A CLEARER SKIES PROPOSAL: THE MULTI-CATEGORY RATIO APPROACH

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INTRODUCTION

While the 1990 Clean Air Act Amendments[1] (Amendments) laid "the groundwork for a new era of smarter government regulation" based on market systems, the United States has not met air quality standards in every city,[2] as former President George H. W. Bush claimed in his speech on November 15, 1990.[3] Air quality standards remain unmet for several reasons. There are problems with the current sulfur dioxide (SO2) trading system, enacted under the 1990 Amendments,[4] and effective market

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[1] Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2399 (codified as amended at 42 U.S.C. §§ 7401-7671q (2000)).

[2] For an official listing of areas not in compliance with national air quality standards, see 40 C.F.R. § 81.300-.346 (2003). For an unofficial listing of areas not in compliance with national air quality standards, see ENVTL. PROT. AGENCY, WELCOME TO THE GREEN BOOK: NONATTAINMENT AREAS FOR CRITERIA POLLUTANTS, http://www.epa.gov/oar/oaqps/greenbk (last updated Sept. 10, 2003).

[3] Regarding the 1990 Amendments, President George H.W. Bush stated:

> [t]he bill will allow the Nation finally to meet air quality standards in every city; and, in total, almost 30 million tons per year of dangerous chemicals and noxious pollutants will be prevented from fouling the air. . . . By employing a system that generates the most environmental protection for every dollar spent, the trading system lays the groundwork for a new era of smarter government regulation; one that is more compatible with economic growth than using only the command and control approaches of the past.

President George H.W. Bush, Remarks upon Signing S. 1630, Pub. L. No. 101-549, 1990 U.S.C.C.A.N. 3887-1, 3887-1 (Nov. 15, 1990).

[4] 42 U.S.C. § 7651-7651o.

systems are under-utilized.[5] SO2 problems arise because the currency of the SO2 tradable market system is measured by the quantity of SO2 emitted, and does not adequately account for the effects of the pollution emitted on the environment or public health.[6] This may be the cause of the much debated problem of hot spots—the "concentrations of pollution with locally significant effects."[7] By basing the currency on an amount emitted rather than environmental and health effects, polluters pay the same price for permits irrespective of the environmental and health harm caused.[8] President George W. Bush's Clear Skies Initiative (Clear Skies) uses the same single-market non-category system as the 1990 Amendments. Therefore, the same currency problem and inequities will exist if Clear Skies is passed in its current form.[9] The Clear Skies Initiative should incorporate the multi-category ratio approach advocated in this Article in order to alleviate these problems.

Economists and scholars have been saying for years what many legislators are just recently realizing: tradable permits can be the logical solution to our nation's pollution problem.[10] The Clean Air Act (CAA) relies heavily on what is known to economists as the command and control approach, which generally involves no trading.[11] The problem with command and control is that abatement costs[12] vary between sources. A uniform regulation

[5] *See* Jonathan Remy Nash & Richard L. Revesz, *Markets and Geography: Designing Marketable Permit Schemes to Control Local and Regional Pollutants*, 28 ECOLOGY L.Q. 569, 587-88 (2001) (discussing the possible effects of SO2 trading on ambient standard violations and hot spots). Nash & Revesz also discuss alternate market approaches. *Id*. at 614-24.

[6] *Id*. at 614.

[7] David M. Driesen, *Free Lunch or Cheap Fix?: The Emissions Trading Idea and the Climate Change Convention*, 26 B.C. ENVTL. AFF. L. REV. 1, 71 (1998). *See also infra* Part II.A.

[8] *See* Nash & Revesz, *supra* note 5, at 576-78 (discussing the variation of environmental impacts with location of pollutant sources).

[9] Clear Skies Act of 2003, H.R. 999, 108th Cong. § 2 (2003) (amending 42 U.S.C. § 7651l-m (2000)).

[10] *See, e.g.*, Norman W. Spaulding III, *Commodification and Its Discontents: Environmentalism and the Promise of Market Incentives*, 16 STAN. ENVTL. L.J. 293, 294 (1997); Barton H. Thompson, Jr., *The Search for Regulatory Alternatives*, 15 STAN. ENVTL. L.J. viii, viii-xi (1996).

[11] *See* Richard B. Stewart, *Models for Environmental Regulation: Central Planning Versus Market-Based Approaches*, 19 B.C. ENVTL. AFF. L. REV. 547, 550-51 (1992).

[12] "Abatement costs" are the costs of cleaning up pollution.

requiring equal control at each facility causes a waste of air pollution expenditures for many of these facilities.[13] Stated simply, a command and control approach is not as cost-effective as a trading approach.

This Article illustrates how Congress should regulate air quality—a communal good.[14] These attempts must begin with an examination of the current system and other theoretical solutions to the current problems associated with trading. This Article argues that by reforming the currency of the current tradable permit approach through the implementation of a multi-category ratio approach we can create a system of controlling air pollution that will base the price of the tradable permit on the environmental and health effects of pollution and not just the quantity of pollution emitted. In other words, Congress should implement a multi-category marketable permit system, with exchange ratios set by the Environmental Protection Agency (EPA) or Congress, that will enable trading between categories. This solution is better than the Clear Skies Initiative because it will not only eliminate or significantly hamper the possible creation of hot spots, but it is also cost-effective, equitable, and relatively easy to implement.

Part I of this Article gives a general overview of the CAA, the 1990 Amendments, and the Clear Skies Initiative. This Article then addresses the currency problem associated with the current

[13] *See* Stewart, *supra* note 11. For example, if industry A and industry B both have to meet the same standard of ten units, and both emit twenty units, each industry would have to abate ten units under the command and control approach. If it costs A two dollars for every abated unit and B one dollar for every abated unit, then A would have to pay twenty dollars to abate the ten units and B would have to pay ten dollars to abate the ten units. Therefore, the total cost to both A and B to abate twenty units would be thirty dollars. A trading system allows B to abate below the standard and sell the difference to A. Thus, assuming the same figures, B could abate all twenty of the units of pollution for a cost of twenty dollars, and subsequently sell the extra ten units to A for fifteen dollars. So A's total cost to meet the standard is fifteen dollars, and B's total cost to meet the standard is five dollars (twenty dollars minus the fifteen dollars received for the credits) with a total cost of twenty dollars to both industries to abate the same amount of pollution as with the command and control approach. This model is overly simplistic as it assumes abatement costs will stay the same per unit and that there are no transaction costs associated with trading.

[14] For a complete discussion of the need for environmental regulation as a "public good," given by a Nobel laureate economist and presidential advisor, see MILTON FRIEDMAN, FREE TO CHOOSE: A PERSONAL STATEMENT 213-18 (1990). Friedman states, "The preservation of the environment and the avoidance of undue pollution are real problems and they are problems concerning which the government has an important role to play." *Id*. at 214.

SO2 system and discusses proposed solutions to the problem in Part II. In Part III it advocates the multi-category ratio approach as the best solution to the currency problem and as the most equitable market system. Part IV explores how to decide which category a specific region will be placed in for each pollutant. This proposal will then address implementation by discussing how to forecast future pollution levels and effects, how to incorporate this system into the CAA, and political feasibility in Part V. Finally, Part VI compares Bush's Clear Skies Initiative with the multi-category ratio approach and explains why the multi-category ratio approach is superior.

I
THE CURRENT AIR POLLUTION CONTROL SYSTEM

There are three main methods of controlling air pollution.[15] The first approach employs the common law of nuisance and will not be discussed here.[16] The second approach involves CAA-imposed end-of-pipe controls that necessitate the use of varying levels of control technology.[17] The third, and undoubtedly the most important, approach is the CAA ambient air quality approach, which includes some control technology as well.[18] Section A focuses on the latter two approaches, section B addresses the 1990 Amendments, and section C examines the Clear Skies Initiative.

A. *The Clean Air Act*

The current air pollution control system comes almost entirely from the CAA[19] and its state counterparts.[20] EPA establishes national ambient air quality standards (NAAQS) (primary and secondary), that set ceilings on the allowable concentration of a particular pollutant in the outdoor air, averaged over a specific time period.[21] The primary responsibility for ensuring that

[15] ARNOLD W. REITZE, JR., AIR POLLUTION CONTROL LAW: COMPLIANCE & ENFORCEMENT 33 (2001).
[16] *Id*.
[17] *Id*.
[18] *Id*.
[19] 42 U.S.C. §§ 7401-7671q (2000).
[20] *See, e.g.*, 401 KY. ADMIN. REGS. §§ 50:010-65:010 (2003).
[21] 42 U.S.C. §§ 7408-7409; TOM TIETENBERG, ENVIRONMENTAL ECONOMICS

NAAQS are met falls on the state control agencies.[22] To meet NAAQS, states develop state implementation plans (SIPs) that must be approved by EPA.[23] States also designate regions within their borders, called Air Quality Control Regions (AQCRs), which are subject to EPA approval.[24] SIPs in nonattainment areas—those areas which have not met the NAAQS standard for at least one pollutant—must include a permit program for newly constructed large sources or large sources that have undergone some major modification.[25] Permits are usually issued based on the control technology.[26] Continuous Emission Monitoring Systems (CEMS) monitor emissions from a source and industrial polluters may be required to install these systems for major stationary sources.[27]

Any unit that has undergone a major modification or is a newly constructed unit is subject to more stringent requirements if the unit affects a Prevention of Significant Deterioration (PSD) area.[28] There are three kinds of PSD areas—designated as Class I, II, or III.[29] All of these areas are in attainment;[30] thus, the purpose of the PSD sections is to prevent these areas from significantly deteriorating while at the same time allowing for economic growth.[31]

Regulators use a maximum achievable control technology standard (MACT)[32] to achieve end-of-the-pipe control for 189 hazardous air pollutants.[33] The MACT standards are based in part on emission levels from the best controlled similar sources.[34] Cost, non-air quality health and environmental impacts, and energy requirements are also large factors in determining the stringency of

AND POLICY 244 (2d ed. 1998).

[22] 42 U.S.C. § 7410.

[23] *Id*.

[24] *Id*. § 7407.

[25] *Id*. § 7410(a)(2)(C).

[26] *Id*.

[27] 42 U.S.C. §§ 7414(a)(3), 7651k(a); 40 C.F.R. § 51.165(a)(xxxi) (2003).

[28] 42 U.S.C. §§ 7470-7492.

[29] *Id*. §§ 7472, 7474.

[30] When a state meets NAAQS for a pollutant, it is "in attainment."

[31] *Id*. §§ 7470-7471.

[32] *Id*. § 7412(d)(2). For the definition of the term "maximum achievable control technology," see 40 C.F.R. § 63.41.

[33] 42 U.S.C. § 7412(b)(1).

[34] *Id*. § 7412(d)(2)-(d)(3).

the standards.[35] There is also a program to help prevent the accidental release of hazardous air pollutants.[36]

B. *The 1990 Amendments*

The 1990 Amendments added an entirely new subchapter, titled "Acid Deposition Control."[37] This subchapter was intended to deal with the problem of acid rain, which "occurs when SO2 and nitrogen oxides (NOx) react in the atmosphere."[38] The Amendments focus on burning fossil fuel in power plants, as these plants produce eighty percent of the SO2 and thirty-three percent of the NOx emitted annually in the United States.[39] For SO2, the Acid Rain Program (EPA's name for the implementation plan)[40] places a mandatory ceiling, or cap, on emissions nationwide from these power plants and allocates emissions to these plants in the form of tradable allowances.[41] An allowance is an authorization to emit one ton of SO2 during or after the year of issuance.[42] The power plants are checked quarterly to ensure that emissions are equal to or less than the allowances held by their owners.[43] Extra unused allowances can be banked (carried over) for future use or sold.[44] "These . . . marketable permits offer an opportunity for [utilities] to make cost-effective decisions about pollution control."[45]

The Acid Rain Program was implemented in two phases.[46]

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[35] *Id*. § 7412(d)(2).

