Nos. 12-1146, 12-1248, 12-1254,
12-1268, 12-1269, and 12-1272

IN THE

Supreme Court of the United States

UTILITY AIR REGULATORY GROUP, *et al.*,
Petitioners,

v.

ENVIRONMENTAL PROTECTION AGENCY, *et al.*,
Respondents.

On Writs of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

BRIEF OF *AMICUS CURIAE* AMERICAN THORACIC SOCIETY IN SUPPORT OF RESPONDENTS

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INTEREST OF THE *AMICUS CURIAE*[1]

The American Thoracic Society (ATS) is an international educational and scientific organization founded in 1905 that represents more than 15,000 health care professionals. ATS works to prevent and fight respiratory disease around the globe through research, education, patient care, and advocacy. ATS publishes three peer-reviewed scientific journals that disseminate groundbreaking research, including studies on air pollution and health.

ATS supports the position of Respondent, the U.S. Environmental Protection Agency (EPA), because EPA's approach addresses greenhouse gas (GHG) emissions from stationary sources, a key contributor of the anthropogenic GHG emissions that cause climate change, and, in turn, harm human health. In light of this case's vital importance to current and future generations of American citizens, *amicus curiae* urges that this Court uphold the decision of the U.S. Court of Appeals for the D.C. Circuit and find that EPA may implement its approach across all regions of the country.

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[1] Pursuant to this Court's Rule 37.2(a), all parties were timely notified of *amicus'* intention to file this brief. Counsel for petitioners and respondents have consented to the filing of this brief and their written consent has been lodged with the Court. Pursuant to this Court's Rule 37.6, *amicus* states that this brief was not authored in whole or in part by counsel for any party and that no person or entity other than *amicus* or her counsel made a monetary contribution intended to fund the preparation or submission of this brief.

SUMMARY OF ARGUMENT

Amicus curiae submits this brief to assist the Court in understanding how climate change—the result of anthropogenic GHG emissions—harms public health. Those harms are diverse and sometimes severe, even deadly. Failure to affirm the decision of the D.C. Circuit would undermine EPA's authority to regulate major stationary sources of GHG emissions. Such a failure would risk incorrectly relegating GHG emissions to an inferior category of air pollutants, despite the threat they pose to the health of hundreds of millions of American citizens, including members of future generations.

Petitioners have asked this Court to muddy Congress's clear instruction to EPA to regulate "any air pollutant" emitted in large amounts by new major stationary sources. As Respondents have explained, acceding to that request would mean abrogating EPA's sound and longstanding interpretation of § 169 of the Act. It would also mean allowing for more emissions of harmful air pollution despite the danger those emissions pose to Americans' health and welfare. By rejecting Petitioners' arguments, this Court would, therefore, leave undisturbed EPA's view that the meaning of "any air pollutant" is clear on its face, as well as preserve EPA's ability to help improve public health by limiting emissions of non-criteria pollutants, including GHGs.

Amicus curiae ATS supports EPA's efforts to regulate GHG emissions in service to the public health and welfare of current and future generations of Americans. Preserving EPA's authority to address GHG emissions from new major sources in all regions of the country is vitally important to that goal. Accordingly, ATS calls on this Court to affirm the decision of the D.C. Circuit.

ARGUMENT

I. CLIMATE CHANGE LEADS TO ADVERSE IMPACTS ON HUMAN HEALTH

Climate change is a human health problem. Left unchecked, the effects of climate change will increasingly create diverse risks for human health. Heat waves will occur more often and will be more intense,[2] rates of ground-level ozone and particulate matter (PM) formation will increase,[3]

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[2] P.B. Duffy & C. Tebaldi, *Increasing prevalence of extreme summer temperatures in the U.S.*, 111 Climatic Change 487 (2012); Thomas R. Karl et al., *Global Climate Change Impacts in the United States* 17–18 (Thomas R. Karl et al. eds., 2009); G.A. Meehl & C. Tebaldi, *More intense, more frequent, and longer lasting heat waves in the 21st Century*, 305 Science 994 (2004).

