and reliance on natural resources within traditional communities.¹⁹

9. *Id.* at ch. 4, 339.

10. *Id.* at ch. 9, 669.

11. *Id.*

12. *Id.*

13. *Id.*

14. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WORKING GROUP II REPORT: IMPACTS, ADAPTATION AND VULNERABILITY 8 (2007), <http://www.ipcc-wg2.org/> (follow "The Full Working Group II Contribution to the Fourth Assessment Report Available Here").

15. *Id.*

16. *Id.*

17. *Id.* at Summary for Policymakers, 11.

18. *Id.* at 12.

19. *Id.* at 13-15.

The third report examines greenhouse gas emission trends and mitigation.²⁰ The WGIII report finds that global greenhouse gas emissions increased 70% between 1970 and 2004, with the largest growth coming from the energy supply sector.²¹ WGIII concludes that changes in behavior and lifestyle, advances in technology, upgrades to energy infrastructure, and improved energy efficiencies can contribute to the mitigation of climate change.²² Reductions in greenhouse gas emissions not only have a positive effect on climate change, but can also provide co-benefits in areas such as improved health and energy security.²³ The WGIII report concludes with a description of policies and laws that are available to governments to limit or reduce greenhouse gas emissions.²⁴

A fourth report synthesizes key lessons from the first three reports. The report lists five “reasons for concern.” These are 1) heightened risks to unique and threatened ecosystems and communities; 2) likely increases in the frequency of, and damage from, droughts, floods, and heat waves; 3) greater vulnerability of the poor and elderly to the adverse effects of climate change; 4) growing economic costs of impacts over time as atmospheric greenhouse gas concentrations increase; and 5) the possibility of significantly rising sea levels from melting of the Greenland and Antarctic ice sheets.²⁵

B. U.S. Greenhouse Gas Emissions

The United States is the largest energy producer and consumer in the world, accounting for about one fourth of the world’s annual energy use. The U.S. has also been the world’s largest emitter of greenhouse gases,²⁶ although China’s carbon dioxide emissions recently surpassed those of the U.S.²⁷ In addition, U.S. per capita energy consumption is among the highest in the world, twice as high as in western Europe and eight times higher than that in China.²⁸

20. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WORKING GROUP III REPORT: MITIGATION OF CLIMATE CHANGE (2007), <http://www.ipcc.ch/ipccreports/ar4-wg3.htm> [hereinafter IPCC WG III].

21. *Id.* at Summary for Policymakers, 3. The IPCC refers to the “energy supply sector” broadly to encompass a variety of power generating sources. The statistics for the energy supply sector in the IPCC report are given to provide contrast to several other broad sectors including, industry, agriculture, transportation, residential and commercial buildings, waste management, and forestry. *See* IPCC WG III, *supra* note 20, at Ch. 4.

22. *See id.* at ch.11.

23. *See id.* at 669-672.

24. *Id.* at ch. 13.

25. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FOURTH ASSESSMENT REPORT, CLIMATE CHANGE 2007: SYNTHESIS REPORT, SUMMARY FOR POLICYMAKERS 20 (2007), http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf.

26. U.S. DEP’T OF STATE, U.S. CLIMATE ACTION REPORT- 2002: THIRD NATIONAL COMMUNICATION OF THE UNITED STATES OF AMERICA UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE 14 (2002), [http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BWHU6/\\$File/uscar.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BWHU6/$File/uscar.pdf) [hereinafter CLIMATE ACTION REPORT 2002]; Press Release, Office of the Press Secretary, President Bush Discusses Global Climate Change (June 11, 2001), <http://www.whitehouse.gov/news/releases/2001/06/20010611-2.html>.

27. NETHERLANDS ENVTL. ASSESSMENT AGENCY, CHINA NOW NO. 1 IN CO₂ EMISSIONS; USA IN SECOND POSITION, <http://www.mnp.nl/en/dossiers/Climatechange/moreinfo/Chinanowno1inCO2emissionsUSAinsecondposition.html> (last visited Mar. 1, 2008).

28. U.S. DEP’T OF ENERGY, ENERGY INFO. ADMIN., INTERNATIONAL ENERGY ANNUAL 2005, TBL. E.1C, WORLD PER CAPITA TOTAL PRIMARY ENERGY CONSUMPTION (MILLION BTU), 1980-2005 (2007), <http://www.eia.doe.gov/pub/international/iealf/tablee1c.xls>.

Like other countries, the United States publishes annually a profile of U.S. greenhouse gas emissions and sinks. Table 1 provides a summary of that profile:

Type of Gas	1990	2005	Total Growth 1990-2005	Total Growth (Percentage Increase)
Carbon Dioxide	5,061.6	6,089.5	1027.9	20.3
Methane	609.1	539.3	(69.8)	(11.5)
Nitrous Oxide	482.0	468.6	4.6	(1.0)
HFCs, PFCs, SF ₆	89.3	163.0	73.7	82.5
TOTAL	6,242.0	7,260.4	1036.4	16.6
Net Carbon Dioxide Flux from Land Use, Land-Use Change, & Forestry	(712.8)	(828.5)	(130.3)	(18.3)
Net Emissions (Sources and Sinks)	5,529.2	6,431.9	902.7	16.3

*Table 1: Net Greenhouse Gas Emissions (Teragrams of carbon dioxide equivalent)*²⁹

Table 1 provides data for six greenhouse gases.³⁰ Because these gases have different global warming potential (a ton of methane represent twenty-one times the warming potential of a ton of carbon dioxide), the numbers in Table 1 are all expressed in carbon dioxide equivalents. Carbon dioxide is the dominant greenhouse gas, contributing 6,089.5 of the 7,260.4 teragrams, or 83.9% of the equivalent emissions in 2005. The overwhelming majority of carbon dioxide emissions, in turn (5751.2 of the 6089.5 teragrams emitted in 2005, or 94.4 %), were from fossil fuel combustion.³¹ Dominant sources of methane emissions are landfills, the digestive systems of animal livestock (particularly cows and sheep), and natural gas pipeline systems. The overwhelming majority of nitrous oxide emissions are from agricultural soil management, although mobile source combustion (primarily automobiles) plays a small role. The remaining pollutants (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) are

29. U.S. EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2005 ES-5 (2006), <http://www.epa.gov/climatechange/emissions/downloads06/07ES.pdf> [hereinafter INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS]. The data in the two right hand columns was derived by calculation. U.S. territories are included separately in the table because of the way data is collected.

30. These are the same six gases recognized in the Kyoto Protocol. *See infra* note 49 and accompanying text.

31. INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS, *supra* note 29, at ES-5.

manufacturing byproducts, although electrical transmission and distribution also contribute to emissions.³²

Table 1 also provides an overall picture of the relationship between emissions and *net* emissions. Emissions exceed net emissions because some carbon dioxide emissions are stored, primarily in soils and trees, thus reducing atmospheric pollution. Yet the amount of carbon stored in 2005 was only slightly more than the amount of carbon that was stored in 1990. This increase is due primarily to an increase in the rate of net carbon accumulation in forest carbon stocks, particularly in tree biomass.³³

Table 2 provides an overview of sources of carbon dioxide emissions in the transportation, industrial, residential, and commercial sectors of the economy. Electricity is listed separately because electricity is a cross-cutting category, used in each of the four economic sectors.

Sector	1990	2005	Total Growth 1990-2005	Total Growth (Percentage Increase)
Transportation	1467.0	1897.9	430.9	29.4
Industrial	1539.8	1575.2	35.4	2.3
Residential	929.9	1208.7	278.8	30.0
Commercial	759.2	1016.8	257.6	33.9
U.S. Territories	28.3	52.5	24.2	85.5
TOTAL	4724.1	5751.2	1027.1	21.7
Electricity	1810.2	2381.2	571.0	31.5

Table 2: Carbon Dioxide Emissions from Fossil Fuel Combustion by End-Use Sector (Teragrams of carbon dioxide equivalent)³⁴

As Table 2 indicates, electricity is the dominant reason for the growth in carbon dioxide emissions, representing 55.6% of the growth in carbon dioxide emissions between 1990 and 2005. Transportation was the fastest growing sector in terms of carbon dioxide emissions during this period, and became the largest of the four economic sectors in terms of emissions (passing industry) between 1990 and 2005. Residential, commercial, and electricity emissions all grew by at least 30% during the same period. Emissions in the industrial sector, by contrast, increased only slightly.

32. *Id.* at ES-8 to ES-10. Sulfur hexafluoride is used in the electric transmission and distribution industry for insulation and current interruption in electric equipment. U.S. EPA, SF₆ EMISSION REDUCTION PARTNERSHIP FOR ELECTRIC POWER SYSTEMS, <http://www.epa.gov/electricpower-sf6/> (last visited Feb. 21, 2008).

33. INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS, *supra* note 29, at ES-12.

34. *Id.* at ES-8. The data in the two right hand columns was derived by calculation. U.S. territories were included separately in the table because of the way data is collected.

C. Policy Options

Policy makers often distinguish between risk assessments (like that provided by the IPCC) and risk management (what to do about the risks). Almost no one questions the need to do *something*. President George W. Bush has described climate change as one of the “great challenges of our time.”³⁵ And there is growing recognition that the environmental changes wrought by warming will affect human well-being in a variety of ways. This is reflected in various governmental and nongovernmental reports on actual or projected national impacts of climate change in the United States,³⁶ and governmental and nongovernmental reports on projected U.S. regional impacts.³⁷ Other reports describe the national security consequences of climate change for the United States.³⁸ The United Kingdom has published a well-known analysis under the leadership of economist Nicholas Stern concluding that it will be much less costly to act now to address climate change than to wait until the impacts of climate change are more fully realized.³⁹ Significantly, the Stern report also identified ethical issues raised by climate change, a perspective that is gaining greater attention.⁴⁰

Virtually all options for addressing climate change fall into one of four categories. The first is emissions control, which involves direct reductions in greenhouse gas emissions. This is the option that is most like traditional pollution control. The second is energy efficiency and conservation, which indirectly reduces greenhouse gas emissions from fossil fuels because it reduces the amount of energy that is used. The third is long-term carbon storage or carbon sequestration. In this option, carbon dioxide is stored in soil, bedrock, or

35. Kenneth T. Walsh, *Bush Moves on Climate Change*, U.S. NEWS & WORLD REPORT, Oct. 11, 2007, available at <http://www.usnews.com/blogs/news-desk/2007/10/4/bush-moves-on-climate-change.html>.

