CARBON DIOXIDE EMISSIONS, CLIMATE CHANGE, AND THE CLEAN AIR ACT: AN ANALYSIS OF WHETHER CARBON DIOXIDE SHOULD BE LISTED AS A CRITERIA POLLUTANT

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I. INTRODUCTION

The year is 2050. Americans wake up to the headline: "Warming . . . Cause[s] Catastrophic Rise in Sea Level."[1] What

[1] Stefan Lovgren, *Warming to Cause Catastrophic Rise in Sea Level?*, NAT'L GEOGRAPHIC NEWS, Apr. 26, 2004 (quoting Jonathan Overpeck, Director of the Institute for the Study of Planet Earth at the University of Arizona in Tuscon, stating that every U.S. East Coast City from Boston to Miami would be impacted and "a one-meter sea rise in New Orleans . . . would mean 'no more Mardi Gras.'"), *at* http://news.nationalgeographic.com/news/2004/04/0420_040420_earthday.html; *see also* DAVID HUNTER ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 595 (2d ed. 2002); John Roach, *By 2050 Warming to Doom Million Species, Study Says,* NAT'L GEOGRAPHIC NEWS, July 12, 2004 (quoting Chris Thomas, conservation biologist, University of Leeds, United Kingdom: "Climate change now represents at least as great a threat to the number of species surviving on earth as habitat-destruction and modification."), *at* http://news.nationalgeographic.com/news/2004/01/0107_040107_extinction.html;

will prevent this title of a 2004 *National Geographic News* article, prognosticating about the impact of global warming on the East Coast, from becoming an actual *New York Times* headline in 2050, 2100, or beyond?[2]

In 2003, the United States Environmental Protection Agency (EPA) ruled that man-made carbon dioxide and other greenhouse gases, identified by many as responsible for the increased greenhouse effect projected to cause global climate change, are not air pollutants for regulatory purposes under the Clean Air Act (CAA, the Act).[3] The EPA reneged on prior admissions that carbon dioxide is an air pollutant by weighing the economic and political ramifications of regulation,[4] in contravention with the Act, which prohibits consideration of implementation costs. This Note addresses the question of whether, under CAA section 108(a)(1), the Administrator must list carbon dioxide as a pollutant for the purpose of issuing air quality criteria.[5]

The potential harm to human health and the environment associated with climate change resulting from human-induced fossil fuel emissions has received international attention for decades and has worked itself into the popular imagination.[6] In

U.S. EPA, *Global Warming—Impacts: Coastal Zones* (noting that the sea level is rising more rapidly in the United States than in other parts of the world), *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ImpactsCoastalZones.html (last modified Jan. 7, 2000).

[2] *See generally* Susan Solomon & Martin Parry, Intergovernmental Panel on Climate Change (IPCC), *Foreword*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, IPCC MEETING ON CURRENT SCIENTIFIC UNDERSTANDING OF THE PROCESS AFFECTING TERRESTRIAL CARBON STOCKS AND HUMAN INFLUENCES UPON THEM iii, iii (David Schimel & Martin Manning eds., 2003) [hereinafter IPCC MEETING] ("The Intergovernmental Panel on Climate Change (IPCC) was established by the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO) in 1988 to undertake scientific and technical assessments relating to climate change."); *see also* A.P.M. Baede et al., IPCC, *The Climate System: An Overview, in* CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS 85, 92 (J.T. Houghton et al. eds., 2001) ("The amount of carbon dioxide, for example, has increased by more than 30% since pre-industrial times and is still increasing at an unprecedented rate of on average 0.4% per year . . . ."), *available at* http://www.grida.no/climate/ipcc_tar/wg1/.

[3] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,928 (Sept. 8, 2003).

[4] *See id.*

[5] *See* 42 U.S.C. § 7408(a)(1) (2000).

[6] *See* SPENCER R. WEART, THE DISCOVERY OF GLOBAL WARMING (2003); *see also* Spencer Weart, *The Discovery of Global Warming* (Mar. 2005)

1992, President George H.W. Bush, responding to a growing concern by the international scientific community about the impact of greenhouse gases, joined other nations in signing the United Nations Framework Convention on Climate Change, a treaty to stabilize greenhouse gas concentrations.[7] Though President Bill Clinton signed the 1997 Kyoto Protocol to the Framework Convention setting targets and timetables for specific carbon dioxide emission reductions among cooperating nations, the treaty was never submitted to the Senate for ratification.[8] Then, in 2001,

(supplementing Weart's book of the same title), *at* http://www.aip.org/history/climate/index.html. The 2004 release of the movie *The Day After Tomorrow*, though presenting a less than scientific approach to the understanding of the impact of greenhouse gas emissions on climate change, brought the issue of global warming to the public for continued debate. *See* Robert B. Semple, Jr., *A Film that Could Warm up the Debate*, N.Y. TIMES, May 27, 2004, 2004 WL 77634636 ("*The Day After Tomorrow* could do more to elevate the issue than any number of Congressional hearings or high minded tracts."); *see also* William Booth, *Turning up the Hype; For 'The Day After,' A Crowded Lobby*, WASH. POST, May 27, 2004, at C4.

> The pop-corny scenario is this: a couple of centuries of excessive emissions of carbon dioxide (the stuff that comes out of tailpipes and smokestacks) has finally warmed the globe enough to shut down the thermo-saline North Atlantic Ocean Current . . . . [I]n a matter of days . . . the weather gets really weird.

Id. Reports of domestic agencies and international organizations point less dramatically to the potentially catastrophic impacts. *See, e.g.*, U. S. EPA, *supra* note 1 ("[A] two foot rise in sea level could eliminate 17–43 percent of US wetlands, . . . with more than half of the loss taking place in Louisiana alone."); Working Group II, IPCC, *Summary for Policymakers, Climate Change 2001: Impacts, Adaptation, and Vulnerability* [hereinafter *Summary for Policymakers*], *in* CLIMATE CHANGE 2001: IMPACTS, ADAPTATION, AND VULNERABILITY 1, 5 (James J. McCarthy et al. eds., 2001) [hereinafter IMPACTS REPORT] (predicting several adverse effects resulting from the greenhouse effect, including an increase in mortality as a result of vector-borne diseases such as malaria, waterborne diseases such as cholera, and heat stress, as well as an increase in the risk of flooding caused by increased precipitation and rising sea levels), *available at* http://www.grida.no/climate/ipcc_tar/wg2/index.htm.

[7] *See* United Nations Framework Convention on Climate Change, May 9, 1992, art. 4.2, 1771 U.N.T.S. 165, 172 (establishing a general goal of restoring the 1990 levels of emissions for certain GHGs); *see also* ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 1062 (4th ed. 2003) (discussing U.S. participation in Rio Earth Summit).

[8] *See* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,927 (Sept. 8, 2003); MARK S. SQUILLACE & DAVID R. WOOLEY, AIR POLLUTION 495 (3d ed. 1999) (The conference was held in Kyoto, Japan, by the parties to the United Nations Framework Convention on Climate Change. The parties sought to reduce greenhouse gas emissions by establishing "targets and timetables" for industrialized nations.); *see also* Kyoto Protocol to United Nations Framework Convention on Climate Change, 3d Sess., Agenda

the George W. Bush administration repudiated the Kyoto Protocol, drawing criticism from the international community.[9] The Bush administration announced in March 2001 that the Kyoto Protocol was "fatally flawed" and "effectively dead."[10] The Bush administration's proposal (the 2002 Clear Skies Initiative) called for specific reductions of sulfur dioxide (SO_2), nitrogen oxides (NO_x), and mercury emissions, and rendered a more flexible approach for carbon dioxide (CO_2) through the Global Climate Change Initiative.[11]

Several New England states, seeking a more accountable approach toward the reduction of anthropogenic (human-

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Item 5, art. 3.1, U.N. Doc. FCCC/CP/1997/L.7/Add.1 (1997). The Protocol called for an overall global emission reduction of greenhouse gas emissions by Annex I parties of at least five percent below 1990 levels in the commitment period 2008 to 2012, with the United States' commitment set at seven percent below its 1990 baseline. *See id.* art. 3.1, annex B. In November 2004, Russia ratified the Kyoto Protocol, *see* Steven Lee Myers, *Putin Ratifies Kyoto Protocol on Emissions*, N.Y. TIMES, Nov. 6, 2004, at A10, setting the stage for the Protocol to go into effect in February 2005. *See* Mark Landler, *Mixed Feelings as Kyoto Pact Takes Effect*, N.Y. TIMES, Feb. 16, 2005, at C1.

[9] *See* PERCIVAL, *supra* note 7, at 1070. Even in its own investigations, the United States found a wide range of potential adverse effects on health and welfare resulting from climate change. *See, e.g.*, U.S. DEP'T OF STATE, U.S. CLIMATE ACTION REPORT–2002, THIRD COMMUNICATION OF THE UNITED STATES OF AMERICA UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE 89 (2002) [hereinafter CLIMATE ACTION REPORT], *available at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenter PublicationsUSClimateActionReport.html.

[10] PERCIVAL, *supra* note 7, at 1070; *see also Statement by EPA Administrator Christie Whitman on Climate Change* (Mar. 16, 2001), *at* http://yosemite.epa.gov/opa/admpress.nsf/b1ab9f485b098972852562e7004dc686/cae026d0ea31a83d85256a110079a1fa!OpenDocument.

> The President has been clear that the Administration does not believe the government should impose mandatory carbon dioxide emission reductions on power plants at a time when the cost of energy is soaring in this nation. . . . I share the President's optimism that we will be able to develop technologies, market incentives, and other creative ways to address global climate change and I fully intend to support him in that effort.

Id. The United States expressed concerns about the failure of the Kyoto Protocol to include developing nations in the commitments for greenhouse gas (GHG) reductions. PERCIVAL, *supra* note 7, at 1063. *But see* Kyoto Protocol to the United Nations Framework Convention on Climate Change, *supra* note 8, art. 12 (providing a mechanism for developed countries to offset their emissions reductions requirements by assisting nonparty countries in achieving emissions reductions).

[11] *See Executive Summary—The Clear Skies Initiative* (Feb. 14, 2004), *at* http://www.whitehouse.gov/news/releases/2002/02/clearskies.html.

induced)[12] carbon dioxide emissions, filed suit on June 4, 2003, against the EPA for failing to regulate carbon dioxide under section 108 of the Clean Air Act.[13] Subsequently, in response to a separate section 202 petition under the Clean Air Act, the EPA ruled that greenhouse gases (GHGs) were not "agents of air pollution" under the Clean Air Act, leaving itself without authority to regulate carbon dioxide under any provision of the Clean Air Act, including sections 108 and 109.[14] The EPA concluded that carbon dioxide is not an "air pollutant" under any of the Clean Air Act's regulatory provisions, including sections 108 and 109,[15] and

[12] *See* PERCIVAL, *supra* note 7, at 1356 (defining anthropogenic as "caused by or relating to the impact of human activity on the environment"); *see also* Baede et al., *supra* note 2, at 92 (referring to emissions from fossil fuel and industrial processes as anthropogenic carbon dioxide emissions); *id.* at 89 (differentiating between "anthropogenic" and "natural" changes in the components of climate systems). "In [the climate change context], the term 'anthropogenic' refers to greenhouse gas emissions and removals that are a direct result of human activities or are the result of natural processes that have been affected by human activities." CLIMATE CHANGE REPORT, *supra* note 9, at 26; *see also* 42 U.S.C. § 7491(g)(3) (2000) (stating that "the term 'manmade air pollution' means air pollution which results directly or indirectly from human activity").

[13] Complaint, Massachusetts v. Whitman (D. Conn. June 4, 2003) (No. 3:03CV984). Maine and Connecticut joined Massachusetts in the effort to obtain a determination that the EPA has a nondiscretionary duty to list carbon dioxide as a criteria pollutant under CAA section 108(a)(1). *See id.*

[14] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,928 (Sept. 8, 2003); *cf.* Plaintiff's Notice of Dismissal Without Prejudice ¶ 1, Massachusetts v. Horinko (D. Conn. 2003) (No. 3:03CV984). The International Center for Technology Assessment (ICTA) and numerous environmental groups had petitioned the EPA on October 20, 1999, to regulate emissions from new motor vehicles and engines under CAA section 202(a)(1). 42 U.S.C. § 7521 (2000). In August 2002, as a result of the EPA's inaction, several petitioners filed a lawsuit against the EPA for unreasonable delay on the 202 ruling. The section 202 petitioners asserted that anthropogenic emissions of CO_2, CH_4, N_2O, and HFCs met the CAA section 302(g) definition of an air pollutant, and that the contribution of motor vehicle greenhouse gas emissions to global climate change qualified these emissions as "air pollutants" under the Clean Air Act. *See* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,923. In August 2003, the EPA responded to the section 202 petition and announced for the first time its position that the agency does not have authority to regulate greenhouse gases under the Clean Air Act. The EPA concluded that Congress had not given the agency authority to address global climate change under the Clean Air Act and that it followed that GHGs were not air pollutants under the Clean Air Act's regulatory provisions, including sections 108, 109, 111, 112, and 202. *See id.* at 52,928. Furthermore, the EPA asserted that the global nature of greenhouse gases, including carbon dioxide, prohibited regulation under the Clean Air Act. *See id.* at 52,927.

[15] *See* Control of Emissions from New Highway Vehicles and Engines, 68

it denied the International Center for Technology Assessment's (ICTA's) section 202 petition.[16] In issuing this decision, the EPA rejected the view held by the previous administration. In an EPA memo to Carol Browner, the EPA administrator, in 1998, Jonathan Cannon, general counsel for the EPA, had concluded that CO_2 was an "air pollutant" under the CAA and thus could be regulated under the CAA if the Administrator determined that CO_2 met the criteria for regulation under one or more provisions of the CAA.[17] General Counsel Robert Fabricant came to the opposite conclusion in his August 2003 memorandum to the EPA acting administrator, Marianne Horinko: "This memorandum explains the reasons for my conclusions and formally withdraws Mr. Cannon's April 10, 1998 memorandum as no longer representing the view's of the EPA's General Counsel."[18]

On September 3, 2003, the states dismissed without prejudice the section 108 lawsuit[19] in favor of filing a challenge in the D.C. Circuit to the EPA's section 202 ruling.[20] The states challenge the EPA's rulings on the section 202 petition and argue that the Clean

Fed. Reg. at 52,929–30 (agreeing with the President's climate change policy, which calls for voluntary actions and incentives aimed at reducing scientific uncertainties and encouraging technological development to effectively address the long-term issue of climate change).

[16] *See id.* at 52,930–32 (noting three components of the President's approach: (1) the reduction of "key uncertainties that exist in our understanding of global climate change"; (2) a call for "voluntary reductions in GHG intensity, including through fuel economy improvements"; and (3) "[t]he 'Climate VISION' (Voluntary Innovative Sector Initiatives: Opportunities Now) program, a Presidential initiative launched by the Department of Energy (DOE) in February 2003, [] a voluntary public-private partnership designed to pursue cost-effective strategies to reduce the growth of GHG emissions, especially by energy-intensive industries.").

[17] *See* Memorandum from Jonathan Z. Cannon, General Counsel, EPA, to Carol M. Browner, Administrator, EPA 4–5 (Apr. 10, 1998) (on file with journal).

[18] Memorandum from Robert E. Fabricant, General Counsel, EPA, to Marianne L. Horinko, Acting Administrator, EPA 1 (Aug. 28, 2003) (on file with journal).

[19] *See* Plaintiff's Notice of Dismissal Without Prejudice, Massachusetts v. Horinko (D. Conn. Sept. 3, 2003) (No. 3:03CV984).

[20] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,922–23; *see also* Amended Petition for Review at 1, Massachusetts v. EPA (D.C. Cir. Oct. 30, 2003) (No. 03-1361). Oral argument for this case took place on April 8, 2005. *See* Oral Argument, Massachusetts v. EPA (D.C. Cir. Apr. 8, 2005) (Nos. 03-0361–03-1368); *see also* Michael Janofsky, *2 Sides Do Battle in Court on Whether E.P.A. Should Regulate Carbon Dioxide*, N.Y. TIMES, Apr. 9, 2005, at A17.

Air Act gives the EPA authority to regulate greenhouse gas emissions from motor vehicles.[21] The New England states will re-evaluate the section 108 complaint, which seeks to have the EPA list carbon dioxide as a criteria pollutant under the Clean Air Act, after the D.C. Circuit issues an opinion on the section 202 ruling.[22]

The basis of the states' challenge is in the provisions of the thirty-five-year-old Clean Air Act, in which Congress charged the administrator of the EPA with the duty of revising the list of criteria pollutants for the purpose of establishing National Ambient Air Quality Standards (NAAQS).[23] Under section 108 of the Clean Air Act, the Administrator must revise the list of criteria pollutants to include "each air pollutant (A) emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare; and (B) the presence of which in the ambient air results from numerous or diverse mobile or stationary sources."[24] Scientific studies compiled by the Intergovernmental Panel on Climate Change (IPCC) (an international panel of more than 2000 scientists from 100 countries) indicate that greenhouse gases, of which anthropogenic carbon dioxide is a major contributor, are responsible for climate changes[25] expected to significantly impact human health and welfare in the United States and throughout the world.[26] This Note will review the states' case and argue that the EPA Administrator must identify carbon dioxide as a "criteria pollutant" under section 108(a)(1) of the Clean Air Act.[27] Part II.A will examine the causal connection between carbon dioxide,

[21] Amended Petition at 1–2, Massachusetts v. U.S. EPA (No. 03-1361).

[22] E-mail from Carol Iancu, Assistant Attorney General, Massachusetts Office of the Attorney General, to Janine Maney (Sept. 7, 2004, 10:11:32 EDT) (on file with journal).

[23] *See* Clean Air Amendments of 1970, Pub. L. No. 91-604, § 108(a)(1), 84 Stat. 1676, 1678 (codified as amended at 42 U.S.C. § 7408(a)(1) (2000)).

[24] *See id.*

[25] HUNTER, *supra* note 1, at 590–91; PERCIVAL, *supra* note 7, at 1057. UNEP established the Intergovernmental Panel on Climate Change (IPCC) in 1988 in order to prepare a scientific report for the 1992 Earth Summit. The IPCC released its Third Assessment on Climate Change in 2001. This Note will use the IPCC reports as the scientific basis for establishing the impact of greenhouse gases, including carbon dioxide, on human beings and on various ecosystems.

[26] *See* CLIMATE ACTION REPORT, *supra* note 9, at 81; *see also* HUNTER, *supra* note 1, at 590–91.

[27] *See* 42 U.S.C. § 7408(a)(1) (2000).

greenhouse gases, and climate change, and will examine the responses of the United States and the United Nations to the projected adverse effects of anthropogenic carbon dioxide emissions. Part II.B will identify the requirements for the EPA Administrator's nondiscretionary duty to list a "criteria pollutant" by reviewing the language of section 108(a)(1)(A)–(B) in conjunction with the definition of an air pollutant under section 302(g).[28] Part III will first apply the facts set forth in Part II.A to the doctrine set forth in Part II.B, and then analyze whether carbon dioxide meets the requirements of section 108(a)(1), leaving the Administrator with a nondiscretionary duty to list carbon dioxide as a "criteria pollutant."[29] Part IV will briefly discuss the policy considerations related to regulating carbon dioxide under the Clean Air Act.

II. BACKGROUND

A. *Background on Carbon Dioxide, Greenhouse Gases, and Climate Change*

1. *The United States' Response to a Global Problem*

In 1988, concerns about climate change led the United Nations to form an international committee to begin discussions on a global treaty to address the issue.[30] The ensuing committee, the Intergovernmental Panel on Climate Change (IPCC), was given the task of assessing the scientific, technical, and economic basis for climate change in preparation for the 1992 Earth Summit in Rio de Janeiro (the Framework Convention).[31] On June 12, 1992, President George H.W. Bush signed—and, in October 1992, the United States Senate ratified—the United Nations Framework

[28] *See* 42 U.S.C. § 7602(g) (2000).

[29] *See* 42 U.S.C. § 7408(a)(1) (2000).

[30] HUNTER, *supra* note 1, at 590.

[31] *Id.*; United Nations Framework Convention on Climate Change, May 9, 1992, art. 2, 1771 U.N.T.S. 165, 169 (stating the treaty's objective to stabilize greenhouse gas emissions "in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system"); *see also id.* art. 4.2(a), 1771 U.N.T.S. at 171 (requiring each party "to adopt national . . . policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs").

Convention on Climate Change (UNFCCC), which provided a general plan for addressing climate change.[32] The UNFCCC required developed country parties to take the lead by adopting national policies to limit anthropogenic greenhouse gas emissions and to protect and enhance greenhouse gas reservoirs and sinks.[33] The United States agreed to reporting commitments on anthropogenic greenhouse gas emissions and removals by sinks, with the goal of reducing GHG emissions, along with other nations, to 1990 levels.[34]

The IPCC conducted a second assessment for climate change in 1995 in preparation for the Kyoto Protocol in 1997. The Kyoto Protocol established targets and timetables for the implementation of carbon dioxide reduction goals among cooperating nations.[35] It called for industrialized countries to lower their overall GHG emissions at least five percent below 1990 levels between the years 2008 and 2012.[36] The United States' commitment to the reduction of GHGs was established at a seven percent net reduction measured against the 1990 baseline,[37] but, though the Clinton administration signed the Kyoto Protocol, the treaty was not submitted to the Senate for ratification.[38]

In 2001, the IPCC released the Third Assessment on Climate Change (Third Assessment). The Third Assessment provides the scientific data used in support of many of the EPA's current web site postings on global warming, as well as the scientific data used in this Note.[39]

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[32] *See* PERCIVAL, *supra* note 7, at 1062.

[33] *See* United Nations Framework Convention on Climate Change, art. 4.2(a), 1771 U.N.T.S. at 171.

[34] *See id.* art. 4.2(b), 1771 U.N.T.S. at 172.

[35] HUNTER, *supra* note 1, at 590 (explaining that the Kyoto Protocol established timetables and targets for countries to achieve in order to slow down the effects of greenhouse gases on climate changes).

[36] Pamela Najor, *Bush Will Not Negotiate Kyoto Pact, Calls for Cabinet Review of CO_2 Issues*, 32 Env't Rep. (BNA) 581, 581 (2001).