[36] *Id*. § 7412(r).

[37] *Id*. § 7651a-7651o.

[38] Paul L. Joskow & Richard Schmalensee, *The Political Economy of Market-Based Environmental Policy: The U.S. Acid Rain Program*, 41 J.L. & ECON. 37, 40 (1998). Acid rain is more properly denoted as acid deposition. *Id*. *See also infra* app. A, fig. 1 (diagramming the origins of acid rain).

[39] DAVID B. FIRESTONE & FRANK C. REED, ENVIRONMENTAL LAW FOR NON-LAWYERS 83 (1993).

[40] EPA, Acid Rain Program: Overview, *at* http://www.epa.gov/airmarkt /arp/overview.html (last visited Dec. 11, 2003).

[41] 42 U.S.C. § 7651b; EPA, PROGRESS REPORT ON THE EPA ACID RAIN PROGRAM 1, 3 (1999) [hereinafter EPA PROGRESS REPORT], http://www.epa.gov/ airmarkt/progress/arpreport/acidrainprogress.pdf.

[42] 42 U.S.C. § 7651a(3).

[43] 40 C.F.R. § 75.64 (2003).

[44] 42 U.S.C. § 7651b(b).

[45] DUANE CHAPMAN, ENVIRONMENTAL ECONOMICS: THEORY, APPLICATION, AND POLICY 203 (2000).

[46] 42 U.S.C. § 7651c-d; Joskow & Schmalensee, *supra* note 38, at 41.

Phase I (1995-1999) required 261 of the highest emitting electric power generators to reduce their emissions by approximately 3.5 million tons per year.[47] In Phase II (beyond 2000), almost every fossil fueled plant entered into the trading system.[48] At the end of each year, plants must hold sufficient allowances to cover their yearly emissions or face substantial financial penalties.[49] Under Phase II, there are 8.9 million allowances available per year for the entire country.[50] This phased implementation has helped to ease the transition for utilities and is a contributing factor in the Amendments' success.[51]

Examining the trends in pollution since 1990 provides substantial proof that tradable permits can be an effective means of controlling pollution, and the Acid Rain Program provides much of this proof.[52] Title IV of the CAA Amendments[53] was the first large-scale implementation of a tradable permit system to control emissions.[54] In the first year under the program SO2 emissions dropped by three million tons, and over the first four years the highest emitting "units were about five million tons below their 1980 levels."[55] In addition to the measured reductions, the price of permits, in probably the most surprising development, has declined in comparison with 1990 analyst expectations.[56] Originally, EPA estimated that the cost of compliance with the new program to utilities would be $4.6 billion per year by 2010.[57] In 1998, however, this cost was reevaluated and estimated to be less than one billion dollars by 2010.[58]

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[47] 42 U.S.C. § 7651c; EPA PROGRESS REPORT, *supra* note 41, at 5.

[48] 42 U.S.C. § 7651d(a). Only Idaho, Alaska, and Hawaii had no plants subject to Phase II of Title IV. Joskow & Schmalensee, *supra* note 38, at 41.

[49] EPA monitors allowances with an Allowance Tracking System. 40 C.F.R. §§ 73.30-53, 75.64 (2003).

[50] 42 U.S.C. 7651b(a)(1).

[51] *See* Joskow & Schmalensee, *supra* note 38, at 41-42 (discussing the flexibility allowed to utility owners during phase-in of trading program).

[52] EPA PROGRESS REPORT, *supra* note 41, at 5.

[53] 42 U.S.C. § 7651-7651o.

[54] Joskow & Schmalensee, *supra* note 38, at 38.

[55] EPA PROGRESS REPORT, *supra* note 41, at 5.

[56] DOUGLAS R. BOHI & DALLAS BURTRAW, RESOURCES FOR THE FUTURE, SO_2 ALLOWANCE TRADING: HOW EXPERIENCE AND EXPECTATIONS MEASURE UP 1 (1997).

[57] EPA PROGRESS REPORT, *supra* note 41, at 4.

[58] *Id*. Scholars have debated the actual cost savings associated with Title IV implementation. Curtis Carlson et al., *Sulfur Dioxide Control by Electric*

Upon examination of the 1990 Amendments, EPA stated to Congress that "the monetizable benefits [resulting from the 1990 Amendments] exceeded the direct compliance costs by four to one."[59] Using sophisticated computer model studies, EPA estimated that twenty three thousand Americans will be saved from premature death, and over 1.7 million asthma attacks will be averted between 1990 and 2010 because of the Amendments.[60] Furthermore, by 2010 the Amendments will have saved 4.1 million work days from being missed, and thirty-one million days in which Americans would have had to limit activity due to air pollution-related illness.[61] Much of this accomplishment, according to EPA, may be attributed to the sizeable reduction in SO2 emissions stemming from the 1990 Amendments.[62] Regrettably, the early success of the Amendments has overshadowed some inherent problems with the single market system.

C. *The Clear Skies Initiative*

President George W. Bush has recently proposed the Clear Skies Initiative, an amendment to the CAA, stating, "[w]e will virtually eliminate the problems of acid rain, which affects so many lakes and forests in the Northeast. We also will dramatically reduce urban smog and nitrogen and mercury deposition."[63] The Clear Skies Initiative claims that it will reduce power plant emissions of SO2 by seventy-three percent, NOx by sixty-seven percent, and mercury by sixty-nine percent.[64] The legislation was first proposed on February 14, 2002, and in late July of the same year it was introduced in the House and Senate.[65]

Utilities: What Are the Gains from Trade?, 108 J. POL. ECON. 1292, 1295-96 (2000) (finding a lower cost savings than BOHI & BURTRAW, *supra* note 56, directly attributable to Title IV).

[59] EPA, THE BENEFITS AND COSTS OF THE CLEAN AIR ACT, 1990 TO 2010, at v (1999), http://www.epa.gov/air/sect812/1990-2010/fullrept.pdf.

[60] *Id*. at 60-61.

[61] *Id*. at 61.

[62] *Id*. at ii.

[63] EPA, Clear Skies: Message from President George W. Bush (July 1, 2002), *at* http://www.epa.gov/air/clearskies/wh.html.

[64] EPA, Clear Skies: Basic Information, *at* http://www.epa.gov/air/clearskies/basic.html (last updated Sept. 8, 2003).

[65] EPA, THE CLEAR SKIES ACT TECHNICAL SUPPORT PACKAGE 2 (2003) [hereinafter EPA 2003 TECHNICAL SUPPORT PACKAGE], http://www.epa.gov/air/clearskies/technical.html.

For SO2 and NOx, Clear Skies covers all fossil fuel boilers and turbines that serve an electric generating unit with a nameplate capacity higher than twenty-five megawatts and that produce electricity for sale.[66] For mercury, the proposal will cover all coal-fired units with the same twenty-five megawatt cut-off.[67] Clear Skies will expand nationwide cap-and-trade programs to NOx and mercury.[68]

As a substantial step in the right direction, the new cap for SO2 is lowered to 4.5 million tons in 2010, and three million tons in 2018.[69] The trading under the original Title IV is continued.[70]

For NOx, there are two separate regions: a Western (Zone 2) and an Eastern Region (Zone 1).[71] The 2008 cap for the Western region is 1.562 million tons, and for the Eastern region the cap is 538 thousand tons.[72] In 2018, the Western cap is 1.162 million tons, and the Eastern cap stays at 538 thousand tons.[73] The regional boundaries are "established based on the nature, magnitude, and source of environmental concerns."[74]

For mercury, the national cap is set at twenty-six tons annually in 2010 and fifteen tons in 2018.[75] The primary focus of control will be on the ionic form of mercury which is prone to deposit close to its source.[76] The administrator will review and collect data for each of the initial caps to ensure that the reductions slated for 2018 are appropriate for each pollutant.[77]

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[66] H.R. 999, 108th Cong. §§ 2, 411(21)(C) (2003) (amending 42 U.S.C. § 7651-7651o (2000)).

[67] *Id*. § 2.

[68] *Id*. (amending 42 U.S.C. § 7651b).

[69] *Id*. (amending 42 U.S.C. § 7651a(4)). *Compare* 42 U.S.C. § 7651b(a)(1) (2000) (noting the current SO2 cap of 8.9 million tons).

[70] *Id*. (amending 42 U.S.C. § 7651b).

[71] The two regions are delineated in *id*. (amending 42 U.S.C. § 7651-7651o).

[72] *Id*. (amending 42 U.S.C. § 7651a(4)).

[73] *Id*.; EPA 2003 TECHNICAL SUPPORT PACKAGE, *supra* note 65, at A7; *See infra* app. A, fig. 4 (diagramming the two NOx regions).

[74] EPA 2003 TECHNICAL SUPPORT PACKAGE, *supra* note 65, at A8.

[75] H.R. 999 § 2 (amending 42 U.S.C. § 7651a).

[76] EPA 2003 TECHNICAL SUPPORT PACKAGE, *supra* note 65, at A9.

[77] H.R. 999 § 2 (amending 42 U.S.C. § 7651i).

II
REFORMING THE CURRENCY OF THE CURRENT TRADABLE PERMIT APPROACH

The currency of the SO2 system and the Clear Skies Initiative is inadequate because it does not account for the environmental or health effects of pollution. The following section discusses why the current tradable permit system does not account for the effects of pollution. The second section discusses some proposed solutions to this problem.

A. *The Currency Problem*

Tradable permits are considered a commodity with a quantifiable market in which pollution credits are awarded to the highest bidder.[78] For instance, "the Chicago Board of Trade now sells rights to emit sulfur dioxide alongside pork bellies, orange juice, and grain futures."[79] Salzman and Ruhl point out that there is intrinsically a problem with assuming fungibility[80] in tradable permit schemes where the currency is based on a unit of pollution emitted.[81] The problem is that the currency does not account for the effect of that pollution on the environment or public health; rather, it equates the effects of all units (or tons) of pollution regardless of topography, geography, wind patterns, surrounding ambient air, or any other factor that may lead to a greater or lesser environmental or health effect.[82]

Salzman and Ruhl express the currency problem in a simple example where marbles are traded across a kitchen table:

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[78] James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607, 611 (2000).

[79] *Id*. (citing *Implementation of the Acid Rain Provisions of the Clean Air Act Amendments of 1990: Hearing Before the Subcommittee on Clean Air and Nuclear Regulation of the Committee on Environment and Public Works, United States Senate*, 103d Cong. 23-25 (1994) (statements of Patrick Arbor, Chairman, Chicago Board of Trade, and Thomas Coleman, Vice President, Economic Analysis & Planning)).

[80] Fungibility in this context refers to the proposition that "things exchanged are sufficiently similar in ways important to the goals of environmental protection." Salzman & Ruhl, *supra* note 78, at 611.

[81] *See id*. at 611-12. "[I]t turns out that *most* [Environmental Trading Markets] involve commodities and trades that exhibit a range of fungibilities." *Id*. at 612 (emphasis added).

[82] *See id*. at 611-14 (discussing the impact of varying fungibility on trading regimes); Nash & Revesz, *supra* note 5, at 617 (describing the factors that determine pollutant impact).