36. NAT'L ASSESSMENT SYNTHESIS TEAM U.S., GLOBAL CLIMATE CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS ON THE UNITED STATES: THE POTENTIAL CONSEQUENCE OF CLIMATE VARIABILITY AND CHANGE, FOUNDATION (2001), <http://www.gcrio.org/NationalAssessment/foundation.html>; NAT'L ASSESSMENT SYNTHESIS TEAM, U.S. GLOBAL CLIMATE CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS ON THE UNITED STATES: THE POTENTIAL CONSEQUENCES OF CLIMATE VARIABILITY AND CHANGE, OVERVIEW (2000), <http://www.gcrio.org/NationalAssessment/overpdf/overview.html>; CAMILLE PARMESAN & HECTOR GALBRAITH, PEW CENTER ON GLOBAL CLIMATE CHANGE, OBSERVED IMPACTS OF GLOBAL CLIMATE CHANGE IN THE U.S. (2004), <http://www.pewclimate.org/docUploads/final%5FObsImpact%2Epdf>.

37. See, e.g., UNION OF CONCERNED SCIENTISTS, CLIMATE CHANGE IN THE NORTHEAST: A REPORT OF THE NORTHEAST CLIMATE IMPACT ASSESSMENT (2006), http://www.climatechoices.org/assets/documents/climatechoices/NECIA_climate_report_final.pdf.

38. MILITARY ADVISORY BOARD, NATIONAL SECURITY AND THE THREAT OF CLIMATE CHANGE (2007), <http://securityandclimate.cna.org/report/National%20Security%20and%20the%20Threat%20of%20Climate%20Change.pdf>.

39. NICOLAS STERN, HER MAJESTY'S TREASURY, GOVERNMENT OF UNITED KINGDOM, STERN REVIEW ON THE ECONOMICS OF CLIMATE CHANGE, http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm (last visited Mar. 8, 2008).

40. These issues include, for example, the effect on future generations of actions by the present generation and the disproportionate effect that climate change caused mostly by developed countries will likely have on developing countries. See, e.g., ROCK ETHICS INSTITUTE, PENN STATE UNIVERSITY, WHITE PAPER ON THE ETHICAL DIMENSIONS OF CLIMATE CHANGE (2006), http://www.ndsciencehumanitiespolicy.org/resources/climate_change_white_paper.pdf; Symposium, *Religion and Ecology: Can the Climate Change?*, 2001 DAEDALUS, J. OF AM. ACAD. ARTS AND SCI. (Fall 2001).

other places so that it is no longer in the atmosphere and cannot return to the atmosphere.⁴¹ Some of these places, or sinks, work naturally (e.g., carbon dioxide storage in trees), but there is also considerable discussion about creating them to store carbon on a massive basis. This option, for example, might enable the carbon dioxide emissions from a coal-fired power plant to be captured and then placed permanently underground.⁴² The final option is adaptation. This option is based on the recognition that climate change is already underway—as indicated by the IPCC reports. The object of adaptation is to anticipate and minimize the negative consequences of climate change.⁴³

Most observers believe that all four of these approaches will be needed to effectively address climate change. As this article indicates, however, the greatest efforts to date have been addressed to the first two options.

II. INTERNATIONAL LAW OF CLIMATE CHANGE

A. *United Nations Framework Convention on Climate Change*

The United States became a party to the United Nations Framework Convention on Climate Change⁴⁴ (Framework Convention) in 1992 under President George H.W. Bush. The U.S. was the fourth country to ratify the Convention.⁴⁵ The Framework Convention took effect in 1994, and now has 189 parties.⁴⁶ In 2001, President George W. Bush reaffirmed the U.S. commitment to the Convention.⁴⁷

The Convention creates an international structure to address climate change, including provisions for reporting of climate change, scientific and technological research, and annual meetings of the conference of the parties. Developed countries agreed to the “aim” of reducing their greenhouse gas emissions to 1990 levels by 2000,⁴⁸ but the Framework Convention does not contain any binding commitments to reduce greenhouse gas emissions by a quantifiable amount by a specific date. The Convention anticipates but does not require that more specific agreements or protocols will accomplish that result in the future. In addition, the Convention treats developed countries and developing countries differently.

41. See, e.g., THOMAS M. KERR, INT’L ENERGY AGENCY, LEGAL ASPECTS OF STORING CO₂: UPDATE AND RECOMMENDATIONS (IEA 2007).

42. Jeffrey W. Moore, *The Potential Law of On-Shore Geologic Sequestration of CO₂ Captured from Coal-Fired Power Plants*, 28 ENERGY L.J. 443 (2007). The New York Power Authority has announced a project to NRG Energy to do just this. Press Release, SNL Financial, NRG Energy, Inc. Receives Conditional Award to Build Advanced Coal-Gasification Power Plant in Western New York: Will Enter into a Strategic Alliance with NYPA, <http://www.snl.com/irweblinkx/file.aspx?IID=4057436&FID=3211361>.

43. Ira R. Feldman and Joshua H. Kahan, *Preparing for the Day After Tomorrow: Frameworks for Climate Change Adaptation*, SUSTAINABLE DEV. L. & POL’Y, Fall 2007, at 61; James G. Titus, *Does the U.S. Government Realize that the Sea is Rising? How to Restructure Federal Programs so that Wetlands and Beaches Survive*, 30 GOLDEN GATE U. L. REV. 717 (2000).

44. *United Nations Framework Convention on Climate Change*, U.N. Doc. A/AC.237/18 (May 9, 1992), reprinted in 31 I.L.M. 849 (1992) [hereinafter *Framework Convention*].

45. UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, STATUS OF RATIFICATION, http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php (last visited Mar. 2, 2008).

46. *Id.*

47. Press Release, *supra* note 26.

48. *Framework Convention*, *supra* note 44, at art. 4.2(a) & (b).

According to its preamble, developed countries have contributed “the largest share of historical and current global emissions of greenhouse gases”, and have higher per capita emissions levels than developing countries.⁴⁹ Because these gases stay in the atmosphere for a significant time, the developed countries’ historic contribution to greenhouse gas emissions has lasting cumulative effects. Thus, in ratifying the Framework Convention, developed countries agreed to adopt policies and measures that will demonstrate that they “are taking the lead” in addressing climate change.⁵⁰ Still, the Convention requires all parties, both developed and developing, to establish, implement, and periodically update national programs to mitigate climate change.⁵¹

B. Kyoto Protocol and Negotiations for Subsequent Protocol

The Kyoto Protocol, named after the Japanese city where it was finalized in 1997, contains binding greenhouse gas emission limits for developed countries.⁵² In 2005, following Russia’s ratification, the Kyoto Protocol became effective.⁵³ Among major developed countries, only the United States is not a party.

Under the Kyoto Protocol, developed countries agreed to reduce their net greenhouse gas emissions by at least 5% from 1990 levels by 2008-2012.⁵⁴ No comparable commitment is included for developing countries. The Protocol contains somewhat different commitments for individual developed countries; notably, the U.S. commitment is 7% below 1990 levels.⁵⁵ Greenhouse gas emissions in the United States are now projected to be more than 25% higher in 2012 than they were in 1990. Thus, the Kyoto target is about 30% below projected “business as usual” emissions.⁵⁶ The Kyoto Protocol applies to six greenhouse gases—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.⁵⁷

A key feature of the Kyoto Protocol, and one which the United States aggressively sought, is the use of market-based trading mechanisms to reduce greenhouse reductions. Several different provisions in the Kyoto Protocol provide these mechanisms. These mechanisms are based to a great extent on U.S. experience implementing the acid rain control provisions of the 1990 Clean Air Act Amendments, which required a roughly 50% reduction in sulfur dioxide

49. *Id.* at preamble ¶ 3. In the preamble, parties also recognize the “special difficulties” of developing countries, including their need for access to new technologies to address climate change. *Id.* at ¶ 20 & 22.

50. *Id.* at art. 4.2(a).

51. *Id.* at art. 4.1(b).

52. *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, U.N. Doc. FCCC/CP/1997/L.7/Add. 1, art. 3.1 & Annex B (Dec. 10, 1997), *reprinted in* 37 I.L.M. 22 (1998) [hereinafter *Kyoto Protocol*].

53. The Protocol became effective when countries accounting for 55% of the carbon dioxide generated by “Annex I” industrialized nations had ratified it. *Id.* at art. 24.1. After the U.S. declined to ratify the Protocol, the Protocol could become effective only when Russia ratified it.

54. *Id.* at art. 3.1. The Annex I or developed countries also agreed to make “demonstrable progress” by 2005 in meeting their commitments. *Id.* at art. 3.2.

55. *Id.* at Annex B.

56. NAT’L COMM’N ON ENERGY POLICY, *ENDING THE ENERGY STALEMATE: A BIPARTISAN STRATEGY TO MEET AMERICAN’S ENERGY CHALLENGES* 25 (2004).

57. *Kyoto Protocol*, *supra* note 52, at Annex A. These are the same gases identified *supra* in Part I.B.

emissions from covered coal-fired electric power plants.⁵⁸ This legislation is considered to be a successful model because it achieved this reduction, and a smaller reduction in nitrogen oxide emissions, at a fraction of the cost that many feared. The reductions were achieved through a set of legal requirements that are referred to as a trading or a cap-and-trade program. The law set an interim cap on emissions from each covered plant. Then it required the EPA to create another and more stringent set of plant-specific emission reduction requirements. The overall cap was to be achieved by 2000. Each operator was allowed to decide how to meet its individual emission reduction requirement. Options include switching to lower sulfur fuels, shutdown of existing facilities, installing pollution controls, improving the fuel-efficiency of power plants, and—of particular prominence—trading.

Trading is premised on the fact that emissions reductions vary in cost at each power plant. In a conventional program, an operator might be required to reduce its emissions by the same amount as all other operators. A trading program, by contrast, enables operators with lower costs to reduce more than required and offer to sell or trade their “excess” reductions to other operators in the form of “allowances,” each equal to one ton of pollutant emissions. Operators with greater costs can consider and accept such offers, particularly if the cost of acquiring allowances is less than the cost of other options, including conventional controls. These operators can then count their acquired allowances toward compliance. The legal structure that makes trading possible and attractive is provided by emissions caps and the operator’s freedom to choose a method of compliance.

This premise of different control costs is also true under the Kyoto Protocol. Greenhouse gas emission reductions have widely varying costs, particularly when these reductions are accomplished in developing countries. Because there are few if any localized effects from carbon dioxide and other greenhouse gas emissions, there is no concern with toxic hot spots from trading (i.e., facilities that continue to emit unhealthy amounts of air pollution because they have purchased allowances elsewhere). On the other hand, the Kyoto Protocol applies to a much greater variety of sources than U.S. power plants, which means that monitoring, verification, and the effectiveness of national legal systems are all important concerns.

