

September 2010

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Recommended Citation

Deborah Behles, *Examining the Air We Breathe: EPA Should Evaluate Cumulative Impacts When It Promulgates National Ambient Air Quality Standards*, 28 Pace Env'tl. L. Rev. 200 (2010)

DOI: <https://doi.org/10.58948/0738-6206.1656>

Available at: <https://digitalcommons.pace.edu/pelr/vol28/iss1/3>

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ARTICLE

Examining the Air We Breathe: EPA Should Evaluate Cumulative Impacts When It Promulgates National Ambient Air Quality Standards

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ABSTRACT

Inhaling air pollutants can lead to a variety of adverse respiratory and cardiovascular health effects. This potential risk for health impacts is likely greater when the mixture of pollutants that exists in ambient air, rather than isolated pollutants, are inhaled. Despite the evidence of potential cumulative impacts, EPA has continued to focus its analysis of health impacts on isolated pollutants instead of the actual mixture we breathe. This article proposes that EPA should evaluate and consider cumulative health impacts when it sets national ambient air quality standards under the Clean Air Act. EPA is considering two pollutants together to determine their impact on the environment; it should do the same type of evaluation for human health impacts. Consideration of cumulative health impacts is consistent with the Act's requirement to set standards at a level requisite to protect public health, could translate into a more accurate way to estimate risks, and could provide a tool for prioritization of emission reductions in the most heavily impacted communities.

* The author thanks Helen Kang, Caroline Koch, and the clients, staff, and students at the Environmental Law and Justice Clinic for their invaluable insights, assistance, and support which contributed greatly to this article. The author also thanks Golden Gate University School of Law for its support of this article.

I. INTRODUCTION

The Clean Air Act (“CAA” or “the Act”) was enacted with the laudable goal of enhancing the quality of the air to protect public health.¹ As an integral measure to accomplish this, the Act requires the Environmental Protection Agency to set National Ambient Air Quality Standards (“NAAQS”) for a set of pollutants, called criteria pollutants, at a level requisite to protect public health. To determine the appropriate level, EPA examines scores of peer-reviewed studies and consults with some of the nation’s leading scientific experts.

This extensive process has historically focused on determining how individual pollutants impact public health rather than the mixture in ambient air. Although EPA has acknowledged that criteria pollutants are likely to create greater health risks when combined with other criteria pollutants, it has not made an effort to quantify or examine this relationship. This disconnect between how the standards are set and what exists in the ambient air results in a failure to meaningfully address cumulative impacts.

The failure of the NAAQS to consider potential cumulative health risks from criteria pollutants is not remedied by other requirements. In fact, this significant issue has remained largely untouched by the regulatory community, which has historically focused its efforts on researching potential cumulative impacts rather than taking action and setting standards. This failure to consider and regulate potential cumulative health impacts has negatively affected low-income and minority communities overburdened by pollution and needs to be changed.

This article proposes that EPA should address cumulative health impacts when it sets air standards under the Act. Consideration of cumulative impacts in the NAAQS process is consistent with the Act’s statutory mandate and its encouragement of the evaluation of cumulative impacts. In addition, it could translate into significant benefits when states implement the standards through their state implementation

1. Clean Air Act § 101, 42 U.S.C. § 7401 (2006).

plans and could lead to prioritization of reductions in communities with the worst air quality.

II. OVERVIEW OF THE NATIONAL AMBIENT AIR QUALITY STANDARDS, CRITERIA POLLUTANTS, AND THEIR RELATIONSHIPS AND INTERACTIONS

The promulgation of NAAQS is an arduous process that involves several months of technical review, evaluations of numerous studies, and critiques from some of the leading experts on air pollution related issues.² This extensive process is one of the most comprehensive evaluations of air pollution related data in the world and has been deferred to in respectable venues such as the World Health Organization.³ After this evaluation is complete, the EPA Administrator historically determines a standard for each individual pollutant by specifying its indicator, time frame, and level.⁴ Although the standard can provide a starting point for states and regulators to determine how to minimize risk to public health from that particular pollutant, it does not shed light on how pollutants interact to create cumulative impacts, how states should prioritize emission reductions, and how best to accomplish reductions when several of the criteria pollutants are interrelated.⁵

A. The NAAQS

Congress enacted the CAA to “protect and enhance the quality of the nation’s air resources so as to promote the public

2. See generally EPA, *NAAQS Review Process*, <http://www.epa.gov/ttn/naaqs/review.html> (last visited Jan. 5, 2010) (providing links to documents from recent reviews).

3. See World Health Organization, *Air Quality Guidelines: Global Update 2005*, at 217 (2006) (describing EPA’s particulate matter criteria document as assembling a “full suite of evidence”), available at http://www.euro.who.int/_data/assets/pdf_file/0005/78638/E90038/pdf.

4. See EPA, *National Ambient Air Quality Standards Table (NAAQS)*, <http://epa.gov/air/criteria.html> (last visited Apr. 10, 2010) (listing standards for criteria pollutants).

5. See *infra* Part III.B-D (discussing issues with standards focused only on one pollutant).

health and welfare and the productive capacity of its population.”⁶ The CAA distinguishes among various pollutants labeling some as “criteria pollutants”⁷ and other as “hazardous air pollutants.”⁸

A cornerstone goal of the CAA is to create and maintain the NAAQS for criteria pollutants.⁹ To establish the NAAQS, EPA initially must complete a list of criteria pollutants,¹⁰ which are pollutants that “may reasonably be anticipated to endanger public health or welfare” and are produced by “numerous or diverse mobile or stationary sources.”¹¹ After listing a criteria pollutant, EPA has twelve months to publish an air quality criteria document that reflects the “latest scientific knowledge” of the pollutant’s effects on the general public.¹²

An independent scientific review committee, the Clean Air Scientific Advisory Committee (“CASAC”), assists with this review process.¹³ This committee reviews the scientific data on the pollutant’s effects on health and recommends revisions in the criteria and the NAAQS.¹⁴ Pursuant to its duties under the Act,

6. 42 U.S.C. § 7401(b)(1).

7. Criteria pollutants are regulated under Sections 108 and 109 of the Clean Air Act. *Id.* § 7408(f)(1)(A); *See id.* §§ 7408-09. The six criteria pollutants are carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, particulates and lead.

8. Hazardous air pollutants are defined and regulated pursuant to Section 112 of the Clean Air Act. *Id.* § 7412.

9. *See id.* § 7401.

10. *Id.* § 7408(a)(1).

11. *Id.* §§ 7408(a)(1)(A-B). Additionally, the statute requires the Administrator to name each pollutant “for which air quality criteria has not been issued before December 31, 1970 but for which he plans to issue air quality criteria under this section.” *Id.* § 7408(a)(1)(C); *see, e.g.,* NRDC v. Train, 411 F. Supp. 864, 867-70 (S.D.N.Y. 1976) (discussing the promulgation of air quality criteria for lead), *aff’d*, 545 F.2d 320 (2d Cir. 1976).

12. 42 U.S.C. § 7408(a)(2) (“The Administrator shall issue air quality criteria...[which] shall accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health and welfare which may be expected from the presence of such pollutant in the ambient air, in varying quantities.”).

13. *Id.* § 7409(d)(2)(A) (“The Administrator shall appoint an independent scientific review committee composed of seven members including at least one member of the National Academy of Sciences, one physician, and one person representing State air pollution control agencies.”).

14. *Id.* § 7409(d)(2)(B-C).

CASAC reviews the criteria document and recommends new standards or revisions to old standards as may be appropriate.¹⁵ CASAC historically played a central role in what level the NAAQS are set at by recommending ranges for the EPA Administrator to pick within.¹⁶ Until 2006, EPA respected and had never questioned CASAC's scientific recommendation.¹⁷ In the last review of particulate matter, however, EPA adopted recommendations outside of the range recommended by CASAC to be protective of public health.¹⁸ CASAC criticized this decision and requested that EPA revise the standard to reflect its recommendation.¹⁹

Next, the Administrator must establish "primary" and "secondary" NAAQS for the criteria pollutants.²⁰ Primary NAAQS are issued at a level "requisite to protect the public health . . . with an adequate margin of safety."²¹ Secondary NAAQS are intended to protect the public from any effects "associated with the presence of such an air pollutant in the ambient air."²² In other words, primary standards are set to protect people, while secondary standards protect the

15. *Id.* § 7409(d)(2). CASAC's role has been compared to a referee's role between of its interactions between EPA, scientists, and advocates. See J. Bachmann, *Will the Circle Be Unbroken: A History of the U.S. National Ambient Air Quality Standards*, 57 J. AIR & WASTE MGMT. ASSN. 652, 680 (2007).

16. See James E. McCarthy, Cong. Res. Service, *Air Quality Standards and Sound Science: What Role for CASAC?* 7-8 (2007), available at <http://ncseonline.org/nle/crsreports>.

17. See *id.* at 14, 16.

18. *Id.* at 2, 8.

19. See Letter from Seven CASAC Members to Stephen Johnson, Administrator, EPA 3 (Sept. 29, 2006), available at <http://www.epa.gov/sab/pdf/casac-ltr-06-003.pdf>.

20. 42 U.S.C. § 7409(a)(1)(A).

21. *Id.* § 7409(b). The statute specifies that the standards should be set (a) in the Administrator's judgment, (b) based on health-related criteria, and (c) with an adequate margin of safety. *Id.* Additionally section 7408(a)(1) provides: "For the purposes of establishing national primary and secondary ambient air quality standards, the Administrator shall . . . publish, and shall from time to time thereafter revise, a list which includes each air pollutant – (A) emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare; (B) the presence of which in the ambient air results from numerous or diverse mobile or stationary sources. *Id.*

22. *Id.* § 7409(b)(2).

environment (agriculture, livestock, buildings, etc). EPA must issue and submit for public comment the proposed primary and secondary NAAQS.²³ Current criteria pollutants include particulate matter, sulfur dioxide, carbon monoxide, nitrogen oxide, ozone, and lead.²⁴

After setting the initial standard, EPA must “complete a thorough review” of the NAAQS every five years and make appropriate revisions.²⁵ EPA historically has not kept up with the revision schedule, citing scientific uncertainty and the enormous administrative burden associated with revising the NAAQS as reasons for its failure.²⁶ Consequently, many of the revision deadlines have been enforced through citizen suits.²⁷ The process EPA follows for these revisions typically follows the same steps outlined above, but EPA can and has made small tweaks to it. In particular, EPA recently outlined the multi-step process that it intends to follow during its future NAAQS review, which includes a planning stage, an integrated science assessment, a risk/exposure assessment, a policy assessment, and rulemaking.²⁸ This multi-step process is largely the same as what EPA has done in the past with some differences, including calling the criteria document an integrated science assessment

23. *Id.* § 7409(a)(2).