> we are trading identical blue marbles, the number of marbles may serve as a perfectly adequate metric. If we are trading blue and yellow marbles, the number and color of marbles are adequate currencies. If, however, some marbles are highly radioactive and others are not, the simple currency metrics of color and quantity fail to capture an important variable. . . . We may end up with a nice pile of marbles that glow in the dark.[83]

In this example, the color and quantity of the marbles—the currency—does not incorporate environmental or health effects associated with the exchange. As a result, the exchange may be inadvertently harmful.[84]

According to studies by the Southern Appalachian Mountain Initiative and by the Hubbard Brook research group, there is evidence that certain plants are contributing excessively to air quality problems in urban communities because they are contributing disproportionate amounts of SO2 near some of the most sensitive ecosystems in their region.[85] This problem is commonly known as the hot spots problem.[86] The formation of hot spots is affected by the location of the source, a topographical barrier, wind patterns, and other factors depending on the type of pollutant at issue.[87] A local pollutant tends to have its greatest effects near the source, while a regional pollutant, like SO2, tends to have its greatest effects a significant distance away from the source.[88]

Under the current trading system, the currency of trading (gross tonnage of pollutants) is inadequate, thus supporting the establishment of a hot spot problem.[89] If the permit price is based

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[83] Salzman & Ruhl, *supra* note 78, at 624.

[84] *Id.*

[85] S. Alliance for Clean Energy, Position on Four Pollutant Legislation, *at* http://www.cleanenergy.org/air/position.html (last visited Dec. 23, 2003).

[86] Byron Swift, *Allowance Trading and SO_2 Hot Spots—Good News from the Acid Rain Program*, 31 Env't Rep. (BNA) 954, 954 (May 12, 2000); ENVTL. DEF., FROM OBSTACLE TO OPPORTUNITY: HOW ACID RAIN EMISSIONS TRADING IS DELIVERING CLEANER AIR 24 (2000), http://www.environmentaldefense.org/documents/645_SO2%2Epdf.

[87] Nash & Revesz, *supra* note 5, at 580.

[88] *Id*. at 580, 587.

[89] Some have argued that there is not currently a hot spot problem. *E.g.*, Swift, *supra* note 86. However, most scholars agree that there will be a problem due to the nature of the current system. *E.g.*, Nash and Revesz, *supra* note 5, at 580 (citing Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command To Self-Control*, 22 HARV. ENVTL. L. REV.

solely on the amount of pollution emitted, and the effects of the pollution are not taken into account, then industries in high effect areas can purchase large amounts of permits for a low cost relative to the environmental impact resulting from the permits.[90] A hot spot problem can result from this accumulation of permits by industries in high impact areas.[91]

Not only does this phenomenon have the ability to cause hot spots, but it is inequitable to charge the same price to industries when the environmental and health effects are not the same.[92] This is analogous to a tort regime in which the remedy for battery is a fixed amount, regardless of the physical or mental damage to the plaintiff. Most people would see this as clearly inequitable. This is exactly what a single-trading market does when it charges industries a fixed price to pollute based solely upon the quantity emitted. The industries are being charged by the punch and not for the effects of their punches on our health or our environment.

Because the current system allows for the formation of hot spots and is inequitable, there is a need for a more rigorous examination of our current tradable permit scheme.[93] We must, as a society, quit trading apples for oranges and stop degrading our air by charging the same price for pollution permits regardless of their effect on the environment or our health. The model proposed in this Article is a better solution, by which polluters pay according to harm rather than solely by emissions levels.

B. *Proposed Solutions To the Currency Problem*

There are at least three theoretical approaches aimed at reforming the current trading system: (1) an ambient permit system;[94] (2) a pollution offset market;[95] and (3) an atmospheric

103, 115 (1998)).

[90] Nash & Revesz, *supra* note 5, at 614.

[91] *Id*.

[92] *See, e.g.*, Nicklas A. Akers, *New Tools for Environmental Justice: Articulating a Net Health Effects Challenge To Emissions Trading Markets*, 7 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 203, 204 (2001) (discussing the tendency of emissions-based trading schemes to be blind to health effects of pollution).

[93] "This is not to say such markets are necessarily inefficient or undesirable; but when significant values remain unaccounted for in the trades, barter becomes the more appropriate model and the need for a more rigorous evaluation process presents itself." Salzman & Ruhl, *supra* note 78, at 693.

[94] *See infra* Part II.B.1.

dispersion model approach.[96] Each approach has its separate strengths, but all of the approaches have weaknesses that may be overcome by the multi-category ratio approach.

1. *Ambient Permit System*

Commentators have urged the adoption of schemes that base tradable pollution units on the environmental degradation caused by pollution.[97] The ambient permit system approach allows the policymaker to determine acceptable ambient standards at various receptor points.[98] At these receptor points, each defining a separate market, computer modeling allows the policymaker to determine which receptor points are affected by emissions. The policymaker then issues permits based on these effects.[99] Plants that wish to increase their emissions would have to determine the effects of their pollution at all affected receptor points, then purchase sufficient permits for each relevant market.[100]

Nash and Revesz have pointed out three intrinsic problems with this approach.[101] "First, such schemes require the establishment and maintenance of permit markets at each of the receptor points."[102] This multiplicity of permit markets will result in high costs of maintenance and supervision, thereby detracting from the system's practicality.[103] Second, Nash and Revesz assert that these markets will be less efficient than single category markets because there are fewer market participants (i.e., not all polluters will be trading in every market).[104] Finally, "the establishment of a market in units of environmental degradation involves dividing the rights associated with traditional emissions

[95] *See infra* Part II.B.2.

[96] *See infra* Part II.B.3.

[97] Nash & Revesz, *supra* note 5, at 618.

[98] *Id*. at 618-19.

[99] *Id*. at 619. For a mathematical exposition of the ambient permit system, see Scott E. Atkinson & T.H. Tietenberg, *The Empirical Properties of Two Classes of Designs for Transferable Discharge Permit Markets*, 9 J. ENVTL. ECON. & MGMT. 101, 104-06 (1982).

[100] Nash & Revesz, *supra* note 5, at 619.

[101] *Id*. at 619-20.

[102] *Id*. at 619 (citing Atkinson & Tietenberg, *supra* note 99, at 102; Robert W. Hahn, *Trade-offs in Designing Markets with Multiple Objectives*, 13 J. ENVTL. ECON. & MGMT. 1, 2 (1986)).

[103] *Id*.

[104] *Id*. at 619-20.

permits into constituent rights to cause damage at various locations."[105] In other words, because of the multitude of locations that could be affected, it would be difficult for industries to comply as they would have to purchase permits in many different markets.[106] Also, since each market would have different numbers of participants, the supply and demand for permits in each market would inevitably vary.[107]

2. *Pollution Offset Market*

Another approach addressed by Nash and Revesz, from a proposal by Alan Krupnick, Wallace Oates, and Eric Van De Verg, is a "pollution offset market."[108] A pollution offset market is a single market where the "parties exchange emission permits at ratios depending on the relative effects of the associated emissions on ambient air quality at receptors with potential to violate the standard."[109] Transactions may only occur if emitters have adverse impacts at common receptor points.[110]

> Let us say that an ambient standard of 10 $\mu g/m^3$ of pollutant *P* governs at receptor point ρ, and that emissions from firms *A* and *B* contribute to levels of *P* at ρ. In particular, let us say that the level of *P* at ρ increases by 3 $\mu g/m^3$ for every ton of *P* emitted annually by *A*, while the level of *P* increases by 1 $\mu g/m^3$ for every ton of *P* emitted annually by *B*. At present, *A* has 2 permits and *B* has 4; each permit entitles the holder to emit 1 ton of *P* annually. Thus, the ambient level of *P* at ρ precisely equals the ambient standard: (2 tons) x (3 $\mu g/m^3$ per ton) + (4 tons) x (1 $\mu g/m^3$ per ton) = 10 $\mu g/m^3$. Now say that *A* decides to purchase 1 permit from *B*. . . . Here, the exchange rate is 1/3. Thus, the seller *B* reduces its emissions by 1 ton (since it is selling 1 permit), but the amount by which *A* is permitted to increase its emissions is restricted by the exchange rate: (1/3) x (1 ton/permit) x (1 permit) = 1/3 ton. Thus, the additional permit obtained by *A* enables *A* to emit a total of 2-

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[105] *Id*. at 620.

[106] *Id*.

[107] *See id*. at 619-21.

[108] *Id*. at 621-22; Alan J. Krupnick et al., *On Marketable Air-Pollution Permits: The Case for a System of Pollution Offsets*, 10 J. ENVTL. ECON. & MGMT. 233, 238-42 (1983).

[109] Albert McGartland, *A Comparison of Two Marketable Discharge Permits Systems*, 15 J. ENVTL. ECON. & MGMT. 35, 37 (1988).

[110] Nash & Revesz, *supra* note 5, at 622.

> 1/3 tons of *P* per year; *B* is permitted to emit 3 tons annually. The 10 $\mu g/m^3$ ambient level of P at ρ is thus not violated: (2-1/3 tons) x (3 $\mu g/m^3$ per ton) + (3 tons) x (1 $\mu g/m^3$ per ton) = 10 $\mu g/m^3$.[111]

Nash and Revesz point out that this method can be confusing and complex when a buyer and seller share more than one common receptor point.[112] Furthermore, there is a problem of "first-come, first-served" allocation at receptor points which are below the ambient standard, because "a source can simply increase its emissions without purchasing any permit if these emissions affect only receptors at which the ambient standard is not constraining."[113] Overall, this method is too complex both for the regulator and the regulated and would have high transaction costs.[114]

3. *Atmospheric Dispersion Model*

A third approach, the one supported by Nash and Revesz, consists of a single trading market in units of emissions where a proposed trade is rejected if it will lead to an ambient violation at any receptor point.[115] The determination of whether to reject a trade is made through computer modeling, accessible by website, where an atmospheric dispersion model predicts the impact of emissions from every source.[116] "The model calculates the impacts on ambient air quality levels of the increase in emissions by the prospective purchaser and the decrease by the perspective

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[111] *Id*. at 622-23.

[112] *See id*. at 623 (discussing the complexity of ratio calculations in these situations and that the trading ratio is determined by the lowest impact receptor, as trades resulting in a standard violation at any receptor point are forbidden).

[113] *Id*. at 623-24.

[114] *Id*. at 624 (noting for example, "[t]he government must . . . maintain a record of the rights accompanying each permit").

[115] *Id*. at 624-25.

[116] *Id*. at 624-26.

> Th[e] determination [of whether or not a trade would be approved] . . . would [be] a fairly straightforward procedure making use of an air-quality model. One would simply enter a new emissions vector (incorporating the proposed addition to emissions and deleting the offsetting reductions) and examine through a simulation exercise the projected effects on pollutant concentrations at each of the receptor points. The proposed transaction would be approved so long as there were no violation of standards at any receptor point.

Id. at 624 n.317 (quoting Krupnick et al., *supra* note 108, at 242 n.16).

seller, and determines whether these changes cause a violation of an ambient standard."[117] This model would not change the structure of the current SO2 system; rather, it simply adds a check that ensures no ambient standard will be broken before a trade is allowed.