Several months before the Kyoto Protocol was agreed to, in July 1997, the Senate, by a vote of 95-0, passed a resolution sponsored by Senators Robert Byrd (D-W.Va.) and Chuck Hagel (R-Neb.). The Byrd-Hagel resolution expressed the sense of the Senate that the United States should not sign any protocol to the Climate Convention unless the protocol met several key conditions.⁵⁹ According to the resolution, the protocol must not “mandate new commitments to limit or reduce greenhouse gas emissions” for developed countries unless it also “mandates new specific scheduled commitments to limit or reduce greenhouse gas emissions for Developing Country Parties within the same compliance period”⁶⁰ In addition, the protocol should not “result in

58. 42 U.S.C. §§ 7651-7651(o) (2000).

59. S. Res. 98, 105th Cong. (1st Sess. 1997); 143 CONG. REC. S8138 (daily ed. July 25, 1997).

60. S. Res. 98, 105th Cong. § 1(1)(A) (1st Sess. 1997). During debate on the resolution, Senator Byrd stated several times that it did not mean developing country commitments would have to be the same as

serious harm to the economy of the United States.”⁶¹ The resolution did not address the issue of developed country leadership, as expressed in the Convention. President Clinton did not submit the Kyoto Protocol to the Senate for ratification.

On March 13, 2001, President George W. Bush repudiated the Kyoto Protocol.⁶² Referring to the Byrd-Hagel resolution, he said he opposed the Protocol “because it exempts 80 percent of the world, including major population centers such as China and India, from compliance, and would cause serious harm to the U.S. economy.”⁶³

Parties to the Kyoto Protocol have already begun discussions for the next round of emissions cuts. The Kyoto reductions are to be achieved by 2008-12, which means that the next round of cuts under the Framework Convention would be sought for a date after that time. The conference of the parties agreed in Bali, Indonesia in late 2007 to a negotiating process that is designed to reach a decision on a post-Kyoto agreement by December 2009.⁶⁴

In the meantime, the U.S. is making an effort to secure emissions reduction commitments from major emitting countries, both developed and developing. According to President Bush, the objective is to agree on “the process by which the major economies would, by the end of 2008, agree upon a post-2012 framework that could include a long-term global goal, nationally defined mid-term goals and strategies, and sector-based approaches for improving energy security and reducing greenhouse gas emissions.”⁶⁵ The European Union, France, Germany, Italy, the United Kingdom, Japan, China, Canada, India, Brazil, South Korea, Mexico, Russia, Australia, Indonesia, and South Africa were invited to join this effort.⁶⁶ Speakers at this meeting, which was held on September 27-28, 2007, emphasized the central role of the Framework Convention in any climate change discussion, stated that developed and developing countries had common but differentiated responsibilities under the Convention, and welcomed the U.S. effort as a contribution to efforts under the Convention.⁶⁷

C. European Union Emissions Trading System

The European Union’s Emissions Trading System (EU ETS) is the first international trading system for carbon dioxide emissions in the world. As described in the preceding section of this article, trading systems operate with

developed country commitments. 143 CONG. REC. S8117 (daily ed. July 25, 1997). “While countries have different levels of development, each must make unique and binding commitments of a pace and kind consistent with their industrialization.” *Id.* at S8131.

61. S. Res. 98, *supra* note 60, § (1)(B).

62. Letter from President George W. Bush to Senators Hagel, Helms, Craig, and Roberts (Mar. 13, 2001), <http://www.whitehouse.gov/news/releases/2001/03/20010314.html>.

63. *Id.*

64. United Nations Conference on Climate Change, *Bali Action Plan*, DECISION-/CP.13 (Dec. 15, 2007), http://unfccc.int/files/meetings/cop_13/application/pdf/cp_bali_action.pdf.

65. *Id.*

66. Invitation from President George W. Bush to Meeting of Major Economies on Energy Security and Climate Change (Aug. 2, 2007), <http://www.whitehouse.gov/news/releases/2007/08/20070803-7.html>.

67. U.S. DEP’T OF STATE, FINAL CHAIRMAN’S SUMMARY: FIRST MAJOR ECONOMIES MEETING ON ENERGY SECURITY AND CLIMATE CHANGE (2007), <http://www.state.gov/g/oes/climate/mem/93021.htm>.

the common currency of an emissions allowance. In the EU ETS, one allowance gives the holder the right to emit one ton of carbon dioxide.⁶⁸ EU Member States determine the quantity of allowances allocated to each covered facility, and companies are then allowed to buy and sell their allowances based on the prevailing price and the relative costs of reducing emissions. Companies may trade directly with each other or through a broker. An electronic registry system tracks changes in ownership of emissions allowances.⁶⁹

The goal of the EU ETS is to help EU Member States achieve compliance with their commitments under the Kyoto Protocol.⁷⁰ The EU ETS does not cover all energy intensive sectors (such as transportation) or all greenhouse gases, but it does cover carbon dioxide emissions from several electricity and industrial industries. Covered industries include oil refineries, powerplants over twenty megawatts (MW) in capacity, coke ovens, iron and steel plants, and cement, glass, lime, brick, ceramics, and pulp and paper facilities.⁷¹ These facilities, combined, contribute about half of the EU's total carbon dioxide emissions.⁷²

The EU ETS is set up in three phases, or "trading periods." The first period began in 2005 and concluded at the end of 2007. The goal of the first trading period was not to meet Kyoto targets, but instead to gain experience with emissions trading.⁷³ The second trading period will operate from 2008-2012, to coincide with the period of the Kyoto Protocol. The third trading period will run from 2013-2020, and will add the airlines as an additional covered industry. The European Commission (EC) is examining whether to expand the EU ETS to other sectors and whether to include additional greenhouse gases in the trading system.⁷⁴

The EU ETS is implemented through each Member State's National Allocation Plan (NAP). A separate NAP is created for each trading program and determines the total quantity of carbon dioxide emissions that Member States grant to facilities, how many allowances to allocate in total for a trading period, and how many allowances each covered entity will receive.⁷⁵ NAPs are submitted to the EC and are assessed under a set of predetermined criteria. Criteria include requirements that the NAP protect against discrimination between companies and sectors, and provide for new entrants, clean technology, and early reduction credits.⁷⁶ For the first trading period, the EC also required that the emissions caps proposed in a NAP be sufficient to put the Member State

68. Press Release, Commission of the European Communities, Questions and Answers on Emissions Trading and National Allocation Plans (Mar. 8, 2005), <http://ec.europa.eu/environment/climat/emission.htm> [hereinafter CEC Q & A]; Giovanna Golini, *Tradable Green Certificate Systems in the E.U.*, 26 ENERGY L.J. 111 (2005).

69. CEC Q & A, *supra* note 68, at question 1.

70. *Id.*

71. *Id.*

72. *Id.*

73. LARRY PARKER, CONGRESSIONAL RESEARCH SERVICE, CLIMATE CHANGE: THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM (EU-ETS) (2006), at CRS-5 [hereinafter PARKER].

74. Jeff Mason, *UPDATE 2- Third phase of EU carbon trading to go through 2020*, REUTERS UK NEWS SERVICE, Oct. 30, 2007, available at <http://uk.reuters.com/article/oilRpt/idUKL3046600620071030>.

75. CEC Q & A, *supra* note 68, at question 3.

76. PARKER, *supra* note 73, at CRS-4.

on the path toward its Kyoto target.⁷⁷ For the second trading period, NAPs must guarantee achievement of Kyoto targets.⁷⁸

Initial results of the first trading period, including lessons learned, are surfacing in the literature. In 2005, over 320 million allowances, worth more than 6.5 billion euros were traded in the EU ETS.⁷⁹ Data also show lower greenhouse gas emissions than previously expected in the first compliance period, although it is unclear whether this reflects actual reductions or an initial over-estimate of baseline emissions.⁸⁰ Furthermore, it is expected that the original EU-15 Member States, on average, will have to reduce their emissions caps 6.8% (119 million metric tons) from their current levels to achieve Kyoto targets in the second trading period.⁸¹ The EU may be able to achieve part of this reduction by trading with newer Member States that expect a surplus.⁸²

D. Canadian Policy

In April 2007, the government of Canada issued an action plan for reducing greenhouse gas emissions and a report outlining the regulatory framework for greenhouse gas controls. The regulatory framework sets targets for reducing emission intensities of greenhouse gases from all major new and existing industrial sources.⁸³ Greenhouse gas intensity is calculated in terms of greenhouse gas emissions per dollar of GDP; it is not an absolute measure of greenhouse gas reductions. For existing facilities, the regulatory framework includes an initial enforceable reduction of 18% from 2006 emission-intensity levels in 2010.⁸⁴ Every year thereafter, a 2% continuous emission intensity improvement will be required.⁸⁵ For new facilities, the regulatory framework provides a required 2% annual improvement, beginning three years after operation of the new facility commences.⁸⁶

Industrial facilities have several options to meet their legal obligations under the greenhouse gas regulatory framework. The government of Canada promotes the use of abatement actions to meet greenhouse gas targets but also provides access to other compliance mechanisms. For example, to a limited extent, sources can meet compliance obligations through contribution to a technology fund, or through early reduction credits.⁸⁷ In addition, sources can meet compliance obligations through domestic and international emissions

77. *Id.*

78. *Id.*

79. *Communication From the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Building a global carbon market – Report pursuant to Article 30 of Directive 2003/87/EC*, at 4, COM (2006) 676 final (Nov. 13, 2006), http://ec.europa.eu/environment/climat/emission/pdf/com2006_676final_en.pdf.

80. *Id.* at 3.

81. PARKER, *supra* note 73, at CRS-14-15.

82. *Id.*

83. CANADIAN MINISTRY OF ENV'T., *REGULATORY FRAMEWORK FOR AIR EMISSIONS* iv (2007), http://www.ec.gc.ca/doc/media/m_124/report_eng.pdf.

84. *Id.*

85. *Id.*

86. *Id.* at 10.

87. *Id.* at 12.

trading and offsets.⁸⁸ The government of Canada also specifically plans to explore possible linkages with state-initiated trading programs in the United States, such as the Western Regional Climate Action Initiative and the Regional Greenhouse Gas Initiative.⁸⁹

III. STATE AND REGIONAL LAW AND REGULATION ON CLIMATE CHANGE

State and local governments in the United States have been in the vanguard of national climate change efforts since at least 2000, and are becoming more active every year.⁹⁰ States are using a variety of legal and policy tools to meet increasingly specific and ambitious greenhouse gas reduction goals. To a growing degree, they are working cooperatively on a regional level.