24. *Id.* § 7407. When the CAA was enacted in 1970, air quality criteria already existed for sulfur oxides, particulates, carbon monoxide, hydrocarbons, and photochemical oxidants. *See, e.g.*, 40 C.F.R. §§ 50.4-.12 (2010). Nitrogen dioxide was added in 1971, and lead was added in 1976. *See id.*

25. 42 U.S.C. § 7409(d)(1); *see also* *Env'tl. Def. Fund v. Thomas*, 870 F.2d 892, 896 (2d Cir. 1989) (concluding that “the Administrator must make some decision regarding the revision of the NAAQS” subject to judicial review when EPA publishes a new criteria document); *see also National Ambient Air Quality Standards (NAAQS)*, *supra* note 4.

26. *See, e.g.*, *National Ambient Air Quality Standards for Carbon Monoxide – Final Decision*, 59 Fed. Reg. 38,906 (Aug. 1, 1994) (discussing EPA’s decision not to revise the carbon monoxide standards due to scientific uncertainty).

27. *See, e.g.*, *Am. Lung Ass’n v. Reilly*, 962 F.2d 258, 263 (2d Cir. 1992) (“when, as here, a statute sets forth a bright-line rule for agency action, ... there is no room for debate -- Congress has prescribed a categorical mandate that deprives EPA of all discretion over the timing of its work.”)

28. Memorandum from Lisa Jackson, Administrator, EPA, *Process for Reviewing National Ambient Air Quality Standards 1-2* (May 21, 2009), available at <http://www.epa.gov/ttn/naaqs/pdfs/NAAQSReviewProcessMemo52109.pdf>.

and calling the staff paper (which historically was the staff's analysis of the criteria document) a risk/exposure assessment.²⁹ In addition to the nomenclature changes, this recent statement by EPA reflects a more concrete focus on risk in the NAAQS process.³⁰

The NAAQS review process is extensive and often takes several months to complete. For example, the particulate matter standard review, which culminated in a final decision in 2006, began in 1999 with the publication of the first external draft of the criteria document.³¹ EPA undertook several drafts of criteria documents and staff papers, held multiple public hearings, and received over 120,000 comments in this particular rulemaking process.³² As an illustration of the enormous scope of the documents that are created, the criteria document for the 2006 standard was over two thousand pages long and reviewed hundreds of studies.³³

After a standard is set, states must submit implementation plans to the Administrator describing how states plan to meet and maintain the standards.³⁴

B. Criteria Pollutants

EPA has designated six pollutants, which all have relationships with each other, as criteria pollutants.³⁵ The NAAQS for these pollutants have recently been evaluated, and mostly lowered, by EPA.³⁶ Of these, particulate matter, ozone, nitrogen dioxide, and sulfur dioxide are closely related to each

29. *Id.* at 2.

30. *See id.* (highlighting increased focus on risk).

31. *See* National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg. 61144, 61146-49 (Oct. 17, 2006) (to be codified at 40 C.F.R. pt. 50).

32. *See id.*

33. *See* EPA, AIR QUALITY CRITERIA FOR PARTICULATE MATTER (2004), available at <http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903>.

34. *See* Clean Air Act § 110, 42 U.S.C. § 7410 (2006).

35. Hydrocarbons were originally designated as a criteria pollutant. *See* Notice of Proposed Standards and List of Air Pollutants, 36 Fed. Reg. 1502-15 (proposed 1971). This was revoked in 1983, and now hydrocarbons are regulated as volatile organic compounds, which are precursors to ozone.

36. *See National Ambient Air Quality Standards (NAAQS)*, *supra* note 4 (listing standards for criteria pollutants in chart).

other due to their chemical and physical attributes, the similarity of their emission sources, and their association with similar adverse health impacts.³⁷ Despite these similarities, each of these pollutants is still evaluated individually for its impacts on human health.

Particulate Matter

Particulate matter (or “PM”) refers to very small airborne solid or liquid particles, such as dust and sand.³⁸ These particles can consist of a complex mixture of organic and inorganic matter in the form of discrete solid and liquid droplets.³⁹ Both natural and anthropogenic sources emit PM. Natural sources include volcanoes, forest fires, windstorms, pollen, and ocean spray.⁴⁰ Anthropogenic sources include industry processes, mining, construction, motor vehicle exhaust, combustion, and refuse incineration.⁴¹

Particulate matter can either be directly emitted from a source or it can form in the atmosphere when reactions occur.⁴² For example, sulfur dioxide and nitrogen oxides can react with a

37. See generally EPA, *Six Common Air Pollutants*, <http://www.epa.gov/air/urbanair/index.html> (last visited July 1, 2010). Lead and carbon monoxide are also related to these pollutants and are undergoing review. For example, EPA is also reviewing the standard for carbon monoxide, which is a colorless odorless gas that is emitted primarily from vehicles that do not completely combust the carbon, and is planning to issue a new final rule for carbon monoxide sometime in 2011. See EPA, *Carbon Monoxide*, <http://www.epa.gov/air/urbanair/co/> (last visited Nov. 17, 2009); Release of Draft Documents Related to the Review of the National Ambient Air Quality Standards for Carbon Monoxide, 75 Fed. Reg. 10252 (proposed Mar. 5, 2010). These pollutants, however, are not the focus of this paper.

38. See EPA, *Particulate Matter: Basic Information*, <http://www.epa.gov/oar/particlepollution/basic.html> (last visited June 26, 2009). Particulate matter has several different terms including suspended particulate matter, total suspended particulates, black smoke, inhalable thoracic particles. See GERARD KIELY, ENVIRONMENTAL ENGINEERING 345 (1997).

39. See *Particulate Matter: Basic Information*, *supra* note 38; KIELY, *supra* note 38, at 346.

40. See C. DAVID COOPER & F.C. ALLEY, AIR POLLUTION CONTROL: A DESIGN APPROACH 101 (2d ed. 1994).

41. See *id.*

42. See *Particulate Matter: Basic Information*, *supra* note 38.

variety of chemicals to form fine particulate matter.⁴³ In addition to particulate matter being generated from stationary sources, a significant share of particulate matter and other criteria pollutants are generated from the transportation industry,⁴⁴ which can create areas of high concentrations of pollution, known as hot spots.⁴⁵

Particulate matter is classified and regulated by size.⁴⁶ PM_{2.5}, also called fine particulate matter, refers to all particles that are less than 2.5 microns in diameter. PM₁₀, also called coarse particulate matter, refers to all particles less than 10 microns in diameter.⁴⁷ Due to its small size, fine particulate matter can become deposited deep in the lung and can even be absorbed into the bloodstream.⁴⁸

During the last NAAQS review, which ended in 2006, the particulate matter standards were lowered.⁴⁹ These revised standards were subsequently called into question.⁵⁰ An EPA report recommends revision of the standards because of the increased strength of research demonstrating that fine particulate matter increases the risk of respiratory and cardiovascular effects at lower levels than previously thought.⁵¹

43. *See id.*

44. *See* Clean Air Act § 111, 42 U.S.C. § 7411 (2006); Transportation Conformity Rule PM_{2.5} and PM₁₀ Amendments, 75 Fed. Reg. 14,260 (Mar. 24, 2010) (to be codified at 40 C.F.R. pt. 93) (outlining transportation conformity for states to control particulates).

45. *See* *Envir. Def. v. EPA*, 509 F.3d 553, 557 (D.C. Cir. 2007).

46. The first particulate matter regulation included all suspended particles. Since that time, particulate matter has been regulated by size. *See* National Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 38,652, 38,666 (July 18, 1997) (discussing regulatory refinements of PM standards).

47. *See* EPA, *Particulate Matter Standards*, EPA, <http://www.epa.gov/pm/standards.html> (last visited Apr. 16, 2010). Coarse particulate matter is intended to capture particles that are smaller than the PM₁₀ size but bigger than PM_{2.5}. *Id.*

48. *See* EPA, *Particulate Matter: Health and Environment*, <http://www.epa.gov/oar/particlepollution/health.html> (last visited Aug. 6, 2010).

49. *See* National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg. at 61,144.

50. *See generally* U.S. EPA, POLICY ASSESSMENT FOR THE REVIEW OF THE PARTICULATE MATTER NATIONAL AMBIENT AIR QUALITY STANDARDS: FIRST EXTERNAL REVIEW DRAFT (2010).

51. EPA stated: “[W]e reach the preliminary conclusion that there is stronger and more consistent and coherent support for the associations between short-

Many states will need to enact plans that conform with the ambient air quality particulate matter requirements as part of their state implementation plan requirements since many states are in non-attainment.⁵²

Ozone

Ground level ozone (or “O₃”), which is the primary component of smog, is a criteria pollutant.⁵³ It forms from natural reactions between nitrous oxides (or “NO_x”) and volatile organic carbons (or “VOCs”) in the presence of sunlight.⁵⁴ Ground level ozone has been associated with a variety of adverse health impacts, including aggravated asthma, increased bronchitis, and problems with the lower and upper respiratory systems.⁵⁵ These impacts can result in missed school and work days, hospital admissions, and premature death.⁵⁶

The last review of the ozone standard set the primary and secondary standards at a level less stringent than the range recommended by the scientific experts that peer reviewed these standards.⁵⁷ In particular, CASAC recommended a range of

and long-term PM 2.5 exposure and a broader range of health outcomes than was available in the last review, providing the basis for fine particles at least as protective as the current PM2.5 standards.” *Id.* at 57.