Although this scheme would assure that ambient standards are met, it too has intrinsic problems. First, this scheme may grossly inhibit trading because of the inherent uncertainty associated with denials of proposed trades.[118] Second, some industries may never be able to purchase permits because their pollution will always cause a violation, and this will greatly reduce the thickness of the market.[119] Third, there will be a race to trade, as a prior trade may inhibit another emitter's potential trade.[120] "Conversely, a prior trade may render viable a subsequent trade that otherwise would have been impermissible."[121] This race to trade could unduly affect the permit price and lead to hasty decision-making. Finally, the cost of creating and the workability of this web model are uncertain.[122] Although this method is a novel idea that may be workable in the future, the next section discusses a model that is more workable under current conditions.

III
A SOLUTION TO THE CURRENCY PROBLEM: THE MULTI-CATEGORY RATIO APPROACH

The multi-category ratio approach would create an efficient trading system for pollutants. It uses ratios for trading emissions permits across zones belonging to different categories, where the categories are based on estimated future pollution levels and

[117] *Id*. at 625.

[118] The price of permits may be affected, since proposed trades will inevitably be riskier due to the possibility of denial. *Id*. at 627.

[119] Emitters in particularly polluted areas would generally be able to trade with one another, but would not be able to purchase permits from emitters in less polluted areas. *Id*. at 634-36.

[120] "Even if each of the trades would be accepted if it were the first to be presented to the website for approval, some trades might not be acceptable if presented later, after other trades have been registered." *Id*. at 634.

[121] *Id*.

[122] The effectiveness of this method will depend heavily on the choice of atmospheric dispersion model and the quality of the data used in that model. *Id*. at 650.

environmental and health effects.[123] After EPA or Congress projects future pollution and damage levels, all AQCRs[124] would be placed in one of four or five[125] categories based on their respective forecasted pollution level and environmental and health damage level. These categories could be defined by colors with the highest effect areas receiving black permits and the lowest receiving yellow permits (example colors from highest effect area to lowest: Black, Blue, Red, Green, Yellow). Trading between colors would be allowed, and would be based on an exchange rate set by either EPA or Congress (e.g., 1 Black = 2 Blue; 1 Blue = 4 Red; 1 Black = 8 Red). With these example figures, an emitter in a black region would have to purchase two blue permits or eight red permits in order to emit one ton of a pollutant, whereas an emitter in a red region could emit eight tons of a pollutant if it obtained one black permit, four tons if it obtained one blue permit, or one ton with a red permit.[126] These ratios would be set so permits would be more expensive when forecasted pollution levels and effects are higher, creating an incentive for industries in that area to pollute less and achieve a lower permit level. If an individual firm in a black area cuts its pollution, it can sell its extra permits at a premium. Thus, there is an even higher incentive to abate pollution in high effect areas. Pennsylvania's AQCRs for carbon monoxide (CO), a local pollutant, provides a good example:[127]

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[123] For a discussion of the effects of multiple-zone schemes without inter-zonal trading, see Atkinson & Tietenberg, *supra* note 99, at 107-08; Nash & Revesz, *supra* note 5, at 615; T.H. TIETENBERG, EMISSIONS TRADING: AN EXERCISE IN REFORMING POLLUTION POLICY 76 (1985).

[124] An AQCR is "any . . . area [deemed] necessary or appropriate for the attainment and maintenance of ambient air quality standards." 42 U.S.C. § 7407(c) (2000). A workable implementation would be to categorize zones based on AQCRs. Therefore, each AQCR would be assigned a color category based on its likely pollution level and level of environmental and health damage. A state may fall into various categories based upon the designation of its AQCRs.

[125] The number of categories will vary depending on the specific pollutant. More than five categories are possible; however, the number of categories should be kept as low as possible for purposes of manageability.

[126] *See* Nash & Revesz, *supra* note 5, at 618 (considering an example where "permits traded within Zone I cause twice as much damage at a given location as permits traded within Zone II. A buyer in Zone I could then purchase permits for two units of emissions from a seller in Zone II for every unit that it wishes to discharge"). For a discussion of this approach, see Krupnick et al., *supra* note 108, at 236 n.6; Tietenberg, *Tradable Permits for Pollution Control When Location Matters*, 5 ENVTL. & RESOURCE ECON. 95, 108 (1991).

[127] Bureau of Air Quality, Pa. Dep't of Envtl. Prot., Bureau of Air Quality Home Page, *at* http://www.dep.state.pa.us/dep/deputate/airwaste/aq/aqhome.htm

The variations in this picture do not indicate the respective permit levels, but simply show the boundaries between AQCRs. Without doing any modeling and thus merely as an example,[128] Region 1, metropolitan Philadelphia, would most likely be designated as a blue or black area for CO because of its high population density (which gives rise to higher CO levels due to automobile use).[129] Region 2 and 4 would be designated as yellow areas.[130] Region 3 would be a green area because it includes Harrisburg which has a moderate population density.[131] Region 5 would be a blue or black area because this area is where Pittsburgh is located.[132] And finally, Region 6 would be a red area because Erie has a relatively high CO level and population density.[133] EPA or Congress would then set ratios between permit categories. It is important to note here that the classification of regional pollutants, such as SO2, would not be based as much on population, so many metropolitan areas would be in lower-cost categories for regional pollutants.

In implementing this approach, Congress could slowly implement a higher permit cost by adjusting the trading ratios over

(last visited Nov. 12, 2003).

[128] All of the following designations are simply to illustrate how the multi-category approach would work.

[129] The 1990 population density of the Philadelphia metropolitan area was 1,380 persons per square mile. CENSUS BUREAU, LAND AREA, POPULATION, AND DENSITY FOR METROPOLITAN AREAS: 1990 (1996) [hereinafter DENSITY REPORT], http://www.census.gov/population/censusdata/90den_ma.txt. The urban center of Philadelphia is a maintenance area for CO. EPA, CARBON MONOXIDE MAINTENANCE STATE/AREA/COUNTY REPORT (2003), *at* http://www.epa.gov/air/oaqps/greenbk/cmcs.html.

[130] The largest metropolitan areas in these areas, Scranton-Wilkes-Barre and Allentown-Bethlehem, had 1990 population densities of 259 and 470 persons per square mile, respectively. DENSITY REPORT, *supra* note 129.

[131] The Harrisburg-Lebanon-Carlisle metropolitan area had a 1990 population density of 295 persons per square mile. *Id*.

[132] Pittsburgh's 1990 population density is 605 persons per square mile. *Id*.

[133] Erie's 1990 population density is 344 persons per square mile. *Id*.

a long time period. At the least, Congress should include these various categories in the Clear Skies Initiative and phase in the ratios over ten years. This would allow the market to adjust slowly over time to the reality that there will be a different permit price depending on the effect of the pollution, as the permits would be tradable on a one-to-one ratio for the first few years.[134] This phase-in approach would give Congress time to adjust the system in case of unforeseen consequences or price disparities.

IV
SPECIFIC CATEGORY ISSUES WITH VARIOUS POLLUTANTS

There are six criteria air pollutants as outlined by EPA: Ozone (O3); NOx; Lead (Pb); Carbon Monoxide (CO); SO2; and Particulate Matter (PM).[135] Lead is no longer a serious air quality issue and will not be discussed here.[136] Mercury emissions may not be manageable under this form of a trading regime at this time.[137] Volatile Organic Compounds (VOCs) are not listed as a criteria air pollutant, but they must be included here because they have an enormous impact on smog.[138] The first section discusses categorical issues with the local pollutants, CO and PM, and the second discusses categorical issues with the regional pollutants, SO2, O3, NOx, and VOCs.

A. *Local Pollutants: Category Issues with CO and PM*

CO is a local gas pollutant that is colorless, odorless, and poisonous.[139] CO exposure at high levels can lead to visual

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[134] In reality the permits in lower cost, lower effect categories would not be traded equally because the industries would know that in ten years the value of these permits would be lower. However, initially the price disparity between classes of permits would be less with gradual implementation than it would be if the ratios were implemented immediately.

[135] A criteria pollutant is one for which a NAAQS is established. 40 C.F.R. § 51.852 (2003). For standards relating to the criteria pollutants, see *id*. § 50.4 to .12.

[136] EPA, 1995 National Air Quality: Status and Trends: Lead (Pb), *at* http://www.epa.gov/air/aqtrnd95/pb.html (last visited Dec. 7, 2003).

[137] *See infra* Part VI.A.1.

[138] EPA, *The Common Air Pollutants (Criteria Air Pollutants)*, *in* THE PLAIN ENGLISH GUIDE TO THE CLEAN AIR ACT (1993), EPA Doc. No. EPA-400-K-93-001, http://www.epa.gov/oar/oaqps/peg_caa/pegcaa11.html.

[139] EPA, 1995 National Air Quality: Status and Trends: Carbon Monoxide (CO), *at* http://www.epa.gov/oar/aqtrnd95/co.html (last updated Apr. 9, 2002).

impairment, reduced work capacity, reduced manual dexterity, poor learning ability, and difficulty in performing complex tasks.[140] It is formed when carbon fuel is not completely burned, and about sixty percent of CO comes from vehicle exhaust.[141] Therefore, cities typically have a high concentration of CO.[142] Industrial processes and fuel combustion sources such as boilers and incinerators are also emitters of CO.[143] Given these features, the category structure for industries would be stricter in higher population areas, and more lax in lower population areas. This would help alleviate some of the CO in metropolitan areas, especially those that still experience very high CO levels.[144] Pollution credits would be much cheaper in low population areas because the main source of CO—motor vehicle exhaust—would not be a contributing source.

Solid or liquid particles in the air are classified generally as PM.[145] Particles vary in size and visibility from large particles that can be seen as smoke to small particles that cannot be seen without a microscope.[146] PM causes ill effects on breathing and lung tissue, causes cancer, and can lead to premature death.[147] PM originates from many different sources, both stationary and mobile.[148] It can also be formed when SO2 and NOx react in the atmosphere.[149] Setting categories for industry emitters of PM other than SO2 and NOx will be more difficult than for CO because of the broad array of emitting sources. Woodstoves, power plants, and diesel trucks are heavy PM emitters,[150] and knowledge of the location and density of these factors may be required for accurate categorization.

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[140] *Id*.
[141] *Id*.
[142] *Id*.
[143] *Id*.
[144] *Id*.
[145] EPA, 1995 National Air Quality: Status and Trends: Particulate Matter (PM-10), *at* http://www.epa.gov/air/aqtrnd95/pm10.html (last updated Apr. 9, 2002).
[146] *Id*.
[147] *Id*.
[148] *Id*.
[149] *Id*.
[150] *Id*.

B. *Regional Pollutants: Category Issues with SO2, O3, NOx, and VOCs*

Sulfur dioxide is formed when fuel containing sulfur is burned and during industrial practices such as metal smelting.[151] SO2 affects "breathing, respiratory illness, alterations in pulmonary defenses, and aggravation of existing cardiovascular disease."[152] A combination of SO2 and NOx in the atmosphere creates sulfuric and nitric acids that cause acid deposition (acid rain).[153] Acid rain can occur hundreds of miles from the SO2 source.[154] Therefore, creating categories for SO2 will be more difficult than for local pollutants, though since the Midwestern states have the worst effect, they are likely to be in a higher effect category than other states.[155]

NO2 is a member of the family of highly reactive gases known as nitrogen oxides, or NOx.[156] NOx comes mainly from motor vehicle exhaust, electric utilities, and industrial boilers.[157] NOx is a primary cause of acid rain and ground-level ozone.[158] Health effects of NOx exposure include lung irritation and "lower resistance to respiratory infections such as influenza."[159] Atmospheric NOx emissions cause both regional and local effects.[160] There is a direct relationship between VOCs and NOx in the creation of ozone.[161] The problem is that decreasing NOx and/or VOC concentrations may lead to an increase in ozone production in some circumstances.[162]

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[151] EPA, 1995 National Air Quality: Status and Trends: Sulfur Dioxide (SO_2), *at* http://www.epa.gov/air/aqtrnd95/so2.html (last updated Apr. 9, 2002).