A. State Efforts

Many states employ a planning process that aims to achieve a greenhouse gas reduction goal through implementation of a suite of legal and policy measures. Others are acting without quantifiable reduction goals, but are nonetheless employing a suite of tools to reduce greenhouse gas emissions. These tools include, but are not limited to, renewable electricity portfolio standards, energy efficiency portfolio standards, net metering, energy efficiency provisions in building codes, public funding or benefit programs for efficiency and renewable energy, tax incentives, and registries for early greenhouse gas reductions. In addition to reducing greenhouse gas emissions, these tools reduce negative external costs of energy generation, require cost effective energy conservation activities, and use the market to reduce net emissions. They also limit and even lower energy costs for the poor, and create employment and economic growth. These tools encourage technological innovations that can lead to even greater greenhouse gas reductions in the future. Many of them also provide greater public understanding of greenhouse gas sources and ways of limiting emissions. Use of these tools can also reduce emissions of other air pollutants, including sulfur dioxide, nitrogen oxides, fine particulates, and ozone.⁹¹

Many states use planning processes to establish goals and to determine the legal and policy tools to employ. Some of these goals are prescribed in legislation; California's Global Warming Solutions Act, for example, sets a goal of reducing the state's greenhouse gas emissions to 1990 levels by 2020.⁹² The planning processes begin with a greenhouse gas emissions inventory that calculates current greenhouse gas emissions, projections of future emissions under a business-as-usual scenario, and a determination of the net emissions

88. *Id.* at 13.

89. *Id.*

90. For a summary of actions on a state-by-state basis, see AMY ROYDEN-BLOOM, NAT'L ASS'N OF CLEAN AIR AGENCIES, STATE GREENHOUSE GAS (GHG) ACTIONS (2008), <http://www.4cleanair.org/Documents/StateGHGActions-chart.pdf>.

91. See, e.g., John Dernbach and the Widener University Law School Seminar on Global Warming, Moving the Climate Debate from Models to Proposed Legislation: Lessons from State Experience, 30 ENVTL. L. REP. (Envtl. L. Inst.) 10,933 (2000).

92. CAL. HEALTH & SAFETY CODE § 38500 (2007). The task of choosing legal and policy tools to meet that goal generally is assigned to the California Air Resources Board. *Id.*

reductions required to meet greenhouse gas emission goals. A portfolio of policy actions is then to be selected from a menu of more than 250 measures.⁹³

Whether or not the state employs a formal planning process, some of the more familiar and basic measures are as follows:

Renewable electricity portfolio standards. Instead of relying only on procedural options and choices, states using a portfolio standard specify the percentage or amount of electricity demand they want to be met by renewable sources by a specific date. Each state has a particular mix, or portfolio, of types of energy sources. Renewable energy portfolio standards set a target for renewable energy in these portfolios that is ordinarily greater than the current percentage of renewable energy. Thus, a state with 2% renewables in its existing portfolio might set a standard of 5%. The standard is typically accompanied by a legal mechanism for achieving it. States typically require every power provider to have renewable energy credits equal to some percentage of its annual sales. Providers can have their own renewable energy sources or purchase credits from other generators. The standard, in sum, comes with a trading system for meeting it. The state certifies these credits, monitors for compliance, and imposes penalties when necessary.⁹⁴

Net Metering. The amount of electricity used in a customer's residence or business is normally measured by a billing meter. A growing number of customers also generate electricity because, for example, they have solar photovoltaic panels on their roofs. Forty states and the District of Columbia now authorize persons with their own energy generation systems to sell electricity they don't use to their local electric utility.⁹⁵ Under these laws, the billing meter must measure electricity going in and out. If the customer's net use of electricity is greater than what it generated, the customer is billed for the difference. If the utility receives more electricity than it provided, it generally pays the customer the difference. Net metering laws eliminate a barrier to market participation by enabling customers to sell electricity. Net metering also provides an additional incentive to develop and use small-scale renewable technologies because excess electricity can be sold to the local utility.

Energy efficiency provisions in building codes. Energy efficiency standards for buildings are primarily a matter of state law, though prompted to some degree by federal legislation. The Energy Policy Act of 1992 required each state to review the energy efficiency provisions in its residential building codes and to determine within two years whether it should adopt the 1992 Model Energy Code published by the Council of American Building Officials.⁹⁶ The Act contains a similar requirement for the review of energy efficiency standards in

93. Robert B. McKinsty, Jr. & Thomas D. Peterson, *The Implications of the New "Old" Federalism in Climate-Change Legislation: How to Function in a Global Marketplace When States Take the Lead*, 20 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 61, 76-84 (2007).

94. For a web-based toolkit that is intended to help citizens and policy makers understand design and implementation issues, see UNION OF CONCERNED SCIENTISTS, RENEWABLE ELECTRICITY STANDARDS TOOLKIT, http://go.ucsusa.org/cgi-bin/RES/state_standards_search.pl?template=main (last visited Mar. 1, 2008).

95. U.S. DEP'T OF ENERGY, NET METERING PROGRAMS BY STATE, http://www.eere.energy.gov/greenpower/resources/maps/netmetering_map.shtml (last visited Mar. 1, 2008).

96. 42 U.S.C. §§ 6832(15), 6833(a) (2000).

commercial building codes.⁹⁷ The Model Energy Code and its commercial counterpart, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Code, are revised periodically. Whenever either code is revised, the Act requires states to consider or adopt updated provisions that the DOE determines “would improve energy efficiency” in residential or commercial buildings.⁹⁸ This legislation has been only modestly successful. In practice, twenty-six states have the most recent and energy efficient residential codes and twenty-five have the most recent and energy efficient commercial codes.⁹⁹ To bolster state performance, the Energy Policy Act of 2005 authorizes the DOE to provide \$25 million annually to states to improve existing energy efficiency codes and to improve compliance with such codes.¹⁰⁰

These codes do not, however, apply to existing residential and commercial buildings. As a consequence, broadly speaking, newer buildings tend to be more energy efficient than older buildings, and often substantially more efficient. Sixty percent of residences are not well insulated, for example, and 70% or more of commercial buildings lack roof or wall insulation.¹⁰¹ Retrofitting and upgrading existing structures and their heating, ventilation, and air conditioning systems offers a considerable opportunity to improve energy efficiency. This is especially true because existing residential and commercial buildings will be around for a long time.

Public funding or benefit programs for efficiency and renewable energy. Public benefit fund programs for energy efficiency and renewable energy are an outgrowth of electricity restructuring laws. These programs are also “perhaps the most significant new policy mechanism for implementing energy efficiency in the past decade.”¹⁰² Eighteen states now implement public benefit funds for energy efficiency.¹⁰³ Of these states, only Wisconsin and Vermont did not also restructure their electric industry.¹⁰⁴ These programs are typically funded through a small public benefit charge in the distribution service part of the electric bill. The charge in these states ranges between 0.03 to 3 mills per kWh. The money is collected and administered by different entities in different states; these include a state agency, an independent entity, and the utilities

97. 42 U.S.C. §§ 6832(16), 6833(b) (2000).

98. 42 U.S.C. § 6833(a)(5) & (b)(2) (2000).

99. MARILYN A. BROWN ET AL., PEW CENTER ON GLOBAL CLIMATE CHANGE, TOWARDS A CLIMATE-FRIENDLY BUILT ENVIRONMENT 46-47 (2005).

100. 42 U.S.C. § 6833(e) (2000).

101. TOWARDS A CLIMATE-FRIENDLY BUILT ENVIRONMENT, *supra* note 99, at 14.

102. MARTIN KUSHLER ET AL., AM. COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY, FIVE YEARS IN: AN EXAMINATION OF THE FIRST HALF-DECADE OF PUBLIC BENEFITS ENERGY EFFICIENCY POLICIES vii (2004), <http://aceee.org/pubs/u041.pdf?CFID=66438&CFTOKEN=27313893>.

103. *Id.* at 6. For state-by-state summaries of public benefit programs, see ALLIANCE TO SAVE ENERGY, STATE ENERGY EFFICIENCY INDEX, <http://www.ase.org/content/article/detail/2604> (last visited Feb. 28, 2008); AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY, SUMMARY TABLE OF PUBLIC BENEFIT PROGRAMS AND ELECTRIC UTILITY RESTRUCTURING (Updated Dec. 2005), <http://www.aceee.org/briefs/mktabl.htm> (last visited Feb. 28, 2008). Public benefit funds are also used for purposes other than energy efficiency, particularly for low income energy assistance and renewable energy. *Id.*; TOWARDS A CLIMATE-FRIENDLY BUILT ENVIRONMENT, *supra* note 99, at 11.

104. *Id.* at 6.

themselves.¹⁰⁵ Whichever entity administers the program, the money is spent on a variety of energy efficiency and renewable energy projects and activities.

Tax incentives. Two common forms of tax incentives are credits and deductions.¹⁰⁶ For energy efficiency, carefully crafted tax incentives validate the technology or activity for which the credit is provided because the government has, in effect, endorsed it. Carefully crafted tax incentives are also “sized” to provide enough motivation to be effective.¹⁰⁷ Tax incentives reduce the initial capital cost of upgrade and retrofit projects. That encourages homeowners and others to undertake such projects, encourages manufacturers to mass market energy-efficient technologies, and introduces these technologies to remodeling firms and independent contractors. By fostering the diffusion of new technologies, tax incentives can also reduce their price.¹⁰⁸ Tax incentives for energy efficiency may be more appropriate and effective for upgrades and retrofits than for new structures because of the size of the existing housing stock and because of their potential to encourage innovation.¹⁰⁹

Registries for early greenhouse gas reductions. Trading systems do not work particularly well unless an operator has some incentive to trade. That incentive is ordinarily provided by a cap on its emissions. Because it is most politically feasible to set caps based on existing emissions, the prospect of a cap-and-trade program for carbon dioxide creates a problem for any emission source that wants to reduce its greenhouse gas emissions now. If it does so, it risks the possibility that its baseline emissions in a future cap-and-trade program will be set at the reduced level, which will force it to make still more reductions. Because these additional reductions are likely to be more expensive than the reductions required at a comparable facility that did not make any reductions, the company that reduced its emissions early might be at a competitive disadvantage. Several states enacted legislation authorizing the creation of such registries, and thirty-nine states, two Canadian provinces, and three Indian tribes are members of The Climate Registry, which is developing a common set of criteria for registering measures to reduce emissions and provide a foundation for including such reductions in a future cap-and-trade program.¹¹⁰

105. *Id.* at 13. Because the fee is attached to the distribution charge, customers cannot avoid it by choosing a different generator to provide their electricity; the generation and distribution charges are separate. *See also*, CARL BLUMSTEIN ET AL., UNIV. OF CAL. ENERGY INSTITUTE, WHO SHOULD ADMINISTER ENERGY-EFFICIENCY PROGRAMS? (2003), <http://www.ucei.berkeley.edu/PDF/csemwp115.pdf> (no single administrative structure for energy efficiency programs in U.S. is obviously better than others).

106. Other incentives include exclusions of an activity from gross income and taxing the activity at a lower or preferential rate. Roberta F. Mann, *Subsidies, Tax Policy and Technological Innovation*, in GLOBAL CLIMATE CHANGE, *supra* note 1.