52. See Transportation Conformity Rule PM_{2.5} and PM₁₀ Amendments, 75 Fed. Reg. at 14,260.

53. See EPA, *Ozone Basics*, <http://www.epa.gov/air/ozonepollution/> (last visited Mar. 8, 2010). Ground level ozone is bad while stratospheric ozone, which forms the ozone layer that provides protection from ultraviolet light, is beneficial for humans. See EPA, *Ozone: Good Up High, Bad Nearby* (June 2003), <http://www.epa.gov/air/oaqps/gooduphigh/> (last visited Oct. 19, 2010).

54. *Id.* Motor vehicles and stationary sources such as power plants emit NO_x and VOCs, which lead to ground levels ozone. See EPA, *Sources of Ground Level Ozone*, (June 2003), <http://www.epa.gov/air/oaqps/gooduphigh/bad.html#6> (last visited Oct. 19, 2010).

55. EPA, *Fact Sheet: Final Revisions to the National Ambient Air Quality Standards for Ozone*, http://www.epa.gov/groundlevelozone/pdfs/2008_03_factsheet.pdf (last visited Oct. 19, 2010).

56. *Id.*

57. See Letter from Dr. Jonathan M. Samet, Chair, CASAC, to Lisa P. Jackson, Administrator, EPA 1 (Feb. 19, 2010), available at [http://yosemite.epa.gov/sab/sabproduct.nsf/WebCASAC/610BB57CFAC8A41C852576CF007076BD/\\$File/EPA-CASAC-10-007-unsigned.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/WebCASAC/610BB57CFAC8A41C852576CF007076BD/$File/EPA-CASAC-10-007-unsigned.pdf).

0.060 to 0.070 ppm⁵⁸ while noting that no significant scientific uncertainty existed that would justify maintaining the standard at 0.080 ppm.⁵⁹ Despite this recommendation, then-EPA Administrator Johnson set the ozone standard at 0.075 ppm.⁶⁰ This decision was criticized by CASAC⁶¹ and scrutinized by Congress.⁶²

EPA is re-reviewing the ozone NAAQS.⁶³ EPA recently proposed a tougher ozone standard – proposing a primary standard between 0.060 and 0.070 ppm.⁶⁴ Due to this review and the proposed new standard, EPA is delaying making nonattainment designations until 2011.⁶⁵ Industry has challenged this reconsideration, citing that the CAA requires review every five years and that this type of review could result in endless reconsiderations of all the NAAQS.⁶⁶

Sulfur Dioxide

Sulfur dioxide (or “SO₂”) is a highly reactive gas that is emitted primarily from fossil fuel combustion and industrial facilities.⁶⁷ Sulfur dioxide emissions have been linked to adverse

58. Parts per million.

59. *Id.* at 1.

60. See Letter from Dr. R. Henderson, Chair, CASAC, to Stephen Johnson, Administrator, EPA 2 (Apr. 7, 2008), available at [http://yosemite.epa.gov/sab/sabproduct.nsf/4AF876432433128852574250069E494/\\$File/EPA-CASAC-08-009-unsigned.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/4AF876432433128852574250069E494/$File/EPA-CASAC-08-009-unsigned.pdf).

61. See *id.*

62. *EPA's New Ozone Standards: Hearing Before the H. Comm. on Oversight & Gov't Reform*, 111th Cong. 2, 5 (2008) (opening statement of Henry A. Waxman, Chairman, H. Comm. on Oversight & Gov't Reform).

63. See Andrew Childers, EPA Proposes Tougher Ozone Standard, Setting of Separate Secondary Standard, 41 Env't Rep. (BNA) 61 (Jan. 8, 2010).

64. See *id.*

65. See Extension of Deadline for Promulgating Designations for the 2008 Ozone National Ambient Air Quality Standards, 75 Fed. Reg. 2,936, 2,937 (Jan. 19, 2010) (to be codified at 40 C.F.R. pt. 81).

66. See Andrew Childers, Petroleum Groups Challenge EPA Data, Authority to Reconsider Ozone Standards, 41 Env't Rep. (BNA) 656 (Mar. 26, 2010).

67. See EPA, *Sulfur Dioxide*, <http://www.epa.gov/air/sulfurdioxide/> (last visited June 3, 2010). Fossil fuel combustion is estimated to cause sixty six percent of sulfur dioxide emissions and industrial facilities are estimated to cause twenty nine percent of the emissions. *Id.*

respiratory impacts including reduced lung function.⁶⁸ In addition to the health impacts, sulfur dioxide contributes to acidification of waterways.⁶⁹ In 1971, EPA promulgated the first ambient air standards for SO₂.⁷⁰ These standards, which were not revised in the 1996 review, set 140 ppb⁷¹ daily and 30 ppb annual primary standards and a 500 ppb three-hour secondary standard.⁷²

On June 22, 2010, EPA established the first hourly primary air quality standard for SO₂ at 75 ppb averaged on an hourly basis.⁷³ This would replace the current standards of 140 ppb measured over 24 hours and 30 ppb averaged annually.⁷⁴ EPA is setting the secondary standard for SO₂, which is intended to protect public welfare and the environment, in a separate rulemaking, together with nitrogen dioxide.⁷⁵

Nitrogen Dioxide

Nitrogen dioxide (or “NO₂”) is a highly reactive gas that is emitted from both stationary sources, such as power plants, and mobile sources, such as cars and trucks.⁷⁶ It has been linked to adverse respiratory impacts and is a precursor to ozone, which is

68. See Primary National Ambient Air Quality Standard for Sulfur Dioxide, 74 Fed. Reg. 64,810, 64,815-822 (Dec. 8, 2009) (to be codified at 40 C.F.R. pt. 50, 53, and 58) (summarizing review of scientific literature and studies related to health impacts from sulfur dioxide emissions).

69. See EPA, EPA/600/R-08/082F, Integrated Science Assessment for Oxides of Nitrogen and Sulfur –Ecological Criteria 2 (2008).

70. See 36 Fed. Reg. 8,187, 8,187 (Apr. 30, 1971) (codified at 42 C.F.R. pt. 410); see also EPA, *Sulfur Dioxide*, <http://www.epa.gov/air/sulfurdioxide/> (last visited June 3, 2010).

71. Parts per billion.

72. Primary National Ambient Air Quality Standard for Sulfur Dioxide, 74 Fed. Reg. at 64,813 (recounting history of SO₂ NAAQS); EPA, *Sulfur Dioxide*, <http://www.epa.gov/air/sulfurdioxide/> (last visited June 3, 2010).

73. See Primary National Ambient Air Quality Standard for Sulfur Dioxide, 75 Fed. Reg. 35,521, 35,524 (June 22, 2010) (to be codified at 40 C.F.R. pt. 50, 53, and 58); Primary National Ambient Air Quality Standard for Sulfur Dioxide, 74 Fed. Reg. at 64,810 (proposed rule).

74. See *id.* at 35,536.

75. See *id.* at 35,521 n2.

76. See EPA, *National Summary of Nitrogen Oxides Emissions*, <http://www.epa.gov/air/emissions/nox.htm> (last visited Nov. 4, 2009).

linked to adverse health impacts.⁷⁷ In addition, nitrogen oxides can form fine particulate matter, which has been associated with respiratory diseases and aggravating cardiovascular diseases.⁷⁸

In 1971, EPA set both the annual primary and secondary standards for NO₂ at 53 ppb.⁷⁹ Recently, EPA promulgated the first ever one-hour primary standard for NO₂ at 100 ppb.⁸⁰ According to EPA, this rule was based on evidence that links short-term exposures from NO₂ to respiratory illnesses and increased emergency room visits.⁸¹ Industry trade groups have challenged the NO₂ air standards.⁸²

Notably, EPA has stated that the monitors that the NO₂ standard requires are the first steps towards multi-pollutant controls.⁸³ Multi-pollutant considerations and evaluations are critical due to the close relationship between several of the criteria pollutants.

C. Criteria Pollutant Relationships

Ozone, particulate matter, sulfur dioxide and nitrogen dioxide emissions are chemically and physically related. Ozone forms from natural reactions between nitrous oxides and volatile organic carbons in the presence of sunlight.⁸⁴ Sulfur dioxide and

77. See Primary National Ambient Air Quality Standards for Nitrogen Dioxide, 75 Fed. Reg. 6,474, 6,480 (Feb. 9, 2010) (to be codified at 40 C.F.R. pt. 50 and 58).

78. *Id.*

79. See EPA, *Nitrogen Dioxide: Basic Information*, <http://www.epa.gov/air/nitrogenoxides/basic.html> (last visited June 29, 2009).

80. See EPA, Final Rule NAAQS NO₂, <http://www.epa.gov/air/nitrogendioxides/actions.html#jan10> (last visited Oct. 19, 2010); Andrew Childers, EPA Announces First One-Hour Standard for Nitrogen Dioxide at 0.10 Parts Per Million, 41 Env't Rep. (BNA) 197 (Jan. 29, 2010).

81. Primary National Ambient Air Quality Standard for Nitrogen Dioxide, 75 Fed. Reg. at 34,404.

82. See *generally* Am. Petroleum Inst. v. EPA, No. 10-1079 (D.C. Cir. filed Apr. 12, 2010).

83. See Andrew Childers, EPA Plans to Issue Guidance This Year on Environmental Justice in Rulemaking, 41 Env't Rep. (BNA) 281 (Feb. 5, 2010).

84. *Id.* Motor vehicles and stationary sources such as power plants emit NO_x and VOCs, which lead to ground levels ozone. See EPA, *Sources of Ground Level Ozone*, <http://www.epa.gov/air/oaqps/gooduphigh/bad.html#6> (last visited Sept. 3, 2009).

nitrogen dioxide can also form fine particulate matter.⁸⁵ Despite these close linkages, EPA's current NAAQS review attempts to isolate each individual pollutant. For example, although sulfur dioxide is known to form fine particulate matter, EPA only analyzed the impact of sulfur dioxide, not this particulate matter, when it determined the NAAQS for sulfur dioxide.⁸⁶

Ozone, particulate matter, sulfur dioxide, and nitrogen dioxide also are emitted from similar sources. Sulfur dioxide is primarily emitted from electrical generation, fossil fuel combustion and industrial processes,⁸⁷ and two of the top sources for fine particulate matter are electrical generation and fossil fuel combustion.⁸⁸ Ground level ozone is formed from a combination of NO_x and VOCs, which are also emitted by electrical utilities and industrial processes.⁸⁹

Ozone, particulate matter, sulfur dioxide, and nitrogen dioxide have also been linked to similar health impacts. Health effects from each can occur from short-term ("acute") and long-term ("chronic") exposure.⁹⁰ For example, air pollution can cause significant damage to children's lungs⁹¹ and can lead to school

85. See 1 EPA, AIR QUALITY CRITERIA FOR PARTICULATE MATTER ch. 2 (2004), available at <http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903>.