[152] *Id*.

[153] Joskow & Schmalensee, *supra* note 38, at 40.

[154] *Id*.

[155] *See infra* app. A, figs. 2, 3.

[156] EPA, 1995 National Air Quality: Status and Trends: Nitrogen Dioxide (NO_2), *at* http://www.epa.gov/air/aqtrnd95/no2.html (last updated Apr. 9, 2002).

[157] *Id*.

[158] *Id*.

[159] *Id*.

[160] Nash & Revesz, *supra* note 5, at 602.

[161] *Id*. at 599.

[162] *Id*. at 600.

> The reason for this facially counterintuitive result is the role of the hydroxyl radical (OH) in the atmospheric photochemistry that leads to the formation of ozone. Its presence is a prerequisite for the series of reactions that allow VOCs to accelerate the conversion of nitrogen monoxide into nitrogen dioxide. The hydroxyl radical, however, also

Smog is primarily composed of ground-level O3.[163] O3 affects the lungs and can cause "chest pain, coughing, nausea, and pulmonary congestion."[164] O3 is "the most complex, difficult to control, and pervasive of the six principal air pollutants . . . [since] ozone is not emitted directly into the air by specific sources."[165] Therefore, category issues do not need to be addressed specifically with O3; however, O3 is formed by the action of sunlight on NOx and VOC in the atmosphere, and therefore controlling these pollutants will help in controlling O3.[166]

The chemical attributes of NOx can create problems within a single market, because NOx emissions trades could cause increases in O3 at both facilities.[167] Currently, EPA simply establishes minimum environmental quality levels at various locations, ignoring the effects of upwind sources, so that "a state might meet its ambient standards precisely *because* it exports a great deal of its pollution."[168] Multiple categories could help alleviate some of these problems by accounting for the effects on other areas. Furthermore, NOx and VOCs might be a perfect example of how the computer modeling website suggested by Nash and Revesz[169] could be used with the multi-category ratio approach. When combining the two, EPA or Congress can ensure an equitable price while simultaneously ensuring compliance with ambient air standards.

> reacts with nitrogen dioxide. Thus, at comparatively low VOC to NO_x concentration ratios (i.e., where NO_x is relatively abundant), the nitrogen dioxide "effectively competes with the VOCs for the [hydroxyl] radical." This reaction decreases the ability of VOCs to convert nitrogen monoxide into nitrogen dioxide, and thus reduces the rate of production of ozone. As a result, if NO_x concentrations are lowered relative to VOC concentrations, "more of the [hydroxyl] radical pool is available to react with the VOCs, leading to greater formation of ozone."

Id. (quoting NAT'L RESEARCH COUNCIL, RETHINKING THE OZONE PROBLEM IN URBAN AND REGIONAL AIR POLLUTION 167-68 (1991)).

[163] EPA, 1995 National Air Quality: Status and Trends: Ozone (O_3), *at* http://www.epa.gov/air/aqtrnd95/o3.html (last updated Apr. 9, 2002).

[164] *Id*.

[165] *Id*.

[166] *Id*.

[167] *See* Nash & Revesz, *supra* note 5, at 602-03.

[168] *Id*. at 601-02.

[169] *See supra* note 116 and accompanying text.

V
IMPLEMENTATION

This Part considers some implementation issues that must be addressed if a multi-category ratio system is to be successful.[170] It begins with an economic examination of how to forecast future pollution levels and damage. The second section analyzes the CAA to see how this approach could be implemented. The final section looks at the political feasibility of the multi-category ratio approach.

A. *Forecasting Future Levels of Pollution and Damage*

The most important aspect of the multi-category ratio approach is forecasting the future levels of pollution in a given region and the damage caused from emissions in that region. Because there would be only four or five classes of permits, the degree of accuracy would not be as high as that required by the atmospheric dispersion model.[171] The two best forecasting techniques are: (1) an econometric binomial logit model;[172] and (2) an average of the pollution levels over the previous five years and a rough estimate of effects.[173] A logit model is an econometric model that examines the relationships between any number of variables and can be used to forecast the probability that a given proposition will be true (e.g., that a region will exceed a standard for a particular pollutant).[174]

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[170] Due to the scope of such a system, this Article will only address some of the more prominent implementation issues.

[171] Nash & Revesz, *supra* note 5, at 650 (discussing the sensitivity of the atmospheric dispersion model to choice of model and data used).

[172] "The binomial logit [model] is an estimation technique for equations with dummy dependent variables that avoids the unboundedness problem of the linear probability model by using a variant of the cumulative logistic function." A.H. STUDENMUND, USING ECONOMETRICS: A PRACTICAL GUIDE 442 (4th ed. 2001).

[173] Without a logit model, AQCRs can still be classified based on the available data we currently have for pollutants such as SO2. With SO2, NOx, and VOCs, for example, the Midwestern AQCRs would likely be classified as having high effects, as industries in the Midwest have the greatest effect on the acid rain problem and some of the highest levels of emissions. *See* ENVTL. DEF., *supra* note 86, at 24 (stating that Midwestern states are the highest-emitting); BOHI & BURTRAW, *supra* note 56, at 7 (comparing compliance plans by state); EPA PROGRESS REPORT, *supra* note 41, at 8-9 (showing the correlation between Midwestern emissions and SO2 levels at Mayville and Whiteface Mountain, New York).

[174] STUDENMUND, *supra* note 172, at 442-46.

The problems encountered with calculating a useable logit model may primarily stem from a lack of available public information.[175] Fortunately, much of the variable data is obtainable through census data or state agencies.[176] Furthermore, the CAA requires the states to provide "air quality modeling . . . for the purpose of predicting the effect on ambient air quality of any emissions of any air pollutant for which the administrator has established a national ambient air quality standard," and "the submission, upon request, of data related to such air quality modeling."[177] Therefore, states can be required to provide the requisite data needed for a logit model.

A logit model to calculate the future pollution levels of a region would use one formula across the United States for each pollutant. Each variable would be a different regional statistic that has an effect on the specific pollutant level being forecasted. For instance, if CO was the pollutant being forecasted, the factors that may make up the logit model might be: (1) number of polluting industries in a given region; (2) population; (3) average income; (4) number of homes; (5) number of automobiles (broken into variables for sport utility vehicles, cars, light trucks, semi-trucks, etc.); (6) geographic landscape; (7) past pollutant levels; (8) number of farms; etc. EPA or Congress would simply plug in the numbers for each given variable and the formula would forecast the CO pollution level for that region. EPA or Congress would then assign the region a color specification after it accounts for the effects from the specific region.

A logit model could also be used to calculate the environmental and health effects of a region's pollution on other regions.[178] For example, in each region the model could set the dependant variable equal to one when the total ambient standard rises above the previous month's standard and equal to zero when the standard stays the same or drops from month to month.[179]

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[175] *See* STUDENMUND, *supra* note 172, at 445 (explaining that sample sizes for logit models must be large).

[176] *S*ee Census Bureau, Census 2000 Gateway, *at* http://www.census.gov/main/www/cen2000.html (last revised Dec. 21, 2003).

[177] 42 U.S.C. § 7410(a)(2)(K) (2000).

[178] *See* STUDENMUND, *supra* note 172, at 447-48.

[179] This is simply an example of one of the possible logit models that could be used for a specific region. Economists could, for example, run models that use hourly or daily data instead of monthly data. Also, the point at which the dependant value would equal one or zero could be raised in increments for each

Then, after models have been forecasted for every region, the region with the highest coefficients for their respective non-dependant variables (each region would have one per model) would be designated as a high effects region.

If a logit model did not produce statistically significant predictive results, pollutants such as CO, SO2, and NOx could be categorized based on their characteristics, and the current nonattainment areas.[180]

B. *The Relationship Between a Multi-Category Ratio Approach and the Clean Air Act*

Implementation of the multi-category ratio approach will need to occur within the framework of the current CAA, making adoption much easier and more likely. The following sections discuss whether the multi-category ratio approach can work with SIPs,[181] PSD,[182] nonattainment,[183] and new source review (NSR).[184] This Article focuses specifically on how to change the current PSD sections as an example of how other sections would be changed.[185] This Article deals only very briefly with SIPs, Nonattainment, and NSR.

1. *State Implementation Plans*

All states are required to adopt a plan to implement EPA air quality standards, which are enforceable by state law.[186] After EPA approves a SIP, the SIP becomes enforceable federal law.[187] EPA has a limited role in the development of SIPs, but EPA may develop a federal implementation plan if the SIP does not receive

data set (hourly, daily, monthly, etc.), or even set based upon health data instead of emissions data.

[180] *See supra* Part IV (explaining each pollutant's attributes and how it would affect categorizing areas); *see also infra* Part V.B.3.

[181] 42 U.S.C. § 7410.

[182] 42 U.S.C. §§ 7470-7492.

[183] 42 U.S.C. §§ 7501-7515.

[184] 42 U.S.C. § 7411.

[185] *See infra* Part V.B.2. It is impossible in a Article of this size to change the other relevant sections (NSR, Nonattainment, SIPs, etc.), but this example should help clarify how it could easily be done.

[186] 42 U.S.C. § 7410. The state must develop a SIP for each AQCR within its boundaries. 42 U.S.C. § 7407(a).

[187] 42 U.S.C. § 7413; REITZE, *supra* note 15, at 55.

EPA approval.[188]

The multi-category ratio approach, if adopted, would surely give less power to the states in regulating emissions because of the national nature of the market system. EPA or Congress would rate each region based on the effects of each region's pollutant emissions. Within each region, the states would still be free to regulate other sources (e.g., indirect sources), but their power to regulate stationary source emissions would be much more limited, due to the ability of plants to swap permits across state boundaries.[189] With any substantial change to the system, as happened with the 1990 Amendments, the SIP program will always have to be revamped.[190]

2. *Prevention of Significant Deterioration*

Sections 7470 to 7492 of the CAA[191] apply to many federal lands and to AQCRs that have air quality that is better than the NAAQS for a criteria pollutant.[192] These regions are designated by the states, subject to EPA approval, and usually both PSD requirements and nonattainment requirements are applicable to the region.[193]

The PSD provisions mandate an increment system that is designed to protect federal lands from deterioration of air quality.[194] Areas where PM, SO2, and NO2 air quality meet and exceed the NAAQS requirement are classified into three categories: Class I, II, and III.[195] Class I areas consist of international parks, national wilderness areas that exceed 5,000 acres, and national parks exceeding 6,000 acres in size.[196] All other areas are automatically designated as Class II, but in certain

[188] Envtl. Prot. Agency v. Brown, 431 U.S. 99 (1977); REITZE, *supra* note 15, at 55-56.

[189] They would, for example, still have to regulate certain PSD Class I areas, for visibility requirements, and for some nonattainment areas, etc.

[190] *See* REITZE, *supra* note 15, at 56-58 (explaining how the SIP program was changed to account for the 1990 Amendments).

[191] 42 U.S.C. §§ 7470-7492.

[192] *Id*. § 7472(b).

[193] *Id*. § 7407(d). This is because an area may be in nonattainment for only one or two criteria pollutants.

[194] *Id*. § 7473.

[195] *Id.* §§ 7274, 7472.