[3] Bertil Forsberg et al., *An expert assessment on climate change and health—with a European focus on lungs and allergies*, 11 Envtl. Health (Supp. 1), June 28, 2012; Daniel J. Jacob & Darrel A. Winner, *Effect of climate change on air quality*, 43 Atmospheric Env't 51, 59 (2009); K. Murazaki & P. Hess, *How does climate change contribute to surface ozone change over the United States?*, 111 J. Geophysical Res.: Atmospheres, Mar. 16, 2006, at 1, 12, 15.

allergen concentrations will increase and persist longer,[4] forest fires will become more frequent and widespread,[5] and extreme weather events, such as droughts, floods, and storms, will become more frequent and more extreme.[6] Through these and other causal channels, climate change will lead more of the American public to become ill, to

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[4] Lewis H. Ziska & Paul J. Beggs, *Anthropogenic climate change and allergen exposure: the role of plant biology*, 129 J. Allergy & Clinical Immunology 27 (2012); Lewis H. Ziska et al., *Recent warming by latitude associated with increased length of ragweed pollen season in central North America*, 108 Proc. Nat'l Acad. Sci. 4248, 4249–50 (2011); J. Emberlin, *Responses in the start of Betula (birch) pollen seasons to recent changes in spring temperatures across Europe*, 46 Int'l J. Biometeorology 159 (2002).

[5] D.V. Spracklen et al., *Impacts of climate change from 2000 to 2050 on wildfire activity and carbonaceous aerosol concentrations in the western United States*, 114 J. Geophysical Res.: Atmospheres, Oct. 27, 2009, at 1–2 (reviewing prior studies and describing findings based on model derived from historical data and trends); *see also* Cordy Tymstra et al., *Impact of climate change on area burned in Alberta's boreal forest*, 16 Int'l J. Wildland Fire 153, 158–59 (2007); M. Flannigan et al., *Future area burned in Canada*, 72 Climate Change 1 (2005).

[6] *Working Group I Contribution to the IPCC Fifth Assessment Report: Climate Change 2013: The Physical Science Basis. Summary for Policymakers* 5, tbl. SPM.1 (Thomas F. Stoker et al. eds., 2013); *see also* William N. Rom & Kent E. Pinkerton, *Introduction: Consequences of Global Warming to the Public's Health*, in *Global Climate Change and Public Health* 1, 13–14 (Kent E. Pinkerton & William N. Rom eds., 2014) (noting recent jump in extreme weather events and describing insurance industry efforts to offset enormous future anticipated losses.).

experience various illnesses with greater severity, and to die prematurely.

A. Mortality Will Increase Due To the Effects of Climate Change

The effects of climate change can be deadly. Chief among the intermediate factors that link climate change to increased mortality are changes to the temperature and humidity of the ambient air, and the attendant promotion of air pollution. Extreme weather is another factor that links climate change to greater mortality.

The heat waves[7] and higher ambient temperatures that will occur with increasing frequency due to climate change are expected to lead to the deaths of American citizens.[8] These

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[7] Tiffany T. Smith et al., *Heat waves in the United States: definitions, patterns, and trends*, 118 Climate Change 811, 812–13 (2013) (noting that "heat wave" does not have a universally accepted definition, but is generally used to refer to temperatures—or a temperature-plus-humidity metric—that exceed seasonally- and regionally-specific averages for two or more consecutive days).

[8] G. Brooke Anderson & Michelle L. Bell, *Heat waves in the United States: mortality risk during heat waves and effect modification by heat wave characteristics in 43 U.S. communities*, 119 Envtl. Health Persps. 210 (2011); Scott Greene et al., *An examination of climate change on extreme heat events and climate-change mortality relationships in large U.S. cities*, 3 Weather, Climate, & Soc'y 281 (2011); Alexander Gershunov et al., *The Great 2006 Heat Wave over California and Nevada: Signal of an Increasing Trend*, 22 J. Climate 6181 (2009); M. Medina-Ramón & Joel Schwartz, *Temperature, temperature extremes, and mortality: a study of acclimatization and effect modification in 50 United States*

expectations are grounded in historical data: many scientists and public health researchers have documented the growing frequency of heat waves and higher temperatures[9] as well as the impact of those weather events on mortality.[10] The best known example of this is the August 2003 heat wave that struck Europe, which led to approximately 32,000 deaths;[11] France alone experienced nearly 15,000 deaths in that month, of which 2,000 occurred in a single day.[12]

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cities, 64 J. Occupational & Envtl. Med. 827 (2007) (identifying causal relationship based on over six million observations).