[37] *Id*.

[38] *See supra* note 8 and accompanying text; *see also* HUNTER, *supra* note 1, at 628. (On October 22, 1997, the Clinton administration announced a plan to stabilize emissions to 1990 levels between the years 2008–2012, which European countries criticized for not providing enough protection.).

[39] *See, e.g.*, U.S. EPA, *Global Warming—Climate: Uncertainties* (citing the IPCC Third Assessment Report (2001)), *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ClimateUncertainties.html (last updated Jan. 7, 2000).

Also in 2001, President George W. Bush[40] repudiated the Kyoto Protocol.[41] A Department of State spokesperson, Richard Boucher, released a statement saying that the Administration opposed the protocol because it exempted developing countries and might injure the United States economy.[42] Disappointed, several European leaders sent a letter to President Bush in 2001 expressing deep concerns for the risks associated with climate change and stating that the majority of climate experts have found clear evidence that climate change will have a significant impact on human beings.[43] Christine Whitman, then the administrator of the EPA, sent a memo to President Bush stating that, though he was not endorsing Kyoto, he could indicate that he would look to the reduction of greenhouse gas emissions internally.[44]

Though President Bush proposed legislation during his first presidential campaign requiring "mandatory emission reductions of carbon dioxide as part of a new strategy to control four pollutants," carbon dioxide, nitrogen oxide, mercury, and sulfur dioxide, protests caused him to reverse course.[45] President Bush's proposed Clear Skies Initiative, announced on February 14, 2002, called for emission reductions of sulfur dioxide, nitrogen oxides,

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[40] Unless otherwise noted, all references to President Bush are to President George Walker Bush, the forty-third President of the United States of America.

[41] HUNTER, *supra* note 1, at 590.

[42] Najor, *supra* note 36, at 581; *see also* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,927 (noting the concerns of the Senate regarding the Protocol commitments, which might harm the U.S. economy, and the intent not to be a signatory unless the Protocol mandated reductions in GHGs by developing countries within the same compliance period). *But see* Kyoto Protocol to the United Nations Framework Convention on Climate Change, *supra* note 8, art. 12 (providing a mechanism for developed countries to offset their emissions reductions requirements by assisting nonparty countries to achieve emissions reductions).

[43] *See* Joe Kirwin, *European Leaders Send Letter to Bush Calling for Cooperation on Kyoto Pact*, 32 Env't Rep. (BNA) 582 (2001).

[44] *See* Susan Bruninga, *Legislation Calling for CO_2 Cut Could Not Pass Congress, Whitman Says*, 32 Env't Rep. (BNA) 582, 583 (2001).

[45] PERCIVAL, *supra* note 7, at 1070–71.

> At the new administration's first cabinet meeting, Treasury Secretary Paul O'Neill circulated copies of a speech he had given when CEO of Alcoa calling for a Manhattan Project to mobilize a governmental response to global climate change. . . . When word leaked that the new president would propose controls on carbon dioxide emissions in his first address to Congress, conservatives flooded the White House with emails protesting the decision. Bush then reversed course . . . .

Id. (citations omitted).

and mercury through a cap-and-trade market-based approach and proposed only voluntary reductions of carbon dioxide through a "Climate Leaders" initiative.[46] On February 12, 2003, the EPA announced a voluntary program, *Climate Vision*, which involves a private and public partnership "to pursue cost-effective initiatives that will reduce the projected growth in America's greenhouse gas emissions."[47]

2. *The Science of Human-Induced Climate Change*

In assessing climate change, the IPCC identified the profound influence that weather and climate have on life on earth.[48] Weather and climate have critical impacts on health, food production, and well-being, and many consider the potential impacts of human-induced climate change a matter for concern.[49] The atmosphere, the most unstable and rapidly changing part of the climate system, changes composition as the earth evolves.[50] A stable climate requires a balance between the incoming solar radiation and the outgoing radiation.[51] GHGs trap the heat within the earth's atmosphere and play an essential role in the earth's

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[46] *See Executive Summary—The Clear Skies Initiative*, *supra* note 11; *Global Climate Change Policy Book* (Feb. 2004) (discussing the Climate Leaders Initiative program to test new greenhouse gas reporting gudelines), *at* http://www.whitehouse.gov/news/releases/ 2002/02/climatechange.html.

[47] *See* Complaint ¶ 60, Massachusetts v. Whitman (D. Conn. June 4, 2003) (No. 3:03CV984) (citing Press Release, EPA Headquarters, Bush Administration Launches "Climate VISION" 2 (Feb. 12, 2003)); *see also* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,932 (Sept. 8, 2003).

[48] Baede et al., *supra* note 2, at 87 ("'[W]eather' . . . is the fluctuating state of the atmosphere around us, characterised by the temperature, wind, precipitation, clouds and other weather elements. . . . 'Climate' refers to the average weather in terms of the mean and its variability over a certain time-span and a certain area.").

[49] *See id*.

[50] *See id.*

> The climate system . . . is an interactive system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere . . . . The Earth's dry atmosphere is made up of nitrogen . . . , oxygen . . . , and argon . . . [, which] do not interact with infrared radiation emitted by the earth. However there are a number of trace gases, such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and ozone (O_3), which do absorb and emit infrared radiation.

Id.

[51] *Id*. at 89.

energy budget.[52] An increased concentration of GHGs in the atmosphere enhances the absorption and emission of infrared radiation, which causes a positive radiative trend known as the greenhouse effect.[53]

In addition to carbon dioxide, the following compounds are GHGs: methane, nitrous oxide, and chlorofluorocarbons.[54] These GHGs add to the effect of increased carbon dioxide in the atmosphere.[55] Though methane has a higher global warming potential than carbon dioxide, carbon dioxide makes up nearly fifty percent of the man-made GHGs, thus significantly contributing to the GHGs responsible for climate change.[56] Greenhouse gases account for three percent of the earth's atmosphere and can alter the climate system though present in relatively low concentrations.[57] The EPA acknowledges that scientists project climate changes of 2.2ºF–10ºF as a result of greenhouse gases by the year 2100.[58]

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[52] *See id.* at 87, 90. "To a large degree the coupling between the oceans and atmosphere determines the energy budget of the climate system. The oceans have a huge heat capacity and a decisive influence on the hydrological cycle of the climate system, and store and exchange large quantities of carbon dioxide." *Id.* at 94.

[53] *See id*. at 93.

> If the amount of carbon dioxide were doubled instantaneously, with everything else remaining the same, the outgoing infrared radiation would be reduced by about 4 Wm^{-2}. . . . To counteract this imbalance, the temperature of the surface-troposphere system would have to increase by 1.2ºC (with an accuracy of ±10%), in the absence of other changes. In reality, due to feedbacks, the response of the climate system is much more complex. . . . [T]he overall effect of the feedbacks amplifies the temperature increase to 1.5 to 4.5ºC. A significant part of this uncertainty range arises from our limited knowledge of clouds and there interaction with radiation. To appreciate the magnitude of this temperature increase, it should be compared with the global mean temperature difference of perhaps 5 or 6ºC from the middle of the last Ice Age to the present interglacial.

Id.

[54] HUNTER, *supra* note 1, at 599.

[55] *See* Baede et al., *supra* note 2, at 93 ("[The] total effect [of greenhouse gases other than carbon dioxide] at the surface is often expressed in terms of the effect of an equivalent increase in carbon dioxide.").

[56] HUNTER, *supra* note 1, at 599.

[57] *Id.* at 589.

[58] U.S. EPA, *Global Warming—Climate: Uncertainties*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ClimateUncertainties.html (last updated Jan. 7, 2000); *see also* Baede et al., *supra* note 2, at 87 (Variables such as "population change, economic change, technological development, and

Reviewing the carbon cycle reveals the complexity of the problem: carbon is fixed in green plants and microorganisms, which convert carbon dioxide into carbohydrates through photosynthesis.[59] Animals obtain carbon by ingesting plants and return carbon dioxide to the atmosphere through respiration.[60] The longer geological cycle produces carbon through the breakdown of sedimentary rocks.[61] The carbon remains in the shells of marine organisms, coal, and natural gases for up to hundreds of millions of years and may be released slowly through erosion.[62] Through the mining and drilling of fossil fuels, humans accelerate the geological release of carbon dioxide into the atmosphere.[63] Too rapid a release of man-made carbon dioxide may throw off the balance of exchanges,[64] since the forests, plants, and ocean algae may be unable to absorb the excessive releases.

The IPCC notes that "climate variations and change, caused by external forcings [sic], may be partly predictable, particularly on the larger, continental and global, spatial scales."[65] Accounting for variables, the IPCC developed various scenarios of human behavior to determine the impact of anthropogenic gases on the climate by taking into consideration such factors as population change, economic change, technological development, and other

other relevant characteristics of future human activity" also influence climate change.); *id.*at 92 ("[T]he warmth of the late 20th century appears to have been unprecedented during the millennium.").

[59] *See* I.C. Prentice et al., IPCC, *The Carbon Cycle and Atmospheric Carbon Dioxide*, *in* SCIENTIFIC BASIS, *supra* note 2, at 183, 191 (discussing the conversion of CO_2 to carbohydrate during photosynthesis). "Increasing carbon dioxide can therefore lead to structural and physiological changes in plants and can further affect plant competition and distribution patterns due to responses of different species." *Id.* at 191 (citations omitted).

[60] HUNTER, *supra* note 1, at 591 (citing M. SOROOS, THE ENDANGERED ATMOSPHERE 31 (1997)).

[61] *Id.* at 592 (citing M. SOROOS, THE ENDANGERED ATMOSPHERE 31 (1997)).

[62] *Id.* at 592 (citing M. SOROOS, THE ENDANGERED ATMOSPHERE 31 (1997)).

[63] *Id.* at 591 (citing M. SOROOS, THE ENDANGERED ATMOSPHERE 31 (1997)).

[64] *See* Prentice, *supra* note 59, at 190 tbl.3.1. The large amounts of carbon dioxide exchanged annually between the atmosphere and the ocean and between the land and the atmosphere represent a significant percentage of the atmospheric carbon dioxide content, often larger than the total anthropogenic contribution. An imbalance in exchanges could lead to "an anomaly of comparable magnitude to the direct anthropogenic perturbation." *Id.* at 191. *See generally* PERCIVAL, *supra* note 7, at 1056 ("While the greenhouse effect is a part of nature, the rapid increase in the atmospheric concentrations of greenhouse gases is directly caused by humankind's activities.").

[65] Baede et al., *supra* note 2, at 87.

"relevant characteristics of future human activity."[66] Science calls for predictions when variables are unknown, and, because all of these factors are subject to change, the IPCC based its forty scenarios on four different narrative storylines and used them to predict future carbon dioxide emissions.[67] Variations of these storylines form the basis for the scenarios describing a different "world evolving through the 21st century, and each may lead to quite different GHG emissions trajectories."[68] At first glance, the projection of climate change over the next one hundred years, ranging from an increase of 2.5ºF–10.4ºF,[69] appears to lend

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[66] *See id.*

[67] These four storylines are described as follows:

> *A1*: A future world of very rapid economic growth, global population that peaks mid-century and declines thereafter, and rapid introduction of new and more efficient technologies. Major underlying themes are economic and cultural convergence and capacity building, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system: fossil-intensive (A1F1), nonfossil energy sources (A1T), and a balance across all sources (A1B).
>
> *A2*: A differentiated world. The underlying theme is self-reliance and the preservation of local identities. Fertility patterns across regions converge very slowly, resulting in continuously increasing population. Economic development is primarily regionally oriented, and per capita economic growth and technological change are more fragmented and slower than other storylines.
>
> *B1*: A convergent world with rapid change in economic structures toward a service and information economy, reductions in material intensity, and introduction of clean technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improving equity, but without additional climate change policies.
>
> *B2*: A world in which the emphasis is on local solutions to economic, social, and environmental sustainability. This is a world with continuously increasing global population at a lower rate than in scenario A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the A1 and B1 storylines. Although this scenario also is oriented toward environmental protection and social equity, it focuses on the local and regional levels.

Timothy R. Carter et al., *Developing and Applying Scenarios*, *in* IMPACTS REPORT, *supra* note 6, 145, 176.

[68] *Id.* at 175–76; *see also* SCIENTIFIC BASIS, *supra* note 2, app. II, 799, 801–07 (providing a table of predicted greenhouse emissions per year under the different scenarios).

[69] *See* CLIMATE ACTION REPORT, *supra* note 9, app. D at 253; *see also Summary for Policymakers*, *supra* note 6, at 13, 69 (projecting 1.4ºC–4.5ºC

support to the concerns about the uncertainty of the impact of greenhouse gases on the global climate because scientists do not yet know the future human-induced variables that will influence climate change. The carbon emission contribution of future generations will remain an unknown until those generations are born, and the influence of the human-induced emissions may vary based upon weather and cloud patterns.[70] A closer look at the IPCC assessment yields greater confidence in the IPCC's thorough application of the scientific method as the scientists study multiple hypothetical situations in order to account for the uncertainties of the future.[71] For example, the IPCC in its Third Assessment projects on the one hand that North America could warm by 1ºC–3ºC over the next century under the low-emission *B1* case scenario but that, on the other hand, warming could be as high as 3.5ºC–7.5ºC for the higher-emission *A2* case scenario.[72] This Note argues that, under the current United States policy, which seeks to implement research to reduce the uncertainties surrounding global warming, regulatory action to reduce carbon dioxide emissions from the burning of fossil fuels will never be possible because we will never be able to predict the future with certainty.

Based on its scenarios, the IPCC makes projections of the impact of climate change on human health and the environment. These projections express the levels of certainty in the following manner: very likely (90–99%); likely (66–90%); and high

increase in globally averaged surface temperature by 2100); Lovgren, *supra* note 1 (reporting IPCC's projection of likely increase in temperature of 1.4ºC–5.8ºC by the year 2100); *cf.* Stewart Cohen et al., *North America*, *in* IMPACTS REPORT, *supra* note 6, at 735, 737 (noting that temperature increases in North America may range from 1ºC–7.5ºC over the next 100 years); EPA, *Global Warming—Climate: Climate* ("Scientists expect that the average global surface temperature could rise 1–4.5º (0.6–2.5ºC) in the next fifty years, and 2.2–10ºF (1.4–5.8ºC) in the next century with significant regional variation."), *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/Climate.html (last updated Jan. 7, 2000).

[70] *See* Carter et al., *supra* note 67, at 175 tbl.3-8 (listing climate variables such as cloud cover and precipitation as potentially having impacts on twenty-first century climate change).

[71] *See supra* notes 64–66 and accompanying text.

[72] Cohen et al., *supra* note 69, at 737. The *Climate Action Report* examines projected impacts under scenarios that project global average warming to range between 2.5ºC–4ºC. The IPCC focuses on impacts arising from an increase in global temperature of 1.4ºC–5.8ºC. *See* CLIMATE ACTION REPORT, *supra* note 9, at 82.

confidence (67–95%).[73] Higher maximum temperatures are projected as very likely in the twenty-first century over nearly all land areas, resulting in increased morbidity due to heat-related deaths, particularly in the elderly and the urban poor.[74] The IPCC projects with a high confidence level that increased maximum temperatures will result in heat stress in livestock and wildlife and an increased risk of damage to some crops in some areas.[75] In this scenario, the increase in demand for electrical cooling will reduce energy supply reliability.[76] On the positive side, the IPCC predicts with a high confidence level a decrease in cold-related human morbidity and mortality and decreased risk of damage to some crops.[77] Unfortunately, an extended range of activity for some pest- and vector-borne diseases may also result.[78] The increased temperatures associated with GHGs could have significant effects on public health, especially in developing countries.[79]

An increased summer drying over most mid-latitude continental interiors is projected as likely to produce an associated risk of drought.[80] The IPCC projects with a high confidence level that drought will yield a decrease in crops, increased damage to building foundations due to ground shrinkage, decreased water resource quantity and quality, and increased risk of forest fires.[81] An increase in tropical cyclone peak wind intensities, as well as in mean and peak precipitation intensities, is likely in some areas, and the IPCC projects with high confidence that the following impacts will occur: increased risk to human life, increased risk of infectious disease epidemics, increased coastal erosion and damage to coastal buildings and infrastructure, and increased damage to coastal ecosystems such as coral reefs and mangroves.[82]

Projections of the impact of increased temperatures suggest reduced lake levels for the Great Lakes and the St. Lawrence River

[73] Carter et al., *supra* note 67, at 180 tbl.3-10, note a.
[74] *See id*. at 180 tbl.3-10.
[75] *See id*.
[76] Carter et al., *supra* note 67, at 180 tbl.3-10.
[77] *See id.*
[78] *See id*.
[79] HUNTER, *supra* note 1, at 596.
[80] IMPACTS REPORT, *supra* note 6, at 180 tbl.3-10.
[81] *See id*.
[82] *See id*.

under most of the IPCC's scenarios.[83] Seasonal shifts in runoff are likely to occur where snowmelt is crucial to the hydrological regime.[84] In addition, changes in the frequency and severity of precipitation may require changes in land use and infrastructure to avoid damage arising from an increased threat of flooding, landslides, and contamination to natural water sources in North America.[85] The IPCC identifies a growing concern for North America due to the financial losses resulting from extreme weather.[86]

The United States issued its own report in May 2002 when the State Department offered to the United Nations the *U.S. Climate Action Report*, which was prepared in response to obligations of the UNFCCC Articles 4 and 12.[87] In the *Climate Action Report*, the term "likely" represents an impact that is "more plausible than other outcomes,"[88] and the report uses the term "very likely" to represent an impact that is "much more plausible than other outcomes."[89] The *Climate Action Report* therefore attaches language to scientific measurements reminiscent of a legal standard that may require significant interpretation, whereas the IPCC report associates levels of certainty with percentages.[90] At

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[83] Cohen et al., *supra* note 69, at 737. "The only exception is the *HadCM2* transient scenario incorporating . . . sulfate aerosol emissions, which suggests slight increases in lake levels and outflows." *Id*.

[84] *See id*.

[85] *See id*.

[86] *See id.* at 741 ("In the United States, there were 28 [extreme weather] events during the 1980–1997 period with losses exceeding US$1 billion. The most costly were the droughts and heat waves of 1988 and 1990, Hurricane Andrew in 1992, and the 1993 Mississippi River Flood, with combined costs exceeding US$100 billion.").

[87] *See* CLIMATE ACTION REPORT, *supra* note 9. The EPA published notice soliciting public comment on the *Climate Action Report* on March 19, 2001. *See* Preparation of Third U.S. Climate Action Report, 66 Fed. Reg. 15,470 (Mar. 19, 2001). The EPA published a second notice soliciting public comment on November 15, 2001. *See* Preparation of Third U.S. Climate Action Report, 66 Fed. Reg. 57,456 (Nov. 15, 2001).

[88] *See* CLIMATE ACTION REPORT, *supra* note 9, at 83; *see also* Complaint ¶ 56, Massachusetts v. Whitman (D. Conn. June 4, 2003) (No. 3:03CV984). *But see* Carter et al., *supra* note 67, at 180 tbl.3-10, note a (defining "likely" as representing a 90–99% chance of occurring).

[89] *See* CLIMATE ACTION REPORT, *supra* note 9, at 83; *cf.* Carter et al., *supra* note 67, at 180 tbl.3-10, note a (defining "very likely" as representing a 66–90% chance of occurring).

[90] *Compare* CLIMATE ACTION REPORT, *supra* note 9, at 83, *with* Carter et al., *supra* note 67, at 180 tbl.3-10, note a. Note that, when assessing the likelihood

the same time, the *Climate Action Report* frequently traces the language of the IPCC Third Assessment, including the "likely" language.[91]

The *Climate Action Report* identifies the following impacts as likely or very likely to occur in the United States during the twenty-first century as a result of carbon dioxide induced global warming:[92]

- increases in mean temperature in the contiguous United States of as much as three to nine degrees Fahrenheit;[93]
- increases in sea levels of up to four to thirty-five inches;[94]
- increases in precipitation, and increases in the damage caused by hurricanes;[95]
- losses of sensitive ecosystems such as coral reefs and coastal wetlands;[96]
- changes in the growth rates of plants[97] and the location of forests;[98]
- shifts in the ranges of species of fish and shellfish due to a narrowing of water temperature ranges in some estuaries;[99]
- increases in frequency and severity of heat waves;
- and other adverse impacts on land and water ecosystems, some of the effects of which may be mitigated through adaptation.[100]

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of harm to human health, the policy maker or scientist must keep in mind the standard that the utilized report requires.

[91] *See* CLIMATE ACTION REPORT, *supra* note 9, at 83.

[92] *See id*. at 84.

[93] *See id.* The *Climate Action Report* refers to IPCC scenarios within the mid-range of projections, which is narrower than the IPCC's full range. *See id.* at 82.

[94] *See id*. at 103.

[95] *See id*. at 100–01.

[96] *See id*. at 104.

[97] *See id*. at 91.

[98] *See id*. at 98.

[99] *See id*. at 103.

[100] *See id*. at 81–112 (Note that this report recognizes other potential contributors to the adverse effects that global warming is likely or very likely to bring about.)

In addition, the *Climate Action Report* identifies the following impacts upon public health or welfare as matters of concern or risks in the United States:

- groundwater shortages;[101]
- droughts and flooding;[102]
- temperature-related illnesses and deaths;[103]
- and the spread of certain infectious diseases.[104]

B. *The Clean Air Act and Criteria Pollutants*

In the Clean Air Act, Congress distinguishes between two types of air pollutants: (1) hazardous pollutants, those causing death or serious illness, and (2) criteria pollutants (the focus of this Note), so named because the EPA must issue criteria documents under section 108 of the CAA.[105] Under section 108(a)(1), Congress charges the Administrator with the duty of listing and revising the list of criteria pollutants for the purpose of issuing air quality criteria under section 108(a)(2).[106] Section 109 then requires the Administrator to publish NAAQS for these criteria pollutants.[107] The states are responsible for adopting state implementation plans (SIPs) for the NAAQS established for the listed criteria pollutants.[108]

Section 108(a) provides in pertinent part:

> (1) For the purpose of establishing national primary and secondary ambient air quality standards the administrator shall . . . publish, and shall from time to time thereafter revise, a list which includes each air pollutant—
>
> (A) emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare;

[101] *See id*. at 100 (Groundwater shortages would be a result of waterborne diseases and water supply contamination due to damage to sewage systems).
[102] *See id*. at 100-01 (noting effects on climate extremes).
[103] *See id*. at 106.
[104] *See id*. at 108.
[105] *See* 42 U.S.C. §§ 7408, 7412 (2000).
[106] *See* 42 U.S.C. § 7408(a) (2000).
[107] *See* 42 U.S.C. § 7409 (2000).
[108] *See* 42 U.S.C. § 7410 (2000).