[196] *Id*. § 7472.

circumstances an area can be redesignated as Class III.[197] Class I increments allow for minimal deterioration, Class II increments allow for moderate deterioration, and Class III areas allow for the most deterioration.[198]

> Increment consumption occurs when major emitting facilities are constructed or modified that increase emissions above regulatory limits after the baseline date. The increment is used up when emissions impact the ambient air to the extent allowed in CAA § 163 [42 U.S.C. § 7473 (2000)] or when the NAAQS is reached, whichever occurs first.[199]

The multi-category ratio approach could be implemented without eliminating the PSD program. In fact, the PSD program would help to curb the deterioration of those areas where pollution effects are low and the area is a cleaner area (Class II) subject to the PSD requirements.[200] Class I areas could be automatically placed in a higher effect category so that permits would be more expensive, or trading could be disallowed in these areas. It may be a better solution, and the one that this Article is advocating, to eliminate the Class II and III designations, but expand the number of Class I areas and disallow trading in these areas. The recommended changes to the PSD Program are outlined in Appendix B.

3. *Nonattainment*

The 1990 Amendments classified O3, CO, and PM nonattainment areas in varying categories based on their degree of pollution.[201] O3 is broken into the following categories: marginal, moderate, serious, severe, and extreme areas.[202] CO is designated as either moderate or serious, and PM is usually considered moderate unless EPA determines that the area cannot attain the standard at which time the area is designated as serious.[203] States

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[197] *Id*. §§ 7274, 7472.

[198] *Id*. § 7473.

[199] REITZE, *supra* note 15, at 109 (footnotes omitted).

[200] There is a strong likelihood with the multi-category ratio approach that many Class II areas would have cheaper permits, because the effects of the pollution in these areas would be less than in areas where pollution levels are higher.

[201] *Id*. § 7407(d)(4).

[202] *Id*. § 7511(a).

[203] *Id*. §§ 7512, 7513.

were given from three to twenty years to achieve the NAAQS standard depending on the various categories.[204] A construction permit program is necessary for new major sources or modifications.[205]

> To obtain a construction permit, offsetting reductions in emissions from other sources of similar pollutants must be obtained. . . .
>
> . . . .
>
> The [Amendments] included several other requirements including provisions for emissions trading. There also were new netting requirements concerning offset ratios for O_3, CO and PM_{10}, depending upon the degree of nonattainment. In extreme O_3 areas, any net increase in emissions triggers offset and control requirements. In other nonattainment areas, some net increase in emissions could occur without making offsets necessary.[206]

For all O3 areas, there are different requirements depending upon the designation of the area.[207] This system is an example of a category system that differentiates regions based upon the effects of pollution, rather than the quantity.[208] For those pollutants that already have designated areas, implementation of the multi-category ratio approach would be simple.[209] The various area designations could be utilized to help set the categories, and furthermore, these areas are already used to comply with a stricter standard. Under the multi-category ratio approach much of the

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[204] *Id*. § 7511(a)(1).

[205] *Id*. § 7503.

[206] REITZE, *supra* note 15, at 82 (citing 42 U.S.C. § 7503(a)(1)(A)).

[207] For example, for ozone areas that are moderate or worse, there are basic inspection and maintenance programs (I/M) required for motor vehicles. 40 C.F.R. §§ 51.350(a)(4), .352 (2003). More stringent inspections are performed to determine whether NOx controls are performing properly in serious, severe, and extreme areas. *Id*. §§ 51.350(a)(2), .351.

[208] To view the current classifications of ozone nonattainment see 40 C.F.R. §§ 81.300-.356; EPA, CLASSIFICATIONS OF OZONE NONATTAINMENT AREAS, *at* http://www.epa.gov /oar/oaqps/greenbk/onc.html (last visited Nov. 19, 2003).

[209] To view the current classifications of CO nonattainment, see EPA, CLASSIFICATIONS OF CARBON MONOXIDE NONATTAINMENT AREAS (2003), http://www.epa.gov/oar/oaqps/greenbk/cnc.html. For a listing of particulate matter nonattaiment areas, see 40 C.F.R. §§ 81.300-.356; EPA, CLASSIFICATIONS OF PARTICULATE MATTER NONATTAINMENT AREAS (2003), http://www.epa.gov/oar/oaqps/greenbk/pnc.html.

nonattainment provisions could be eliminated when ratios became effective because the price of permits in nonattainment areas, or areas that contribute significantly to nonattainment areas would be much higher. This Article's recommendations for amending the nonattainment sections are too lengthy to be included here, but the same type of modification can be done as with PSD. Furthermore, much of the amending of nonattainment sections would depend on political give and take.

4. *New Source Review*

Every new or modified source under the CAA is subject to NSR.[210] These sources must meet the PSD requirements or lowest achievable emissions rates (LAER) for their emissions.[211] In nonattainment areas, LAER is the requirement; in PSD areas, the best available control technology is required.[212] Enforcement has been difficult with NSR,[213] and many old plants that are not subject to NSR are still operating.[214] This is why a multi-category approach is a better way of dealing with new sources, because they must purchase permits to enter the market, and therefore the same total amount of pollution would be emitted as was emitted before their entrance into the market. Furthermore, with a category approach such as the one being proposed, new sources would be encouraged to open in areas where their pollution is not as damaging because the permits in those areas would be cheaper.

The multi-category ratio approach would not need NSR once ratios were in place. The 1990 Amendments allocated SO2 permits to facilities that began operation before September 30, 1990 based on their past fuel usage.[215] Facilities that began operation between October 1, 1990, and December 31, 1995, were allocated allowances for Phase II of the program.[216] All facilities that commenced operation after 1995 had to purchase permits on

[210] 42 U.S.C. § 7475; REITZE, *supra* note 15, at 235.

[211] 42 U.S.C. §§ 7475(a)(4), 7503(a)(2), 7475(d).

[212] *Id*. §§ 7475(a)(4), 7503(a)(2).

[213] For an outline of enforcement issues with NSR, see EPA, *Compliance with Permitting Critical to Clean Air Act Goals*, ENFORCEMENT ALERT, Jan. 1999, at 3-4 (Jan. 1999), http://www.epa.gov/compliance/resources/newsletters/civil/enfalert/newsource.pdf.

[214] REITZE, *supra* note 15, at 235.

[215] *Id*. at 256 (citing 42 U.S.C. § 7651c).

[216] *Id*. (citing 42 U.S.C. § 7651d(g)(4)).

the open market.[217] The same system of allocation could be used for the multi-category ratio approach. New sources would either be included in Phase II of implementation or would be required to purchase already existing permits. Of course, the new sources would also have to meet the PSD and nonattainment standards as well.

C. *Political Implementation*

Politically, implementation of a multi-category ratio approach would be moderately difficult. Because a permit is a quasi-property right, the associated allocation decisions will be as highly politicized as tax legislation or appropriations bills.[218] Many industries would support the multi-category ratio approach because they would be able to obtain cheaper permits in more rural areas, and the program would be much easier to work with, as much of the complicated NSR system could be eliminated. A positive externality to the multi-category ratio approach may be economic growth in rural areas.[219] Fortunately, almost all municipalities and industries would agree that improved air quality would be beneficial.[220]

The environmental groups who now disfavor tradable permits legislation should support the multi-category ratio approach because it includes the effects of pollution and not just the quantity of pollution emitted.[221] The old maxim of the environmental groups that tradable permits are a "license to pollute" has faded with the proven success of the 1990 Amendments when compared with the old command and control approach.[222] Surely

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[217] *Id*. (citing 42 U.S.C. § 7651b(e)).

[218] *See, e.g.*, Nathaniel O. Keohane et al., *The Choice of Regulatory Instruments in Environmental Policy*, 22 HARV. ENVTL. L. REV. 313, 352-53 (1998).

[219] The multi-category ratio approach would, in some cases, allow industries in more rural areas to pay less for their tradable permits and would therefore benefit rural economies.

[220] Richard Lehfeldt & Greg Nelson, *"Industry Is from Mars, Environmentalists Are from Venus: Reconciling Our Differences on Earth"—A Utility Perspective*, 17 J. LAND USE & ENVTL. L. 427, 428 (2002).

[221] *See* ENVTL. DEF., *supra* note 86, at ii (stating Environmental Defense's support of "cap and trade" models); Nash & Revesz, *supra* note 5, at 618.

[222] *Id*. *See also* Bruce Yandle, *Public Choice and the Environment: From the Frying Pan To the Fire*, *in* POLITICAL ENVIRONMENTALISM: GOING BEHIND THE GREEN CURTAIN 42 (Terry L. Anderson ed., 2000) ("[T]he most dedicated environmentalists see pollution fees and taxes as a way for rich polluters to buy

environmental groups would see the benefits of a market system that adjusts the permit price based on the environmental and health effects of the pollution.

VI
THE MULTI-CATEGORY RATIO APPROACH: A CLEARER SKIES PROPOSAL

The multi-category ratio approach improves upon the Clear Skies Initiative. Although Clear Skies may be more workable than the current CAA in certain areas, it has fundamental flaws which can be remedied by the multi-category ratio approach. This Part first addresses the flaws in the Clear Skies Initiative, and follows with a comparison between Clear Skies and the multi-category ratio approach.

A. *Problems with the Clear Skies Initiative*

Although scholars and environmentalists have attacked the Bush proposal on many different grounds,[223] this Article focuses on three main flaws: (1) mercury trading; (2) permit allocation; and (3) the removal of NSR. These three flaws must be resolved if Clear Skies is to be successful in its goals. Furthermore, Bush's proposal is extremely ambiguous in how it would be implemented with other sections of the CAA.[224]

1. *A Mercury Trading Regime Is Premature*

First, mercury should not be traded because we do not currently have the monitoring capabilities, or CEMS, in place.[225] Accurate monitoring is a pre-requisite for a trading regime—without it a trading regime is bound to be either unworkable or subject to abuse. Bush's proposal allows the administrator to

licenses to pollute, which in the extreme view is seen as the equivalent of selling permits to commit murder.").

[223] Daniel Altman, *Just How Far Can Trading of Emissions Be Extended?*, N.Y. TIMES, May 31, 2002, at C1.

[224] For example, the NOx provisions in Bush's Clear Skies Initiative never once refer to or amend any sections of the CAA other than those included in Subchapter IV-A. *See* H.R. 999, 108th Cong. § 2 (2003) (amending 42 U.S.C. § 7651-7651o (2000)).

[225] There is currently no requirement for CEMS for mercury in coal-fired power plants. Under Clear Skies, EPA is required to specify CEMS standards for mercury. *Id*. (amending 42 U.S.C. § 7651d).

"specify an alternative monitoring system for determining mercury emissions to the extent that the administrator determines that CEMS for mercury . . . are not commercially available."[226] This gives the administrator and industry too much discretion. Furthermore, a high percentage of the mercury that ends up in our country is emitted elsewhere.[227]

Mercury could eventually be included in a multi-category ratio approach (perhaps in a provision calling for its future categorization), but to do so now would be premature. For mercury, there should be a section calling for categorization in 2010. Until then, the current MACT standards should be left in place or, if one trading market is used, the caps must be lower than those in the Clear Skies Initiative.[228]

2. *Permit Allocation Is Non-Reviewable*

Second, the section on allocation of permits under the Clear Skies Initiative gives unfettered control to the administrator and disallows review by the courts.[229] It states, "[T]he calculation of the allocation for any unit or facility, and the determination of any values used in such calculation . . . [is] not subject to judicial review."[230] This allows the administrator to hand out valuable permits at no cost without being subject to judicial review. To alleviate this problem, there must be a greater percentage of permits allocated to the auctions, and the administrator's actions must be reviewable.