86. See Primary National Ambient Air Quality Standard for Sulfur Dioxide, 74 Fed. Reg. 64,810, 64,813-814 (Dec. 8, 2009) (to be codified at 40 C.F.R. pt. 50, 53, and 58).

87. See EPA, *Sulfur Dioxide, National Sulfur Dioxide Emissions*, <http://www.epa.gov/air/emissions/so2.htm> (last visited Nov. 4, 2009).

88. See EPA, *Particulate Matter Sources, National Particulate Matter 2.5 Emissions by Source Sector in 2005*, EPA, <http://www.epa.gov/air/emissions/pm.htm> (last visited Nov. 4, 2010).

89. See EPA, *Ground Level Ozone*, <http://www.epa.gov/glo/> (last visited Mar. 8, 2010).

90. Even in 1977, one commentator observed, "the most important health effects appear to be associated with chronic exposure, that is, exposure of relatively low concentrations for long periods of time, conditions that exist in most cities." A. KNEESE, *ECONOMICS AND THE ENVIRONMENT* 33-34 (1977).

91. See W. J. Gauderman, et. al., *The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age*, 351 NEW ENG. J. MED. 1057, 1058 (2004).

absences.⁹² This is particularly true when the children live in communities with high pollution.⁹³

Numerous studies link short and long-term exposure of several of these criteria pollutants to both respiratory and cardiovascular effects.⁹⁴ In particular, sulfur dioxide, nitrogen oxides, ozone, and particulate matter have all been linked to adverse impacts to the lungs and respiratory system.⁹⁵ For example, a recent study links long-term exposure to nitrogen dioxide and fine particulate matter to a greater risk of elderly people being hospitalized due to pneumonia.⁹⁶ Based in part on studies such as this one, EPA found that increases in fine particulate matter levels, which are created in part from nitrogen dioxide and sulfur dioxide emissions, below the ambient air quality standard increases the risks of respiratory and cardiovascular effects.⁹⁷ EPA also posited that there is a causal link between particulate matter exposure below the current air quality standards for short periods of time and increased risk of heart attack and death.⁹⁸ EPA further found a causal link

92. See F. Gililiand, *The Effects of Ambient Air Pollution on School Absenteeism Due to Respiratory Illness*, 12 EPIDEMIOLOGY 43, 43 (2001).

93. See R. McConnell, *Asthma in Exercising Children: A Cohort Study*, 359 AM. J. RESPIR. CRIT. CARE MED. 386, 366 (2002); see also W. James Gauderman, et al, *Association Between Air Pollution and Lung Function Growth in Southern California Children*, 166 AM. J. RESPIR. CRIT. CARE MED. 76, 82 (2000).

94. See EPA, *About Air Toxics*, <http://www.epa.gov/air/toxicair/newtoxics.html> (last visited Mar. 3, 2009).

95. See EPA, *What are the Six Common Air Pollutants?*, <http://www.epa.gov/air/urbanair/> (last visited July 1, 2010).

96. See M. Loeb et. al., *Long-Term Exposure to Ambient Air Pollution and Risk of Hospitalization with Community-acquired Pneumonia in Older Adults*, 181 AM. J. RESPIR. CRIT. CARE MED. 47, 47 (2010).

97. EPA, EPA/600/R-08/139F, INTEGRATED SCIENCE ASSESSMENT FOR PARTICULATE MATTER, FINAL REPORT 2-26 (2009). The assessment found that increases in fine particulate matter concentrations of 10 micrograms per cubic meter in areas well below the 35 micrograms per cubic meter daily limit resulted in increased cardiovascular risks. *Id.* The assessment similarly found that hospital admissions and emergency room visits for respiratory impacts such as asthma increased with mean concentrations far below the daily limit. *Id.*

98. *Id.* at 2-11

between long-term exposure to particulate matter and increased risk of cardiovascular effects and premature death.⁹⁹

In addition to these similarities, criteria pollutants have been called surrogates for other pollutants. For example, carbon monoxide has been named as a surrogate for organic air toxics and particulate matter has been named as a surrogate for toxic metals.¹⁰⁰

D. Evidence of Cumulative Health Impacts

Each breath of air contains a mixture of a variety of particles and gases, and these particles and gases can and do interact. As EPA summarized in the recent ozone criteria document, “[h]ealth effects caused by the complex mixture are undoubtedly different (either subtly or significantly) from the additive effects of a few of the hundreds of compounds present.”¹⁰¹ After reviewing studies that attempt to isolate how pollutants interact with ozone, EPA found that:

All interaction possibilities have occurred, depending upon the composition of the mixture, the endpoint examined, and the exposure regimen. In some cases, no interaction was found. Most often, additivity (the effects of the mixture are equal to the sum of the effects of the individual components) or synergism (the effects of the mixture are greater than the sum of the effects of the individual components) was observed. Antagonism (the effects of the mixture are less than the sum of the individual components) was rarely found.¹⁰²

99. *Id.* The report also suggests that there is a causal relationship between long-term exposure to particulate matter and cancer and reproductive health impacts. *Id.* at 2-15

100. See National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers, 75 Fed. Reg. 31,895, 31,899 (proposed June 4, 2010) (to be codified at 40 C.F.R. pt. 63) (using surrogates to propose new air requirements for boilers).

101. EPA, EPA/600/R-05/004aF-cF, Air Quality Criteria for Ozone and Related Photochemical Oxidants 5-65 (2006).

102. *Id.* at 5-66.

Some air pollutants are known to have synergistic effects. For example, sulfate particles can be absorbed in water and then carry other particles deep into the lung.¹⁰³ In addition, interactions containing ozone are generally synergistic, which means that ozone may produce more significant impacts when it is a component of mixtures than when it is inhaled alone.¹⁰⁴

EPA further found that PM_{2.5} and co-pollutants also react: “[s]everal studies have concluded that ambient concentrations of O₃, NO₂ and SO₂ are associated between ambient gases and personal exposure to PM_{2.5} of ambient origin exist, such associations are complex and vary by season and location.”¹⁰⁵ EPA similarly found that the relationship between ozone and other pollutants was complex: “[e]valuation of interactions between O₃ and co-pollutants is a complex task. Responses are dependent on a number of host and environmental factors, such that different studies using the same co-pollutants may show different types or magnitudes of interactions.”¹⁰⁶

EPA’s findings demonstrate that ozone-containing mixtures generally create greater impacts than ozone by itself and that these interactions can occur at environmentally relevant levels.¹⁰⁷ There is still a lot of evaluation that needs to be done to determine how co-pollutants factor into health impacts, but available evidence shows that the health effects are likely greater when multiple pollutants exist with criteria pollutants such as PM_{2.5} and O₃. Despite this evidence, the criteria documents fails to provide any recommendations, conduct any further evaluation, or consider these findings to address these potential cumulative health impacts.

In addition to causing cumulative health impacts, criteria pollutants can cause similar impacts to the environment. One of

103. U.S. EPA, THE MULTI-POLLUTANT REPORT: TECHNICAL CONCEPTS & EXAMPLES 1-9 (2008), *available at* http://www.epa.gov/air/airtrends/specialstudies/20080702_multipoll.pdf.

104. AIR QUALITY CRITERIA FOR OZONE AND RELATED PHOTOCHEMICAL OXIDANTS, *supra* note 102, at 5-77 to 5-78.

105. INTEGRATED SCIENCE ASSESSMENT FOR PARTICULATE MATTER, FINAL REPORT, *supra* note 98, at 3-191.

106. AIR QUALITY CRITERIA FOR OZONE AND RELATED PHOTOCHEMICAL OXIDANTS, *supra* note 102, at 5-77.

107. *Id.*

these impacts is acidification, which is caused by both sulfur oxides and nitrous oxides. Due to the similar impact of these pollutants on the environment, EPA has started a joint review of sulfur oxides and nitrous oxides for the secondary standard and developed an atmospheric acidification potential index.¹⁰⁸ EPA has proposed a conceptual framework for addressing the complex linkages between the various components of the two pollutants and their impacts.¹⁰⁹ CASAC has approved the development of an integrated secondary standard as a “valid, scientifically based approach.”¹¹⁰ CASAC found that EPA had shown the “components of the current secondary standards are inappropriate in terms of indicators, averaging times, levels and forms, as well as their single pollutant approach to multi-pollutant problems.”¹¹¹ CASAC further concluded that standards addressing particular endpoints is more appropriate in certain situations than a single standard.¹¹²

III. CUMULATIVE IMPACTS FROM CRITERIA POLLUTANTS ARE NOT MEANINGFULLY ADDRESSED IN OTHER WAYS.

Although other CAA requirements and other statutes have attempted to examine cumulative impacts, none of these meaningfully evaluates how risks from cumulative criteria pollutants should be addressed. Some steps have been made towards recognizing the importance of cumulative impacts

108. See Review of the Secondary National Ambient Air Quality Standards for Oxides of Sulfur, 75 Fed. Reg. 11,877, 11,877 (Mar. 19, 2010).

109. See *id.*

110. Letter from CASAC to Lisa P. Jackson, Administrator, EPA, on Review of the *Policy Assessment for the Review of the Secondary National Ambient Air Quality Standards for NO_x and SO_x: First Draft 1* (Apr. 29, 2010), available at [http://yosemite.epa.gov/sab/sabproduct.nsf/ea5d9a9b55cc319285256cbd005a472e/7c35c4501a9e0b5385257714004dba4d/\\$FILE/29April2010%20PA%20Report.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/ea5d9a9b55cc319285256cbd005a472e/7c35c4501a9e0b5385257714004dba4d/$FILE/29April2010%20PA%20Report.pdf).