> (B) the presence of which in the ambient air results from numerous or diverse mobile or stationary sources; and
>
> (C) for which air quality criteria had not been issued before the date of enactment of the Clean Air Act Amendments of 1970, but for which he plans to issue air quality criteria under this section.[109]

The language of section 108(a)(1) raises four questions, the discussion of which will establish the framework for this Note's analysis of whether carbon dioxide must be listed as a criteria pollutant: First, what qualifies as an air pollutant for consideration under the Clean Air Act? Second, does the Administrator have a duty to revise the list of criteria pollutants? Third, how are the requirements for the criteria pollutant test to be applied? Finally, what data must the Administrator use when determining whether a pollutant meets the requirements under section 108(a)(1)?

1. *What Qualifies as an "Air Pollutant" for Purposes of Listing a Criteria Pollutant Under the Clean Air Act?*

Before analyzing whether a substance fulfills the requirements of section 108(a) of the Clean Air Act, the Administrator must initially determine that a substance is an "air pollutant."[110] According to section 302(g), an air pollutant is defined as:

> any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive (including source material, special nuclear material, and byproduct material) substance or matter which is emitted into or otherwise enters the ambient air. Such term includes any precursors to the formation of any air pollutant, to the extent that the Administrator has identified such precursor or precursors for the particular purpose for which the term "air pollutant" is used.[111]

The Clean Air Act therefore defines "air pollutant" broadly,[112] indicating that the term encompasses any "air pollution agent or combination of such agents."[113] Under section 302(g), the

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[109] 42 U.S.C. § 7408(a)(1) (2000).

[110] *See id.*

[111] 42 U.S.C. § 7602(g) (2000).

[112] *See, e.g.*, Alabama Power Co. v. Costle, 636 F.2d 323, 353 (D.C. Cir. 1979) (stating that "§ 302(g) defines [air pollutant] extremely broadly").

[113] 42 U.S.C. § 7602(g).

Administrator has discretion to identify air pollutant precursors as air pollutants, but the language of the statute indicates that all air pollution agents are automatically air pollutants under the Clean Air Act.[114]

2. *Does the Administrator Have a Duty to Revise the List of Criteria Pollutants?*

The language of the CAA requires the Administrator to publish a list of pollutants, and "from time to time thereafter revise, a list which includes each air pollutant."[115] Does the term "revise" under section 108 mean "to add to" or "remove from" the initial list, or does the term "revise" mean to modify the criteria for the listed pollutants? The statutory language of the CAA, case law, legislative history, and previous action taken by the Administrator in adding airborne lead to the original list of criteria pollutants indicate that the mandate for the agency to revise the list of criteria pollutants requires the Administrator to add potential pollutants that meet the requirements of section 108(a)(1) to the list of criteria pollutants.[116]

First, with respect to the statutory language, note that the mandate, "[s]hall . . . revise," is found in the language of section 108(a)(1), which establishes the requirements for listing a pollutant as a "criteria pollutant," rather than in section 108(a)(2), which requires the Administrator to issue air quality criteria for the listed pollutants.[117] Since the mandate "to revise" is attached to the language setting forth the requirements for the listing of a criteria pollutant, the plain language of the statute indicates that Congress intended that the list itself be revised.[118]

Furthermore, section 108(a)(2) requires the Administrator to

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[114] *See id*.

[115] *See* 42 U.S.C. § 7408(a)(1).

[116] *See* NRDC v. Train, 545 F.2d 320 (2d Cir. 1976).

[117] *Compare* 42 U.S.C. § 7408(a)(1), *with* 42 U.S.C. § 7408(a)(2) (2000).

[118] *See id*. (emphasis added). Mandatory language (i.e., "shall") is used. Congress intended for the Administrator to revise air quality criteria and primary and secondary standards as well. The provision in CAA section 109(d)(1) requires the Administrator (every five years and as needed) to review the air quality criteria under section 108 and the NAAQS promulgated under section 109. *See* 42 U.S.C. § 7409 (2000). The review and revision mandate in section 108 speaks to the revision of the list of criteria pollutants, whereas the review and revision mandate of section 109 speaks to the revision of the published criteria under section 108 and the NAAQS set under section 109.

issue air quality criteria within twelve months of including "such" pollutant on a list, indicating that pollutants would be added to the original list.[119] Congress must have intended that additional pollutants would be added to the list of criteria pollutants; otherwise the language of section 108(a)(2) would be superfluous. Additionally, the language of section 109(a)(1)(A)—which charges the Administrator to, within thirty days of the 1970 enactment, publish proposed NAAQS for the previously listed criteria pollutants—indicates that Congress intended that the Administrator would later list new criteria pollutants.[120] The language of section 109(d)(1) further indicates that the NAAQS and the list of criteria pollutants under section 108 must be re-evaluated and revised every five years and as needed.[121]

Case law has further refined the requirements of section 108. In 1976, the Natural Resources Defense Council (NRDC) sued the EPA administrator, Russell Train, to compel him to list lead as a criteria pollutant under the CAA.[122] On appeal, the Second Circuit held that the Administrator had a nondiscretionary duty to list a potential pollutant as a criteria pollutant when the requirements of section 108(a)(1)(A)–(B) are met.[123] In *NRDC v. Train,* the EPA stipulated that the requirements of section 108(a)(1)(A)–(B) were met, but insisted that listing was at the discretion of the administrator, relying on the language of section 108(a)(1)(C), which stated that the Adminstrator shall include on the list air pollutants "for which air quality criteria had not been issued before December 31, 1970, but for which he plans to issue air quality criteria under this section."[124] The Administrator viewed section

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[119] *See* Clean Air Amendments of 1970, Pub. L. No. 91-604, § 108(a)(2), 84 Stat. 1676, 1678–79 (codified as amended at 42 U.S.C. § 7408(a)(2).

[120] *See* 42 U.S.C. § 7409(a)(1)(A) (2000).

[121] *See* 42 U.S.C. § 7409(d)(1) (2000).

> Not later than December 31, 1980, and at five-year intervals thereafter, the Administrator shall complete a thorough review of the criteria . . . and the national ambient air quality standards . . . and shall make such revisions in such criteria and standards and promulgate such new standards as may be appropriate . . . .

Id.

[122] NRDC. v. Train, 411 F. Supp. 864, 866 (S.D.N.Y. 1976), *aff'd*, 545 F.2d 320 (2d Cir. 1976).

[123] NRDC v. Train, 545 F.2d 320, 325 (2d Cir. 1976).

[124] Clean Air Amendments of 1970, Pub. L. No. 91-604, § 108(a)(1)(C), 84 Stat. 1676, 1678–79 (codified as amended at 42 U.S.C. § 7408(a)(1)(C) (2000)). *See* NRDC v. Train, 545 F.2d at 322.

108(a)(1)(C) as a third prong to the test for identifying a criteria pollutant.[125] Because section 108(a)(1)(C) refers to the "plans" of the Administrator, the EPA argued that the Administrator should have had complete discretion when deciding to add to the list of criteria pollutants.[126] The EPA asserted that the Administrator had the discretion to choose to regulate lead under section 211 (providing for the regulation of fuels), as an alternative to regulating under section 108(a)(1).[127] The court, however, read the statutory provisions in section 108, setting the NAAQS, and in section 211, establishing the lead content in motor vehicle gasoline, neither as mutually exclusive nor as alternative provisions.[128] Though lead was regulated under section 211, the Administrator was still required to list lead as a criteria pollutant under section 108, since lead met the first two criteria of section 108.[129]

The *NRDC v. Train* court therefore rejected the EPA's interpretation that the Administrator's duty to name lead as a criteria pollutant was discretionary, reasoning that the language of section 108(a)(1) contains mandatory language—"the Administrator shall . . . publish . . . and . . . revise . . . a list"—and, if the court accepted the EPA's interpretation, the language in section 108(a)(1) would become "mere surplusage."[130] The *NRDC v. Train* court viewed the admittedly ambiguous language of section 108(a)(1)(C) in the context of the Act as a whole and its legislative history, arguing that Congress's inclusion of a specific timetable "would be an exercise in futility" if the Administrator could choose not to issue air quality criteria.[131] The *NRDC v. Train* court cited to a Senate Report anticipating the addition of pollutants to the list under sections 108 and 109.[132] The report noted that air quality criteria had been issued for five pollution

[125] *See* NRDC v. Train, 545 F.2d at 322.

[126] *Id.*

[127] *Id.*; *see also* Clean Air Amendments of 1970, Pub. L. No. 91-604, § 211(c)(1)(A), 84 Stat. 1676, 1698 (codified as amended at 42 U.S.C. § 7545 (2000)).

[128] *See* NRDC v. Train, 545 F.2d at 327.

[129] *See id.* at 328.

[130] *Id.* at 324–25.

[131] *Id.* at 327–28 ("The discretion . . . does not extend to the issuance of air quality standards for substances derived from specified sources which the administrator has already adjudged injurious to health.").

[132] *See id.* at 326 (citing S. REP. NO. 4358 (1970)).

agents in 1970 (sulfur oxides, particulates, carbon monoxide, hydrocarbons, and photochemical oxidants) and then identified other contaminants of broad national concern including fluorides, nitrogen oxides, polynuclear organic matter, lead, and odors.[133] The report then stated that "others may be added to this group as knowledge increases."[134] The *NRDC v. Train* court found that though the Administrator planned to issue air quality criteria for specific pollutants prior to the enactment of the 1970 CAA, such prior planning by the Administrator was not a separate requirement for listing as a "criteria pollutant" under CAA section 108(a)(1).[135]

More than a dozen years later, in *Environmental Defense Fund (EDF) v. Thomas*, a number of environmental groups and six states challenged the Administrator's failure to revise the NAAQS for sulfur oxides.[136] In response to the specific 1977 amendment calling for review and revision of the NAAQS by December 31, 1980,[137] the Administrator reviewed air quality criteria for sulfur oxides (one of the original criteria pollutants) in 1979.[138] The Administrator took no official action, neither revising nor declining to revise the standards.[139] The court in *EDF v. Thomas* held that while the determination of whether to revise the NAAQS was at the discretion of the Administrator, the Administrator's duty to make a determination was nondiscretionary since the 1984-85 critical assessment triggered a mandatory decision-making process by the Administrator.[140] The court held that the Administrator had the discretion to determine the form and substance of the NAAQS at issue but that the Administrator had a nondiscretionary duty to make some formal decision based on the critical assessment.[141]

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[133] *Id.*

[134] *Id.*

[135] *See id.* at 324–25.

[136] 870 F.2d 892, 894 (2d Cir. 1989). In *Environmental Defense Fund v. Thomas*, the Administrator did not stipulate that the NAAQS for sulfur oxides met the requirements of 42 U.S.C. § 7408(a)(1)(A)–(B), and the court held that the duty to revise the NAAQS was discretionary because the requirements were in fact not met, *id.*at 900, whereas, in *NRDC v. Train*, the court held that the Administrator's duty was nondiscretionary because the administrator had found that the listing criteria were met. *See* text accompanying *supra* note 122.

[137] Clean Air Amendments of 1977, Pub. L. No. 95-95, § 106(a)(d)(1), 91 Stat. 685, 691 (codified as amended at 42 U.S.C. § 7409(d)(1) (2000)).

[138] *See* EDF v. Thomas, 870 F.2d at 895.

[139] *Id.*

[140] *See id.* at 900.

[141] *See id.*

The *EDF v. Thomas* court distinguished its decision from *NRDC v. Train*, stating that the decision in *NRDC v. Train* was "a thoroughly ministerial one," while the issue in *EDF v. Thomas* required the court to consider directing the Administrator to revise the NAAQS in a particular manner.[142] Although the court in *EDF v. Thomas* did not order the Administrator to make a specific revision of the NAAQS, the 1984–85 "critical assessment"[143] triggered a nondiscretionary duty for the EPA to determine whether and what kind of a decision was necessary.[144] *Environmental Defense Fund v. Thomas* therefore does nothing to undermine the decision in *NRDC v. Train* that the Administrator has a nondiscretionary duty to list a pollutant that meets the requirements under section 108(a)(1)(A)–(B).[145]

Legislative history further indicates that Congress intended for the Administrator to fulfill the statutory mandate to re-evaluate and revise the list of criteria pollutants, adding to that list when necessary. Because there was not a formal procedure in place for evaluating the list of "criteria pollutants," Congress established a more specific plan for revision in the 1977 Clean Air Act Amendments, mandating that the standards be revised by December 31, 1980, and every five years thereafter.[146] In the

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[142] *Id.* at 899–900.

> *Train* is still distinguishable from the present case. The duty at issue in *Train* was a thoroughly ministerial one. We did no more than affirm an order compelling the EPA to include "lead" on a list and to issue some NAAQS for lead. We did not, however, specify the content of those NAAQS. *Train* thus stands solely for the proposition that the district court has jurisdiction, under Section 304, to compel the Administrator to perform purely ministerial acts, not to order the Administrator to make particular judgmental decisions. An order in the instant case to the Administrator to revise the NAAQS for SOx would be essentially meaningless and unenforceable unless it also directed that he revise those NAAQS in a particular manner. Formulating the details of substantive NAAQS, however, clearly requires the sort of scientific judgment that is the "hallmark" of agency discretion.

Id. (citations omitted).

[143] *Id.* at 895.

[144] *Id.* at 900 ("No discernible congressional purpose is served by creating a bureaucratic twilight zone, in which many of the [CAA's] purposes might become subject to evasion.").

[145] *See id.* at 895 (Once the Administrator completed the critical assessment, the Administrator had a nondiscretionary duty to make a decision to revise the NAAQS or not to revise the NAAQS.).

[146] *See* Clean Air Act Amendments of 1977, Pub. L. No. 95-95, § 106, 91 Stat. 685, 691 (codified as amended at 42 U.S.C. § 7409 (2000)).

Senate Report accompanying the proposal for the 1990 Clean Air Act Amendments, the Senate expressed regret that the congressional mandate (to reissue or revise ambient standards by December 31, 1980) was "clearly not being met."[147] The Senate referred to the listing of lead in 1978 as one of only two new standards promulgated by the agency prior to the end of 1980, and credited litigation with stimulating EPA compliance.[148] The Senate urged the Administrator to fulfill the duty to evaluate the list of criteria pollutants, with an eye toward adding to the list in addition to revising air quality criteria for the original criteria pollutants.[149]

To summarize, the language of sections 108 and 109, case law, legislative history, and the action of the EPA in listing lead as a criteria pollutant all indicate that Congress intended for the Administrator to re-evaluate and revise the list of criteria pollutants under section 108(a)(1). Next, this Note will look at the requirements under the Clean Air Act section 108(a)(1)(A)–(B) establishing the test for the Administrator's mandatory duty to list a potential pollutant as a criteria pollutant.

3. *What Must the Administrator Do When Applying the Test in Section 108(a)(1)?*

As discussed above, upon determining that a substance is an air pollutant, the Administrator must implement the test found in section 108(a)(1)(A)–(B) in order to evaluate whether a potential air pollutant must be added to the list of criteria pollutants. If the Administrator determines that in her judgment a potential air pollutant (A) is one whose emissions "cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare" and (B) "the presence of which in the ambient air results from numerous or diverse mobile or stationary sources,"[150] the Administrator has a nondiscretionary duty to list

[147] S. REP. NO. 101-228, at 6 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3392.

[148] *See id.* at 5.

[149] *See id*. at 5–6 (The Senate uses almost a derisive tone to discuss the lack of action taken by EPA with respect to the congressional mandate to reissue and revise, citing the few actions taken since the 1977 amendments, of which two were court initiated.)

[150] 42 U.S.C. § 7408(a)(1) (2000). The language of the 1970 version of section 108(a)(1)(A), in place when *Train* was decided, read as follows: "which in his judgment has an adverse effect on public health or welfare." Clean Air

the pollutant as a "criteria pollutant."[151] The *NRDC v. Train* court identified the test for listing a criteria pollutant under section 108(a)(1) as an independent analysis for each potential pollutant, requiring the EPA to look only at the requirements under section 108(a)(1)(A)–(B), without considering any other regulatory schemes that might be available to the Administrator.[152]

In 1971 and 1978, the EPA administrator determined that the requirements of section 108(a)(1)(A)–(B) were met prior to issuing air quality criteria for nitrogen oxides[153] and airborne lead,[154] the two current criteria pollutants for which air quality criteria had not been issued prior to December 31, 1970.[155] The EPA in January 1971 announced that it would establish air quality criteria[156] for nitrogen oxides based on the following assessment:

> Nitrogen oxides result from the fixation of nitrogen and oxygen at high temperatures and are typically associated with the

Amendments of 1970, Pub. L. No. 91-604, § 108(a)(1)(A), 84 Stat. 1676, 1678 (codified as amended at 42 U.S.C. § 7408(a)(1)(A) (2000)). This Note will address the impact of the difference between the 1970 language and the current language on the determination of whether a pollutant must be listed as a criteria pollutant.

[151] *See* NRDC v. Train, 545 F.2d 320, 325 (2d Cir. 1976).

[152] *Id.* at 327.

[153] *See* Notice of Proposed Standards for Sulfur Oxides, Particulate Matter, Carbon Monoxide, Photochemical Oxidants, Hydrocarbons, and Nitrogen Oxides, 36 Fed. Reg. 1502 (Jan. 30, 1971) ("The Administrator has determined that nitrogen oxides . . . are air polluants which adversely affect public health and welfare.").

[154] *See* National Primary and Secondary Ambient Air Quality Standards for Lead, 43 Fed. Reg. 46,246 (Oct. 5, 1978); *see also* NRDC v. Train, 545 F.2d at 324.

[155] *See* Notice of Proposed Standards for Sulfur Oxides, Particulate Matter, Carbon Monoxide, Photochemical Oxidants, Hydrocarbons, and Nitrogen Oxides, 36 Fed. Reg. at 1502 (noting that prior to December 31, 1970, air quality criteria had been issued for sulfur oxides, particulate matter, carbon monoxide, photochemical oxidants, and hydrocarbons).

[156] *See generally* Lead Industries Ass'n v. EPA, 647 F.2d 1130, 1136–37 (D.C. Cir. 1980).

> Section 108 makes it clear that the term "air quality criteria" means something different from the conventional meaning of "criterion"; such "criteria" do not constitute "standards" or "guidelines," but rather refer to a document to be prepared by EPA which is to provide the scientific basis for promulgation of air quality standards for the pollutant. This criteria document must "accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health or welfare . . . ."

Id. (citing 42 U.S.C. § 7408(a)(2) (2000)).

> combustion processes. They are also related to certain chemical processes. The principal nitrogen oxide formed in the combustion process is nitric oxide. This compound *has not been shown to have health or welfare effects at present or anticipated ambient concentrations*. However there are several atmospheric reactions which lead to the oxidation of nitric oxide, and the presence of nitrogen dioxide in the ambient air has been associated with a variety of respiratory diseases. Nitrogen dioxide is essential to the production of photochemical smog. At higher concentrations its presence has been implicated in the corrosion of electrical components as well as vegetation damage.[157]

The EPA indicated some level of uncertainty by not specifying the "several atmospheric reactions" that lead to the oxidation of the nitric oxide compound, which had no known present or anticipated effects on health or welfare but which resulted in nitrogen dioxide, a compound associated with various respiratory diseases.[158] Though the 1970 section 108 standard ("has an adverse effect on public health or welfare"[159]) was less precautionary than the current section 108 standard ("may reasonably be anticipated to endanger health or welfare"[160]), the Administrator still recognized that a pollutant, nitric oxide, which has "not been shown to have health or welfare effects at present or anticipated ambient concentrations,"[161] was worthy of listing as a criteria pollutant.

In examining the EPA's criteria for airborne lead, the D.C. Circuit recognized that "centuries of mining and smelting, and the use of lead in a variety of human activities, have increased the natural background concentration of lead in the environment."[162] The EPA admitted that when lead is present in the body "in

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[157] *See* Notice of Proposed Standards for Sulfur Oxides, Particulate Matter, Carbon Monoxide, Photochemical Oxidants, Hydrocarbons, and Nitrogen Oxides, 36 Fed. Reg. at 1502 (emphasis added).

[158] *See id*.

[159] Clean Air Amendments of 1970, Pub. L. No. 91-604, § 108(a)(1), 84 Stat. 1676, 1678 (codified as amended at 42 U.S.C. § 7408(a)(1) (2000)).

[160] 42 U.S.C. § 7408(a)(1) (2000).

[161] *See* Notice of Proposed Standards for Sulfur Oxides, Particulate Matter, Carbon Monoxide, Photochemical Oxidants, Hydrocarbons, and Nitrogen Oxides, 36 Fed. Reg. at 1502.

[162] *See* Lead Industries Ass'n v. EPA, 647 F. 2d 1130, 1135 (D.C. Cir. 1980) (citing U.S. EPA, *Air Quality Criteria for Lead* 1-1 and Joint Appendix A (JA) 1105).

sufficient concentration [it] attacks the blood, kidneys, and central nervous and other systems, and causes anemia, kidney damage, severe brain damage, and death."[163] Furthermore, the EPA identified the difficulty of setting a standard for airborne lead, since lead can enter the body of the individual through several sources: diet, placing hands on lead-based objects and then placing hands in the mouth, and breathing lead-contaminated air.[164]

Despite the difficulty of identifying the lead contribution from a specific source, the EPA listed lead as a criteria pollutant. The EPA found that the exhaust of motor vehicles powered by leaded gasoline accounted for eighty-eight percent of the total lead emissions in the United States.[165] Of the remaining twelve percent, eight percent of lead emissions resulted from solid waste incineration and the combustion of waste oil, and four percent came from industrial facilities in the U.S.[166] Therefore, though lead emissions were already regulated under section 211[167] as a fuel additive, though the source of lead (i.e., emission or ingestion) made it difficult to identify the contribution to adverse health effects of airborne lead, and though stationary sources only accounted for twelve percent of the airborne lead emissions while mobile sources accounted for eighty-eight percent, the Administrator was still required to list lead as a criteria pollutant under section 108.