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[226] *Id*.

[227] EPA, MERCURY WHITE PAPER 1 (n.d.), http://www.epa.gov/oar/whtpaper.pdf; EPA Mercury Study Report to Congress: Overview, *at* http://www.epa.gov/oar/mercover.html (last updated Aug. 19, 2003).

[228] Bush's Clear Skies Initiative sets the caps too high for mercury, because the MACT standards under consideration by EPA would result in lower total emissions. *Compare* Barry J. Goehler, *Control of Mercury Emissions from Coal-Fired Electric Power Plants*, 9 ENVTL. LAW. 119, 172 (2002) ("[I]t is not inconceivable for the MACT floor for sources burning bituminous coal to be in the vicinity of 80-90% reduction of mercury emissions and for sources burning subbituminous coal to be above 30% reduction of mercury emissions.") *with* EPA 2003 TECHNICAL SUPPORT PACKAGE, *supra* note 65, at A9 ("The Clear Skies Act will cut mercury emissions from coal-fired power generators by 69% when fully implemented."). Furthermore, without CEMS in place, it is premature to establish a trading regime.

[229] H.R. 999 § 2 (amending 42 U.S.C. § 7651b).

[230] *Id*.

3. *New Source Review Is Severely Limited*

Finally, Clear Skies removes NSR and allows significant deterioration in attainment areas other than Class I areas.[231] Although Clear Skies subjects (or exempts from the exemption) facilities within a fifty kilometer radius of a Class I area to NSR,[232] all facilities not within a fifty mile radius of a Class I area would no longer be subject to preconstruction review requirements and Best Available Retrofit Technology (BART).[233] The problem with exempting so many trading facilities is that the trading regime used does not account for the effects of pollution from these sources, and therefore there is a strong possibility of significant deterioration in attainment areas. [234] The purpose of the CAA is "to protect and enhance the quality of the Nation's air resources,"[235] and allowing significant deterioration of attainment areas is not within the scope of Congress' articulated purpose.

B. *Why a Multi-Category Ratio Approach Is a Better Solution*

The multi-category ratio approach solves many of the problems associated with a single market trading regime—many of the problems that will arise if Clear Skies is adopted. The multi-category ratio approach adjusts the price of a permit based on the environmental and health effects of pollution while the Clear Skies Initiative bases the price solely on the quantity emitted. The multi-category ratio approach will thus help alleviate the creation of hot spots and is more equitable.

Additionally, the problems of permit allocation and the removal of NSR would not be problems, or at least as great of problems, under the multi-category ratio approach. Because there would be a limited number of permits to allocate in each category, abusive allocation by the administrator is much less of a concern. Also, much of NSR could be eliminated under the multi-category ratio approach because the price of the permit would be higher in

[231] *See id*. (amending 42 U.S.C. § 7651-7651o) ("An affected unit shall not be considered a major emitting facility or major stationary source, or a part of a major emitting facility or major stationary source for purposes of compliance with the requirements of parts C and D of title I.").

[232] *Id*.

[233] Clear Skies does set forth some of its own requirements but they are much less stringent than those contained within NSR. *Id*.

[234] *Id*. (amending 42 U.S.C. § 7651a).

[235] 42 U.S.C. § 7401(b).

areas where the effects are the greatest. Under Clear Skies, a new source can enter the market and pay the same price for its permits regardless of the harm caused. However, under the multi-category ratio approach, a new source will have an incentive to enter markets that have cheaper permits—where its entry will have lower environmental and health effects. Also, the multi-category ratio approach expands PSD Class I areas, while Clear Skies does not.

There are clear benefits from a system that accounts for the effects of pollution within the price of a permit. Since the approach will work within the confines of the current CAA, it would be relatively easy to implement. Moreover, the multi-category ratio approach is only slightly more complex for the regulated industries than the current single-market system.

CONCLUSION

The future of air pollution regulation will be the further implementation of tradable permits. After the success of the SO2 program, gradual tradable permit implementation is likely. There will be specific difficulties regarding specific pollutants in the implementation of tradable permits regulation, but change can and will occur.

The multi-category ratio approach has some slight problems but is a workable solution to the currency problem and the inherent inequity of a tradable permit system. If legislators are not convinced, then the same approach should be taken with the multi-category ratio approach as with the tradable permit approach—use one pollutant as a case study. SO2 is of great environmental concern (due to its role in acid rain) and has already been a test subject of emissions trading,[236] making it an ideal pollutant on which to test this approach. Regardless of whether the multi-category ratio approach is used, something must be done about the currency problem and the inequities of a single market system. Tradable permits have achieved great progress in acid rain control; however, neither the current regulations nor the Clear Skies Initiative is the sustainable answer to America's air pollution problem.

[236] *See supra* Part I.B.

APPENDIX A

FIGURE 1: ORIGINS OF ACID RAIN [237]

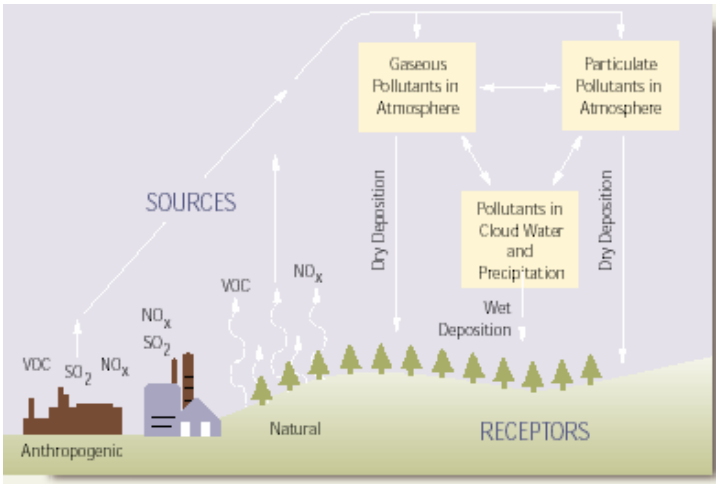
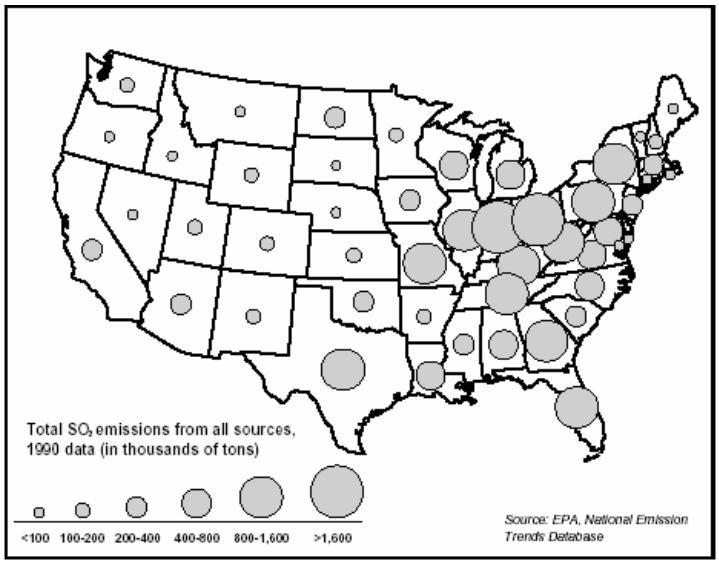


FIGURE 2: SO2 EMISSIONS[238]



[237] EPA PROGRESS REPORT, *supra* note 41, at 3.
[238] ENVTL. DEF., *supra* note 86, at 7.

FIGURE 3: MIDWESTERN EFFECTS[239]

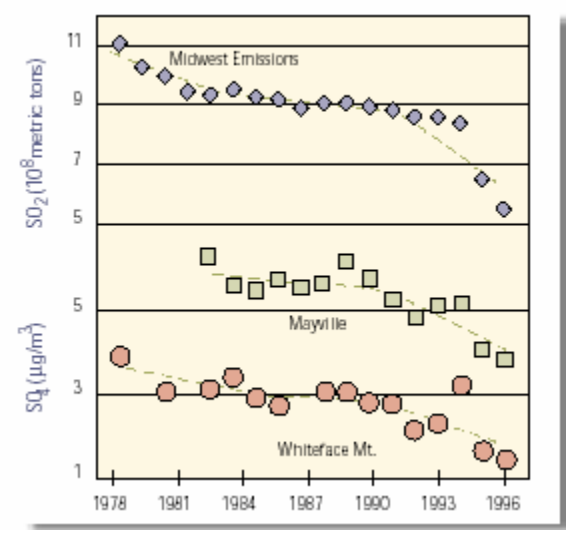
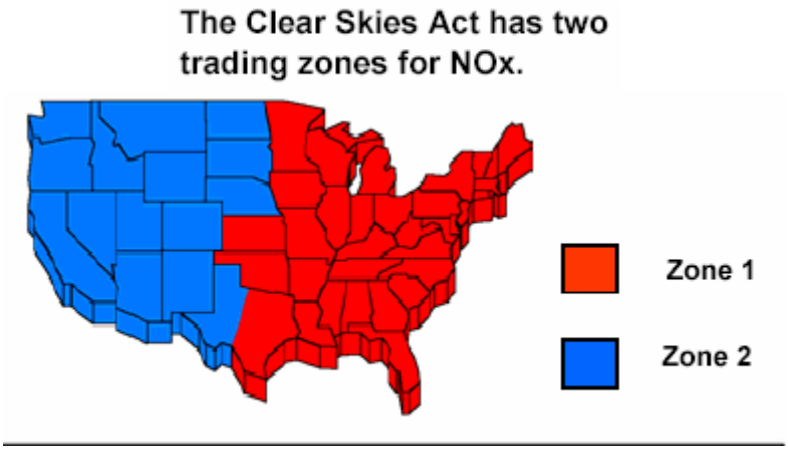


FIGURE 4: CLEAR SKIES TRADING ZONES[240]



[239] EPA PROGRESS REPORT, *supra* note 41, at 8.
[240] EPA 2003 TECHNICAL SUPPORT PACKAGE, *supra* note 65, at A7.

APPENDIX B

This Article recommends the following changes to the PSD program (bracketed language is added and crossed out language is removed):

§ 7470. Congressional declaration of purpose

The purposes of this part are as follows:

(1) to protect public health and welfare from any actual or potential adverse effect which in the Administrator's judgment may reasonably be anticipate[d] to occur from air pollution or from exposures to pollutants in other media, which pollutants originate as emissions to the ambient air, notwithstanding attainment and maintenance of all national ambient air quality standards;

(2) to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national sea-shores, and other areas of special national or regional natural, recreational, scenic, or historic value;

(3) to insure that economic growth will occur in a manner consistent with the preservation of existing clean air resources;

~~(4) to assure that emissions from any source in any State will not interfere with any portion of the applicable implementation plan to prevent significant deterioration of air quality for any other State;~~ and

(5) to assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all consequences of such a decision and after adequate procedural opportunities for informed public participation in the decision making process.[241]

Section 4 should be removed because the color assigned to a specific region outside of a Class I area will account for the effects of pollution on the area.[242]

§ 7471. Plan requirements

In accordance with the policy of section 7401(b)(1) of this title,

[241] 42 U.S.C. § 7470 (2000).