107. ELIZABETH BROWN ET AL., AM. COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY, TAX CREDITS FOR ENERGY EFFICIENCY AND GREEN BUILDINGS: OPPORTUNITIES FOR STATE ACTION vii (2002), <http://www.aceee.org/pubs/e021full.pdf>.

108. WILLIAM PRINDLE ET AL., AM. COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY, ENERGY EFFICIENCY'S NEXT GENERATION: INNOVATION AT THE STATE LEVEL 32 (2003), <http://www.aceee.org/pubs/e031full.pdf>.

109. David G. Duff, *Tax Policy and Global Warming*, 51 CANADIAN TAX J. 2063, 2101 (2003).

110. The Climate Registry, <http://www.theclimateregistry.org/index.html> (last visited Feb. 27, 2008). The Energy Policy Act of 1992 requires the Department of Energy to establish guidelines and voluntary reporting procedures for persons who reduce, sequester, or avoid greenhouse gas emissions, and to establish a database comprised of such information. 42 U.S.C. § 13385(b) (2000). Such information, which has been reported since 1993, may include reductions based on trades, and recording a claim under this program

B. Regional Efforts

A growing number of states are moving on a regional basis. Ten northeastern states (Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, Vermont, Massachusetts, Rhode Island, and Maryland) formed the Regional Greenhouse Gas Initiative to develop a regional emissions cap-and-trade program. RGGI has developed a model rule to establish a cap and trade program for electric utilities. The goal of this effort is to achieve a 10% reduction in carbon dioxide emissions from covered facilities, and to achieve that reduction between 2015 and 2018.¹¹¹ Most of the RGGI states have already proposed individual state rules to implement the model rule. Six western States (Arizona, California, New Mexico, Oregon, Utah, and Washington) and two Canadian provinces (British Columbia and Manitoba) participate in the Western Climate Initiative to adopt a regional emissions cap for multiple economic sectors and a cap-and-trade system.¹¹² These states and provinces have established a goal of reducing greenhouse gas emissions by 15% below 2005 levels by 2020; they recently released a workplan setting out a process for achieving that reduction.¹¹³

The regional efforts are significant in at least two respects. They provide a greater degree of uniformity among states than might otherwise exist with state-by-state efforts. They also indicate a growing bipartisan consensus at the state level that additional measures need to be taken to address climate change.

C. Tort Law and Litigation

State tort law may influence, or will influence, the direction of climate change law in at least two ways—nuisance litigation and the siting of carbon storage or sequestration facilities.

Tort law has thus far not been a successful means for plaintiffs to prosecute claims concerning greenhouse gas emissions and climate change. In *State of Connecticut v. American Electric Power Co.*,¹¹⁴ eight states and other plaintiffs brought suit against five utilities under 1) federal common law and 2) state public nuisance law. Defendants were alleged to be the five largest emitters of carbon dioxide in the U.S. Plaintiffs sought a court order to reduce their carbon dioxide emissions by “a specified percentage each year for at least a decade.”¹¹⁵ Because the issue touches “on so many areas of national and international policy,” and because neither Congress nor the President has made an initial policy determination on this issue, the court dismissed the case as a non-

provides some evidence of its validity. The state-led Climate Registry effort is premised on the belief that the federal reporting requirement does not provide a reliable basis for measuring reductions. Partly in response, the Department of Energy recently modified the federal reporting requirements. Final Rule, *Guidelines for Voluntary Greenhouse Gas Reporting*, 71 Fed. Reg. 20,783 (2006) (codified at 10 C.F.R. pt. 300).

111. REGIONAL GREENHOUSE GAS INITIATIVE, MODEL RULE (2007), http://www.rggi.org/docs/model_rule_corrected_1_5_07.pdf.

112. Western Climate Initiative, <http://www.westernclimateinitiative.org/Index.cfm> (last visited Feb. 27, 2008).

113. WESTERN CLIMATE INITIATIVE, WORK PLAN OCTOBER 2007-AUGUST 2008 (2007), <http://www.westernclimateinitiative.org/ewebeditpro/items/O104F13792.pdf>.

114. *Connecticut v. Am. Elec. Power Co.*, 406 F. Supp. 2d 265 (S.D.N.Y. 2005), *appeal pending*, No. 05-5104 (2d. Cir.).

115. *Id.* at 270.

justiciable political question.¹¹⁶ Similarly, California's attorney general sued auto manufacturers in 2006 for damages for contributing to the alleged public nuisance of climate change. A federal district court dismissed the case in 2007 on grounds that resemble those in the *American Electric Power* case.¹¹⁷

Issues of tort liability will likely also arise as carbon sequestration becomes an increasingly viable option for mitigating climate change. Tort liability can arise from several different aspects of carbon sequestration. There is liability associated with the operational aspects of transporting and injecting carbon dioxide.¹¹⁸ There is also liability associated with risks at the site, including migration of carbon dioxide within the storage area, and seismic events.¹¹⁹ In addition, the long time frame of carbon dioxide storage, which may extend past the involvement of current industry participants, creates tort liability issues concerning the parties who will be responsible for future leakage and continued monitoring after plants are decommissioned or retired.¹²⁰ Similar issues, of course, already arise with underground storage tanks and long-term responsibility for waste disposal facilities.

D. Corporate Governance

State law, and particularly Delaware corporate law, imposes a set of fiduciary duties on corporate officers and directors. While these duties, including a duty of care and a duty of loyalty, stay more or less unchanged, the application of these rules to climate change may alter the way in which officers and directors need to act. Thus, a "prudent board of directors . . . should as a best practice actively consider, and may soon be obliged to consider," the effect of climate change on its business and facilities.¹²¹

IV. NATIONAL LAW AND POLICY ON CLIMATE CHANGE

The United States is already developing a body of climate change law and policy at the national level. To a great degree, this body of law is growing out of environmental law and energy law, as well as other areas of law. This national policy also includes President Bush's greenhouse gas intensity goal.

A. Energy Law and Policy

U.S. energy policy traditionally has been directed toward ensuring a plentiful and reliable supply of energy at low prices and with appropriate environmental and public health protections. U.S. energy law and policy has had

116. *Id.* at 272.

117. *California v. General Motors Corp.*, No. C06-05755 MJJ, 2007 U.S. Dist. LEXIS 68547 (N.D. Cal. Sept. 17, 2007).

118. Moore, *supra* note 42; M.A. de Figueiredo, et al., Presentation at the Second Annual Conference on Carbon Sequestration: Towards a Long-Term Liability Framework for Geologic Carbon Sequestration (May 2003), http://sequestration.mit.edu/pdf/defigueiredo_et_al_MIT_paper.pdf [hereinafter Figueiredo].

119. Figueiredo, *supra* note 118.

120. Marianne Horinko, Am. Pub. Power Ass'n, White Paper, Carbon Capture and Sequestration Legal and Environmental Challenges Ahead 4 (2007), <http://www.appanet.org/files/PDFs/Attachment%20%236.pdf>.

121. Jeffrey A. Smith & Matthew Morreale, *The Fiduciary Duties of Officers and Directors*, GLOBAL CLIMATE CHANGE AND U.S. LAW, *supra* note 1, at 497, 528. See also, Perry E. Wallace, *Global Climate Change and the Challenge to Modern American Corporate Governance*, 55 SMU L. REV. 493 (2002).

a mixed effect on U.S. greenhouse gas emissions, sometimes contributing to increased emissions, and sometimes causing lower emissions than would otherwise occur. Key features of this law and policy are as follows:

Energy efficiency standards for appliances and other equipment. Federal efficiency standards for appliances and other equipment were first required by the National Appliance Energy Conservation Act of 1987.¹²² The Act establishes energy efficiency standards for certain consumer products and authorizes the Department of Energy (DOE) to set new or amended energy conservation standards for a variety of consumer products.¹²³ As a consequence, standards have been established (and often subsequently made more stringent) for a variety of appliances, including washing machines, clothes dryers, and refrigerators.¹²⁴ Existing appliance and equipment efficiency standards reduced U.S. carbon emissions from fossil fuels by 1.7% in 2000, and should triple these benefits by 2020.¹²⁵

On December 19, 2007, President Bush signed into law the Energy Independence and Security Act of 2007.¹²⁶ The Act includes provisions designed to improve energy efficiency in lighting, appliances, and buildings. For example, Title III of the Act sets new efficiency standards for a variety of products, including dishwashers, dehumidifiers, refrigerators, freezers, and residential boilers.¹²⁷ Title III of the Act also sets energy efficiency standards for incandescent lamps and provides for consumer education on lighting.¹²⁸ Title IV of the Act, which focuses on building efficiency, requires among other things that total energy use in federal buildings be reduced by 30% (relative to 2005 levels) by 2015.¹²⁹

Corporate Average Fuel Economy Standards for Motor Vehicles. Energy efficiency standards for automobiles exist primarily in the form of corporate average fuel economy (CAFE) standards for motor vehicles. These standards are established by the Department of Transportation under the Energy Policy and Conservation Act, which was first adopted in 1975 in the wake of the 1973-74 oil embargo.¹³⁰ The mandated average fuel economy for automobiles increased from 18.0 to 27.5 miles per gallon (mpg) between 1978 and 1990, a level that remained unchanged until late in 2007.¹³¹

122. Pub. L. No. 100-12, 101 Stat. 103 (1987) (codified at 42 U.S.C. §§ 6291-97, 6299, 6302, 6303, 6305, 6306, 6308, & 6309 (2000)).

123. 42 U.S.C. § 6295 (2000). Water conservation standards are also authorized. Water conservation furthers energy efficiency to the extent that it reduces the amount of water that needs to be heated or cooled.

124. 10 C.F.R. § 430.32 (2006). There are also water conservation standards for water closets and urinals, which do not ordinarily involve heating or cooling of water. 10 C.F.R. § 430.32(q) & (r).

125. U.S. EPA, CLEAN ENERGY-ENVIRONMENT GUIDE TO ACTION: POLICIES, BEST PRACTICES, AND ACTION STEPS FOR STATES 4-54 (2006), http://www.epa.gov/cleanenergy/documents/gta/guide_action_full.pdf.

126. Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492 (2007); see also, Press Release, Office of the Press Secretary, Fact Sheet: The Energy Independence and Security Act of 2007 (Dec. 19, 2007), <http://www.whitehouse.gov/news/releases/2007/12/20071219-1.html>.

127. Energy Independence and Security Act §§ 301-316.

128. *Id.* §§ 321-325.

129. *Id.* § 431.

130. 49 U.S.C. §§ 32901-32919 (2000).

131. 49 C.F.R. § 531.5(a) (2007).