4. *Under Section 108(a), on What Data Must the Administrator Base Her Decision When Evaluating a Potential "Criteria Pollutant"?*

Under the Clean Air Act section 108(a)(2), air quality criteria established for the listed pollutants must accurately reflect the "latest scientific knowledge," as that data identifies the effects of the pollutant on public health and welfare.[168] When establishing the NAAQS for the "criteria pollutants" under section 109 (a

[163] *Lead Industries Ass'n*, 647 F.2d at 1135–36 (citing U.S. EPA, *Air Quality Criteria for Lead* 1-6, 1-9 and JA 1110–13)

[164] *Id.* at 1136 (citing U.S. EPA, *Air Quality Criteria for Lead* 1-5, 7-9 and JA 1108, 1179).

[165] *Id.* at 1136 (citing U.S. EPA, *Air Quality Criteria for Lead* 5-3 and JA 1140).

[166] *Id.* at 1136 (citing U.S. EPA, *Air Quality Criteria for Lead* 5-3 and JA 1140).

[167] 42 U.S.C. § 7545(k)(3)(A)(iii) (2000).

[168] *See* 42 U.S.C. § 7408(a)(2) (2000).

separate question from the initial listing of the pollutant as a "criteria pollutant"), the Administrator must appoint an independent scientific review committee to advise on the mandatory five-year revision and to review criteria and standards under section 109(d)(1).[169] The seven-member independent scientific review committee is to include at least one member of the National Academy of Sciences, one physician, and one person representing state air pollution control agencies.[170] The Administrator has an obligation to review the latest scientific data when determining whether a pollutant is reasonably anticipated to endanger public health or welfare, and the scientific review committee must advise the Administrator when "additional knowledge" is required to enable the Administrator to appraise the revisions made pursuant to sections 108 and 109 for criteria pollutants.[171]

III. ANALYSIS: DOES THE ADMINISTRATOR HAVE A MANDATORY DUTY TO LIST CARBON DIOXIDE AS A CRITERIA POLLUTANT UNDER THE CLEAN AIR ACT SECTION 108(A)(1)?

Based on the interpretation of section 108 discussed in Part II, the Administrator's analysis of whether carbon dioxide must be listed as a criteria pollutant is independent from the question of Congress's regulation or nonregulation of carbon dioxide under any other statutory or nonstatutory provisions, and the analysis must be based solely upon satisfying the requirements of section 108(a)(1)(A)–(B).[172] To determine whether carbon dioxide must be listed as a criteria pollutant under section 108(a)(1), the Administrator should ask, according to the latest scientific studies:

(1) Is carbon dioxide an air pollutant under the CAA?

(2) Does carbon dioxide cause or contribute to air pollution?

(3) Is the presence of carbon dioxide in the ambient air

[169] *See* 42 U.S.C. § 7409(d)(1) (2000).

[170] *See id.*

[171] *See* 42 U.S.C. § 7409(d)(2)(C) (2000) (The committee must advise the Administrator on, among other things, "the relative contribution to air pollution concentrations of natural as well as anthropogenic activity" and "any adverse public health, welfare, social, economic or energy effects which may result from various strategies for attainment and maintenance of [NAAQS].").

[172] *See* NRDC v. Train, 545 F.2d 320, 325 (2d Cir. 1976).

reasonably anticipated to endanger public health or welfare?

(4) Is the presence of carbon dioxide in the ambient air a result of numerous or diverse mobile or stationary sources?[173]

If the Administrator answers yes to all of these questions, then the Administrator has a nondiscretionary duty to list carbon dioxide as a criteria pollutant. The Administrator does not have the discretion to choose among a variety of regulatory schemes.

A. *Is Carbon Dioxide an Air Pollutant Under the Clean Air Act?*

As discussed in Part II.B.1, only a substance that qualifies as an "air pollutant" may be considered under the CAA's NAAQS program. On March 11, 1998, Carol Browner, the former administrator of the EPA, told Representative Tom DeLay during appropriation hearings that the CAA provides the necessary authority to regulate carbon dioxide emissions, and Browner requested a legal memorandum on the issue from General Counsel Jonathan Cannon.[174] In a 1998 memorandum to Browner, Cannon addressed whether carbon dioxide and three other pollutants fell within the CAA's definition of an "air pollutant."[175] The Cannon memo identified the broad definition of an "air pollutant" under section 302(g) and concluded that carbon dioxide was an "air pollutant" within the meaning of the CAA.[176]

In determining whether carbon dioxide falls within the definition of an air pollutant, the fact that the substance is naturally occurring is not determinative, as the EPA has already regulated some naturally occurring substances that are harmful to human health, welfare, or the environment.[177] In General Counsel Gary S. Guzy's testimony during legislative hearings in 1999, he also described carbon dioxide as an "air pollutant" under the CAA—

[173] *See* 42 U.S.C. § 7408(a)(1)(B) (2000).

[174] *See Is CO_2 a Pollutant and Does EPA Have the Power to Regulate It?: J. Hearing of the Subcomm. on Nat'l Econ. Growth, Natural Res. & Regulatory Affairs of the Comm. on Gov't Reform and the Subcomm. on Energy and Env't of the Comm. on Sci.*, 106th Cong. 16 (1999) [hereinafter *Joint Hearing*] (testimony of Gary S. Guzy, General Counsel, EPA) (describing Browner's appearance before the committee).

[175] Memorandum from Jonathan Z. Cannon to Carol M. Browner, *supra* note 18, at 1 (discussing the EPA's authority to regulate emissions of carbon dioxide).

[176] *See id*. at 2–3.

[177] *See* Memorandum from Jonathan Z. Cannon to Carol Browner, *supra* note 18, at 3.

affirming Cannon's memo—and stated that a substance can be an "air pollutant" under the CAA even if the pollutant has both natural and man-made sources.[178] Guzy also testified that while carbon dioxide is an "air pollutant" within the scope of the Clean Air Act, "this by itself does not lead to regulation," and the Clean Air Act provides a number of regulatory schemes for an "air pollutant."[179] In this context, he then raised the section 108 problem regarding carbon dioxide, describing the section 108(a)(1) factors for determining whether an "air pollutant" is a "criteria pollutant."[180]

Later, however, the EPA withdrew EPA's prior admissions and concluded that GHGs, including carbon dioxide, are not air pollutants under the CAA's regulatory provisions, and so are not subject to regulation under sections 108 and 109.[181] On September 8, 2003, the EPA definitively ruled in response to a section 202 petition that carbon dioxide was not an air pollutant subject to regulation under the CAA and that "[the EPA] cannot and should not regulate GHG emissions from motor vehicles under the Clean Air Act."[182] The EPA stated in the ruling, written by Jeffrey Holmstead, Assistant Administrator for Air and Radiation, that "it is hard to imagine any issue in the environmental area having greater 'economic and political significance' than regulations that might lead to global climate change."[183] In the ruling, the EPA considered whether the regulation of carbon dioxide emissions would raise economic and political issues, thereby reading a cost factor into the air pollutant analysis contrary to the NAAQS

[178] *See Joint Hearing*, *supra* note 174, at 17.

[179] *Id.*at 18.

[180] *Id.* at 17.

[181] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,928 (Sept. 8, 2003); *see also* Plaintiff's Notice of Dismissal Without Prejudice ¶ 1, Massachusetts v. Horinko (D. Conn. 2003) (No. 3:03CV984). On the same day as the section 202 ruling, the EPA, referring to its action on the 202 petition, served a motion to dismiss the New England states' section 108 lawsuit.

[182] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,925.

[183] *Id* at 52,928. CAA section 202(a)(1) requires the Administrator to set standards for "any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may be reasonably anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1) (2000).

system of sections 108 and 109.[184] The EPA relied heavily upon a memorandum from Robert Fabricant, General Counsel for the EPA, to Marianne L. Horinko, the acting Administrator, when withdrawing prior admissions of former General Counsel Jonathan Cannon.[185] Fabricant's analysis was as follows: "Because the CAA does not authorize regulation to address climate change, it follows that CO_2 and other GHGs, as such, are not air pollutants under the CAA's regulatory provisions, including sections 108, 109, 111, 112 and 202."[186]

Fabricant's analysis, adopted by the EPA, concludes that carbon dioxide and greenhouse gases do not fulfill the statutory prerequisite for CAA regulation.[187] Fabricant infers from Congress's silence regarding the regulation of greenhouse gases a lack of congressional intent to regulate greenhouse gases under any provisions of the CAA. Fabricant then determines that because Congress did not authorize the regulation of GHGs under the CAA, greenhouse gases, including carbon dioxide, are not air pollutants for purposes of the CAA, and that greenhouse gases therefore do not satisfy the statutory prerequisites as an air pollutant. Fabricant's conclusory analysis is logically insufficient. The lack of congressional intent to regulate a substance cannot be inferred from silence when the statute supplies a test for (1) identifying air pollutants[188] and (2) identifying criteria pollutants.[189] The test would have no value if a substance that otherwise meets the test might still allow an inference—based on a lack of indication of congressional intent—that the pollutant does not satisfy the test.

In the section 202 ruling, the EPA also cites Fabricant's memo for the assertion that "a substance does not meet the CAA definition of [an] 'air pollutant' simply because it is a 'physical, chemical, biological, radioactive . . . substance or matter which is

[184] *See* Whitman v. American Trucking Assn's, Inc., 531 U.S. 457, 486 (2001) (holding that "[t]he EPA may not consider implementation costs in setting primary and secondary NAAQS").

[185] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,925 (adopting Fabricant's opinion as the position of the EPA).

[186] Memorandum from Robert E. Fabricant to Marianne L. Horinko, *supra* note 18, at 10.

[187] *See* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,928.

[188] *See* 42 § U.S.C. 7602(g) (2000).

[189] *See* 42 U.S.C. § 7408(a)(1) (2000).

emitted into or otherwise enters the ambient air.' It must also be an 'air pollution agent.'"[190] It should follow from General Counsel Fabricant's reasoning that those substances already identified as "air pollutants" are also air pollution agents.[191] Those substances that Congress has identified in the CAA as pollutants are covered in the first sentence of the definition in section 302(g): "[A]n air pollutant is any air pollutant agent . . . ."[192] Therefore, the Administrator would not need to identify air pollutants already identified by Congress as air pollutants. The issue as to whether a substance is an air pollution agent could only arise with respect to a substance not yet identified as an air pollutant.

The foregoing analysis is relevant to the question of whether carbon dioxide should be listed as a criteria pollutant because carbon dioxide is explicitly identified as an air pollutant under section 103(g). Therefore, Congress's intent to indicate that the named air pollutant is an air pollutant can be inferred from this section.[193] The EPA section 202 ruling, on the other hand, responds to the section 103(g) identification of carbon dioxide as an air pollutant by stating that carbon dioxide is only mentioned as an air pollutant in the research and development provisions of the Clean Air Act.[194] Nevertheless, though Congress addresses a nonregulatory scheme for the "air pollutant" carbon dioxide under CAA section 103(g), an argument can be made that Congress itself has identified carbon dioxide as an air pollutant.

The text of the current CAA identifying carbon dioxide as an air pollutant under section 103(g), in combination with the prior statements by and analyses of the EPA's general counsels and administrator, should lend support to the states' challenge to the section 202 ruling that carbon dioxide is not an "air pollutant" under the CAA.[195]

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[190] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,929 n.3; *see also* 42 U.S.C. § 7602(g) (2000).

[191] *See* 42 U.S.C. § 7602 (2000) (referring to air pollutants as a subset of air polluting agents). *But see* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,926, 52,928–29 (rejecting the argument that carbon dioxide is an "air pollutant" under the section 302(g), despite the fact that section 103(g) refers to carbon dioxide as an air pollutant).

[192] *See* 42 U.S.C. § 7602(g).

[193] 42 U.S.C. § 7403(g) (2000).

[194] *See* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,926.

[195] *See* 42 U.S.C. § 7403(g); Amended Petition for Review, Massachusetts v.

The EPA's change in position, however, follows from its reading of the Supreme Court decision, *FDA v. Brown & Williamson*,[196] cautioning "agencies against using broadly worded statutory authority to regulate in areas raising unusually significant economic and political issues when Congress has specifically addressed those areas in other statutes."[197] The EPA asserts that limiting carbon dioxide emissions from power plants would have substantial economic implications, as would finding alternative modes of transportation.[198] Furthermore, the EPA asserts that regulation of activities associated with global climate change would have enormous political implications, as indicated by the numerous bills presented in Congress over the last fifteen years.[199]

The EPA's application of *Brown & Williamson* to the analysis of an air pollutant under section 103(g) does not match up with the health-based goals of the CAA.[200] If the EPA determines that carbon dioxide is an air pollutant or is not an air pollutant based on political considerations, rather than through research and evaluation of the latest scientific studies, the health-based goals of the CAA are jeopardized. The result of such a system would

EPA (D.C. Cir. Oct. 30, 2003) (No. 03-1361).

[196] 529 U.S. 120 (2000).

[197] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,925. In *FDA v. Brown & Williamson Tobacco Corp.*, the Court found that Congress had "foreclosed the removal of tobacco products from the market" by the FDA because Congress had acted multiple times in the field of tobacco and health. 529 U.S. at 137. The EPA makes an analogy between tobacco and carbon dioxide, based in part on the economic implications of regulating CO_2 emissions. The EPA equates actions already taken with respect to carbon dioxide regulation with Congress's prohibition of tobacco regulation, but the CAA and the Food, Drug, and Cosmetic Act present distinct issues. The Clean Air Act provides a statutory test for determining the listing of a criteria pollutant with explicit requirements under section 108(a)(1). Economic and political considerations are not factored into the analysis. Furthermore, the fact that the EPA regulates criteria pollutants under several regulatory schemes has been deemed to not factor into the section 108(a)(1) analysis in *NRDC v. Train*. *See* NRDC v. Train, 545 F.2d 320, 325 (2d Cir. 1976).

[198] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,928.

[199] *See id*.

[200] Under *American Trucking* and the *Lead Industries* cases, cost may not be considered in establishing the NAAQS or in making the initial determination as to whether carbon dioxide must be listed as a criteria pollutant. *See* Whitman v. American Trucking Ass'ns, Inc., 531 U.S. 457, 486 (2001) (noting that the EPA may not consider cost when setting NAAQS); *see also* Clean Air Amendments of 1970, Pub. L. No. 91-604, § 2(a), 84 Stat. 1676, 1676 (codified as amended at 42 U.S.C. § 7403 (2000)).

naturally be at odds with the overall health-based goals of the CAA, since the progress made through the control of emissions under one Administrator could be lost if political considerations led another Administrator to reject the identification of a substance as an air pollutant. Furthermore, if the EPA required a political litmus test for the air pollutant analysis under section 108, the objective test for determining criteria pollutants would become subject to the political climate of the present moment. Ultimately, that which is deemed an air pollutant one day could be deemed a non-air pollutant or a nontraditional air pollutant another day because politics rather than science formed the basis of the determination.

The EPA's application of *Brown & Williamson* is misplaced, moreover, because the EPA would read a cost analysis into the requirements for listing a criteria pollutant under section 108(a)(1). In addition, Congress's clear intent to preclude a cost analysis in the Clean Air Act's NAAQS program is ignored under the auspices of protecting the congressional intent not to use "broadly worded statutory authority to regulate in areas raising unusually significant economic and political issues."[201] Under the Clean Air Act, cost may not be considered in setting the NAAQS or in determining which pollutants to list as criteria pollutants, since the regulatory scheme is a health-based performance standard.[202] The EPA reasoned that the Court in *Brown & Williamson* recognized that tobacco constituted "a significant portion of the American economy," and, in light of the language and structure of the Federal Food, Drug, and Cosmetic Act (FDCA), the court "determined that Congress did not 'intend[] to delegate a decision of such economic and political significance to an agency in so cryptic a fashion.'"[203] The EPA then stated: "It is hard to imagine any issue in the environmental area having greater 'economic and political significance' than regulation of activities that might lead to global climate change."[204] The FDCA and CAA are two distinct

[201] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,928.

[202] *Cf. American Trucking*, 531 U.S. at 469 (noting that EPA may not consider implementation costs in setting NAAQS under section 109(b) of the CAA); *see* PERCIVAL, *supra* note 7, at 131.

[203] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,928 (citing *Brown & Williamson*, 529 U.S. at 160).

[204] *Id*.

regulatory schemes, and the EPA's application of the structure of the FDCA to the CAA without regard to the overwhelming goal of the CAA to protect the health of the public without considering cost is an arbitrary application at best.[205] Though the EPA admits that *Brown & Williamson* looked to the language, history, and structure of the FDCA in reaching its decision that the FDA did not have authority to regulate tobacco products under the statute due to the economic and political considerations, the EPA does not itself take into consideration the language, structure, and history of the CAA when applying economic and political considerations to the regulation of GHGs under the CAA. The criteria pollutant NAAQS program under the Clean Air Act precludes a cost analysis, and, unlike the FDCA, section 108 of the CAA does not provide the EPA Administrator with a broad grant of statutory authority. Rather, it provides a very specific test and program for reviewing and revising the list of criteria pollutants.

The Supreme Court interpreted *Brown & Williamson* in the context of the CAA in *Whitman v. American Trucking*:[206] "Congress, we have held, does not alter the details of a regulatory scheme in vague terms or ancillary provisions—it does not, one might say, hide elephants in mouseholes."[207] In *American Trucking*, the Supreme Court held that cost may not be considered as an "unenumerated" factor that the EPA may consider in applying the criteria under CAA sections 108 and 109.[208] The cost factor "is *both* so indirectly related to public health *and* so full of potential for canceling the conclusions drawn from direct health effects that it would surely have been expressly mentioned in §§ 108 and 109 had Congress meant it to be considered."[209] The EPA's attempt to add a cost balance to the section 108(a)(1)

[205] The Court in *Brown & Williamson* noted that, should the FDA exert jurisdiction over tobacco, the result would be a total ban, thus violating the clear implication in subsequent tobacco legislation that Congress's intent is to allow the industry to continue in some form. However, the EPA does not maintain that a similar outcome will result from a finding that carbon dioxide is an air pollutant. *Cf. Brown & Williamson*, 529 U.S. at 127.

[206] *See American Trucking*, 531 U.S. at 466 (citing *Brown & Williamson*, 529 U.S. at 132–33 ("Words that can have more than one meaning are given content, however, by their surroundings.")).

[207] *American Trucking*, 531 U.S. at 466 (citing inter alia *Brown & Williamson*, 529 U.S. at 159–60 (2000)).

[208] *See id*. at 469 (noting the absence of implementation costs in the statutory scheme).

[209] *See id.* (emphasis in original).

analysis for any pollutant that has an economic and political significance is in direct opposition to the health-based goals of sections 108 and 109.[210]

Analysis under *Chevron U.S.A. Inc. v. NRDC*[211] may prove helpful in evaluating the EPA's analysis as to whether carbon dioxide is an air pollutant. A court reviewing an agency's construction of a statute, administered by that agency, must ask first "whether Congress has directly spoken to the precise question at issue."[212] If Congress's intent is clear, then the agency and court must "give effect to the unambiguously expressed intent of Congress."[213] If the statute is silent or ambiguous as to intent, then a court will determine if the agency's interpretation is "based on a permissible construction of the statute."[214] A court must defer to the EPA's reasonable interpretation of a statute when Congress has not spoken directly to the question at issue.[215]

The section 108 analysis simply provides a framework for the Administrator to identify criteria pollutants.[216] Rather than Congress identifying each air pollutant subject to regulation under the CAA, Congress delegated that duty to the Administrator of the EPA, statutorily providing the Administrator with a test for identifying such pollutants.[217] Congress has not specifically identified substances to be included or excluded from the list of criteria pollutants,[218] so of course Congress has not specifically identified carbon dioxide for regulation under section 108.

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[210] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,925 (Sept. 8, 2003). When the EPA reversed course on the identification of carbon dioxide as an air pollutant in this ruling, the EPA asserted that prior EPA counsel did not have *Brown & Williamson* before them, which "cautions agencies" against regulating in "areas raising unusually significant economic and political issues." *See id.* However, the current EPA forgets that they have before them *American Trucking*, which prohibits the reading of a cost analysis into the Clean Air Act. *See American Trucking*, 531 U.S. at 486.

[211] 467 U.S. 837 (1984).

[212] *Id*. at 842.

[213] *Id.* at 842–43.

[214] *Id.* at 843.

[215] *See id.* at 844–45.

[216] *See* 42 U.S.C. § 7408(a)(1) (2000).

[217] *See* 42 U.S.C. § 7408(a)(1); *see also* S. REP. NO. 101-228, at 5 (1990), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3391.

[218] *Cf.* S. REP. NO. 101-228, at 5 (stating that EPA has the authority to set ambient standards for additional pollutants).

Instead, Congress has delegated to the Administrator of the EPA the duty to reissue and revise the NAAQS, including adding to the list of criteria pollutants those pollutants that meet the requirements under section 108(a)(1).[219] An argument may be made that Congress intended to identify carbon dioxide as an air pollutant under section 103(g); however, even if we accept the EPA argument that section 103(g) is not dispositive, the EPA may not through a negative inference determine that carbon dioxide is not an air pollutant.[220] The CAA does not indicate that Congress intended to omit any substance as a potential air pollutant for consideration under the CAA. By providing a test for listing criteria pollutants and by not specifically excluding any pollutants from the analysis, Congress could have only meant that any pollutant that fulfills the test's requirements must be listed. Any other result would be absurd. Why would Congress have a mandatory test with conditions for listing, and then say that a pollutant that is not identified under the CAA as a criteria pollutant cannot be listed?

The EPA also proclaims that it lacks authority to regulate GHGs, including carbon dioxide, because of the global effect of these substances.[221] Yet Congress enacted provisions on stratospheric ozone depletion under the Clean Air Act, and further provided that the Administrator should list the global warming potential for each of the Class I and Class II listed ozone depleting

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[219] *See* 42 U.S.C. § 7408(a)(1); *supra* notes 115–135 and accompanying text; *see also* S. REP. NO. 101-228, at 6 (noting that "EPA has authority to establish ambient standards for additional pollutants").