111. *Id.* at 9. CASAC further stated that “[t]his index can be the basis of a standard that protects sensitive ecosystems while allowing for the situation that in most locations in the U.S. NO_x and SO_x deposition may not be causing substantial harm.” *Id.* at 1.

112. *Id.* at 20 (“The Panel is concerned that a single standard addressing both acidification and nutrient enrichment is probably not practical at this point.”).

consideration. To this end, EPA has recognized the value of regulating multiple pollutants since “[e]xposure pathways and risks are affected by multiple pollutants (and may be enhanced by pollutant interactions).”¹¹³ Scholars have also recognized the problem of cumulative impacts and called for adoption of the precautionary principle, which focuses on avoiding harm before it occurs and requires industrial interests to show that they do not cause harm.¹¹⁴ These regulatory and non-regulatory developments, however, have not yet had much success. One of the biggest challenges facing cumulative impact policy is moving from research to substantive requirements.¹¹⁵ In addition, no process has the intensive health evaluation like the NAAQS to be able to start unraveling and quantifying potential cumulative health impacts.

A. Cumulative Impacts Under Common Law

The attempt to remedy the cumulative harm by multiple sources is not a novel idea. In fact, cumulative impacts were addressed over a century ago under a nuisance theory. Under the early vestiges of the theory, landowners were required to avoid injuring others in the community with their operations.¹¹⁶ This requirement extended to owners even if the injury resulted from multiple sources. One of these cases found an upriver slaughterhouse liable for nuisance even though the slaughterhouse’s impacts, by themselves, did not cause an injury:

One drop of poison in a person’s cup, may have no injurious effect. But when a dozen, or twenty, or fifty, each put in a drop,

113. THE MULTI-POLLUTANT REPORT: TECHNICAL CONCEPTS & EXAMPLES, *supra* note 104, at 1-2.

114. Frank Ackerman & Lisa Heinzerling, Priceless: On Knowing the Price of Everything and the Value of Nothing 223-39 (2004); Thomas O. McGarity et al., Sophisticated Sabotage: The Intellectual Games Used to Subvert Responsible Regulation 218-22 (2004).

115. See Devon Payne-Sturges et al., We Cannot Do It Alone: Building a Multi-Systems Approach for Assessing and Eliminating Environmental Health Disparities, 102 ENVTL. RESEARCH 141, 144 (2006) (“[T]he challenge is moving from research to action, and developing policies not just at EPA but at all levels of government.”).

116. *Mugler v. Kansas*, 123 U.S. 623, 665 (1887).

fatal results may follow. It would not do to say that neither was to be held responsible. In that state of facts, as in the one presented by this case, each element of contributive injury is a part of one common whole, and to stop the mischief of the whole, each part in detail must be arrested and removed.¹¹⁷

Nuisance theories were used for air pollution issues with limited success until the CAA and its predecessors were passed.¹¹⁸ One major change that has occurred between common law nuisance and the promulgation of environmental statutes is that regulation today is often divided between different pollutants and focuses on the sources of those pollutants instead of examining the overall problem.¹¹⁹

Although the consideration of cumulative impact issues under a nuisance theory is again being considered in some of the greenhouse gas cases for climate change,¹²⁰ the CAA and its regulations are currently the primary means of regulating criteria pollutants.

B. Evaluation of Multiple Air Pollutants Under Other Clean Air Act Provisions

Although EPA's NAAQS analysis has started examining environmental impacts of criteria pollutants in a multi-pollutant framework, it still focuses on individual pollutants for health impacts. EPA, however, has taken steps related to other provisions of the CAA to consider multi-pollutant measures.

EPA's regulatory response to air pollution has historically regulated one pollutant at a time. For example, EPA requirements under the Prevention of Significant Deterioration program¹²¹ and the New Source Performance Standards

117. *Woodyear v. Schaefer*, 57 Md. 1, 10 (Md. 1881); Joseph H. Guth, *Cumulative Impacts: Death-Knell for Cost-Benefit Analysis in Environmental Decisions*, 11 BARRY L. REV. 23, 46-47 (2008).

118. See NOGA MORAG-LEVINE, CHASING THE WIND: REGULATING AIR POLLUTION IN THE COMMON LAW STATE 130-31 (2003).

119. See Guth, *supra* note 118, at 49.

120. See, e.g., *Connecticut v. Am. Elec. Power*, 582 F.3d 309, 314 (2d Cir. 2009).

121. See, e.g., 40 C.F.R. § 52.21(b)(1)(i) (defining major stationary source as a source that emits more than a certain level of "a regulated NSR pollutant"); 40

program¹²² are focused on pollutant by pollutant regulation of stationary sources.

In the mid-1990's, after many years of focusing on separating air pollutants, EPA started examining potential multi-pollutant regulatory measures.¹²³ Soon after that, EPA affirmed its interest in a multi-pollutant approach "to reduce the number, administrative complexity and cost of its requirements while improving the likelihood of achieving environmental results."¹²⁴ EPA, through a stakeholder process, began by focusing attention primarily on three pollutants – mercury, NO_x, and SO₂ – from the electric power industry.¹²⁵ Later EPA expanded the scope of pollutants and started to evaluate multiple pollutants with an instrument EPA was using to evaluate state's efforts to enact NO_x requirements – the NO_x SIP call.¹²⁶

Then, in May 2005, EPA developed a regulatory program called Clean Air Interstate Rule ("CAIR").¹²⁷ CAIR required the power industry to reduce SO₂ and NO_x emissions from twenty eight eastern states and Washington D.C.¹²⁸ EPA concurrently developed the Clean Air Mercury Rule where it attempted to regulate mercury from electric generating units under the New Source Performance Standards.¹²⁹ Both rules underwent judicial rule. The D.C. Circuit remanded CAIR for compliance with the CAA.¹³⁰ The D.C. Circuit also found that the Clean Air Mercury Rule violated the plain text of the CAA.¹³¹

C.F.R. § 52.21(b)(2)(i) (defining major modification as a physical or operational change that results in an emissions increase of "a regulated NSR pollutant").

122. See 40 C.F.R. § 60.14(a) ("[A]n existing facility shall become an affected facility for each pollutant . . . for which there is an increase in the emission rate to the atmosphere.").

123. See Sam Napolitano et al., *A Multi-Pollutant Strategy*, PUB. UTIL. FORT., Jan. 2009, at 34.

124. *Id.* at 35 (citing Clean Air Power Initiative, Office of Air and Radiation, EPA (Oct. 1996)).

125. See *id.*

126. EPA, ANALYSIS OF EMISSION REDUCTION OPTIONS FOR THE ELECTRIC POWER INDUSTRY 36 (Mar. 1999).

127. See Clean Air Interstate Rule, 70 Fed. Reg. 25,162 (May 12, 2005).

128. *Id.* at 25,165.

129. See Clean Air Mercury Rule, 70 Fed. Reg. 15,995, 15,994 (Mar. 2005).

130. See *North Carolina v. EPA*, 531 F.3d 896, 930 (D.C. Cir. 2008).

131. See *New Jersey v. EPA*, 517 F.3d 574, 583 (D.C. Cir. 2008).

EPA is expecting to propose a new toxics rule in early 2011¹³² with a final rule later that year.¹³³ During the summer of 2010, EPA further proposed regulations that require boiler operators to cut mercury emissions.¹³⁴ These regulations also simultaneously require emission reductions of other pollutants.¹³⁵

In addition to these recent rulemaking attempts, EPA admits that a multi-pollutant management system would improve the current regulatory framework.¹³⁶ In particular, EPA's recent analysis of a multi-pollutant strategy focuses on ozone, fine particles, and air toxics since "these pollutants remain among the most persistent air quality problems affecting human health."¹³⁷ Nevertheless, although these pollutants are a starting point, EPA has recognized that a multi-pollutant strategy must necessarily include more than these pollutants.¹³⁸

EPA has also received encouragement from outside sources to regulate multi-pollutants simultaneously. The Board of Scientific Counselors has encouraged EPA to promulgate multi-pollutant regulations, which consider interactions of pollutants and toxics.¹³⁹ Partly in response to this, on October 7, 2008, EPA told an advisory panel that it was going to pursue sector-wide, multi-pollutant air regulations.¹⁴⁰ In this announcement, an EPA representative said the agency would ensure that the

132. See Andrew Childers, *Officials Says EPA Rules, Senate Bill Limiting Power Plant Emissions 'Mutually Reinforcing'*, 41 Env't Rep. (BNA) 461 (2010).

133. See Andrew Childers, *EPA Report Recommends Air Standard for Sulfur, Nitrogen Based on Acidification*, 41 Env't Rep. (BNA) 597 (2010).

134. See, e.g., 75 Fed. Reg. 31,895, 31916 (2010) (codified at 40 C.F.R. pt. 241).

135. See *id.* at 31,908 (proposing emission limits on particulate matter, mercury, carbon monoxide and dioxins).

136. See THE MULTI-POLLUTANT REPORT: TECHNICAL CONCEPTS & EXAMPLES, *supra* note 104, at 1-2.

137. *Id.*

138. See *id.*

139. See Andrew Childers, *EPA Advisors Say Agency Should Consider Multipollutant Approach in Setting Standards*, 40 Env't Rep. (BNA) 2175 (2009).

140. See Andrew Childers, *EPA Tells Advisory Panel About Plans to Pursue Multipollutant Regulations*, 40 Env't Rep. (BNA) 2389 (2009).

implementation and health outcomes are a focus of the new rules.¹⁴¹

In a similar vein, Congress has introduced various multi-pollutant proposals designed to reduce power plant emissions.¹⁴² A current bill in the Senate would expand national emissions trading programs for sulfur dioxide and nitrogen oxides by 2012 and require power plants to cut emissions of mercury by ninety percent by 2015.¹⁴³ Congress, then, continued this effort and attempted to pass several bills requiring multi-pollutant reductions from the electric utility industry.¹⁴⁴

Thus, EPA is starting to shift its focus from individual pollutant to multi-pollutant regulatory schemes, but EPA still has a lot more work to do. Although achieving public health and environmental results was the goal of many of the multi-pollutant steps EPA has taken, EPA's various efforts over the years have focused on the source of the pollution, not the concentration of pollution and its relationship to health impacts. To truly reduce risk to human health and the environment, EPA's focus needs to be shifted to the impacts and risks of air pollution rather than the sources.