The required average fuel economy for light trucks, which at least until recently represented a large and rapidly growing share of the motor-vehicle market, is much lower. From the 1996 to 2004 model years, the average required fuel economy for light trucks has been 20.7 miles per gallon, rising to 21.0 miles per gallon for 2005 and 22.2 miles per gallon for the 2007 model year.¹³² A 2002 report by the National Research Council concluded that without the CAFE program national gasoline consumption would otherwise be “about 2.8 million barrels per day greater than it is, or about 14 percent of today’s consumption.”¹³³ In April 2006, the Transportation Department adopted a final rule increasing the average fuel economy standard for light trucks to 23.5 miles per gallon for model year 2010.¹³⁴ The standard also assigned a “footprint” value based on the size of the vehicle and a specific fuel-efficiency target for that “footprint,” rather than basing the standard on a fleetwide average for all vehicles.¹³⁵ Eleven states, four public interest groups, and others challenged the rule for not requiring even greater improvements in fuel efficiency. On November 15, 2007, in *Center for Biological Diversity v. National Highway Traffic Safety Administration*, a federal court of appeals held, among other things, that the agency’s assessment of benefits and costs of achieving greater fuel efficiency under the act did not include the benefits of reducing greenhouse gas emissions.¹³⁶

The Energy Independence and Security Act of 2007 significantly changes the corporate average fuel economy standards. The Act requires that the Secretary of Transportation prescribe a separate average fuel economy standard for passenger automobiles and a separate average fuel economy standard for light trucks to achieve a combined standard for model year 2020 of at least thirty-five miles per gallon for the total fleet manufactured for sale in the United States.¹³⁷ The Act also establishes a new fuel economy program for commercial medium- and heavy-duty on-highway vehicles and work trucks.¹³⁸

Energy efficiency provisions in building codes. As already noted, the Energy Policy Act of 1992 has led about half the states to adopt the most current, energy-efficient building codes.¹³⁹ Energy efficiency improvements in buildings can have a major impact on U.S. greenhouse gas emissions. Existing residential and commercial buildings are responsible for almost 40% of the nation’s annual

132. *Id.* § 533.5(a), Table IV.

133. COMMITTEE ON THE EFFECTIVENESS AND IMPACT OF CORPORATE AVERAGE FUEL ECONOMY (CAFE) STANDARDS, NAT’L RESEARCH COUNCIL, EFFECTIVENESS AND IMPACT OF CORPORATE AVERAGE FUEL ECONOMY (CAFE) STANDARDS 3 (2002), <http://www.nap.edu/catalog/10172.html#toc>. (“[T]he CAFE program has been particularly effective in keeping fuel economy above the levels to which it might have fallen when real gasoline prices began their long decline in the early 1980s.”).

134. Average Fuel Economy Standards for Light Trucks Model Years 2008-2011, 49 C.F.R. Pts. 523, 533 and 537 (2007).

135. *Id.*

136. *Center for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 508 F.3d 508 (9th Cir. 2007).

137. Energy Independence and Security Act § 102; *see also* FRED SISSINE, CONGRESSIONAL RESEARCH SERVICE, ENERGY INDEPENDENCE AND SECURITY ACT OF 2007: A SUMMARY OF MAJOR PROVISIONS, CRS-4-5 (2007), http://energy.senate.gov/public/_files/RL342941.pdf.

138. *Id.*

139. TOWARDS A CLIMATE-FRIENDLY BUILT ENVIRONMENT, *supra* note 99, at 2-3.

energy consumption;¹⁴⁰ the percentage would almost certainly be higher but for these standards.

Required use of biofuels. The Energy Policy Act of 2005 requires the EPA to establish regulations requiring the volume of renewable fuel sold or introduced into commerce in the U.S. annually to increase from 4.0 billion gallons in 2006 to 7.5 billion gallons in 2012.¹⁴¹ According to a clarifying rule adopted by the EPA at the end of 2005, the 2006 requirement works out to 2.78% by volume of U.S. gasoline sales.¹⁴² Under the Act, renewable fuels include cellulosic biomass ethanol, waste derived ethanol, and biodiesel.¹⁴³ Ethanol production was already projected to exceed 4.0 billion gallons in 2006, and thus there was little concern about meeting the initial target.¹⁴⁴ In addition, dual fueled vehicles in the federal fleet are now required, in general, to be operated using only alternative fuels.¹⁴⁵ The 2007 Energy Independence and Security Act requiring fuel producers to use at least thirty-six billion gallons of biofuels by 2022.¹⁴⁶

Financial Incentives. For some time, U.S. energy policy has provided two kinds of financial incentives. On one hand, there have been a variety of direct and indirect subsidies for the production of energy, particularly oil, natural gas, and coal.¹⁴⁷ Because these subsidies are greater than those for renewable energy and energy conservation and efficiency, they tend to give fossil fuels a competitive edge in the marketplace.¹⁴⁸ On the other hand, the sale of gasoline and diesel fuel is subject to federal as well as state taxes.¹⁴⁹ In addition, federal law also provides a variety of tax incentives for renewable energy, energy conservation, and alternative fuel vehicles.¹⁵⁰ There does not appear to be any justification of this mix of taxes, tax incentives, and subsidies as representing an optimal approach to climate change.

2001 National Energy Policy. President Bush's 2001 National Energy Policy describes "our nation's energy crisis" in terms of a "fundamental

140. John Dernbach & the Widener University Law School Seminar on Energy Efficiency, *Stabilizing and Then Reducing U.S. Energy Consumption: Legal and Policy Tools for Efficiency and Conservation*, 37 ENVTL. L. REP. 10,003, 10,008 (2007).

141. 42 U.S.C. § 7545 (2000).

142. Direct Final Rulemaking, *Regulation of Fuels and Fuel Additives: Renewable Fuel Standard Requirements for 2006*, 70 Fed. Reg. 77,325 (2005) (to be codified at 40 C.F.R. Pt. 80).

143. Energy Policy Act of 2005, Pub. L. No. 109-58, § 1501(a), 119 Stat. 594, 1067 (2005); 42 U.S.C. § 7545.

144. 70 Fed. Reg. 77,325, at 77,327.

145. Energy Policy Act of 2005 § 701; 42 U.S.C. § 6374(a)(3)(E) (2000).

146. Energy Independence and Security Act §§ 201-210.

147. Roberta Mann, *Subsidies, Tax Policy and Technological Innovation*, in GLOBAL CLIMATE CHANGE AND U.S. LAW, *supra* note 1, at 565, 576-83; DAVID SANDALOW, FREEDOM FROM OIL: HOW THE NEXT PRESIDENT CAN END THE UNITED STATES' OIL ADDICTION 125 & n. 11 (McGraw-Hill 2007) (describing "large literature on externalities related to oil use, as well as on government subsidies that promote oil use"); Doug Koplow & John Dernbach, *Federal Fossil Fuel Subsidies and Greenhouse Gas Emissions: A Case Study of Increasing Transparency for Fiscal Policy*, 26 ANN. REV. ENERGY & ENV'T 361 (2001).

148. *Id.*

149. John C. Dernbach, *supra* note 140, at 10,003, 10,023.

150. Roberta Mann, *Subsidies, Tax Policy and Technological Innovation*, in GLOBAL CLIMATE CHANGE AND U.S. LAW, *supra* note 1, at 566-76.

imbalance between supply and demand.”¹⁵¹ While many of its recommendations focused on protecting and increasing domestic energy supplies, and reducing the impacts of high energy prices, some of its recommendations, including those for renewable energy and energy efficiency, would reduce greenhouse gas emissions to some extent below projected levels.¹⁵² The only recommendation specifically referring to climate change concerned government research.¹⁵³ Many of the Policy’s recommendations have already been implemented to some degree.¹⁵⁴

“20 in 10 Plan.” President Bush’s January 2007 State of the Union Address proposed a new goal for liquid fuels. The President’s “20 in 10” plan is to cut American gasoline usage by 20% over the next 10 years.¹⁵⁵ The plan is to be implemented by setting a mandatory fuel standard that requires thirty-five billion gallons of renewable and other alternative fuels by 2017.¹⁵⁶ The plan also proposes to continue efforts to increase fuel efficiency.¹⁵⁷

Congressional Inquiries to the Executive Branch. Increased attention on climate change has sparked congressional inquiries towards executive branch agencies that work in energy. For example, on October 11, 2007, Representative Henry Waxman sent Chairman Kelliher of the Federal Energy Regulatory Commission (FERC) a letter regarding the FERC’s climate change policy, how the FERC factors potential global warming pollution into its decisions, and how the FERC is assisting states in the effort to reduce the effects of climate change.¹⁵⁸

B. Environmental Law

Although the era of modern environmental law began more than three decades ago, environmental law has had a fairly limited impact on greenhouse gas emissions. The United States Supreme Court’s April 2007 decision in *Massachusetts v. Environmental Protection Agency*,¹⁵⁹ however, made the Clean Air Act a likely basis for future regulation as well as the most likely foundation for future climate change legislation.

1. Clean Air Act

Under the Clean Air Act, the EPA has established national ambient air quality standards for six pollutants—sulfur dioxide, ozone, lead, particulate matter, carbon monoxide, and nitrogen dioxide. These standards are intended primarily to protect human health from the adverse effects of these air pollutants,

151. NAT’L ENERGY POLICY DEV. GROUP, NATIONAL ENERGY POLICY vii (2001), <http://www.whitehouse.gov/energy/National-Energy-Policy.pdf>.

152. *Id.* at app. 1.

153. *Id.* at 8-16.

154. U.S. DEP’T OF ENERGY, NATIONAL ENERGY POLICY: STATUS REPORT ON IMPLEMENTATION OF NEP RECOMMENDATIONS (2005), http://www.energy.gov/media/NEP_Implementation_Report.pdf.

155. Press Conference, President George W. Bush, President Bush Discusses CAFÉ and Alternative Fuel Standards (May 14, 2007), <http://www.whitehouse.gov/news/releases/2007/05/20070514-4.html>.

156. *Id.*

157. *Id.*

158. Letter from Rep. Henry Waxman, Congress of the United States, to Chairman Joseph Kelliher, Chairman of the Fed. Energy Reg. Comm’n (Oct. 11, 2007), <http://oversight.house.gov/documents/20071011110945.pdf>.

159. *Massachusetts v. EPA*, 127 S. Ct. 1438 (2007).

which are also known as criteria pollutants. The Act authorizes a significant regulatory program, principally administered by the states, to control emissions of these pollutants from stationary sources such as power plants and factories, in order to attain these standards. A second major program under the Clean Air Act controls emissions of air pollutants from motor vehicles. These two programs, taken together, have resulted in significant improvements to air quality and human health in the United States since 1970.

The Supreme Court in *Massachusetts v. EPA* was concerned with a petition to the EPA to regulate greenhouse gas emissions from motor vehicles under the Clean Air Act. But the decision has ramifications for the entire Act. The Court held that greenhouse gases such as carbon dioxide are air pollutants under the Clean Air Act.¹⁶⁰ The EPA had insisted in this and other Clean Air Act cases that greenhouse gases were not pollutants under the statute. The Court also held that the EPA did not properly apply the Clean Air Act when it denied the petition for rulemaking because it did not base its decision on the statutory language requiring the EPA to regulate pollutants that “may reasonably be anticipated to endanger public health or welfare.”¹⁶¹ The Court remanded the case to the EPA to make a decision based on the statutory language.