[220] Congress does establish an initial list of hazardous air pollutants. The Administrator is charged with the duty of revising the list of hazardous pollutants. *See* 42 U.S.C. § 7412(b)(2) (2000). No list similar to the hazardous pollutant list was provided under the NAAQS provisions, though the Administrator had identified specific air pollutants prior to the initial identification of criteria pollutants under 42 U.S.C. § 7408(a)(1).

[221] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,928 (Sept. 8, 2003).

> The root of the definition indicates that for a substance to be an "air pollutant," it must be an "agent" of "air pollution." Because EPA lacks CAA regulatory authority to address global climate change the term air pollution as used in the regulatory provisions cannot be interpreted to encompass global climate change. Thus CO2 and other GHGs are not "agents" of air pollution and do not satisfy the CAA section 302(g) definition of "air pollutant" for purposes of those provisions.

Id.

substances.[222] These provisions indicate that Congress did not perceive that the global impact of GHGs would preclude any regulatory actions by the EPA.

Assuming, as has the EPA, that Congress did not express an affirmative intent for carbon dioxide to be identified as an air pollutant, one must ask if the EPA interpretation of the CAA is reasonable under the second part of the Chevron analysis.[223] The EPA's preclusion of any pollutant from the NAAQS program based on a congressional failure to explicitly identify that pollutant for purposes of regulation under the Clean Air Act is not a reasonable interpretation of the section 108 analysis. Congress could not have intended to provide the EPA with a test for determining criteria pollutants without providing the EPA with the authority to apply the section 108(a)(1) test to any pollutant.

In *Whitman v. American Trucking,* the Supreme Court would not defer to the EPA's attempt at gap filling when that attempt rendered the "carefully designed restrictions on the EPA discretion utterly nugatory."[224] While the issue in *American Trucking* is the extent of the EPA's authority in revising the NAAQS rather than whether there is an explicit restriction set by Congress, the analysis as to statutory interpretation in general provides guidance for purposes of identifying the extent of the Administrator's delegated duty to identify criteria pollutants. Here, if the EPA determines (1) that the EPA has no authority to revise the list of criteria pollutants unless a pollutant has been identified by Congress as an air pollutant subject to the Clean Air Act, and (2) that the Administrator may only add to the list those pollutants identified

[222] *See* Clean Air Amendments of 1990, Pub. L. No. 101-549, § 602(e), 104 Stat. 2399, 2652 (codified as amended at 42 U.S.C. § 7671a(e) (2000)) ("[T]he Administrator shall publish the global warming potential of each listed substance. The preceding sentence shall not be construed to be the basis of any additional regulation under this chapter."). While Congress expressly prohibits use of this section to justify regulation of a specific substance, the overall Subchapter VI of the Clean Air Act evidences that the Act addresses substances of a global nature, which would cut against the EPA's argument precluding GHGs from CAA because of the global nature of these substances. *Cf.* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,926 ("The CAA provisions addressing stratospheric ozone depletion demonstrate that Congress has understood the need for specifically tailored solutions to global atmospheric issues, and has expressly granted regulatory authority when it has concluded that controls may be needed as part of those solutions.").

[223] *See Chevron U.S.A. Inc.*, 467 U.S. at 844–45.

[224] Whitman v. American Trucking Ass'ns, Inc., 531 U.S. 457, 484 (2001).

by Congress for purposes of regulation under the CAA, then the section 108(a)(1)(A) test for identifying criteria pollutants is rendered useless or, using the Supreme Court's term, "nugatory."[225] Congress can only have intended that the Administrator have not only the authority but also the nondiscretionary duty under section 108(a)(1)(A) to identify pollutants for the purpose of establishing criteria documents, without considering the political and economic implications of such identification.

The EPA further asserted that even if carbon dioxide were an air pollutant subject to regulation under the CAA, "Congress has not authorized the Agency to regulate CO_2 emissions from motor vehicles to the extent such standards would effectively regulate car and light truck fuel economy, which is governed by a comprehensive statute administered by [the Department of Transportation]."[226] The EPA concluded that the new section 103(g) requires the EPA to identify only voluntary ("nonregulatory") measures for preventing or reducing multiple air pollutants, including carbon dioxide, which, according to the EPA, indicates a lack of congressional intent to regulate carbon dioxide under the Clean Air Act.[227] The EPA also indicated that Congress's failure to identify GHGs for regulatory purposes under the 1990 CAA Amendments indicates congressional intent to, among other things, learn more about GHGs prior to taking regulatory action.[228] Because Congress has chosen other approaches to the GHG and global warming phenomena, the EPA concluded that the CAA is not the proper instrument for dealing with carbon dioxide and GHGs.[229] *NRDC v. Train*, however, held

[225] *See* text accompanying *supra* notes 130 and 224.

[226] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,925.

[227] *See id.* at 52,926.

[228] *See id.* at 52,927.

[229] *See id*. The EPA also refers to the public comments of those who oppose regulation of carbon dioxide under the Clean Air Act:

At the same time other commentators correctly note that (1) no CAA provision specifically authorizes global climate change regulation, (2) the only CAA provision specifically mentioning CO_2 authorizes only "nonregulatory" measures, (3) the codified CAA provisions related to global climate change expressly preclude the use of those provisions to authorize regulation; (4) a Senate committee proposal to include motor vehicle CO_2 standards in the 1990 CAA amendments failed, (5) Federal statutes expressly addressing global climate change do not authorize regulation, and (6) numerous congressional actions

that regulation of a pollutant—in that case, lead—under another regulatory scheme could not be the basis for precluding that pollutant from listing as a criteria pollutant under section 108 of the Clean Air Act.[230] As discussed in Part II, the *NRDC v. Train* court read the statutory provisions in section 108, setting the NAAQS, and section 211, establishing the lead content in motor vehicle gasoline, as neither mutually exclusive nor alternative provisions.[231]

Under the *NRDC v. Train* analysis, when the EPA identifies other approaches that Congress has taken or has not taken toward the regulation of carbon dioxide and other greenhouse gases, the EPA may not jump to the conclusion that anthropogenic carbon dioxide emissions are not subject to regulation under the CAA without applying the analysis that Congress provided for the Administrator under section 108(a)(1).[232] Neither Congress's failure to identify carbon dioxide as a criteria pollutant under the 1990 amendments, its decision to give the Department of Transportation authority to regulate fuel economy under the Energy Policy and Conservation Act, nor its calling for research of carbon dioxide and other GHGs may serve as the basis for precluding the Administrator from identifying carbon dioxide as a criteria pollutant under the Clean Air Act if the requirements of section 108 are met.[233] The initial question under CAA section

suggest that Congress has yet to decide that such regulation is warranted. *See id* at 52,925–26. *But see* S. REP. NO. 101-228, at 6 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3392 (calling for the Administrator to fulfill the duty to reissue and revise the NAAQS. Since Congress delegated the duty to identify criteria pollutants to the Administrator of the EPA, Congress's failure to identify carbon dioxide as a criteria pollutant is not relevant. The Senate encourages the Administrator to take action in the 1990 Senate Report on the Clean Air Act Amendments.). The EPA also notes in its section 202 ruling that President Bush had introduced a Climate Change Research Initiative "to study areas of uncertainty and identify priority areas where investments can make a difference." Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,930–31 (Sept. 8, 2003).

[230] *See* NRDC v. Train, 545 F.2d 320, 324–25 (2d Cir. 1976).

[231] *See* NRDC v. Train, 411 F. Supp. 864, 869 (S.D.N.Y. 1976), *aff'd* 545 F.2d at 327.

[232] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,925.

[233] *Compare* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,927-29 (using other congressional action to determine that carbon dioxide is not a criteria pollutant under the CAA); *see also* S. REP. NO. 101-228, at 6 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3392 (The Senate

108 is whether carbon dioxide is an air pollutant, and the EPA may not sidestep the threshold question by identifying other policy approaches to carbon dioxide emissions and GHGs.

Furthermore, the EPA may not skip ahead to the complex issues surrounding the regulation of GHGs in making the threshold determination as to whether carbon dioxide is an air pollutant subject to regulation under the CAA.[234] In its section 202 notice of denial, the EPA seemed to incorporate the complexity of the global warming problem into the determination of whether carbon dioxide satisfies the initial definition of an air pollutant under the CAA.[235] The EPA stated that the NAAQS system could not effectively address the issues of global climate change.[236] Carbon dioxide, identified by the EPA as the most pervasive GHG,[237] has a resident time of roughly fifty to two hundred years, and results in a consistent distribution in a global atmospheric pool.[238] Assessment of the effects on atmospheric concentrations of carbon dioxide in the U.S. would present complex issues in the NAAQS context.[239] The EPA reasoned that the NAAQS could not be attained for any area of the United States until such a standard were attained by the entire world.[240]

The trial court in *NRDC v. Train* anticipated that complex issues might arise under the section 108 analysis:

> Finally, we turn to an additional argument of defendants that the Administrator needs discretion not to list lead under § 108 because the data which would be necessary to support an ambient air standard for lead is arguably lacking. . . . We do not think that the potential lack of data would have been an

report on the EPA administrator's lack of action in revising the NAAQS seems to reflect a disappointment in the EPA's failure to carry forth the delegated duties under sections 108 and 109, duties which may include regulation of GHGs.).

[234] NRDC v. Train, 545 F.2d at 324.

[235] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,931.

[236] *See id.* at 52,927. *But see* Baede et al., *supra* note 2, at 92, (noting that scientists can identify the anthropogenic nature of carbon dioxide stocks by the isotopic construction).

[237] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,927.

[238] *Id.* ("Many GHGs reside in the earth's atmosphere for very long periods of time. . . . This long lifetime along with atmospheric dynamics means that CO_2 is well mixed throughout the atmosphere . . . .").

[239] *See id*.

[240] *See id*.

> appropriate consideration prior to the listing of a pollutant under § 108 in any event. Under the statutory scheme, the listing of a pollutant is no more than a threshold to the remedial provisions . . . . The statute appears to assume that, for each pollutant which must be listed, criteria and a national standard can be established. A twelve month period is provided for that purpose. However, Congress cannot require the impossible. It may be that a pollutant exists that meets the listing requirements of § 108 but for which no criteria or national standard is possible. That issue is not before this court. The only question here is the threshold one of whether lead must be listed according to § 108 and we have determined that it must.[241]

The threshold question—whether carbon dioxide must be listed as a criteria pollutant—is distinct from setting the criteria and determining the NAAQS.[242] The EPA has a nondiscretionary duty to list carbon dioxide if the substance meets the CAA section 108 criteria, notwithstanding the complex issues that surround setting air quality criteria and the primary and secondary NAAQS once it has been listed.[243]

Although *NRDC v. Train* suggests that the threshold question as to the listing of carbon dioxide as a criteria pollutant is distinct from the question as to whether a national standard for anthropogenic carbon dioxide emissions can be established, the EPA seems to factor the complexity of the greenhouse gas problem into its initial determination that carbon dioxide is not an air pollutant.[244] The difficulty in establishing a national standard for carbon dioxide may not be an appropriate consideration prior to the listing of a pollutant under section 108.[245]

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[241] NRDC v. Train, 411 F. Supp. 864, 870 (S.D.N.Y. 1976).

[242] *Id*.

[243] *See id*.

[244] *See* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,931.

[245] NRDC v. Train, 411 F.Supp. at 870, *aff'd*, 545 F.2d at 324. Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,931 (discussing the EPA's concerns with respect to the difficulty of establishing a national standard for CO_2 when considering the section 202 petition). The U.S. desire for flexibility in meeting any potential commitments under the Kyoto Protocol might add to the complexity of potentially setting NAAQS for anthropogenic carbon dioxide emissions; yet this flexibility will allow the United States to cooperate in attaining a joint global CO_2 reduction with cooperating nations, while enabling the U.S. to purchase emissions from countries such as

The EPA also considers the complexity and uniqueness of greenhouse gases under the NAAQS program when determining whether carbon dioxide is an air pollutant, concluding that the regulation of carbon dioxide emissions under the Clean Air Act is not proper because Congress has taken other actions to address greenhouse gases.[246] This part of EPA's analysis is also not consistent with *NRDC v. Train*, which held that any air pollutant that meets the requirements under CAA section 108(a)(1)(A)–(B), notwithstanding measures taken under other statutory schemes, must be identified as a criteria pollutant.[247]

To summarize, the EPA's initial determination that carbon dioxide is not an air pollutant is unreasonable because section 103(g) explicitly identifies carbon dioxide as an air pollutant.[248] In addition, the EPA should be held to prior admissions that carbon dioxide is an air pollutant, subject to possible regulation under sections 108 and 109 of the Clean Air Act, since carbon dioxide falls clearly within the broad definition of an "air pollutant" under section 302(g), which classifies an air pollutant as a "physical [and] chemical substance . . . emitted into . . . the ambient air,"[249] and as such carbon dioxide, an air pollutant, satisfies the initial requirement under section 108.

B. *Does Carbon Dioxide Cause or Contribute to Air Pollution?*

Under the Clean Air Act section 108(a)(1), a potential pollutant must cause or contribute to the pollution in the ambient

Russia. In other words, the trading provisions under the Kyoto Protocol that the U.S. desired, as well as the setoffs available for reforestation, add to the complexity of the GHG problem, but these complexities are desired by the United States and so should not provide an excuse for failing to regulate GHGs. *See* HUNTER, *supra* note 1, at 640–41.

[246] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,930.

[247] NRDC v. Train, 545 F.2d 320, 325 (2d Cir. 1976).

[248] The EPA also determined that the term "air pollutant" under the Clean Air Act requires an additional analysis of "air pollution agent." *See* Memorandum from Robert E. Fabricant to Marianne L. Horinko, *supra* note 18, at 10.

[249] *See* 42 U.S.C. § 7602(g) (2000); *Joint Hearing*, *supra* note 174, at 19 ("CO_2 is in the class of compounds that could be subject to several of the Clean Air Act's regulatory approaches."); Memorandum from Jonathan Z. Cannon to Carol Browner, *supra* note 18, at 4 ("While CO_2, as an air pollutant, is within EPA's scope of authority to regulate, the Administrator has not yet determined that CO_2 meets the criteria for regulation under one or more provisions of the Act.").

air, which may reasonably be anticipated to endanger public health or welfare.[250] Carbon dioxide is a major contributor to the combination of agents creating GHGs.[251] Carbon dioxide comprises nearly fifty percent of all anthropogenic GHGs.[252] The United States is a major contributor to the increase in GHGs over the last century.[253] The EPA states that GHGs have made the earth a more hospitable 60ºF; however, the EPA admits that "problems may arise when atmospheric concentrations of greenhouse gases increase."[254] The EPA acknowledges that atmospheric concentrations of carbon dioxide have increased nearly thirty percent since the Industrial Revolution, affecting the balance and the capability of vegetation and the oceans to absorb the increased emissions.[255] According to the EPA, fossil fuels from cars, trucks, homes, businesses, and factories account for ninety-eight percent of carbon dioxide emissions in the United States.[256] According to the New England states' section 108 complaint, total carbon dioxide emissions are projected to increase by forty-three percent in the United States by 2020.[257] Furthermore, according to the EPA, the United States currently emits more GHGs per person than any other country.[258] In their complaint, the states also claimed that reducing carbon dioxide emissions could be effective

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[250] 42 U.S.C. § 7408(a)(1) (2000).

[251] Paul E. Gray, *The Paradox of Technological Development*, *in* TECHNOLOGY AND ENVIRONMENT 192, 196 (Jesse H. Ausubel & Hedy E. Sladovich eds., 1989).

[252] HUNTER, *supra* note 1, at 599.

[253] *See id*.

[254] U.S. EPA, *Global Warming—Climate: Climate*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/Climate.html (last updated Jan. 7, 2000).

[255] *See id*.

[256] *See id*; *see also* U.S. EPA, *Global Warming—Emissions: Individual*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/EmissionsIndividual.html (last modified Jan. 7, 2000).

> In the United States, approximately 6.6 tons . . . of greenhouse gases are emitted per person every year. . . . Most of these emissions, about 82%, are from burning fossil fuels to generate electricity and power our cars. The remaining emissions are from methane in wastes in our landfills, raising livestock, natural gas pipelines, and coal, as well as from industrial chemicals and other sources.

Id.

[257] Complaint ¶ 29, Massachusetts v. Whitman (D. Conn. June 4, 2003) (No. 3:03CV984).

[258] *See Global Warming—Emissions: Individual*, *supra* note 256.

in stopping the increase and stabilizing atmospheric concentrations of carbon dioxide, which will lessen the adverse affects of global warming.[259]

For section 108(a)(1)'s requirement that the emissions of carbon dioxide, in the Administrator's judgment, *cause or contribute to air pollution*,[260] it is enough that carbon dioxide combines with methane, chlorofluorocarbons, and nitrous oxides to create greenhouse gases responsible for global warming[261] and that the EPA acknowledges that a majority of the carbon dioxide emissions in the United States are from man-made sources and further admits that the United States is a major world contributor to greenhouse gases, including carbon dioxide.[262]

C. *Is the Presence of Carbon Dioxide in the Ambient Air Reasonably Anticipated to Endanger Public Health or Welfare?*

Having determined that carbon dioxide is an air pollutant that contributes to GHGs, the next step in this analysis is to break down the language of section 108(a)(1)(A) and determine whether carbon dioxide emissions are reasonably anticipated to endanger public health or welfare. The IPCC's Third Assessment provides the scientific data needed to identify whether carbon dioxide rises to the requisite level.[263]

1. *Does Carbon Dioxide Meet the Level of Certainty that the Administrator Must Demonstrate to Determine Whether It May Reasonably Be Anticipated to Endanger Public Health?*

The Clean Air Act's legislative history indicates that the EPA should take a preventive approach to air pollution.[264] The

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[259] Complaint ¶ 31, Massachusetts v. Whitman (No. 3:03CV984).

[260] *See* 42 U.S.C. § 7408(a)(1) (2000).

[261] *See* HUNTER, *supra* note 1, at 589; *see also supra* note 157 and accompanying text (discussing nitrogen oxides).

[262] *See* U.S. EPA, *Global Warming—Climate: Climate*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/Climate.html (last modifed Jan. 7, 2000).

[263] The EPA relies upon this information on their website. *See, e.g.*, U.S. EPA, *Global Warming—Impacts: International Impacts*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ImpactsInternationalImpacts.html (last modified Jan. 7, 2000).

[264] *See* H.R. REP. No. 91-1146, at 6 (1970), *reprinted in* 1970 U.S.C.C.A.N. 5356, 5361.

pollution-fighting strategies in place prior to the 1970 amendments were often slow and cumbersome.[265] The CAA targeted the reduction of present pollution and the prevention of new significant pollution problems.[266] The House Report described the purpose of the 1970 Clean Air Act as "to speed up, expand, and intensify the war against pollution in the United States."[267] The "may reasonably be anticipated to endanger" statutory language from the 1977 amendments further enabled the Administrator to take early steps to prevent harms, the extent of which could not be established with absolute certainty.[268]

This current statutory language of the Clean Air Act suggests anticipation of a future danger and has an even more precautionary tone than the 1970 language: "has an adverse effect on public health or welfare."[269] The change in section 108 from the 1970 present tense "has" to the 1977 future conditional "may reasonably be anticipated to endanger" suggests that the Administrator must contemplate harms that are not yet certain.[270] What level of certainty is then required under the "may reasonably be anticipated to endanger" standard?

Since *Train* was decided under the 1970 section 108 language, and since the Administrator has not issued new criteria pollutants since listing airborne lead in 1978, courts have not interpreted the 1977 language in section 108 "may reasonably be anticipated to endanger" under CAA section 108.[271] Courts have, however, examined similar language in other parts of the statute. In *Ethyl Corp. v. EPA*, the court upheld the EPA's interpretation of the "will endanger" language of section 211(c)(1)(A).[272] Various manufacturers of lead additives and refiners of gasoline challenged the EPA's promulgation of low-lead regulations, claiming that the Administrator had misinterpreted "will endanger."[273] The *Ethyl*

[265] *See id.* at 5.
[266] *See id.* at 6.
[267] *Id.* at 1.
[268] *See* Clean Air Amendments of 1977, Pub. L. No. 95-95, § 401(a), 91 Stat. 685, 790–91(codified as amended at 42 U.S.C. § 7408(a)(1)(A) (2000)).
[269] *Compare id.*, *with* Clean Air Amendments of 1970, Pub. L. No. 91-604, § 108(a)(1)(A), 84 Stat. 1676, 1678 (codified as amended at 42 U.S.C. § 7408(a)(1)(A) (2000)).
[270] *See id.*
[271] *See* NRDC v. Train, 545 F.2d 320 (2d Cir. 1976).
[272] *See* Ethyl Corp. v. EPA, 541 F.2d 1, 12 (D.C. Cir. 1976).
[273] *Id.* at 10–11.

court distinguished "will endanger" in section 211 from the 1970 language of section 108(a)(1)(A), "has an adverse effect on public health and welfare," the latter requiring an actual adverse effect.[274]

Because the *Ethyl* court found it appropriate to interpret the 1970 language of section 211 by analogy to the 1970 language of section 108, a comparison of section 211's "will endanger" to section 108(a)(1)(A)'s 1977 language, "may reasonably be anticipated to endanger," will be helpful in determining the level of certainty required to list a pollutant under the Clean Air Act section 108(a)(1). On its face, the phrase "will endanger" requires a greater level of certainty than does "may reasonably be anticipated to endanger."[275] Yet the term "endanger" (without even considering the qualification "will" or "is reasonably anticipated to") itself suggests that "when one is endangered, harm is threatened; no actual injury need ever occur."[276] The *Ethyl* court upheld the Administrator's interpretation of "will endanger" as meaning "presents a significant risk of harm."[277] Under section 108(a)(1)(A), "may reasonably be anticipated to endanger" qualifies the language even further[278] than "will endanger" under section 211. Under the Administrator's interpretation of "endanger" upheld in *Ethyl*, the level of certainty required to determine whether carbon dioxide should be listed as a "criteria pollutant" would be a showing that global warming as a result of greenhouse gases is reasonably anticipated to present a significant risk of harm.

According to the D.C. Circuit, Congress maintained a precautionary intent in the 1970 Clean Air Act Amendment

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[274] *Id.* at 14.