C. Cumulative Impacts Under Other Regulatory Schemes

Cumulative impacts from air pollution have been considered in environmental assessment requirements. In particular, under the National Environmental Protection Act ("NEPA"), agencies are required to consider cumulative impacts.¹⁴⁵ The Council on Environmental Quality has defined cumulative impacts as:

[T]he impact on the environment which results from the incremental impact of the action when added to other past,

141. *See id.*

142. *See, e.g.,* The Clean Power Act, S.150, 109th Congress (2005); The Clean Air Planning Act, S.843, 108th Congress (2003).

143. *See* Clean Air Act Amendments of 2010, S. 2995, 111th Cong. (2010).

144. *See, e.g.,* Clear Skies Act of 2005, S. 131, 109th Cong. (2005).

145. CEQ developed guidelines for evaluating cumulative impacts under NEPA. *See* <http://www.nepa.gov/nepa/ccenepa/sec5.pdf>; *see also* 40 C.F.R. § 1508.7 (2007).

present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.¹⁴⁶

Pursuant to these NEPA requirements, cumulative impacts have been defined as including: “past, present and reasonably foreseeable future actions”¹⁴⁷ in recognition that the total impact of several projects can be greater than their sum.¹⁴⁸ These cumulative impact requirements are intended, in part, to prevent agencies from approving projects piecemeal to avoid consideration of the entire project.¹⁴⁹ Now, a NEPA cumulative impact analysis must also include the impacts on greenhouse gas emissions.¹⁵⁰

In addition, EPA has started developing a general risk assessment framework,¹⁵¹ which focuses on an “integrated assessment involving suites of pollutants in several media that may cause a variety of adverse effects on humans, plants, animals, or even ecological systems and their processes and

146. 40 C.F.R. §1508.7 (2010).

147. *Dep’t of Transp. v. Public Citizen*, 541 U.S. 752, 769 (2004) (quoting C.F.R. § 1508.7) (An “agency is required to evaluate the cumulative impact of its action, which is defined as ‘the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.’”).

148. *See, e.g., Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 994 (9th Cir. 2004) (“Cumulative impacts of multiple projects can be significant in different ways...Sometimes the total impact from a set of impacts may be greater than the sum of the parts.”).

149. *See, e.g., Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 897 (9th Cir. 2002) (subjecting analysis to cumulative impacts requirement because otherwise “the Forest Service will be free to amend road density standards throughout the forest piecemeal, without ever having to evaluate the amendments’ cumulative environmental impacts.”).

150. *See, e.g., Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 508 F.3d 508, 550 (9th Cir. 2007).

151. EPA, *FRAMEWORK FOR CUMULATIVE RISK ASSESSMENT* xvii (2003), available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=54944>; EPA, *CONSIDERATIONS FOR DEVELOPING ALTERNATIVE HEALTH RISK ASSESSMENT APPROACHES FOR ADDRESSING MULTIPLE CHEMICALS, EXPOSURES AND EFFECTS* (External Review Draft) xix (2006), available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=149983>.

functions.”¹⁵² While EPA has examined risk assessments, it has historically not given the same level of attention to “whether its programs cause disproportionately high adverse human health or environmental effects on minority and low-income populations.”¹⁵³

States have also defined cumulative impacts. For example, New Jersey’s Environmental Justice Order draws attention to the need to evaluate cumulative impacts stating that “the cumulative impact of multiple sources of exposure to environmental hazards in low-income and people of color communities, and the roles of multiple agencies in addressing the causes and factors that compromise environmental health and quality of life in these communities require an interagency response.”¹⁵⁴ In addition, California Environmental Protection Agency has defined cumulative impacts as:

[E]xposures, public health or environmental effects from the combined emissions and discharges, in a geographic area, including environmental pollution from all sources, whether single or multi-media, routinely, accidentally, or otherwise released. Impacts will take into account sensitive populations and socio-economic factors, where applicable and to the extent data are available.¹⁵⁵

Notably, California has adopted laws requiring consideration of environmental justice, of which cumulative impacts is a central issue and concern.¹⁵⁶ California has also formed a Cumulative

152. EPA, CUMULATIVE RISK ASSESSMENT, PLANNING AND SCOPING (1997), available at <http://www.epa.gov/OSA/spc/pdfs/cumrisk2.pdf>.

153. EPA, OFFICE OF INSPECTOR GENERAL, REPORT ON ENVIRONMENTAL JUSTICE 5 (2006), available at <http://www.epa.gov/oigearth/reports/2006/20060918-2006-P-00034.pdf>.

154. N.J. Exec. Order No. 96 (2009); see Robert W. Collin, *Environmental Justice in Oregon: It's the Law*, 38 ENVTL. L. 413, 430 (2008) (stating that N.J.’s Env’t Justice Exec. Order “is one of the most far reaching environmental justice processes so far at the state level.”).

155. CAL. EPA, ADDRESSING THE ISSUES OF CUMULATIVE IMPACTS AND PRECAUTIONARY APPROACH IN THE EJ PILOT PROJECTS 1 (2005), available at http://www.calepa.ca.gov/EnvJustice/ActionPlan/PhaseI/March2005/CI_PA.pdf.

156. CAL. GOV’T CODE § 65040.12 (West 2010); CAL. PUB. RES. CODE §§ 71110 - 71116 (West 2010), available at <http://www.calepa.ca.gov/EnvJustice/Documents/2003/FinalReport.pdf>.

Impacts and Precautionary Approaches Workgroup, starting to study the impact of various chemicals on communities. Through this work, a lead investigator has identified different approaches to tackle the cumulative impact problem – incorporate cumulative impacts into decision-making.¹⁵⁷

Moreover, due to the overwhelming evidence that some communities face a disproportionate share of environmental burdens, some local governments have taken it upon themselves to determine toxic risks.¹⁵⁸ For example, the Air District in Los Angeles has proposed a plan to identify and reduce community exposure in overburdened areas in Boyle Heights.¹⁵⁹

Although these measures are intended to consider cumulative impacts from air pollution, the assessment is limited and does not delve into the scientific data to the extent that EPA does during the NAAQS process. Therefore, none of these measures provide an adequate substitute for EPA's failure to evaluate cumulative health impacts in the NAAQS process.

IV. THE NAAQS PROCESS SHOULD ADDRESS CUMULATIVE HEALTH IMPACTS.

The NAAQS are required to be set at levels requisite to protect public health. Yet, the current NAAQS process does not answer essential questions regarding how pollutants interact to create cumulative impacts in the air pollution mixture and how best to prioritize reductions when several of the criteria pollutants are interrelated.¹⁶⁰ It also does not give states the tools they need to most effectively reduce risks from the criteria

157. Amy Kyle, Project Elements - Assessing and Addressing Cumulative Impacts and Precautionary Approaches, Presentation Before the CIPA Workgroup 4 35 (June 5, 2008), available at <http://www.oehha.org/ej/pdf/Kyle061308.pdf>.

158. See, e.g., Clifford Rechtschaffen, *Fighting Back Against a Power Plant: Some Lessons from the Legal and Organizing Efforts of the Bayview-Hunters Point Community*, 14 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 537, 553 (2008) (discussing efforts by San Francisco and Atlanta).

159. See Carolyn Whetzel, *South Coast Air District Plans to Help Neighborhoods With Many Pollution Sources*, 41 Env't Rep. (BNA) 802 (2010).

160. See *supra* Part I at 3 (discussing issues with standards focused only on one pollutant).

pollutants.¹⁶¹ Rather, states are left to their own devices to come up with ways to reduce pollutants and meet attainment standards.

Instead of letting states come up with a patchwork of determinations on how to prioritize and reduce risks, the NAAQS process could be used to determine what impacts result from cumulative pollution. The NAAQS process is an extensive scientific evaluation with a public process that could effectively and thoughtfully evaluate the cumulative health impacts from criteria pollutants.

A. Consideration of Cumulative Health Impacts Is Consistent with the Plain Language of the Clean Air Act.

Importantly, the CAA's broad goal to "promote public health and welfare" through air pollution prevention and control¹⁶² is consistent with consideration of cumulative impacts of multiple air pollutants. In fact, the CAA specifically requires "[c]onsideration of individual, as well as complex mixtures of, air pollutants and their chemical transformations in the atmosphere."¹⁶³ The Act also requires EPA to understand interactions between pollutants including the "mechanism through which anthropogenic and biogenic volatile organic compounds react to form ozone and other oxidants."¹⁶⁴ The Act's definition of air pollution also includes consideration of multiple pollutants by including "[a]ny air pollution agent or combination of such agents."¹⁶⁵ The definition also specifically includes "any precursors to the formation of any air pollutant, to the extent the

161. *See generally* The Clean Air Act of 1963, Pub. L. No. 88-206, 77 Stat. 392 (codified as amended starting at 42 § 7401); The Clean Air Act of 1967, Pub. L. No. 90-148, 81 Stat. 485 (codified as amended starting at 42 §§ 1857f-6d) (requiring the Secretary of Health, Education and Welfare (EPA had not been established) to "develop and issue to the States such criteria of air quality as in his judgment may be requisite for the protection of public health and welfare.").

162. Clean Air Act § 101, 42 U.S.C. § 7401(b)(1) (2006).

163. *Id.* § 7403(c)(1).

164. *Id.* § 7403(c)(3)(B).

165. *Id.* § 7602(g).