The most obvious question now in front of the EPA is what to do with the petition. Essentially, the EPA has three choices. It can find that greenhouse gases may reasonably be anticipated to endanger public health or welfare (an endangerment finding) and regulate greenhouse gases from motor vehicles; it can find no endangerment and refuse to regulate greenhouse gases, an option that may not be possible because of the state of climate change science; or it can refuse to regulate based on another reason that is not inconsistent with the statute.¹⁶² The EPA will not be able to argue that CAFE standards are a more appropriate way to reduce greenhouse gas emissions because the Court rejected that argument.

By deciding that greenhouse gases are air pollutants for purposes of motor vehicle regulation, though, the Court also decided that greenhouse gases are air pollutants for purposes of all other regulation under the Clean Air Act. This has significant consequences for state regulation of motor vehicle greenhouse gas emissions. The Clean Air Act expressly preempts state regulation of motor vehicle emissions.¹⁶³ But the Act provides an exception for California if the state submits a waiver petition showing, among other things, that California’s regulation is needed “to meet compelling and extraordinary conditions.”¹⁶⁴ California has historically obtained a waiver and adopted more stringent motor vehicle emission standards. Under the Clean Air Act, if the EPA grants California a waiver for greenhouse gases, other states may then adopt the California standards.¹⁶⁵ On December 19, 2007, the EPA denied California’s

160. *Id.* at 1462.

161. *Id.*

162. The Court left open this third possibility with the following: “We need not and do not reach the question whether on remand EPA must make an endangerment finding, or whether policy concerns can inform EPA’s actions in the event that it makes such a finding.” *Id.* at 1463.

163. 42 U.S.C. § 7521(a) (2000).

164. 42 U.S.C. § 7543(b) (2000).

165. 42 U.S.C. § 7507 (2000).

request for a waiver, stating that the waiver is not needed to meet compelling and extraordinary conditions and that “[t]he Bush administration is moving forward with a clear national solution—not a confusing patchwork of state rules.”¹⁶⁶ On January 2, 2008, California filed a petition for review with the Ninth Circuit challenging the EPA’s denial.¹⁶⁷

In 2002, the California legislature required California Air Resources Board (CARB) to “develop and adopt regulations that achieve the maximum feasible and cost-effective reduction of greenhouse gas emissions from motor vehicles.”¹⁶⁸ In 2004, the CARB adopted regulations restricting emissions of four greenhouse gases from motor vehicles. The standards take effect for model year 2009, becoming more stringent each year until 2016.¹⁶⁹ Twelve other states (with more than one-third of the U.S. population) have adopted the California rule or committed to do so—Connecticut, Florida, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington. Prior to *Massachusetts v. EPA*, the EPA had been saying it had no authority to act on California’s waiver petition. Now, with the EPA’s denial of the California waiver petition, the ensuing litigation will focus on the EPA’s legal and factual grounds for denying the waiver under the Clean Air Act, not on whether the Clean Air Act authorizes the EPA to act. In September 2007, moreover, a federal district court in Vermont denied a sweeping challenge to Vermont’s effort to adopt the California standard.¹⁷⁰

Finally, the Clean Air Act authorizes the EPA to establish performance standards for air pollutants from new or modified stationary sources.¹⁷¹ In 2006, a coalition of environmental groups, states, and cities challenged the EPA’s newly adopted New Source Performance Standards for certain utility and industrial power plants.¹⁷² During the comment period, petitioners asked the EPA to regulate greenhouse gas emissions under these standards. The EPA declined, saying it did not have authority to regulate greenhouse gases.¹⁷³ Now that the Supreme Court has decided that greenhouse gases are air pollutants, the EPA’s rationale for not setting new source performance standards for greenhouse gases is no longer valid.

166. John M. Broder & Micheline Maynard, *E.P.A. Denies California Emission’s Waiver*, N.Y. TIMES, Dec. 19, 2007.

167. Petition for Review of Decision of the U.S. EPA, *California v. U.S. EPA*, (9th Cir. Jan. 2, 2008), http://ag.ca.gov/cms_attachments/press/pdfs/n1514_epapetition-1.pdf.

168. CAL. HEALTH & SAFETY CODE § 43018.5 (West 2006).

169. CAL. CODE REGS. tit. 13, § 1961 (2007).

170. *Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, 508 F. Supp. 2d 295 (D. Vt. 2007).

171. 42 U.S.C. § 7411 (2000). “The term ‘standard of performance’ means a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.” *Id.* § 7411(a)(1) (2000).

172. *Coke Oven Envtl. Task Force v. EPA*, No. 06-1131 (D.C. Cir. filed Apr. 7, 2006). On Sept. 13, 2006, the court ordered that the “issue related to the regulation of carbon dioxide and other greenhouse gas emissions” be severed from the rest of the case, held in abeyance until the Supreme Court’s decision in *Massachusetts v. EPA*, and assigned this case its own docket number. The case is now known as *New York v. EPA*, No. 06-1322 (D.C. Cir. filed Sept. 13, 2006).

173. Final Rulemaking, Standards of Performance, 71 Fed. Reg. 9866 (Feb. 27, 2006) (to be codified at 40 C.F.R. pt. 60).

2. National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires federal agencies considering any major federal action “significantly affecting the quality of the human environment” to prepare a detailed statement on “the environmental impact of the proposed action” and “alternatives to the proposed action.”¹⁷⁴ It is increasingly clear that federal agencies need to consider the climate change effects of their activities under the NEPA, including impacts from activities in the United States¹⁷⁵ and also activities sponsored by federal agencies in other countries.¹⁷⁶ In its recent decision in *Center for Biological Diversity v. National Highway Traffic Safety Administration*, the court also remanded the 2006 CAFE regulation for light trucks because of the agency’s failure to fully analyze its climate change impacts under the NEPA.¹⁷⁷

C. Bush Administration Greenhouse Gas Intensity Goal

The key element in the Bush Administration’s approach to addressing climate change is a national greenhouse gas intensity goal. In 2002, about one year after repudiating the Kyoto Protocol, President Bush established a goal of reducing the greenhouse gas intensity of the U.S. economy by 18% by 2012, which is projected to prevent the emission of 500 million metric tons of emissions over the decade.¹⁷⁸ As already noted, greenhouse gas intensity measures greenhouse gas emissions per dollar of GDP; it is not an absolute measure of greenhouse gas reductions. The United States has no absolute goal for reducing greenhouse emissions. This greenhouse gas intensity policy works out to a 1.96% annual reduction.¹⁷⁹ The Administration claimed that this would be an improvement over the 1.4% annual improvement in greenhouse gas intensity that was then projected for the same period.¹⁸⁰ If the effort succeeds,

174. 42 U.S.C. § 4332(2)(C) (2000).

175. For example, in *Mid States Coal for Progress v. Surface Transp. Bd.*, 345 F.3d 520 (8th Cir. 2003), petitioners challenged approval to construct or upgrade hundreds of miles of rail line used to ship coal from Wyoming’s Powder River Basin. The court held that the agency’s failure to consider air pollution impacts from coal consumption, including carbon dioxide, nitrous oxide, mercury, and sulfur dioxide, was arbitrary and capricious. The agency then performed an analysis of air pollution impacts, including impacts from carbon dioxide. The court upheld the Board’s decision based on this analysis. *Mayo Found. v. Surface Transp. Bd.*, 472 F.3d 545 (8th Cir. 2006).

176. In *Friends of the Earth v. Mosbacher*, 488 F. Supp. 2d 889 (N.D. Cal. 2007), plaintiffs challenged the Overseas Private Investment Corporation and the Export-Import Bank for funding international fossil fuel projects that contribute to climate change. The court denied defendants’ motion for summary judgment, saying it could not determine as a matter of law that the NEPA did not apply to these projects. *Id.*

177. *Center for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 508 F.3d 508 (9th Cir. 2007).

178. THE WHITE HOUSE, GLOBAL CLIMATE CHANGE POLICY BOOK (2002), <http://www.whitehouse.gov/news/releases/2002/02/climatechange.html>.

179. S. Pacala & R. Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, 305 SCIENCE 968, 969, Aug. 13, 2004.

180. GLOBAL CLIMATE CHANGE POLICY BOOK, *supra* note 178. The 1.4% figure is slightly lower than the annual intensity reductions forecast during the same period. In 2002, a 1.5% annual energy intensity reduction was projected for 2002-2020. ENERGY INFO. ADMIN., U.S. DEP’T OF ENERGY, ANNUAL ENERGY OUTLOOK 2002 WITH PROJECTIONS TO 2020: OVERVIEW (2002), <http://www.eia.doe.gov/oiaf/archive/aeo02/index.html>. The projected energy intensity reduction one year earlier, in 2001, was 1.6%. ENERGY INFO. ADMIN., U.S. DEP’T OF ENERGY, ANNUAL ENERGY OUTLOOK 2001 WITH PROJECTIONS TO 2020 5 (2000), [http://tonto.eia.doe.gov/FTP/ROOT/forecasting/0383\(2001\).pdf](http://tonto.eia.doe.gov/FTP/ROOT/forecasting/0383(2001).pdf).

U.S. greenhouse gas emissions for this decade will be 2% lower than otherwise projected.¹⁸¹ By contrast, the Kyoto Protocol would have reduced U.S. greenhouse gas emissions by about 30% below projected emissions.¹⁸² Between 2004 and 2005, U.S. greenhouse gas intensity declined by 2.5%.¹⁸³

D. Securities Law

Federal securities laws require publicly traded corporations to publicly disclose legal proceedings that may have a material effect on them and to provide other information about the proceedings. The application of these longstanding rules to climate change is of particular concern for publicly traded electric utilities, car makers, and others, and is also the subject of growing shareholder activism.¹⁸⁴ In September 2007, the California Public Employees' Retirement System and others petitioned the Securities and Exchange Commission "to request a clarifying statement that publicly traded corporations must disclose the financial risks presented by climate change."¹⁸⁵

E. Consumer Protection Law

The Federal Trade Commission (FTC) Act gives the FTC authority to bring enforcement actions against false or misleading marketing claims, including environmental marketing claims.¹⁸⁶ The FTC issues environmental or "green" guidelines to help marketers understand general environmental marketing principles as well as specific green claims, such as recycled content, degradability, or ozone safety.¹⁸⁷ The FTC was scheduled to review its green marketing guidelines in 2009, but it is accelerating its review due to the increase in green marketing claims related to greenhouse gas issues.¹⁸⁸ Specifically, the FTC's review will focus, among other things, on carbon offset claims.¹⁸⁹ Carbon offsets are purchased by companies or individuals in exchange for a promise to reduce carbon emissions, via, for example, tree planting or installing solar panels. The intangible nature of carbon offsets raise difficult consumer protection challenges because consumers cannot easily verify what they are

181. Letter from John B. Stephenson, Director, Natural Resources and Environment, General Accounting Office, to Senators Ernest F. Hollings & John F. Kerry (Oct. 28, 2003), <http://www.gao.gov/new.items/d04146r.pdf> (concerning climate change: trends in greenhouse gas emissions and emissions intensity in the United States and other high-emitting nations).