[275] *Compare* Clean Air Amendments of 1977, Pub. L. No. 95-95, § 401(e), 91 Stat. 685, 791 (codified as amended at 42 U.S.C. § 7545 (2000)), *with* Clean Air Amendments of 1970, Pub. L. No. 91-604, § 211(c)(1)(A), 84 Stat. 1676, 1698 (codified as amended at 42 U.S.C. § 7545 (2000)).

[276] *See Ethyl Corp.*, 541 F.2d at 13.

[277] *See id.* (quoting Control of Lead Additives in Gasoline, 38 Fed. Reg. 33,734 (Dec. 6, 1973)).

[278] Webster's defines "anticipate" as "to look forward to as certain: expect," WEBSTER'S NINTH NEW COLLEGIATE DICTIONARY 91 (9th ed. 1991), whereas "will" is "used to express futurity." *Id.* at 1350. The *Ethyl* court read the phrase "will endanger" as leaving room for uncertainty, and so the language "may reasonably be anticipated to endanger" provides for an even greater level of uncertainty. This favors identifying carbon dioxide as an air pollutant when the adverse effects are not certain.

sections 108 to 110.[279] In *Lead Industries Association v. EPA*, the court reviewed the EPA's regulations establishing NAAQS for lead.[280] *Lead Industries* maintains that Congress granted discretion under the statutory language "in the judgment of the administrator" to allow the Administrator to take action, even though uncertainties and limitations exist in the scientific data.[281] Under the CAA, however, Congress intended for the Administrator to act *in favor of* protecting health, welfare, and the environment, rather than interpreting the statute narrowly.[282] The court in *Ethyl* emphasized that "[q]uestions involving the environment are particularly prone to uncertainty."[283]

Furthermore, the court in *Lead Industries* agreed with the Administrator's interpretation of the precautionary nature of the Clean Air Act. The Administrator, citing the House Report to the 1977 Clean Air Act Amendments, argued that the Clean Air Act's purposes are "to emphasize the preventive or precautionary nature . . . , to assure that regulatory action can effectively prevent harm before it occurs; to emphasize the predominant value of the protection of public health."[284] Case law and legislative history both support the idea that the complex nature of environmental concerns often involves evidence that is difficult to establish because it is on "the frontier of scientific knowledge."[285]

The EPA devotes a web site to the uncertainties of global warming.[286] The site identifies the following "fundamental scientific uncertainties" about global warming: "How much more warming will occur? How fast will this warming occur? And what are the potential adverse and beneficial effects?"[287] The EPA

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[279] *See* Lead Industries Ass'n v. EPA, 647 F. 2d 1130, 1155 (D.C. Cir. 1980).

[280] *Id*. at 1137–48.

[281] *Id.* at 1152–53.

[282] S. REP. NO. 101-228, at 247 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3631 (citing United States v. Conservation Chemical Co., 619 F. Supp. 162, 193 (W.D. Mo. 1985)).

[283] Ethyl Corp. v. EPA, 541 F.2d 1, 12 (D.C. Cir. 1976).

[284] *See Lead Industries Ass'n*, 647 F. 2d at 1152.

[285] *See, e.g.*, *Ethyl Corp.*, 541 F.2d at 28 (describing atmospheric science as on the "frontiers of scientific knowledge"); *see also* S. REP. NO. 101-228, at 247, *reprinted in* 1990 U.S.C.C.A.N. at 3631.

[286] U.S. EPA, *Global Warming—Climate: Uncertainties*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ClimateUncertainties.html (last modified Jan. 7, 2000).

[287] *Id*.

acknowledges that "[g]lobal warming poses real risks," though "the exact nature of these risks remains uncertain."[288] Rather than dividing the environmental impact of GHGs by trends and confidence levels in specific regions and assigning percentages as categorized by the IPCC, the EPA web site divides impacts resulting from global warming into three specific categories: (1) "What is known for certain"; (2) "What is likely but not certain"; and (3) "What are the big unknowns."[289] The EPA admits that increased temperatures, storms, and rising sea levels are reasonably certain to occur. However, the EPA on its web site labels the impact on the environment (e.g., the location and extent of harms) among the "Big Unknowns":

> Scientists have identified that our health, agriculture, water resources, forests, wildlife and coastal areas are vulnerable to the changes that global warming may bring. But projecting what the exact impacts will be over the 21st century remains very difficult. This is especially true when one asks how a local region will be affected. Scientists are more confident about their projections for large-scale areas . . . and less confident about the ones for small-scale areas . . . .[290]

Though the EPA acknowledges the certainty of the *global risks* due to increased greenhouse gas emissions, in general, the EPA shifts local harms into this category of "Big Unknowns."

The *Climate Action Report* sets forth findings regarding the potential occurence of various adverse effects on health and welfare arising from global warming.[291] The report uses the term "very likely" to represent an impact that is "much more plausible

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[288] *Id*.

[289] *See id*.

[290] *Id*. Figuring out how much of the human-induced accumulation of greenhouse gases since pre-industrial times is responsible for global warming trends is not easy. *See generally* PERCIVAL, *supra* note 7, at 1055 (noting that carbon dioxide was present at a concentration of about 280 ppm in the atmosphere prior to the industrial revolution in the mid-eighteenth century and that, by 1997, the concentration increased thirty percent, bringing the level of carbon dioxide in the atmosphere to approximately 360 ppm (citing 1997 COUNCIL ON ENVTL. QUALITY ANN. REP. 194)).

[291] CLIMATE ACTION REPORT, *supra* note 9, at 81 ("In its June 2001 report the Committee on the Science of Climate Change, which was convened by the National Research Council (NRC) of the National Academy of Sciences, concluded that '[h]uman-induced warming and associated sea level rises are expected to continue through the 21st century.'"); *see also* Complaint ¶ 56, Massachusetts v. Whitman (D. Conn. June 4, 2003) (No. 3:03CV984).

than other outcomes,"[292] and the term "likely" represents an impact that is "more plausible than other outcomes."[293] The New England states' complaint characterized the United States' formal report to the United Nations as concluding that "global warming will likely produce wide-ranging and potentially devastating impacts to public health and welfare."[294]

Under section 108(a)(1)(A) and under the Administrator's interpretation upheld in *Ethyl*, the level of certainty required to determine whether carbon dioxide should be listed as a "criteria pollutant" is a showing that carbon dioxide is reasonably anticipated to present a risk of harm to human health or welfare.[295] The "high confidence," "very likely," and "likely" projections as labeled by the IPCC in the 2001 Third Assessment and the comparable terms identified by the *Climate Action Report* certainly rise to the requisite level.[296] National and international attempts to control carbon dioxide emissions and other GHGs, as well as the attention paid to GHGs by the international community and the voluntary programs established in the United States, all lend further support to the theory that carbon dioxide is "reasonably anticipated to endanger public health or welfare."[297]

In reviewing the impact that greenhouse gases will have on public health or welfare, the Administrator must consider all of the associated risks reasonably anticipated to endanger public health or

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[292] *See* CLIMATE ACTION REPORT, *supra* note 9, at 83.

[293] *Id.*; *see also* Complaint ¶¶ 56–58, Massachusetts v. Whitman (No. 3:03CV984).

[294] *Id.* ¶ 2.

[295] *See supra* text accompanying notes 274–78; *see also* Ethyl Corp. v. EPA, 541 F.2d 1, 13 (D.C. Cir. 1976) (interpreting the term "endanger"). *See generally* PERCIVAL, *supra* note 7, at 1057 (noting that the IPCC 1990 initial assessment "found that it is 'certain' that 'there is a natural greenhouse effect which already keeps the Earth warmer than it would otherwise be' and that 'emissions resulting from human activities are substantially increasing the atmospheric concentrations of greenhouse gases'").

[296] *See* Carter et al., *supra* note 67, at 180 tbl.3-10. The IPCC acknowledges the uncertainties involved in predicting the exact amount and/or type of harm that will occur. This is why they identify forty possible scenarios based on four narratives. *Id.* at 175–76. This uncertainty, however, does not affect the probabilities given to the various effects when they are labelled as "likely," "very likely," or "high confidence."

[297] *See* 42 U.S.C. § 7408(a)(1)(A) (2000); *cf.* GARY C. BRYNER, BLUE SKIES GREEN POLITICS: THE CLEAN AIR ACT OF 1990 AND ITS IMPLEMENTATION 87 (1995) (discussing domestic and international attention paid to greenhouse gases).

welfare. The nature of the problem of GHG-induced climate change lends itself to many uncertainties. These uncertainties notwithstanding, Congress's precautionary purpose under the CAA to speed up the process of addressing air pollution provides for a discretionary approach so that the Administrator may address the impact of GHGs on the climate.

To summarize, under section 108(a)(1)(A)'s standard of "may reasonably be anticipated to endanger," the level of certainty required to determine whether carbon dioxide should be listed as a "criteria pollutant" is a showing that carbon dioxide is reasonably anticipated to present a significant risk of harm.[298] Therefore, the question could be phrased as follows: When a peer review committee of more than 2000 scientists (i.e., the IPCC) determines a level of probability for an impact on health or the environment as between ninety and ninety-nine percent, or between sixty-six and ninety percent, or between sixty-seven and ninety-five percent, does the level of certainty support a conclusion that a pollutant "may reasonably be anticipated to present a significant risk of harm"?[299] The same question arises under the *Climate Action Report*'s language: When the U.S. projects an impact that is "more plausible" than other outcomes, or is "much more plausible" than other outcomes, does this level of certainty support a conclusion that a pollutant "may reasonably be anticipated to present a significant risk of harm"?[300]

2. *Who Is the "Public" that the Clean Air Act Seeks to Protect, and Is That Public Affected by Global Warming Resulting from the Presence of Carbon Dioxide in the Ambient Air?*

a. *International vs. National*

The goal of the CAA is to protect the populations of the United States, or, as stated in the House Report, to assure "that the air we breathe throughout the Nation is wholesome once again."[301] The Senate Report for the 1990 amendments described the "air" as

[298] *See Ethyl Corp.*, 541 F.2d at 13 (interpreting the term "endanger").

[299] *See* text accompanying *supra* notes 73–74 (noting that these percentages were used by the IPCC to define the terms, "very likely," "likely," and "highly confident," under quantifiable scenarios and storylines).

[300] *See also* text accompanying *supra* notes 274–78 (discussing the *Ethyl Corp.* decision).

[301] H.R. REP. No. 91-1146, at 1 (1970), *reprinted in* 1970 U.S.C.C.A.N. 5356, 5356.

a national resource.[302] Such language from the legislative history indicates that the CAA seeks primarily to regulate the effects of air pollution within the United States. Nevertheless, the Senate has recognized that air pollution does not stop at international borders and that controls in one area may prove pointless if the quality of the air entering the region is poor.[303]

Though the United States' efforts to reduce carbon dioxide emissions could have only an effect on the impact of greenhouse gases that is in some way proportionate to its share of global emissions, and though U.S. efforts could have only a limited effect on minimizing the projected endangerment to public health in the United States, the efforts will nonetheless produce some effect.[304] In its section 202 ruling, the EPA stated that since concentrations of carbon dioxide "are fairly consistent globally, the potential for adverse or beneficial effects in the U.S. from these concentrations depends on complicated interactions of many variables."[305] The EPA suggested that the only standard that would be effective would be a worldwide ambient air quality standard rather than a national standard, requiring the entire world to be either in or out of compliance.[306] The New England states, on the other hand, claim that reducing carbon dioxide emissions through effective regulation will stabilize concentrations of carbon dioxide and lessen the adverse impacts of global warming, producing beneficial effects in the New England states and elsewhere.[307] Of course, the United States is not bound by international law to

[302] *See* S. REP. NO. 101-228, at 5 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3391.

[303] S. REP. NO. 101-228, at 13, *reprinted in* 1990 U.S.C.C.A.N. at 3399.

[304] Complaint ¶ 31, Massachusetts v. Whitman (D. Conn. June 4, 2003) (No. 3:03CV984); *see also* HUNTER, *supra* note 1, at 619 (explaining that the Kyoto Protocol established timetables and targets for countries to achieve to slow down greenhouse gases' effects on climate change).

[305] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,927 (Sept. 8, 2003).

[306] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,927. The Kyoto Protocol is an example of a tool that provides a vehicle for a goal to reduce carbon dioxide emissions globally, while providing the United States and other nations with specific emission target reductions. *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change, *supra* note 8, art. 24 (The Kyoto Protocol requires signatures by no less than fifty-five parties, incorporating parties which account "for at least 55 per cent of the carbon dioxide emissions for 1990.").

[307] Complaint ¶ 31, Massachusetts v. Whitman (No. 3:03CV984).

contribute to an international effort, but the Administrator of the EPA is bound to follow the congressional mandate to reissue and revise the list of criteria pollutants under the Clean Air Act.[308] In addition, section 115 of the CAA requires the Administrator to modify the SIPs in a state that is the originator of a pollutant that endangers health or welfare in another country.[309] The Administrator has a nondiscretionary duty to provide a remedy where the foreign government offers the same.[310] That the United States' efforts to control carbon dioxide emissions produce a positive and incidental effect on other jurisdictions should not preclude regulation under the Clean Air Act, since the United States will experience the benefit from its own emission reductions.[311] International cooperation would only increase the benefits that controlling carbon dioxide emissions would have on United States populations.

b. *Special Populations vs. General Populations*

In addition to the question of whether the Clean Air Act may address problems with global effects, there have been questions about whether the Clean Air Act is intended to protect small domestic populations that are particularly sensitive to air pollutants. In a 1987 article, Justice Scalia asked: "[D]oes a particular pollutant constitute a threat if it would produce illness in only 100 highly susceptible individuals nationwide? What about 5000 individuals or 50,000 individuals?"[312] He suggests that, under the CAA, whether public health is endangered is a fact-based policy analysis to determine the acceptable level of illness.[313] The Senate Report to the original 1970 CAA includes sensitive populations, such as asthmatics and emphysematics among the populations of the public to be protected under sections 108 and 109,[314] and, in setting the primary NAAQS, the EPA considers the health of special populations, including sensitive populations, such as asthmatics, children, and the elderly.[315]

[308] *See supra* Part II.B.

[309] *See* 42 U.S.C. § 7415 (2000).

[310] *See* 42 U.S.C. § 7415(c) (2000).

[311] *See supra* notes 301–03 (discussing the Clean Air Act's national focus).

[312] Justice Antonin Scalia, *Responsibilities of Regulatory Agencies Under Environmental Laws*, 24 HOUS. L. REV. 97, 103 (1987).

[313] *See id*.

[314] S. REP. NO. 91-1196, at 10 (1970).

[315] *See* U.S. EPA, *National Ambient Air Quality Standards (NAAQS)*, *at*

Protection of the most sensitive groups should be a major consideration of the Administrator when setting the NAAQS.[316] In particular, the Senate expressed concern about the adverse affects of specific "criteria pollutants" on both special and general populations.[317] For example, legislative history indicated that adverse effects on the following populations should be considered in setting the NAAQS: the elderly, people with pre-existing respiratory problems, children, a group known as "responders" who make up twenty percent of the population, fetuses, persons with heart diseases, six million asthmatics, seven million people with pulmonary disease, and healthy people.[318]

When considering whether carbon dioxide is reasonably anticipated to endanger public health, the Administrator must consider the impact of greenhouse gas-induced climate change both on the general population and on special populations. In its Third Assessment, the IPCC addressed the impact of climate change on special populations. The IPCC expected impacts of future climate change extremes to fall disproportionately on the poor,[319] suggesting that socioeconomic factors have an impact on the actual risk of climate-sensitive diseases such as dengue and yellow fever.[320] Patients with specific allergies to grass pollen are at risk for storm-related asthma.[321] Higher temperatures are very likely under simple extremes to produce increased incidence of death and serious illness in older age groups and the urban poor.[322] Special populations may be unable to adapt to changes in the environment and may experience a greater risk of harm than the general population. A significant portion of the U.S. population might not have the means or skills to adjust to the loss of

http://www.epa.gov/air/criteria.html (last updated Oct. 1, 2004).

[316] Lead Industries Ass'n v. EPA, 647 F.2d 1130, 1141 (D.C. Cir. 1980); *see also* S. REP. NO. 101-228, at 5 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3391 (discussing how criteria pollutants affect specific categories of people as well as the population at large).

[317] S. REP. NO. 101-228, at 7 (1970), *reprinted in* 1990 U.S.C.C.A.N. at 3393.

[318] *Id.*

[319] *Summary for Policymakers*, *supra* note 6, at 6.

[320] Cohen et al., *supra* note 69, at 763; *see also* HUNTER, *supra* note 1, at 602–03 (explaining that socioeconomic groups with less access to health care are more likely to suffer adverse health effects).

[321] Cohen et al., *supra* note 69, at 761.

[322] Carter et al., *supra* note 67, at 180 tbl.3-10; *see also* Cohen et al., *supra* note 69, at 761 (noting that the "[i]ncreased frequency and severity of heat waves may lead to an increase in illness and death" among the elderly and poor).

habitat.[323] The EPA acknowledges that "the elderly, particularly those living alone, and children are in the greatest danger during heat waves."[324] Sensitive groups may also be more vulnerable to vector-borne diseases such as malaria and dengue predicted to spread to North America as a result of global warming.[325]

In addition to differential impacts on individuals based on their socioeconomic status, age, or health, the IPCC identified the impacts of climate change on regional populations in the United States, as well as on the general population. In its 2001 Working Group II assessment, the IPCC looked at the impacts on, adaptation by, and vulnerabilty of the population at large in various regions of the United States.[326] The IPCC analyzed the following sub-regions in relationship to climate change: Pacific, Rocky Mountains-Southwest United States, Prairies-Great Plains, Great Lakes and St. Lawrence River, North Atlantic, and the Southeast United States.[327] When assessing whether the adverse effects of carbon dioxide and greenhouse gases adversely affect public health or welfare in the United States, the Administrator might rely on this regional analysis.

3. *Are Carbon Dioxide Emissions Reasonably Anticipated to Endanger Public Health?*

The term "public health" is left undefined by the CAA,[328] but the language of section 109(b)(1) helps to define the scope of the term under section 108(a)(1)(A) for the purpose of listing criteria pollutants.[329] *Black's Law Dictionary* defines public health as both

> (1) the health of the community at large and (2) the healthful or sanitary condition of the general body of people or the

[323] HUNTER, *supra* note 1, at 602.

[324] U.S. EPA, *Direct Weather-Related Mortality*, *available at* http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BUTFX/$File/mortality_text.pdf (last visited Apr. 14, 2005).

[325] *See* HUNTER, *supra* note 1, at 602–03.

[326] *See* Cohen et al., supra note 69, at 775–76.

[327] *Id*. Climate change must be viewed regionally to account for the variances in regional climate. *See* CLIMATE ACTION REPORT, *supra* note 9, at 88 ("U.S. climate conditions vary from the cold of an Alaskan winter to the heat of a Texas summer.").

[328] *Cf.* Clean Air Amendments of 1977, Pub. L. No. 91-604, § 15(a)(1), 84 Stat. 1676, 1710 (codified as amended at 42 U.S.C. § 7602(h) (2000)) (regarding "language referring to effects on welfare").

[329] *See* 42 U.S.C. § 7409(b)(1) (2000).

> community en masse; esp., the methods of maintaining the health of the community, as by preventive medicine and organized care for the sick.[330]

Since health is not defined in the Clean Air Act, the scope of its application for setting the NAAQS in section 109 may prove helpful in understanding what coverage Congress intended when using the term "public health." The primary NAAQS must allow for an "adequate margin of safety," which is "requisite to protect public health."[331] Section 109(b) does not specify what Congress intended in the language "requisite to protect public health."[332] The extent to which the Administrator may protect health was at issue in *Lead Industries*.[333] The plaintiffs in *Lead Industries* contested the types of health effects on which the Administrator could base air quality standards.[334] The court in *Lead Industries* responded to their arguments by referring to the precautionary nature of the statute, pointing out that some uncertainty about health effects is inevitable, and that it was the clear congressional intent to allow the EPA to address these uncertainties.[335] The court identified Congress's intent to allow for an "adequate margin of safety" as an intent to allow protection against effects whose medical significance was a matter of disagreement or against effects that research had not yet uncovered.[336] The *Lead Industries* court held that the Administrator did not exceed his authority when promulgating air quality standards for lead that were protective of children, based on subclinical effects of lead exposure, which had not proved harmful to health.[337]

The legislative history of the Clean Air Act and case law reveal that the Administrator may not consider economic and technological feasibility, when fulfilling duties under the Clean Air Act sections 108 to 110.[338] The Senate Report indicated that the goal of the Clean Air Act was to protect the public from adverse

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[330] BLACK'S LAW DICTIONARY 737 (8th ed. 2004).
[331] *See id*.
[332] *See* Lead Industries Ass'n v. EPA, 647 F.2d 1130, 1152 (D.C. Cir. 1980).
[333] *Id.* at 1148.
[334] *Id*. at 1151–52.
[335] *Id.* at 1154.
[336] *Id.*
[337] *See id*. at 1153–56.
[338] *Id.* at 1149.

health effects.[339] In *Whitman v. American Trucking*, the court interpreted "requisite" to mean sufficient, but not more than necessary—setting the minimum requirement encompassing the Administrator's discretion to establish NAAQS under CAA section 109.[340] The oral argument for *American Trucking* suggested that the Administrator should conduct a health balance of positive health effects weighed against negative health effects.[341] When looking at the impact on public health, the Administrator may consider the effects in the ambient air that are of medical significance, as well as "treatability" factors.[342] The Administrator may balance the positive impact that greenhouse gas-induced climate change may have on public health against the negative impact on public health.[343]

In *Whitman v. American Trucking*, the court held that the terms "adequate margin of safety" and "requisite" did not "leave room to pad health effects with cost concerns."[344] In an attempt to read a cost analysis into the Clean Air Act, American Trucking Associations, Inc. had argued that Congress did not adopt the language of the Senate bill ("health of persons") but instead adopted the language of the House bill ("public health").[345] The Supreme Court found it implausible that Congress intended to give the EPA the discretion to include cost in establishing NAAQS within its assessment of an adequate margin of safety.[346] The Court stated that the cost factor is "so indirectly related to public health" and "so full of potential for canceling the conclusions drawn from direct health effects" that Congress would have expressly included cost factors in sections 108 and 109, if Congress had intended to give the Administrator the discretion to

[339] S. REP. NO. 91-1196, at 1 (1970).