Administrator has identified such precursor or precursors for the particular purpose for which the term ‘air pollutant’ is used.”¹⁶⁶

Although EPA has historically interpreted the requirement to publish criteria documents as somehow limited to each individual pollutant, the text does not provide this limitation. Criteria documents are required to accurately reflect “all identifiable effects on public health or welfare which may be expected from the presence of such pollutant in the ambient air, in varying quantities.”¹⁶⁷ This includes information on “variable factors (including atmospheric conditions) which of themselves or in combination with other factors may alter the effects on public health or welfare of such air pollutant.”¹⁶⁸ Since cumulative effects are expected and have been identified as an issue impacting public health, EPA should evaluate them.

The standards, likewise, should consider the cumulative impacts of the pollutants to determine the risks to public health. The CAA requires that the standards be based on the criteria document and set at a level “requisite to protect public health” with “an adequate margin of safety.”¹⁶⁹ Further supporting consideration of cumulative impacts, CASAC, the regulatory body formed pursuant to CAA requirements to give scientific advice, has asked them to consider cumulative impacts.¹⁷⁰

Even though it could be argued that cumulative impacts will be difficult to consider because of uncertainties, EPA has authority to and should act even in light of such uncertainties.¹⁷¹ In fact, EPA’s recent consideration of sulfur dioxide with nitrogen

166. *Id.*

167. *Id.* § 7408(a)(2).

168. *Id.* § 7408(a)(2)(A).

169. *Id.* § 7409(b)(1).

170. *See infra* Part III.B (discussing some of CASAC’s comments).

171. The legislative history demonstrates that Congress considered this. *See* S. REP. NO. 91-1196, A Legislative History of the Clean Air Act Amendments of 1970, Vol. 1, at 411 (1974). It states:

“The Committee is aware that there are many gaps in the available scientific knowledge of the welfare and other environmental effects of air pollution agents. . . . A great deal of basic research will be needed to determine the long-term air quality goals which are required to protect the public health and welfare from any potential effects of air pollution. In the meantime, the Secretary will be expected to establish such national goals on the basis of the best information available to him.”

dioxide for the secondary standard demonstrates that consideration of two standards together is possible.¹⁷² Recent court cases also suggest a new emphasis on the measure of risk rather than the uncertainty of the science. For example, while examining two studies of respiratory effects on children, the D.C. Circuit found that the two studies “are related and together indicate a significant public health risk.”¹⁷³ Consistent with this emphasis on risk, EPA should evaluate cumulative impacts in the NAAQS process.

B. Addressing Cumulative Impacts Would Allow for a More Realistic Assessment of Risks to Public Health.

The NAAQS are intended to define what EPA believes is clean air,¹⁷⁴ but the NAAQS fail to define what levels of pollutants are necessary for clean air when pollutants co-exist and react. Despite a drop in concentrations of criteria pollutants in the last twenty years,¹⁷⁵ a large percentage of the population lives in areas not attaining the NAAQS. In 2008, an estimated one hundred and twenty seven million people lived in areas that exceeded one or more air quality standards.¹⁷⁶ These levels in turn mean that a significant percentage of the population is at a higher risk for health impacts, but the NAAQS fail to take into account the higher risks that result from cumulative pollution. As an EPA representative admitted in a recent interview, “[w]e don’t talk enough about health implications of our rules.”¹⁷⁷

Scientists have confirmed that criteria air pollutants create a high risk to public health,¹⁷⁸ but by failing to directly consider the integral relationship between several of the criteria

172. *See supra* Part I.C.

173. *Am. Farm Bureau Fed’n v. EPA*, 559 F.3d 512, 525 (D.C. Cir. 2009).

174. *See* 42 U.S.C. §§ 7408-7409.

175. *See* EPA, OUR NATION’S AIR – STATUS AND TRENDS THROUGH 2008 8 (2010), available at <http://www.epa.gov/airtrends/2010/report/fullreport.pdf>.

176. *Id.* at 1.

177. Childers, *supra* note 141 (quoting Gina McCarthy, EPA Assistant Administrator for Air and Radiation).

178. *See* EPA SCIENTIFIC ADVISORY BOARD, REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION 7 (1990), available at <http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000PNG1.txt>.

pollutants, the standards do not adequately quantify those risks. Studies relied on to promulgate air quality standards spend considerable energy attempting to isolate the impacts of individual pollutants on health to come up with a standard. In particular, the epidemiological and toxicological studies relied on to set air quality standards attempt to isolate the pollutants to determine each pollutant's individual impact.¹⁷⁹ Problematically, this does not consider the cumulative impact of breathing multiple pollutants. Thus, isolated standards such as these only provide part of the picture of how air pollutants in the ambient air impact public health and welfare.

Notably, CASAC has recommended that EPA consider co-pollutant interactions several times. As demonstrated by the 2006 ozone criteria document, where only around fifteen pages of a two thousand and one hundred page document are devoted to discussing the impacts of co-pollutant interactions on health effects, a comprehensive analysis of co-pollutant interactions has been lacking.¹⁸⁰ Due to this type of dearth of analysis, CASAC has strongly recommended that particles and ozone "multi-pollutants and their influence on the toxicity of NO_x and SO_x should be considered in the integrated plans."¹⁸¹ CASAC also found that this emphasis was lacking in a NAAQS integrated plan it was reviewing because "the plans appear to specifically exclude any consideration of the combined influences of the many secondary transformation products (gaseous, aerosol and deposition), which inevitably result from, and coexist with, these precursor pollutants."¹⁸² In another comment during the most recent review of the ozone standard, one CASAC member recommended that "[i]n considering the ozone NAAQS, it is

179. See THE MULTI-POLLUTANT REPORT: TECHNICAL CONCEPTS AND EXAMPLES, *supra* note 104, at 1-8.

180. See AIR QUALITY CRITERIA FOR OZONE AND RELATED PHOTOCHEMICAL OXIDANTS, *supra* note 102, at 5-65 to 5-79.

181. Letter from Dr. Rogene Henderson, Chair, CASAC, to Stephen L. Johnson, Administrator, EPA, on Clean Air Scientific Advisory Committee's (CASAC) Consultation on the Draft Integrated Plans for Review of the Primary NAAQS for NO₂ and SO₂ 2 (June 8, 2007).

182. *Id.*

process “provides an important opportunity to consider the health impacts on minority, low-income, and indigenous populations.”¹⁸⁷

Since cumulative impacts are not meaningfully addressed in the NAAQS process, states are not equipped to evaluate which communities are exposed to the greatest risks of adverse health impacts.¹⁸⁸ This lack of consideration of the cumulative impacts of multiple air pollutants is a significant concern for communities already overburdened by pollution.

Numerous studies have shown that low-income and minority communities bear more of the cumulative burden of pollution.¹⁸⁹ In particular, minority and low-income communities disproportionately bear the environmental and health impacts from fossil fuel exploration, extraction, production, consumption and disposal.¹⁹⁰ These activities produce and lead to several criteria pollutants including fine PM and NOx. There are many examples of these types of environmental justice communities. For example, in the San Francisco Bay Area, the Bay Area Air Quality Management District has designated neighborhoods with high populations of minorities such as Bayview Hunters Point and Richmond as high impact areas for air pollution.¹⁹¹ As

187. EPA, EPA'S ACTION DEVELOPMENT PROCESS: INTERIM GUIDANCE ON CONSIDERING ENVIRONMENTAL JUSTICE DURING THE DEVELOPMENT OF AN ACTION 5 (2010), *available at* <http://www.epa.gov/environmentaljustice/resources/policy/considering-ej-in-rulemaking-guide-07-2010.pdf>.

188. The subject of risk and perceptions of risk has been discussed at length by a number of commentators. *See, e.g.*, Cass R. Sunstein, *Which Risks First?*, 1997 U. CHI. LEGAL F. 101, 103-05 (1997). Here, states are not given the tools to make the determination Sunstein promotes to determine the answer to such questions, such as whether risk is inequitably distributed.

189. *See, e.g.*, Clifford Rechtschaffen, *The Evidence of Environmental Injustice*, 12 ENVTL. LAW NEWS No. 3 (2003), *available at* <http://environmental.calbar.ca.gov/Publications/EnvironmentalLawNews.aspx#v123> and http://www.ggu.edu/school_of_law/law_faculty/full_time_faculty_m_z/rechtschaffen_book_resources/attachment/article.pdf; UNITED CHURCH OF CHRIST, TOXIC WASTES AND RACE AT TWENTY x-xi (2007), *available at* <http://www.ucc.org/justice/environmental-justice/pdfs/toxic-wastes-and-race-at-twenty-1987-2007.pdf>.

190. *Id.*; *see* CALIFORNIA ENVIRONMENTAL JUSTICE MOVEMENT, DECLARATION AGAINST THE USE OF CARBON TRADING SCHEMES TO ADDRESS CLIMATE CHANGE, *available at* <http://www.ejmmatters.org/declaration.html>.

191. *See* Philip Martien, Community Air Risk Evaluation (CARE) Program Overview, Presentation (Mar. 5, 2009), *available at* http://www.baaqmd.gov/~media/Files/Planning_and_Research/CARE_Program/Task_Force

another example, the San Joaquin Valley area, where low-income, and often minority, farm workers are concentrated, is designated an “extreme” nonattainment area.¹⁹²

These overburdened communities often experience higher incidences of respiratory health effects (which have been linked to criteria pollutants) than other communities.¹⁹³ Several studies have demonstrated that asthma rates are higher among minorities.¹⁹⁴ Other studies have found that asthma rates are higher in low-income areas. One study found that children living in a low socioeconomic status community had a seventy percent higher risk of acquiring asthma than children living in a higher socioeconomic status neighborhood.¹⁹⁵ Studies also show that exposure to road traffic emissions worsens asthma in children.¹⁹⁶ Community residents living in overburdened communities want and need a serious evaluation of health problems resulting from cumulative burdens.¹⁹⁷

This disparity due to a higher cumulative burden of pollution will only increase due to climate change.¹⁹⁸ In

Meetings/030509 CI/20090305_CI_CareOverview.ashx (Bayview Hunters Point area is identified as “East San Francisco” in the presentation).

192. See 40 C.F.R. § 81.305 (2006).

193. For example, the Bayview Hunters-Point community in San Francisco, which houses the majority of industry in the city, suffers higher bronchitis and asthma rates than the rest of the area. See Rechtschaffen, *supra* note 159, at 553.