182. NAT'L COMM'N ON ENERGY POL'Y, ENDING THE ENERGY STALEMATE: A BIPARTISAN STRATEGY TO MEET AMERICA'S ENERGY CHALLENGES 25 (2004).

183. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, EMISSIONS OF GREENHOUSE GASES IN THE UNITED STATES 2005 ix (2006), <http://www.eia.doe.gov/oiaf/1605/1605aold.html>.

184. Jeffrey A. Smith & Matthew Morreale, *Disclosure Issues*, in GLOBAL CLIMATE CHANGE, *supra* note 1, at 453-54.

185. Petition for Interpretative Guidance on Climate Risk Disclosure, California Public Employees' Retirement System et al. (Sec. & Exchange Comm'n Sept. 18, 2007), http://www.environmentaldefense.org/documents/6986_SECPetition_ClimateDisclosure.pdf.

186. FED. TRADE COMM'N, COMPLYING WITH THE ENVIRONMENTAL MARKETING GUIDES 1 (2000), <http://www.ftc.gov/bcp/online/pubs/buspubs/greenguides.shtm>.

187. Press Release, Fed. Trade Comm'n, FTC Reviews Environmental Marketing Guides, Announces Public Meetings (Nov. 26, 2007), <http://www.ftc.gov/opa/2007/11/enviro.shtm>.

188. Steven Mufson, *Green Marketing Review is Put On Fast Track at FTC*, WASH. POST, Nov. 27, 2007, at D01.

189. *Id.*

purchasing or whether the commodity actually has the claimed environmental attributes.¹⁹⁰ The FTC held a workshop in early 2008 and solicited comment on issues of concern.¹⁹¹

V. STEPS TOWARD NATIONAL CLIMATE CHANGE LEGISLATION

A significant number of comprehensive climate change bills were introduced in 2007.¹⁹² These bills are comprehensive because they address all six greenhouse gases that are subject to reduction under the Kyoto Protocol, not just carbon dioxide. They also apply to all sectors of the economy, not just, for example, electrical generation or transportation. The bills tend to cover the largest emitters of greenhouse gases and those entities indirectly responsible for the largest share of emissions. The bills would also establish a national goal of reducing greenhouse gas emissions to one-quarter or one-third of existing levels by 2050. If Congress decides to adopt comprehensive regulation of greenhouse gas emissions, it has three basic options.¹⁹³ These are a cap-and-trade approach, a greenhouse gas tax, and a “sectoral hybrid” approach. As indicated by the bills introduced in 2007, the sectoral hybrid is the direction in which U.S. policy is most likely to evolve.¹⁹⁴

The cap-and-trade approach builds on U.S. experience with the acid rain provisions of the 1990 Clean Air Act amendments, which imposed emissions reductions on many electric power plants.¹⁹⁵ Within that approach, there are “downstream” and “upstream” options. A “downstream” approach involves the direct regulation of emitters. The 1990 Clean Air Act amendments, for instance, represent “downstream” regulation of power plants. A pure “downstream” approach in the U.S. would be impossible because it would include direct regulation of millions of cars and buildings.¹⁹⁶ An “upstream” approach, by contrast, would capture such sources through direct regulation of, for example,

190. Announcement of Public Workshop; Request for Public Comment, *Guides for the Use of Environmental Marketing Claims; Carbon Offsets and Renewable Energy Certificates; Public Workshop*, at 11, <http://www.ftc.gov/os/2007/11/P954501carbfrm.pdf>.

191. Announcement of Public Workshop; Request for Public Comment, *Guides for the Use of Environmental Marketing Claims; Carbon Offsets and Renewable Energy Certificates; Public Workshop*, 72 Fed. Reg. 66,094 (Nov. 27, 2007).

192. Two proposals, companion bills in many respects, are the Climate Stewardship and Innovation Act of 2007, S. 280, 110th Cong. (1st Sess. 2007) (Sen. Lieberman and six cosponsors, including Sen. McCain) and the Climate Stewardship Act of 2007 H. R. 620, 110th Cong. (1st Sess. 2007) (Rep. Olver and 17 cosponsors). The other four are the Low Carbon Economy Act of 2007, S. 1766, 110th Cong. (1st Sess. 2007) (Sen. Bingaman and six cosponsors), the Global Warming Pollution Reduction Act, S. 309, 110th Cong. (1st Sess. 2007) (Sen. Sanders and ten cosponsors), the Global Warming Reduction Act of 2007, S. 485, 110th Cong. (1st Sess. 2007) (Sen. Kerry and one cosponsor), and the Safe Climate Act of 2007, H.R. 1590, 110th Cong. (1st Sess. 2007) (Rep. Waxman and 131 cosponsors). A seventh bill, America’s Climate Security Act, S. 2191, 110th Cong. (1st Sess. 2007), is sponsored by Sen. Lieberman and has nine cosponsors, including Sen. Warner.

193. Robert R. Nordhaus & Kyle W. Danish, *Assessing the Options for Designing a Mandatory U.S. Greenhouse Gas Reduction Program*, 32 B.C. ENVTL. AFF. L. REV. 97 (2005) [hereinafter *Assessing the Options*]. The paper also appears, in substantially the same form, as ROBERT R. NORDHAUS & KYLE W. DANISH, PEW CENTER ON GLOBAL CLIMATE CHANGE, *DESIGNING A MANDATORY GREENHOUSE GAS REDUCTION PROGRAM FOR THE U.S.* (2003), <http://www.pewclimate.org/docUploads/USGas%2Epdf>.

194. *Assessing the Options*, *supra* note 193, at 163.

195. 42 U.S.C. §§ 7651-7651(o) (2000).

196. ELEC. POWER RESEARCH INST., *CLIMATE BRIEF: UPSTREAM AND DOWNSTREAM APPROACHES TO CARBON DIOXIDE REGULATION* (2005), <http://www.epriweb.com/public/000000000001007762.pdf>.

upstream gasoline and home heating fuel refiners or suppliers. Still another approach to cap-and-trade would establish a “downstream” cap-and-trade system that would apply only to large stationary sources such as power plants or industrial facilities.¹⁹⁷ Some of the comprehensive bills now before Congress do just that.¹⁹⁸

A greenhouse gas tax, the preferred approach for most economists, is attractive because it would be comprehensive and because it would reach all sources regardless of their size. It is not clear in advance, however, how much greenhouse gas emissions reduction would be achieved. The public reaction to recent high oil prices indicates that the effect may be easier to measure afterwards than it is to predict in advance. An additional problem, of course, is political acceptability. Still, there are indications that policy makers may be taking a carbon tax more seriously.¹⁹⁹

The “sectoral hybrid” approach employs both a large-source cap-and-trade program and product efficiency standards such as those for automobiles and appliances.²⁰⁰ This approach would build on existing experience and would, if designed properly, reach most of the economy. Many of the bills now before Congress would cap overall emissions and emissions from covered entities at declining levels in accordance with emissions reduction goals, and authorize regulated entities to purchase and use allowances (equal to one ton of carbon dioxide equivalent) to meet required reductions. They also combine a cap-and-trade approach with renewable energy portfolio standards and similar requirements.²⁰¹ A great many organizations have made recommendations to Congress on these and other issues.²⁰²

There are, of course, other issues. One is how to most effectively maintain and enhance the considerable state and local efforts that already exist.²⁰³ A second is how to most effectively engage individuals in a national effort to address climate change.²⁰⁴ A third is whether we can effectively address climate change without addressing increasing energy demand in the United States and the rest of the world.²⁰⁵

197. *Assessing the Options*, supra note 193, at 161.

198. *E.g.*, S. 280, 110th Cong. § 3 (1st Sess. 2007) (definition of covered entity); H.R. 620, 110th Cong. § 3 (1st Sess. 2007) (definition of covered entity).

199. John D. Dingell, *The Power in the Carbon Tax*, WASH. POST, Aug. 2, 2007, at A21 (in which Mr. Dingell, who chairs the House Energy and Commerce Committee, advocates a carbon tax).

200. *Assessing the Options*, supra note 193, at 110, 163.

201. *E.g.*, S. 309, 110th Cong. (1st Sess. 2007); S. 485, 110th Cong. (1st Sess. 2007).

202. *See, e.g.*, NAT'L COMM'N ON ENERGY POL'Y, ENERGY POLICY RECOMMENDATIONS TO THE PRESIDENT AND THE 110TH CONGRESS (2007), http://www.energycommission.org/files/contentFiles/NCEP_Recommendations_April_2007_4656f9759c345.pdf.

203. Robert B. McKinstry, Jr. & Thomas D. Peterson, *The Implications of the New “Old” Federalism in Climate-Change Legislation: How to Function in a Global Marketplace When States Take the Lead*, 20 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 61 (2007); Thomas D. Peterson, Robert B. McKinstry, Jr., & John C. Dernbach, *Developing a Comprehensive Approach to Climate Change Policy in the United States: Integrating Levels of Government and Economic Sectors*, 25 VA. ENVTL. L.J. (forthcoming 2007).

204. John C. Dernbach, *Harnessing Individual Behavior to Address Climate Change: Options for Congress*, 25 VA. ENVTL. L. J. (forthcoming 2007).

205. John C. Dernbach, *Overcoming the Behavioral Impetus for Greater Energy Consumption*, 20 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 15 (2007); John C. Dernbach, supra note 140.

VI. CONCLUSION

Global temperatures are increasing in large part because of human caused greenhouse gas emissions, and this warming is affecting both natural systems and human wellbeing. International legal programs to deal with climate change, particularly within the EU, are already well underway. Within the United States, there has been significant activity at the state level, both in the design and implementation of specific legal tools and in growing regional cooperation. At a federal level in the United States, laws that were enacted before climate change became a significant issue, including the Clean Air Act, are being redirected toward climate change.

The coming years will see increased attention to a wide range of climate issues. International frameworks may be modified to provide a successor to the Kyoto Protocol and for other purposes. Congress is likely to enact comprehensive climate change legislation at some point. A new field of law is developing—climate change law—and it draws upon the expertise of not only lawyers but also other professionals. Understanding the legal, scientific, and other trends in climate change is as essential for lawyers as it is for their clients.