[340] Whitman v. American Trucking Ass'ns, Inc., 531 U.S. 457, 473 (2001).

[341] *See* Oral Argument at 21–22, Whitman v. American Trucking Ass'ns, Inc., 531 U.S. 457 (2001) (No. 99-1426).

[342] *Id.* at 40–41.

[343] *See id.* at 21–22; *see also* CLIMATE ACTION REPORT, *supra* note 9, at 82 (identifying such benefits from increased atmospheric carbon dioxide as "an extended growing season, with increased crop and forest productivities, extended seasons for construction and warm-weather recreation, and reduced heating requirements and cold-weather mortality").

[344] 531 U.S. at 468.

[345] *See* Oral Argument at 18, *American Trucking* (No. 99-1426).

[346] *American Trucking*, 531 U.S. at 469.

consider the cost factor.[347]

With respect to greenhouse gas emissions, the Administrator should weigh the projected negative impacts of climate change on human health against the projected beneficial impacts on human health. The IPCC projected the following adverse impacts in the twenty-first century, based on models and other studies: a reduction in crop yields in tropical and sub-tropical regions, a general reduction in crop yields in most mid-latitude regions; decreased water availability in the subtropics; an increased mortality as a result of vector-borne diseases, such as malaria, and waterborne diseases, such as cholera; an increase in heat stress mortality; and an increase in the risk of flooding, as a result of increased precipitation and rising sea levels.[348] The IPCC identified the following projected beneficial impacts based on models and other studies: increased potential crop yield in some mid-latitude areas, under scenarios of increased temperatures of less than a few degrees Celsius; a potential increase in global timber supply from appropriately managed forests; increased water supplies in southeast Asia; and reduced winter mortality in mid- to high latitude regions.[349]

In the United States, the northeastern and midwestern cities might experience the greatest number of heat-related illnesses and deaths in response to increased summer temperatures.[350] In a warmer world, heat waves in North America are projected to become more frequent and severe, leading to increases in illness and death, particularly among the young, the elderly, the poor, the frail, the ill, those who take medication that affects the body's thermoregulatory ability, and those who live on the top floors of apartment buildings without access to air conditioning, especially

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[347] *Id*.

[348] *Summary for Policymakers*, *supra* note 6, at 5; *see also* HUNTER, *supra* note 1, at 596 (establishing that the World Health Organization identifies the following global health effects as a result of increased temperatures: increased illness and death from heat waves and air pollution, outbreaks of insect-borne infectious diseases, and increased cases of diarrhea and other waterborne diseases); HUNTER, *supra* note 1, at 603 (stating that small island countries are at greatest risk due to increased sea levels).

[349] *Summary for Policymakers*, *supra* note 6, at 6.

[350] Cohen et al., *supra* note 69, at 761 (citing episodes of heat-related deaths of 118 persons in Philadelphia in 1993, 91 persons in Milwaukee in 1995, and 726 persons in Chicago in 1995). Note the recent deaths in New York due to increased temperatures. *See* Tara Bahrampour, *Most Deadly of the Natural Disasters: The Heat Wave*, N.Y. TIMES, Aug. 13, 2002, at F5.

those in large urban areas.[351] Heat waves will affect populations with existing respiratory and cardiovascular diseases, but will also increase the risk of morbidity in the general population that may result from heat stroke and heat exhaustion.[352] On the other hand, the decrease in cold-related illness as a result of global warming is likely to produce a beneficial effect in the reduction of cold-related mortality.[353]

The IPCC postulates that health impacts of extreme weather events will yield an increase in the frequency and severity of extreme weather events.[354] These extreme events may result in adverse health effects such as an increase in "deaths, injuries, toxic contamination or ingestion, infectious diseases, stress-related disorders, environmentally forced migration, and settlement in poorer urban areas."[355] Increased temperatures may lead to a greater frequency of flooding, posing risks to human life and property, as well as marine life.[356] Floodwaters that enter sites containing toxic wastes, sewage, or animal wastes may lead to immediate human exposure to these wastes.[357] Scientists express concern over possible increased drought as a result of higher concentrations of greenhouse gases in the atmosphere.[358] Increased drying would produce more frequent and longer droughts, followed by an increased number of heat waves and

[351] *Id*. Though the IPCC does not explain the greater impact upon the northeastern and midwestern states as a result of increased temperatures, the inference that adaptation would mitigate these effects to some extent can be drawn from the IPCC report. *See* Cohen et al., *supra* note 69, at 761. The cities of the Northeast and Midwest are large cement-filled urban areas, with little shade, and no air conditioning in the impoverished areas. The harmful effects of heat-related illnesses might be mitigated in these large urban areas if measures are taken to provide air conditioning or alternative areas to live during the hotter months. *See id.*

[352] Cohen et al., *supra* note 69, at 761; *see also* CLIMATE ACTION REPORT, *supra* note 9, at 106 (More deaths are associated with extreme heat in the United States than any other extreme weather events. During a 1995 five-day heat wave in Chicago with maximum temperatures ranging between 93ºF–104ºF, the number of deaths rose by eighty-five percent).

[353] Cohen et al., *supra* note 69, at 761.

[354] *Id.*

[355] *Id*.

[356] *Id.* at 749, 762.

[357] *Id*. at 762.

[358] *See* CLIVAR/PAGES/IPCC Workshop, *supra* note 463 (noting that risk of increased summer continental drought exists in the United States as a result of global warming, since evaporation exceeds precipitation in the summer months across the United States).

wildfires.[359]

The IPCC in its 2001 assessment also addressed the potential indirect health impacts of climate change.[360] For instance, the IPCC reports that outbreaks of St. Louis encephalitis (SLE) in the midwestern United States are apparently associated with a sequence of warm, wet winters, cold springs, and hot, dry summers[361] and that, in the western United States, an increase in the average temperature of 3ºC–5ºC may cause a northern shift in the distribution of western equine encephalitis (WEE) and SLE outbreaks and a decrease in the range of WEE in southern California.[362] Global warming may cause malaria to extend northward into temperate countries and reintroduce it back into the United States.[363] Hantavirus pulmonary syndrome (HPS) is a virus present in rodents in the United States and Canada.[364] Since changes in the climate and ecology affect rodent behavior, changes in the incidence of HPS are anticipated from global warming.[365] Recent outbreaks of cryptosporidium can be linked to increases in ambient air temperatures, prolonged summer seasons, increased rainfall and runoff, and watersheds with urban and agricultural mixtures.[366] Toxic organisms such as red tides may flourish in

[359] *See id*. at 5. The workshop calls for more data and research on the use of paleoclimatic information to clarify natural versus anthropogenic influences on drought patterns. A planned 2007 IPCC Fourth Assessment will review patterns of climate trends and whether these patterns are linked to human influences. The Fourth Assessment will also address the question, "Are climate extremes such as droughts, floods, and heat waves changing, and are they expected to change in the future?" *See id*. at 5, 12; *see also* CLIMATE ACTION REPORT, *supra* note 9, at 101 (noting likely occurrence of more frequent and longer dry periods in interior portions of the country).

[360] Cohen et al., *supra* note 69, at 762.

[361] *Id.*

[362] *Id*. Note that, under conservative predictions, a 2.5ºF temperature increase is anticipated over the next 100 years, and under some scenarios as much as a 10.4ºF increase is projected. *See supra* note 69 and accompanying text.

[363] *Id.* at 762–63; *see also* CLIMATE ACTION REPORT, *supra* note 9, at 108 (noting increased global risk from resurgent malaria outbreaks due to climate change).

[364] Cohen et al., *supra* note 69, at 763; *see also* CLIMATE ACTION REPORT, *supra* note 9, at 108 ("Higher temperatures may increase or reduce vector survival rate, depending on each specific vector, ecology, and many other factors.").

[365] Cohen et al., *supra* note 69, at 763 (noting, however, that changes in incidence of HPS "will be difficult to predict because of local rainfall variability").

[366] *See id.* at 764.

warm marine water, leading to shellfish poisoning.[367] Marine-related illness has increased in the United States during El Niño stints in the last twenty-five years.[368] Waterborne diseases resulting from warm marine water "have been demonstrated to cause illness in humans and death in some species of fish."[369]

The IPCC assessed the regional impacts on human populations resulting from climate change. With increased temperatures, the coastal regions are vulnerable to rising sea levels, storm surges, frequent flooding, and salt intrusion,[370] effects that will have a broad impact since more than sixty-five percent of North Americans live in coastal communities.[371] In particular, the coastal regions will be at increased risk for contamination of fresh water by nearby salt water bodies.[372] Flooding and salt intrusion may adversely affect farming and manufacturing activity in low lying areas.[373] Scenario-based studies over the past fifteen years in the Great Lakes and St. Lawrence sub-regions consistently indicate that a warmer climate will lead to lower lake levels and reductions in water supply, necessitating water resource and ecosystem management and raising health concerns.[374] With regards to inland regions, the Rocky Mountains and Southwest U.S. sub-regions are susceptible to drought; however, the harmful effects may be mitigated through water banks (though these water banks may adversely impact aquatic ecosystems).[375]

The New England states, in their section 108 complaint, rely upon the U.S.'s *Climate Action Report*[376] and the EPA's "Global Warming" web site describing specific adverse impacts on public health "reasonably anticipated"[377] to occur in the New England

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[367] *See id*.
[368] *See id*.
[369] *See id*.
[370] *See id.* at 766.
[371] *See id*.
[372] *See id*.
[373] *See id.*
[374] *See id.* at 778.
[375] *See id.* at 777.
[376] Complaint ¶¶ 56–57, Massachusetts v. Whitman (D. Conn. June 4, 2003) (No. 3:03CV984); *see also* CLIMATE ACTION REPORT, *supra* note 9.
[377] Complaint ¶ 56, Massachusetts v. Whitman (No. 3:03CV984); *see also* U.S. EPA, *Global Warming—Impacts: Health*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/Impactshealth.html (last modified Jan. 7, 2000).

states as a result of climate change.[378] The New England states claim the following adverse impacts on public health: higher temperatures and increased frequency of heat waves, which may increase the number of heat-related deaths;[379] increased ground-level ozone, which may aggravate respiratory illnesses such as asthma;[380] warmer temperatures and wetter conditions, which may increase the potential for transmission and/or incidence of diseases including malaria, dengue fever, Eastern equine encephalitis, and Lyme disease in the New England states because ticks, their rodent hosts, and mosquito populations will likely increase due to increased temperatures;[381] and harmful toxic algae blooms (red tides) carrying bacteria such as cholera, which are likely to increase as a result of warmer seas.[382]

On the other hand, scientists identify some crops that would benefit from temperature increases associated with increased carbon dioxide emissions. In the Great Plains, however, crops are likely to decrease due to drought.[383] For those people dependent on the resources of their region, a negative impact on public health is anticipated due to the risk of crop damage.[384] Heat-related deaths are anticipated under most scenarios in North America as a result of climate changes, and sensitive populations may be more

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[378] *See* Complaint ¶¶ 56, 66, Massachusetts v. Whitman (No. 3:03CV984). By 2100, average temperatures in Massachusetts could increase by about 4ºF (with a range of 1–8ºF) in winter and spring and about 5ºF (with a range of 2–10º F) in summer and fall. By 2100, average temperatures in Connecticut could increase by about 4ºF (with a range of 2–8ºF) for all seasons. By 2100, average temperatures in Maine could increase by about 4ºF (with a range of 2–8ºF), slightly less in spring and fall and slightly more in summer and winter.

Id. ¶ 67.

[379] *Id.* ¶¶ 70–71 ("By 2050, it has been projected that heat-related deaths in Boston during a typical summer could increase 50%, from close to 100 heat-related deaths per summer to over 150."); *see also* OFFICE OF POLICY, PLANNING AND EVALUATION, U.S. EPA, EPA 230-F-97-008u, CLIMATE CHANGE AND MASSACHUSETTS 3 (1997), *available at* http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/ SHSU5BUSRR/$File/ma_impct.pdf.

[380] Complaint ¶¶ 72–74, Massachusetts v. Whitman (No. 3:03CV984); *see also* OFFICE OF POLICY, PLANNING AND EVALUATION, U.S. EPA, *supra* note 379, at 3.

[381] Complaint ¶ 76, Massachusetts v. Whitman (No. 3:03CV984); *see also* OFFICE OF POLICY, PLANNING AND EVALUATION, U.S. EPA, *supra* note 379, at 3.

[382] Complaint ¶ 77, Massachusetts v. Whitman (No. 3:03CV984); *see also* OFFICE OF POLICY, PLANNING AND EVALUATION, U.S. EPA, *supra* note 379, at 3.

[383] HUNTER, *supra* note 1, at 602.

[384] HUNTER, *supra* note 1, at 602.

affected as a result of increased maximum temperatures.[385] Intervening public health action and treatment would determine the incidence of death.[386]

On its web site, the EPA itself identifies projected regional and global adverse impacts of global warming.[387] Extremely hot temperatures increase the number of people who die daily as a result of cardiovascular and respiratory emergencies.[388] Studies show that an increase of about 2ºF in Atlanta would increase heat-related deaths anywhere from 78 deaths per year to between 96 and 247 deaths per year in the city.[389] Though warmer temperatures may decrease the number of cold-related deaths, twice as many people die from heat-related deaths in the United States as die from cold-related deaths, so the overall mortality rate would increase.[390] Furthermore, the EPA asserts that global warming is unlikely to reduce the occasional cold spells or extreme events responsible for the majority of cold-related deaths.[391] The EPA admits that global warming may also increase the risk of infectious diseases, spread by insects like mosquitoes,[392] and the EPA also acknowledges that vector-borne diseases such as malaria, dengue fever, yellow fever, and encephalitis could move northward.[393] The EPA asserts, however, that the risks associated with global warming will not inevitably result in increased

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[385] Cohen et al., *supra* note 69, at 761.

[386] *See id*.

[387] *See* U.S. EPA, *supra* note 377.

> Throughout the world, the prevalence of particular diseases and other threats to human health depend largely on local climate. Extreme temperatures can directly cause the loss of life. Moreover, several serious diseases appear only in warm areas. Finally, warm temperatures can increase air and water pollution, which in turn harm human health.

Id.

[388] *See id*. ("In July 1995, a heat wave killed more than 700 people in the Chicago area alone.").

[389] *See id*.

[390] *See id*.

[391] *See* U.S. EPA, *Global Warming—Impacts: Health* ("For the most part, cold-related deaths occur during occasional cold spells in areas with mild winters where people prepare less for cold, or during extreme cold events like the severe snow storm that struck Colorado in November of 1997."), *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ImpactsHealth.html (last modified Jan 7, 2000).

[392] *See id*.

[393] *See id*.

mortality if proper adaptive measures are enforced.[394] Based on the potential effects described above, it is difficult to argue that carbon dioxide emissions may not reasonably be anticipated to endanger public health in North America.

The potential adverse health effects in the United States as a result of the presence of carbon dioxide in the ambient air are significant. The health effects associated with morbidity and mortality as a result of anthropogenic carbon dioxide induced climate change give rise to the requisite level of endangerment to public health, under section 108(a)(1)(A).[395] The IPCC assessment associates high confidence levels for multiple serious potential impacts on the public health of the general population and special populations of the United States, under likely and very likely scenarios, identifying a level of certainty between 66–90% and higher for some scenarios.[396] The United States and the EPA also identify numerous adverse impacts, including projected increases in overall mortality and numerous impacts on the public health, identifying these impacts as "likely" and "very likely" to occur as a result of climate change associated with human activity.[397] In keeping with congressional intent to protect the public health and to speed up the response to air pollution under the Clean Air Act, the Administrator should list carbon dioxide as a criteria pollutant, since carbon dioxide is reasonably anticipated to endanger public health.

4. *What Did Congress Mean by "or Welfare," and Is Carbon Dioxide Present in the Ambient Air Reasonably Anticipated to Endanger Public Welfare?*

The CAA requires the Administrator to determine whether a pollutant is reasonably anticipated to endanger public health *or welfare*.[398] The CAA defines effects on "welfare" in section 302(h) as including "effects on soils, water crops, vegetation, man-

[394] *See id*. ("Malaria is rare in the United States [and the] nation has the ability to rapidly identify and contain outbreaks . . . . Heat-related deaths can be prevented [by moving] vulnerable people to air-conditioned buildings and by reducing the emissions of photochemical oxidants which cause ground-level ozone.").

[395] 42 U.S.C. § 7408(a)(1)(A) (2000).

[396] *See* text accompanying *supra* note 73.

[397] *See supra* notes 324, 377 and accompanying text; *see infra* notes 411, 417.

[398] 42 U.S.C. § 7408(a)(1)(A) (2000).

made materials, animals, wildlife, weather, visibility, and climate, [and] damage to and deterioration of property."[399] Applying the Senate's construction of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to an interpretation of the term "or" in the Clean Air Act section 108(a)(1)(A), the use of the disjunctive "or" leads to the conclusion that endangerment to public welfare alone would trigger the requirement in section 108(a)(1)(A).[400] The projected climate change as a result of greenhouse gases with nothing more would satisfy the requirement of the statute since weather is independently identified under the definition of welfare in the Clean Air Act.[401]

According to the IPCC, natural systems are vulnerable to climate change because of limited adaptive capacity, and some systems may suffer irreversible damage.[402] Natural systems at risk include "glaciers, coral reefs and atolls, mangroves, boreal and tropical forests, polar and alpine ecosystems, prairie wetlands, and remnant native grasslands."[403] Global warming will lead to a loss of habitat for cold water fish and a gain of habitat for warm water fish.[404] Some species of animals that are labeled "critically endangered" could become extinct as a result of climate changes.[405] Though some species may flourish with climate change, climate change may place some more vulnerable species at risk of extinction.[406] Failure to adapt to climate change by forests and other ecosystems could lead to a substantial loss of biodiversity and natural resources.[407] The *Climate Action Report* projects deterioration of the United States' coral reefs due to increased carbon dioxide concentrations.[408] Indirect effects would accompany such deterioration since coral reefs support fisheries,

[399] 42 U.S.C. § 7602(h) (2000).

[400] S. REP. NO. 101-228, at 287 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3631.

[401] *See* 42 U.S.C. § 7602(h).

[402] *Summary for Policymakers*, *supra* note 6, at 4.

[403] *See id*. at 4–5.

[404] HUNTER, *supra* note 1, at 598.

[405] *Id*. Globally, wildlife populations have been affected and continue to be affected directly as a result of climate change and indirectly through changes in vegetation. *See id.*

[406] *Summary for Policymakers*, *supra* note 6, at 5 ("It is well established that the geographical extent of the damage or loss, and the number of systems affected, will increase with the magnitude and rate of climate change.").

[407] HUNTER, *supra* note 1, at 598.

[408] *See* CLIMATE ACTION REPORT, *supra* note 9, at 104.

protect the coastal areas, and provide a habitat for marine biodiversity useful for genetic research.[409] The IPCC projects that sea levels will rise between four and thirty-five inches during the twenty-first century.[410]

The New England states claim that rising sea levels attributed to global warming will adversely affect the coast of the New England states.[411] The states claim that "[b]arrier beaches, salt marshes, and other wetland resource areas buffer the coast from storms, waves and flooding."[412] The states also claim that, each year, rising sea levels result in the loss of sixty-five acres of land in Rhode Island, Cape Cod, Nantucket, and Martha's Vineyard.[413] Furthermore, they claim that sea level rise will inundate coastal wetlands, destroying habitats for commercial game species and migratory birds, as well as for other wildlife.[414] The New England states also claim that barrier beach island refuges for migratory birds, including the piping plover and the endangered roseate tern, will be threatened or lost as a result of rising sea levels.[415] Finally, they claim that harbor and gray seals using the beaches in the winter are also likely to lose habitat with a rise in sea level.[416]

The southeastern United States and the Gulf of Mexico are vulnerable to hypoxia, and scientists project that "[i]ncreases in extreme precipitation events, which are likely to occur with climate change, are likely to exacerbate coastal eutrophication problems in many locations."[417] Human-induced climate change will diminish the reliability of practices designed to reduce nitrogen losses from agricultural watersheds, with impacts on natural ecosystems.[418] The shorelines in Florida and Louisiana are

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[409] *See id*. at 104.

[410] *See id*. at 103.

[411] Complaint ¶¶ 81–92, Massachusetts v. Whitman, (D. Conn. June 4, 2003) (No. 3:03CV984). *See generally* U.S. EPA, *supra* note 1.

[412] Complaint ¶ 83, Massachusetts v. Whitman (No. 3:03CV984); *see also* U.S. EPA, *supra* note 379, at 3 ("At Boston, sea level already is rising by 11 inches per century, and it is likely to rise another 22 inches by 2100.").

[413] Complaint ¶ 83, Massachusetts v. Whitman (No. 3:03CV984).

[414] *Id*. ¶ 84; *see also* U.S. EPA, *supra* note 379, at 4.

[415] Complaint ¶ 84, Massachusetts v. Whitman (No. 3:03CV984) (listing the Monomy National Wildlife Refuge, south of Cape Cod, and the Parker River National Wildlife Refuge in northeastern Massachusetts as habitats potentially adversely affected).

[416] *See id*.

[417] Cohen et al., *supra* note 69, at 780.

[418] *See id. But see* CLIMATE ACTION REPORT, *supra* note 9, at 91. Increased

at risk for erosion and storm surges, and, under some more dire predictions, the Florida Keys' and Louisiana's existence are seriously threatened by flooding due to the melting of glaciers and the subsequent rise in sea level.[419] According to the EPA, the sea level is rising more rapidly in the United States than in some other parts of the world.[420] Rising sea levels inundate wetlands, erode beaches, and increase salinity of rivers, bays, and groundwater tables.[421] "[A] two foot rise in sea level could eliminate 17–43 percent of U.S. wetlands, with more than half of the loss taking place in Louisiana alone."[422] Climate change will increase the vulnerability of coastal areas to flooding.[423] Climate changes and rising sea levels could lead to the erosion of the shoreline and associated habitats, changes in sediment, and increased coastal flooding.[424]

Carbon dioxide emissions will have an impact on the public welfare throughout the United States. For instance, the impact of these emissions will be felt in the U.S.-Mexican border states, which are highly vulnerable to droughts and flooding.[425] Scientists identify the relationship between climate and hydrology: as evaporation exceeds precipitation, a soil moisture deficit results.[426] The IPCC maintains that global warming will result in reduced lake levels for the Great Lakes and the St. Lawrence.[427] Problems in the Caribbean may occur as a result of climate change, producing changes in sea levels that will affect coastal ecosystems, aquatic ecosystems, and possibly economically important species.[428] Some scientists predict that beech and sugar maple trees could disappear from the eastern United States because they would not be capable of reproduction under the new climate

carbon dioxide may enhance plant growth if the plants have sufficient water and nutrients (such as nitrogen). The *Climate Action Report* projects increased crop yields in general as a result of increased carbon dioxide emissions in the atmosphere. *See id.*

[419] *See* HUNTER, *supra* note 1, at 595.