[242] More weight (a stricter category) could be given to effects on a Class I area if Congress so chooses.

each applicable implementation plan shall contain emission limitations and such other measures as may be necessary, as determined under regulations promulgated under this part, to prevent significant deterioration of air quality in each region (or portion thereof) designated pursuant to section 7407 of this title as attainment or unclassifiable.[; that is, a class I area as defined by section 7472.][243]

§ 7472. Initial classifications

(a) Areas designated as Class I

Upon the enactment of this part, all—

(1) international parks,

(2) national wilderness areas which exceed 5,000 acres in size,

(3) national memorial parks which exceed 5,000 acres in size, and

(4) national parks which exceed 6,000 acres in size, and which are in existence on August 7, 1977,

[and

(5) areas which exceeds ten thousand acres in size and is a national monument, a national primitive area, a national preserve, a national recreation area, a national wild and scenic river, a national wildlife refuge, a national lakeshore or seashore, and a national park or national wilderness area established after August 7, 1977, which exceeds 10,000 acres in size,[244]]

shall be class I areas and may not be redesignated. ~~All areas which were redesignated as class I under regulations promulgated before August 7, 1977, shall be class I areas which may be redesignated as provided in this part.~~[245] The extent of the areas designated as class I under this section shall conform to any changes in the boundaries of such areas which have occurred subsequent to August 7, 1977, or which may occur subsequent to November 15, 1990.

~~**(b) Areas designated as class II**~~

~~All areas in such State designated pursuant to section 7407(d) of this title as attainment or unclassifiable which are not established as class I under subsection (a) of this section shall~~

[243] 42 U.S.C. § 7471.

[244] This expands Class I areas. The language is taken directly from the current § 7474 that allows redesignation of these areas. *Id*. § 7474.

[245] This is eliminated because redesignation will not be allowed.

~~be class II areas unless redesignated under section 7474 of this title.~~[246]

This eliminates all areas except Class I, which expand. The next section deals with increments and ceilings:

§ 7473. Increments and ceilings

(a) Sulfur oxide and particulate matter; requirement that maximum allowable increases and maximum allowable concentrations not be exceeded

In the case of sulfur oxide and particulate matter, each applicable implementation plan shall contain measures assuring that maximum allowable increases over baseline concentrations of, and maximum allowable concentrations of, such pollutant shall not be exceeded. In the case of any maximum allowable increase (except an allowable increase specified under section 7475(d)(2)(C)(iv) of this title) for a pollutant based on concentrations permitted under national ambient air quality standards for any period other than the annual period, such regulations shall permit such maximum allowable increase to be exceeded during one such period per year.

(b) Maximum allowable increases in concentrations over baseline concentrations

(1) For any class I areas, the maximum allowable increase in concentrations of sulfur dioxide and particulate matter over the baseline concentration of such pollutant shall not exceed the following amounts:

Pollutant	Maximum allowable increase (in micrograms per cubic meter)
Particulate matter:	
Annual geometric mean	[4][247]
Twenty-four-hour maximum	10
Sulfur dioxide:	
Annual arithmetic mean	2
Twenty-four-hour maximum	5
Three-hour maximum	25

[246] 42 U.S.C. § 7472.

[247] The amount has been changed to reflect the updated regulatory standard. 40 C.F.R. § 52.21(c) (2003).

[Nitrogen dioxide:
Annual Average 2.5][248]

(2) For any ~~class II~~ [class I] area [classified under section 7472(a)(5) which was previously a class II area before January 5, 2004, for a period of ten years], the maximum allowable concentrations of sulfur dioxide and particulate matter over baseline concentration of such pollutant shall not exceed the following amounts:

Pollutant	Maximum allowable increase (in micrograms per cubic meter)
Particulate matter:	
Annual geometric mean	[17][249]
Twenty-four-hour maximum	37
Sulfur dioxide:	
Annual arithmetic mean	20
Twenty-four-hour maximum	91
Three-hour maximum	512
[Nitrogen dioxide:	
Annual Average	25][250]

Part (2) (above) should be amended to allow time for new areas designated as Class I to meet stricter increment standards. Part (3) of this subsection should be removed as it deals with Class III areas.[251]

(~~4~~[3]) The maximum allowable concentration of any air pollutant in a~~ny~~ [class I] area to which this part applies shall not exceed a concentration for such pollutant for each period of exposure equal to—

(A) the concentration permitted under the national secondary ambient air quality standard, or

(B) the concentration permitted under the national primary ambient air quality standard,

whichever concentration is lowest for such pollutant for such

[248] NO2 has been added to reflect the current regulatory standard. *Id*.

[249] The amount has been changed to reflect the updated regulatory standard. *Id*.

[250] NO2 has been added to reflect the current regulatory standard. *Id*.

[251] 42 U.S.C. § 7473(b)(3).

period of exposure.[252]

Part (c), "Orders or rules for determining compliance with maximum allowable increases in ambient concentrations of air pollutants," can be left exactly the same.[253]

Section 7474 (164) can be entirely eliminated because it deals with redesignation of areas.[254] Since there is now only one designation type (Class I), redesignating areas is unnecessary. Because the preconstruction requirements only deal with construction in a Class I area, § 7474 should be changed as follows:

> **§ 7474. [Petition for reclassification or inclusion in 7475 requirements**
>
> **(a) Petition for reclassification or inclusion in 7475 requirements**
>
> (1) A Governor of a State may petition and compel the Administrator for an AQCR in another State to be placed in a higher permit category if there is significant evidence that the permit level proposed or implemented is not accurately accounting for the effects of that State's pollution on a petitioner's class I area; or
>
> (2) A Governor of a State may petition and compel the Administrator to subject a new or newly modified major facility in another State to meet the requirements of section 7475 if placing the entire AQCR in a higher category would be over burdensome to the State and is unnecessary as determined by the Administrator.
>
> (3) If a Governor of either State disagrees with the Administrator's determination that Governor may petition the President, and the President may approve or disapprove the Administrator's determination. The President's action is not reviewable in any court.]

Section 7475 deals with preconstruction requirements and should be amended as follows:

> **§ 7475. Preconstruction requirements**
>
> **(a) Major emitting facilities on which construction is commenced**
>
> No major emitting facility on which construction is commenced

[252] *Id*. § 7473(b)(4).
[253] *Id*. § 7473(c).
[254] *Id*. § 7474.

after August 7, 1977, may be constructed in a~~ny~~ [class I] area to which this part applies unless—

(1) a permit has been issued for such proposed facility in accordance with this part setting forth emission limitations for such facility which conform to the requirements of this part;

(2) the proposed permit has been subject to a review in accordance with this section, the required analysis has been conducted in accordance with regulations promulgated by the Administrator, and a public hearing has been held with opportunity for interested persons including representatives of the Administrator to appear and submit written or oral presentations on the air quality impact of such source, alternatives thereto, control technology requirements, and other appropriate considerations;

(3) the owner or operator of such facility demonstrates, as required pursuant to section 7410(j) of this title, that emissions from construction or operation of such facility will not cause or contribute to, air pollution in excess of any (A) maximum allowable increase or maximum allowable concentration for any pollutant in any area to which this part applies more than one time per year, (B) national ambient air quality standard in any air quality control region, or (C) any other applicable emission standard or standard of performance under this chapter;

(4) the proposed facility is subject to the best available control technology for each pollutant subject to regulation under this chapter emitted from, or which results from, such facility;

(5) the provisions of subsection (d) of this section with respect to protection of class I areas have been complied with for such facility;

(6) there has been an analysis of any air quality impacts projected for that area as a result of growth associated with such facility;

(7) the person who owns or operates, or proposes to own or operate, a major emitting facility for which a permit is required under this part agrees to conduct such monitoring as may be necessary to determine the effect which emissions from any such facility may have, or is having, on air quality in any area which may be affected by emissions from such source~~;~~[.] ~~and~~

~~(8) in the case of a source which proposes to construct in a class~~

~~III area, emissions from which would cause or contribute to exceeding the maximum allowable increments applicable to class II area and where no standard under section 7411 of this title has been promulgated subsequent to August 7, 1977, for such source category, the Administrator has approved the determination of best available control technology as set forth in the permit.~~ [255]

Subsection (b)[256] should be removed completely and (c) should remain the same:

(c) Permit applications

Any completed permit application under section 7410 of this title for a major emitting facility in any area to which this part applies shall be granted or denied not later than one year after the date of filing of such completed application.[257]

Subsection (d) should be amended as follows:

(d) Action taken on permit applications; notice; adverse impact on air quality related values~~; variance; emission limitations~~

(1) Each State shall transmit to the Administrator a copy of each permit application relating to a major emitting facility received by such State and provide notice to the Administrator of every action related to the consideration of such permit.

(2)(A) The Administrator shall provide notice of the permit application to the Federal Land Manager and the Federal official charged with direct responsibility for management of any lands within a class I area which may be affected by emissions from the proposed facility.

(B) The Federal Land Manager and the Federal official charged with direct responsibility for management of such lands shall have an affirmative responsibility to protect the air quality related values (including visibility) of any such lands within a class I area and to consider, in consultation with the Administrator, ~~whether a proposed major emitting facility will have an adverse impact on such values.~~ [whether a proposed major emitting facility outside of the area should be reassigned classification or not included in the trading system under the same requirements as 7474 except without petition by a State

[255] *Id*. § 7475(a).
[256] *Id*. § 7475(b).
[257] *Id*. § 7475(c).

Governor.][258]

Subsection (C)(i)-(iv), and (D)(i)-(iii) should be completely removed because the language added in (d)(2)(B) would account for the issues covered in these subsections.[259] Section (e), titled "Analysis; continuous air quality monitoring data; regulations; model adjustments," should be left in its entirety.[260]

Section 7476, titled "Other pollutants," was implemented in 1977 to force EPA to develop PSD regulations for NO2, CO, hydrocarbons, and petrochemical oxidants.[261] EPA has not done so for any pollutants other than NO2.[262] If the multi-category ratio approach is to be adopted for CO, increments would have to be created for Class I areas. If this were to happen, § 7476 can be left alone, except that CO and NO2 would be removed from (a), and (f) would be eliminated in its entirety. Section 7477 should be left as follows:

§ 7477. Enforcement

> The Administrator shall, and a State may, take such measures, including issuance of an order, or seeking injunctive relief, as necessary to prevent the construction or modification of a major emitting facility which does not conform to the requirements of this part, or which is proposed to be constructed in an area designated pursuant to section 7407(d) of this title as attainment or unclassifiable and which is not subject to an implementation plan which meets the requirements of this part.[263]

Section 7478, titled "Period before plan approval," can be left intact if need be,[264] as well as the definition section[265] which would not affect the multi-category ratio approach.

The visibility program can be left in place exactly as it currently appears, as it deals only with certain Class I areas.[266] It would not hinder the multi-category ratio approach because only

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[258] *Id*. § 7475(d).

[259] *Id*. § 7475(d)(C), (D).

[260] *Id*. § 7475(e).

[261] Clean Air Act Amendments of 1977, Pub. L. No. 95-95, § 127(a), 91 Stat. 739 (1977).

[262] 40 C.F.R. 52.21(c) (2003).

[263] 42 U.S.C. § 7477.

[264] *Id*. § 7478.

[265] *Id*. § 7479.

[266] This will be true only where the Secretary of Interior and the federal land managers find that visibility is an important value. 42 U.S.C. § 7491(a).

industries that contribute to visibility in these specific areas would have to use certain technology (usually a BART standard), or whatever the individual SIPs call for. Furthermore, the visibility effects can and should be included in the categorizations of areas, and the existing visibility sections can be left in place to ensure that visibility is not hindered in these areas. However, it is hoped that eventually they will be unnecessary.