194. See, e.g., Marielena Lara et al., *Heterogeneity of Childhood Asthma Among Hispanic Children: Puerto Rican Children Bear a Disproportionate Burden*, 117 PEDIATRICS 43 (2006); Marla McDaniel et al., *Racial Disparities in Childhood Asthma in the United States: Evidence from the National Health Interview Survey, 1997 to 2003*, 117 PEDIATRICS 5 (2006); Diane R. Gold & Rosalind White, *Population Disparities in Asthma*, 26 ANN. REV. PUB. HEALTH 89 (2005).

195. See Luz Claudio et al., *Prevalence of Childhood Asthma in Urban Communities: The Impact of Ethnicity and Income*, 16 ANNALS EPIDEMIOLOGY 332, 332 (2006).

196. See HEALTH EFFECTS INSTITUTE, TRAFFIC-RELATED AIR POLLUTION: A CRITICAL REVIEW OF THE LITERATURE ON EMISSIONS, EXPOSURE, AND HEALTH EFFECTS EXECUTIVE SUMMARY 8 (2010), available at <http://pubs.healtheffects.org/getfile.php?u=552>.

197. See Rechtschaffen, *supra* note 159, at 553.

198. For example, in 2004, the Congressional Black Caucus Foundation reported that African-Americans are twice as likely to die than the general population as a result of a heat wave and nearly three times more likely to die of

particular, cap and trade regulatory regimes, which are the primary regulatory regimes being examined in the U.S., can create hot spots in areas already experiencing high levels of pollution, which in turn leads to a greater cumulative health risk.¹⁹⁹ Greenhouse gas levels are directly related to the environmental burden these communities currently face partly because stationary and mobile sources that burn fossil fuels also emit a host of other harmful air pollutants including particulate matter, nitrogen oxides, sulfur dioxide, and mercury.

In addition to heat-related impacts, increases in temperature increase smog and thus deteriorate air quality.²⁰⁰ As temperatures increase, nitrogen oxides will react with volatile organic compounds and sunlight at an increased rate, which will increase the atmospheric concentrations of ozone in urban areas.²⁰¹ This predicted air quality deterioration in urban areas

asthma than Whites. See AFRICAN AMERICANS AND CLIMATE CHANGE: AN UNEQUAL BURDEN (2004), available at www.rprogress.org/publications/2004/CBCF_REPORT_F.pdf. The limited capability of low income and minority communities to adapt to climate change was also recently recognized by California's Attorney General:

"The impacts of global warming experienced by [communities of color] and poor communities will be exacerbated because these groups are often the least able to adapt. They typically have less access to health care and medical, home, and renter's insurance; less money to purchase air conditioning or to move away from droughts, floods and fires caused by global warming; and spend a higher percentage of their income on necessities such as gasoline, water, and electricity, which will become scarcer and more expensive with climate change."

Office of California Attorney General, *Global Warming's Unequal Impacts*, available at <http://aq.ca.gov/globalwarming/unequal.php>.

199. See Richard Toshiyuki Drury et al., *Pollution Trading and Environmental Injustice: Los Angeles' Failed Experiment in Air Quality Policy*, 9 DUKE ENVTL. LAW & POL'Y F. 231, 272 (1999); see also Carol M. Rose, *Hot Spots in the Legislative Climate Change Proposals*, 102 NW. U. L. REV. 189, 190 (2008) (discussing how cap and trade systems create hot spots); Alice Kaswan, *Environmental Justice & Domestic Climate Change Policy*, 38 ENVTL. L. REP. (Envtl. Law Inst.) 10287, 10299 (2008); Ida Martinac, *Considering Environmental Justice in the Decision to Unbundled Renewable Energy Certificates*, 35 GOLDEN GATE U. L. REV. 491, 523 (2005) (explaining how RECLAIM created hot spots).

200. See Mark Z. Jacobson, *On the Causal Link Between Carbon Dioxide and Air Pollution Mortality*, 35 GEOPHYSICAL RESEARCH LETTERS L03809 1 (2008).

201. See *id.* at 4-5.

will most severely impact low-income and minority communities that live in these areas.²⁰²

Consistent with its commitment to environmental justice,²⁰³ EPA should assess cumulative impacts in the NAAQS process to help equip states with the necessary knowledge to prioritize reductions in these overburdened communities.²⁰⁴ Importantly, however, a meaningful assessment of the cumulative impacts from air pollution is only the first step in assisting overburdened communities. The health problems cannot be meaningfully evaluated solely by focusing on risk assessment.²⁰⁵ The presence of polluting facilities impacts an area in a variety of ways that regulators should also consider.²⁰⁶

D. Consideration of Cumulative Health Impacts Could Give States More Information to Accomplish Protective Levels.

By separating out each criteria pollutant during the NAAQS process, the NAAQS do not provide meaningful information for states to use to determine how to most effectively reduce levels of pollution. Although criteria air pollutant levels have generally decreased in recent years, ozone and fine particulate matter are continuing, widespread problems.²⁰⁷ Many areas of the country are in non-attainment for either ozone

202. See RACHEL MORELLO-FROSCH ET AL., *THE CLIMATE GAP: INEQUALITIES IN HOW CLIMATE CHANGE HURTS AMERICANS & HOW TO CLOSE THE GAP* 5, 13 (2009), available at http://college.usc.edu/per/documents/The_Climate_Gap_Full_Report_FINAL.pdf.

203. See e.g., EPA, *Environmental Justice*, <http://www.epa.gov/compliance/ej/index.html> (last visited October 14, 2010) (describing EPA's current efforts related to environmental justice).

204. See Andrew Childers, *Justice Will Be 'Defining Issue' for EPA as It Reviews Rulemaking Procedures*, 41 *Env't Rep. (BNA)* 629 (2010).

205. See Brian D. Israel, *An Environmental Justice Critique of Risk Assessment*, 3 *N.Y.U. ENVTL. LAW J.* 469, 495 (1994); see also Rechtschaffen, *supra* note 159, at 547.

206. Overall quality of life diminishes in neighborhoods that face high levels of industrialization. See Rechtschaffen, *supra* note 159, at 547.

207. See THE MULTI-POLLUTANT REPORT: TECHNICAL CONCEPTS & EXAMPLES, *supra* note 104, at 4-1.

or fine particulate matter or are close to non-attainment.²⁰⁸ Many areas of the country are also above levels of concerns for multiple hazardous air pollutants.²⁰⁹ Monitors only measure the concentration of particular pollutants at one place and time. Air concentrations can change quickly and drastically since air pollutants are constantly moving and reacting with other constituents in the air. This is particularly an issue for fine particulate matter and ozone, which can originate from the reaction of other pollutants.

In addition, because indicators change, monitoring equipment needs to be continually updated to be effective. Since the NAAQS process only identifies concentrations of concern, monitors are the only way states have to evaluate whether reductions measures work. With the possibility of changing standards every five years at different schedules, monitoring equipment may not be adequate and may need to be constantly updated. For example, in response to EPA's proposed short-term NAAQS standard for SO₂, states have asked for more money to install monitoring equipment.²¹⁰

Moreover, some states will have considerable difficulties determining how to reduce pollution to levels necessary for some pollutants if background levels exceed the standard levels or if pollutants are transported in from other states. This problem is highlighted by many states' failures to submit plans related to the transport of particles.²¹¹ Although CASAC supports EPA's decision to revise the ozone standards, it has indicated a concern for implementation due to the background ozone levels in some

208. See, e.g., Air Quality Designations for the 2006 24-Hour Fine Particle (PM_{2.5}) National Ambient Air Quality Standards, 74 Fed. Reg. 58,688 (Nov. 13, 2009) (designating nonattainment areas for fine particulate matter); see THE MULTI-POLLUTANT REPORT: TECHNICAL CONCEPTS & EXAMPLES, *supra* note 104, at 4-1.

209. See THE MULTI-POLLUTANT REPORT: TECHNICAL CONCEPTS & EXAMPLES, *supra* note 104, at 2-2.

210. See Andrew Childers, *States Offer Support for Proposed Standard on Sulfur Dioxide, Want Funds for Monitoring*, 41 Env't Rep. (BNA) 360 (2010).

211. See Finding of Failure to Submit Section 110 State Implementation Plans for Interstate Transport for the 2006 National Ambient Air Quality Standards for Fine Particulate Matter, 75 Fed. Reg. 32,673, 32,673 (June 9, 2010) (finding that 23 states and six other jurisdictions failed to submit plans to reduce interstate transport of fine particulate matter).

parts of the country.²¹² Not surprisingly, industry representatives have complained that these revisions will set standards at levels that cannot be achieved.²¹³ The difficulty of only considering one pollutant at a time when the pollutants are interconnected creates uncertainty in implementation that makes it difficult to determine how to comply.²¹⁴

V. CONCLUSION

Evidence shows that criteria pollutants can cause greater risks to human health when combined with other pollutants. These relationships need to be evaluated and considered to determine what standard will ensure that air concentrations are at a level requisite to protect public health. EPA took the right step when it decided to consider two criteria pollutants together to promulgate a secondary standard. EPA's effort correctly focuses on endpoints for determining a standard that will protect the environment. EPA now needs to take the same step when it evaluates the primary standards for criteria pollutants to determine a standard that will protect public health based on health endpoints.

212. See Andrew Childers, *Scientific Advisors Endorse EPA Proposal on Ozone Despite Implementation Concerns*, 41 Env't Rep. (BNA) 199 (2010).

213. See Andrew Childers, *Air Standards for Fine Particles Fail to Protect Health, Visibility, Report Finds*, 41 Env't Rep. (BNA) 525 (2010).

214. In a draft letter from the South Coast Air District in California to EPA, the South Coast states: "[t]he current piecemeal approach also increases uncertainty in the regulated community in that requirements for emissions controls may change when moving from one pollutant to the next in the SIP process. This makes it harder for businesses to plan for future regulation related to complying with air quality regulations and may also result in stranded investment in pollution control." *South Coast Urges EPA Shift on SIP Policies to Meet Ozone Standard*, INSIDE CAL/EPA (Inside Washington Publishers, Arlington, V.A.) Mar. 12, 2010.