[420] *See* U.S. EPA, *supra* note 1.

[421] *See id*.

[422] *See id*.

[423] *See id*.

[424] HUNTER, *supra* note 1, at 595.

[425] Cohen et al., *supra* note 69, at 781–82.

[426] *See id*.

[427] *See id.* at 737, 778.

[428] *See id.* at 783; *see also* CLIMATE ACTION REPORT, *supra* note 9, at 103 (discussing the possible changes in sea level due to climate change).

conditions.[429] According to the EPA, "[i]f the earth warms 2ºC (3.6ºF) in 100 years . . . , [a] species [of trees] would have to migrate about 2 miles every year."[430] Since seed-bearing and nut-bearing trees such as oaks are only likely to spread a few hundred feet per year, the range of a specific species may diminish, leading to a less diverse mix of tree species in some forests.[431]

Congress intended the Administrator to fulfill the duties under the Clean Air Act in a precautionary manner. The projected impacts due to global warming on public welfare described in the preceding paragraphs are projected with a high to moderate level of confidence. They provide significant support for the argument that carbon dioxide significantly contributes to greenhouse gases responsible for global warming that may reasonably be anticipated to endanger public welfare.

D. *Is the Presence of Anthropogenic Carbon Dioxide in the Ambient Air a Result of Numerous or Diverse Mobile or Stationary Sources?*

Since the birth of the Industrial Revolution in the eighteenth century, the burning of fossil fuels for industrial and domestic purposes has added a human contribution to greenhouse gases present in the atmosphere.[432] According to the IPCC, the amount of carbon dioxide present in the atmosphere has increased more than thirty percent since preindustrial times, and continues to increase at a rate of 0.4% per year, primarily due to the combustion of fossil fuels and deforestation.[433] The IPCC stated in its 2001 report, "we know that this increase is anthropogenic because the changing isotopic composition of the atmospheric CO_2 betrays the fossil origin of the increase."[434] According to the IPCC, the increased concentration of greenhouse gases in the atmosphere

[429] HUNTER, *supra* note 1, at 596–97.

[430] *See* U.S. EPA, *Global Warming—Impacts: Forests*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/Impactsforests.html (last modified Jan. 7, 2000).

[431] *See id*.

[432] Baede et al., *supra* note 2, at 92; *see also* CLIMATE ACTION REPORT, *supra* note 9, at 83 ("While the range of possible outcomes is very broad, all projections prepared by the IPCC (2001d) indicate that the anthropogenic contribution to global climate change will be greater during the 21st century than during the 20th century.").

[433] Baede et al., *supra* note 2, at 92.

[434] *Id*.

enhances the absorption and emission of infrared radiation resulting in the enhanced greenhouse effect.[435] Anthropogenic greenhouse gases other than carbon dioxide add to the effect of increased anthropogenic carbon dioxide in the atmosphere.[436]

In 1997, the EPA acknowledged that

> [g]ases in the atmosphere such as carbon dioxide and methane trap the sun's energy and warm the earth. This natural "greenhouse effect" is intensified by human activities, especially the combustion of fossil fuels. Increased energy use in cars, homes, and factories raise the concentration of carbon dioxide in the atmosphere, and this can cause a variety of impacts on the global climate. As the climate changes, natural systems will be destabilized, which could pose a number of risks to human health.[437]

In 1999, total greenhouse gas emissions in the U.S. rose to 11.7% above 1990 emissions.[438] Carbon dioxide emissions make up 82.4% of the U.S.'s GHG emissions,[439] and the combustion of fossil fuels is the dominant source of carbon dioxide emissions in the United States.[440]

Anthropogenic carbon dioxide emissions are therefore present in the ambient air as a result of numerous or diverse mobile or stationary sources. The EPA defines mobile sources as "moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles and gasoline-powered lawn mowers."[441] In the *Climate Action Report*, the U.S. reported that the number of registered highway vehicles in the U.S. had increased at a faster rate than the population.[442] The report further stated that "[p]assenger cars, trucks, motorcycles, and buses emit significant quantities of air pollutants with local, regional, and global effects"[443] and that "[m]otor vehicles are major sources of

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[435] *See id.* at 93.

[436] *See id.* (The total effect of other greenhouse gases at the surface is often expressed in "terms of the effect of an equivalent increase in carbon dioxide.").

[437] OFFICE OF POLICY, PLANNING AND EVALUATION, U.S. EPA, EPA 236-F-97-005, CLIMATE CHANGE AND PUBLIC HEALTH 1 (1997).

[438] *See* CLIMATE ACTION REPORT, *supra* note 9, at 28.

[439] *See id.* at 30 fig.3-4.

[440] *See id.* at 38.

[441] OFFICE OF POLICY ANALYSIS & REVIEW, U.S. EPA, THE PLAIN ENGLISH GUIDE TO THE CLEAN AIR ACT 22 (1993).

[442] CLIMATE ACTION REPORT, *supra* note 9, at 35.

[443] *See id.*

CO, CO_2, & CH_4."[444] Between 1990 and 1999, transportation was responsible for a fairly consistent twenty-six percent of the total U.S. greenhouse gas emissions.[445]

A stationary source is defined under the Clean Air Act as follows: "generally any source of an air pollutant except those emissions resulting directly from an internal combustion engine for transportation purposes or from a nonroad engine or a nonroad vehicle . . . ."[446] "Activities related to the generation, transmission, and distribution of electricity in the United States" account for a significant percentage of the total U.S. greenhouse gas emissions.[447] In 1996, the demands of a cold winter resulted in rising gas prices, causing electric utilities to switch from natural gas to the more carbon-intensive coal, thereby causing overall carbon dioxide emissions to increase.[448] In 1998, warmer weather led to lower carbon dioxide emissions as the use of natural gas for heating purposes was reduced.[449] However, the hot summer offset many of the gains, as the demand for air conditioning increased.[450] Cement manufacturers and electric utilities have continued to contribute to the increase in greenhouse gas emissions.[451]

As noted earlier, the combustion of fossil fuels is the largest contributor to U.S. greenhouse gas emissions.[452] Transportation accounted for thirty-one percent of carbon dioxide emissions from fossil fuel combustion in 1999, most of which came from the combustion of petroleum products.[453] Meanwhile, thirty-six

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[444] *See id.* An inference could easily be drawn that the *Climate Action Report* here recognizes that carbon dioxide is an air pollutant.

[445] *See id.* at 36.

[446] *See* 42 U.S.C. § 7602(z) (2000); *see also* OFFICE OF POLICY ANALYSIS & REVIEW, U.S. EPA, *supra* note 441, at 23 (Stationary sources include power plants, gas stations, incinerators, and houses. Sources include factories and dry cleaning businesses.).

[447] CLIMATE ACTION REPORT, *supra* note 9, at 26 (finding that electrical utilities accounted for twenty-nine percent of U.S. emissions from 1990 to 1999).

[448] *See id.* at 30.

[449] *Id.*

[450] *See id*.

[451] *See id.* at 29.

[452] *See* text accompanying *supra* note 440.

[453] CLIMATE ACTION REPORT, *supra* note 9, at 40 fig.3-14. "Slightly less than two-thirds of the emissions resulted from gasoline consumption in motor vehicles. The remaining emissions came from other transportation activities, including the combusion of diesel fuel in heavy duty vehichles and jet fuel in aircraft." *Id*. at 40–41.

percent of U.S. carbon dioxide emissions from the combustion of fossil fuels came from the electric utilities, with the remaining sixty-four percent coming from "other uses in the residential, commercial, industrial and transportation end-use sectors."[454] Fossil fuels burning in large power plants and emitted from automobiles account for nearly eighty percent of carbon dioxide present in the ambient air; cement manufacturing and "deforestation" generate much of the remaining twenty percent of carbon dioxide present in the ambient air.[455] These statistics support the argument that the presence of carbon dioxide in the ambient air in the United States results from numerous or diverse mobile or stationary sources, fulfilling the final requirement for assessing a potential pollutant's eligibility for listing under section 108(a)(1)(B) of the CAA.[456]

IV. POLICY CONSIDERATIONS: THE CHALLENGE OF SETTING NAAQS FOR CARBON DIOXIDE

The EPA's consideration of the complexity of the problem of greenhouse gases should not factor into the section 108 analysis, since the complexity of the global warming problem does not directly address the question of whether carbon dioxide is an air pollutant.[457] In its section 202 ruling, however, the EPA seemed to focus on the complexity of regulating greenhouse gases.[458] This

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[454] *Id*. at 40.

[455] HUNTER, *supra* note 1, at 599. *See generally* PERCIVAL, *supra* note 7, at 1056.

> The combustion of fossil fuels releases carbon dioxide; coal releases almost twice as much per unit of energy as natural gas, while oil is about halfway in between. Since trees store carbon dioxide as they grow, cutting and burning of trees (as is occurring on a vast scale in tropical rain forests) releases carbon dioxide while simultaneously reducing the amount of carbon dioxide being removed from the atmosphere by forests.

Id.

[456] *See* 42 U.S.C. § 7408(a)(1)(B) (2000).

[457] See NRDC v. Train, 545 F.2d at 324 n.5 (2d Cir. 1976), for the Second Circuit's statement that "[i]t is irrelevant that the current state of scientific knowledge may make it difficult to set an ambient air quality standard."

[458] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,930 (Sept. 8, 2003) ("The science of climate change is extraordinarily complex and still evolving. Although there have been substantial advances in climate change science, there continue to be important uncertainties in our understanding of the factors that may affect future climate change and how

Note's analysis suggests that the Administrator must proceed with the section 108 inquiry despite the difficulties of regulating greenhouse gases if carbon dioxide meets the threshold standard and is categorized as an "air pollutant."[459] Though Congress does not indicate that the complexity in setting the NAAQS is a factor for considering air pollutant status under the Clean Air Act, and though the trial court decision in *NRDC v. Train* implicitly stated that the complex nature of setting ambient standards for a substance does not get at the threshold question of whether the substance is a pollutant,[460] the EPA has precluded listing due to the complexity of regulating carbon dioxide and other greenhouse gases.

The international scientific community continues to address the complex issues surrounding the impact of anthropogenic carbon dioxide on the carbon cycle. Scientists are currently studying carbon sinks and processes contributing to carbon uptake, considering the following topics: separability, permanence, saturation, stability, and attribution.[461] The IPCC continues to venture into more detailed research on land management and carbon stocks.[462] Scientists are in the process of planning for the IPCC Fourth Assessment scheduled to meet in 2007, identifying questions of interest to policy makers concerning the human influence upon regional and global climate change.[463]

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it should be addressed.").

[459] *See* NRDC v. Train, 545 F.2d at 324 n.5 (noting that Congress was aware of uncertainy and complexity regarding effects of air pollution and citing legislative history in support of argument that such difficulties do not affect duty to regulate).

[460] NRDC v. Train, 411 F. Supp. 864, 870 (S.D.N.Y. 1976).

[461] IPCC MEETING, *supra* note 2, at 6.

[462] *See id*. at 19 (defining carbon stocks as "[t]he absolute quantity of carbon held within a reservoir at a specified time").

[463] *See* CLIVAR/PAGES/IPCC Workshop, *A multi-millenia perspective on drought and implications for the future*, Nov. 18–21, 2003, at 5 [hereinafter CLIVAR/PAGES/IPCC Workshop] (a workshop in Tucson, Arizona, sponsored by the World Climate Research Program (WCRP), the program on Climate Variability and Predictability (CLIVAR), the International Geosphere Biosphere Program (IGBP), the program on Past Global Changes (PAGES), and the Intergovernmental Program on Climate Change), *available at* http://ipcc-wg1.ucar.edu/meeting/Drght/materials/wg1_meeting_Drght_finalreport.pdf. At this workshop in Tuscon, Arizona, S. Solomon, co-chair of Working Group 1, outlined the framework for the 2007 Fourth Assessment, identifying key issues for policy makers, including the evidence for global and regional changes in temperature, precipitation, and circulation; whether climate extremes such as

Scientists are able to identify the amount of human-induced carbon dioxide by measuring the isotopic concentrations of the anthropogenic carbon dioxide emissions in the atmosphere and by finding correlations between fossil fuel burning and atmospheric CO_2.[464] Scientists continue to study the impact of deforestation, the contribution of various sources of carbon dioxide emissions on the climate, and methods to preserve carbon sinks through proper land management and reforestation.[465]

To determine a national standard for setting the NAAQS, the Administrator of the EPA could determine that the seven percent reduction of carbon dioxide emissions against the 1990 baseline target by 2012 represents an achievable national standard, protective of health and welfare to the populations of the United States. The EPA, however, is concerned that any regulation of greenhouse gases by the United States would be offset by countries (specifically developing countries) who allow an increase in carbon dioxide emissions.[466] While this concern may be valid, the European Union and other industrialized countries attempting to reduce greenhouse gas emissions surely experience the frustration of trying to control carbon dioxide levels, while the United States, the largest contributor of carbon dioxide emissions from fossil fuels, fails to take adequate steps to reduce its fair share of emissions towards a global five percent reduction below the 1990 baseline by 2012.[467] While the contribution to greenhouse gas emissions of developing countries will substantially increase over the next several decades,[468] the cumulative warming effect of the developing nations will not equal the effect of the industrialized nations until after 2100.[469] Measures taken by the United States

droughts were changing or were expected to change; and how patterns of circulation affect regional climate trends. *Id.*

[464] *See* Prentice et al., *supra* note 59, at 187.

[465] *See* Baede et al., *supra* note 2, at 92.

[466] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,927 (Sept. 8, 2003). The EPA suggested in this ruling that a national standard cannot be attained since greenhouse gases are globally distributed. *Id*.

[467] *See* PERCIVAL, *supra* note 7, at 1056 fig.11.3 (listing the United States as the largest contributor of carbon dioxide emissions from fossil fuel burning in 1996).

[468] *See* PERCIVAL, *supra* note 7, at 1056 (noting the increase in use of fossil fuels in developing countries relative to developed countries).

[469] PERCIVAL, *supra* note 7, at 1069 ("Per capita emissions in the United States are more than 20 times greater than those of India. . . . The *increase* in

and other industrialized nations to reduce greenhouse gas emissions by 2012 could effectively achieve a global reduction in greenhouse gases of more than five percent measured against the 1990 baseline, even without the participation of the developing countries.

Though establishing a national standard for carbon dioxide reductions presents unique challenges since carbon dioxide "is fairly consistent in concentration throughout the *world's* atmosphere up to approximately the lower stratosphere,"[470] the U.S. may set and achieve a national standard for carbon dioxide reductions, which, in cooperation with other nations, will diminish the projected adverse effects to human health and welfare in the United States. The goal of the Clean Air Act to protect the health and welfare of the populations of the United States may be better achieved if the United States joins in the efforts of other nations to reduce carbon dioxide emissions from fossil fuels.[471]

Alternatively, the EPA may determine that a national standard for carbon dioxide emission reductions different than the seven percent reduction goal set under the Kyoto Protocol reflects more accurately the United State's contribution to worldwide carbon dioxide emissions affecting global and regional climate change. Following the Third Assessment, the IPCC continues to research the impact of human-induced emissions of carbon dioxide on climate change.[472] The IPCC identifies two necessary steps for identifying human-induced climate change: detection of climate change and attribution of that change to a specific cause.[473] The

U.S. emissions from 1990 to 1996 was greater than the *total* combined annual emissions from Brazil and Indonesia." (citing CHRISTOPHER FLAVIN & SETH DUNN, RISING SUN, GATHERING WINDS: POLICIES TO STABILIZE THE CLIMATE AND STRENGTHEN ECONOMIES 13, 16–17 (1997)).

[470] Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. at 52,927.

[471] *See generally* H.R. REP. No. 91-1146, at 5 (1970), *reprinted in* 1970 U.S.C.C.A.N. 5356, 5360 (urging Congress to adopt emission standards for mobile sources to secure public health and well-being).

[472] Solomon & Parry, *supra* note 2, at iii (noting that the IPCC realizes that many key scientific issues were considered speculative at time of Third Assessment, and that it was considered "essential that the IPCC survey the current state of the science, and, in particular, the developments in the science" since the Assessment).

[473] Baede et al., *supra* note 2, at 97 (noting that observation of increased global mean temperature since nineteenth century does not by itself identify an anthropogenic effect on the climate system since climate naturally varies on all time scales. The detection problem requires a careful quantitative analysis that

U.S. EPA may establish a formula that identifies the impact of climate change on specific regions in the United States as a result of projected temperature increases related to fossil fuel emissions.[474] The EPA already keeps track of greenhouse gas inventories in order to meet reporting commitments to the United Nations Framework Convention. Electric power companies participating in voluntary carbon dioxide emission controls may prove useful in establishing specific caps on emissions industry wide. The regulation of greenhouse gas emissions presents many challenges under the NAAQS system; yet the national goals of protection of public health and welfare must drive the global warming policy decisions under the Clean Air Act.

V. CONCLUSION

Once the Administrator makes the initial determination (based on the latest scientific studies) that carbon dioxide is an air pollutant emitted from numerous or diverse mobile or stationary sources, which contributes to greenhouse gases responsible for global warming, and once the Administrator determines that these greenhouse gases are reasonably anticipated to endanger public health or welfare, the Administrator has a nondiscretionary duty to list carbon dioxide as a criteria pollutant.[475] The Administrator's duty to review potential pollutants under the Clean Air Act's section 108 requires a careful analysis of the latest scientific studies. The IPCC—made up of more than 2000 scientists recognized by the EPA and others as experts in the field—provides substantive quantitative, as well as qualitative, evidence in the Third Assessment Report of 2001 that greenhouse gases are reasonably anticipated to endanger public health or welfare in the United States.[476]

an observed climate change is unusual. The problem of establishing the most likely cause of the change has been addressed by the IPCC. They have compared the observed change with "model calculations based on anthropogenic forcing by greenhouse gases," assuming that patterns carry a "fingerprint of their cause.").

[474] Other organizations have conducted regional analyses based on such models. *Cf.* Carter et al., *supra* note 67, at 180 tbl.3-10 (noting regional and general effects of future carbon dioxide emissions); *see also* Cohen et al., *supra* note 69, at 737 (projecting a 1°C–7.7°C increase in temperature in North America in the next century).

[475] *See* NRDC v. Train, 545 F.2d 320, 325 (2d Cir. 1976).

[476] *See* text accompanying *supra* notes 373–456; *see supra* note 25.

The fact that regulating carbon dioxide may present technically challenging issues should not preclude the listing of carbon dioxide as a criteria pollutant if the requirements under the section 108(a)(1)(A)–(B) are met. The feasibility of regulating a potential pollutant presents an independent issue and has no bearing on the Administrator's duty to list a pollutant identified as a "criteria pollutant."[477] Since carbon dioxide, an air pollutant, is a major contributor to the combination of agents known as greenhouse gases and since carbon dioxide's presence in the ambient air is the result of numerous or diverse mobile or stationary sources, the Administrator must list carbon dioxide as a criteria pollutant. Today, the same six criteria pollutants identified in the Senate Report for the 1990 Amendments are still the only ones regulated as "criteria pollutants": ozone, lead, particulate matter, carbon monoxide, nitrogen dioxide, and sulfur dioxide.[478] Since the EPA fails to regulate carbon dioxide emissions on its own initiative, once again litigation has become necessary to force the EPA to fulfill its congressional mandate to issue and revise the list of criteria pollutants.[479]

Scientists do not know how anthropogenic carbon dioxide emissions rates will vary over the next 100 years, or what kind of control technologies may be in place to decrease projected emissions, and so various storylines have been developed by the IPCC to account for these unknowns.[480] The storyline will continue to develop over the next 100 years. The United States' attempts to reduce fossil fuel emissions, or, in the alternative, its

[477] *See* NRDC v. Train, 545 F.2d 320, 324–25 (2d Cir. 1976). *But see* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,928 (Sept. 8, 2003) (concluding that it is unreasonable to conclude that Congress authorized the EPA to address global climate change under the Clean Air Act).

[478] *Compare* S. REP. NO. 101-228, at 5 (1989), *reprinted in* 1990 U.S.C.C.A.N. 3385, 3391, *with* National Ambient Air Quality Standards (NAAQS), *supra* note 315.

[479] *See* S. REP. NO. 101-228, at 6, *reprinted in* 1990 U.S.C.C.A.N. at 3392 (noting the role litigation can play in forcing the EPA to promulgate new standards).

[480] Carter et al., *supra* note 67, 175–76 (describing scenarios that attempt to account for these unknowns); *see also* CLIMATE ACTION REPORT, *supra* note 9, at 81 ("While current analyses are unable to predict with confidence the timing, magnitude, or regional distribution of climate change, the best scientific information indicates that if greenhouse gas emissions continue to increase, changes are likely to occur.").

procrastination policies, will alter the story of climate change in the twenty-first century. The loss of acres of shoreline down the East Coast; loss of biodiversity throughout the nation; increased floods, droughts, wildfires, and storm surges; and the potential loss of habitats, particularly in Louisiana and the Florida Keys; together with increased vector-borne diseases and heat-related illnesses—all of these phenomena are reasonably anticipated harms resulting from increased carbon dioxide emissions in the ambient air. Critics may argue that catastrophic harm is not certain or even anticipated, but few critics may argue with the projections of scientists throughout the world indicating that increased anthropogenic carbon dioxide emissions are reasonably anticipated to endanger public health or welfare, satisfying the requirements for action under section 108 of the Clean Air Act.