[9] David H. Levinson & Christopher J. Fettig, *Climate Change: Overview of Data Sources, Observed and Predicted Temperature Changes, and Impacts on Public and Environmental Health*, in *Global Climate Change and Public Health* 31, 33–36 (Kent E. Pinkerton & William N. Rom eds., 2014) (collecting citations to leading research and summarizing past and projected increases in ambient temperatures).

[10] *See, e.g.*, Shakoor Hajat & Tom Kosatky, *Heat-related mortality: a review and exploration of heterogeneity*, 64 J. Epidemiology & Community Health 753 (2010) (estimating from 25 years of data that risk of mortality in various cities increased by 1–3% with each degree-Centigrade increase in temperature above threshold); Sumi Hoshiko et al., *A simple method for estimating excess mortality due to heat waves, as applied to the 2006 California heat wave*, 55 Int'l J. Pub. Health 133 (2010); Bart D. Ostro et al., *Estimating the mortality effect of the July 2006 California heat wave*, 109 Envtl. Res. 614 (2009).

[11] Anne Fouillet et al., *Excess mortality related to the August 2003 heat wave in France*, 80 Int'l Archives Occupational & Envtl. Health 16 (2006).

[12] Laurent Argaud et al., *Short- and Long-term Outcomes of Heatstroke Following the 2003 Heat Wave in Lyon, France*,

Particular factors intensify the effect of heat waves on mortality. Cities—the sites of urban "heat islands" that heat up faster and hold heat longer than non-urban areas[13]—will experience especially severe heat stress due to climate change.[14] Heat waves in cities are consistently accompanied by increased mortality.[15] Heat wave-related mortality is also sensitive to the duration and intensity of heat waves: predictably, more people die when heat waves are longer and hotter.[16] Finally, mortality rates amid heat waves also tend to be higher in places unaccustomed to high temperatures.[17] As

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167 Archives Internal Med. 2177 (2007); Jean-François Dhainaut et al., *Unprecedented heat-related deaths during the 2003 heat wave in Paris: consequences on emergency departments*, 8 Critical Care 1 (2004).

[13] Jonathan A. Patz et al., *Impact of regional climate change on human health*, 438 Nature 310 (2005) (noting that "most cities" ambient air temperature exceeds temperatures in surrounding rural areas by 5–11 degrees Centigrade); C.J.G. Morris & I. Simmonds, *Associations between varying magnitudes of the urban heat island and the synoptic climatology in Melbourne, Australia*, 20 Int'l J. Climatology 1931 (2000).

[14] Anthony J. McMichael et al., *International study of temperature, heat and urban mortality: the 'ISOTHURM' project*, 37 Int'l J. Epidemiology 1121, 1130 (2008).

[15] Rom & Pinkerton, *supra* note 6, at 10; *see also* Anthony J. McMichael et al., *Climate change and human health: present and future risks*, 367 Lancet 859, 862, 864 (2006) (noting that more people will be at risk from heat extremes due to trends of aging populations and urbanization).

[16] Daniela D'Ippoliti et al., *The impact of heat waves on mortality in 9 European cities: results from the EuroHEAT project*, 9 Envtl. Health, July 16, 2010.

[17] Rom & Pinkerton *supra* note 6, at 10; G. Brooke Anderson

climate change delivers more frequent heat waves, all three of these factors will continue to amplify the effects of those heat waves on mortality.

Some heat wave-related deaths reflect a short-term displacement of mortality among individuals whose deaths are hastened by only days or weeks.[18] However, statistical analysis has shown that such displacement generally accounts for a small fraction of the mortality related to heat waves, if it accounts for any at all.[19]

The simple stress of hotter weather, independent of acute heat waves, can also increase mortality.[20] This effect can take the form of heat

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& Michelle L. Bell, *Weather-related mortality: how heat, cold, and heat waves affect mortality in the United States*, 20 Epidemiology 205 (2009); L.G. Chestnut et al., *Analysis of differences in hot-weather-related mortality across 44 US metropolitan areas*, 1 Envtl. Sci. & Tech. 59 (1998).

[18] *See, e.g.*, Michela Baccini et al., *Heat Effects on Mortality in 15 European Cities*, 19 Epidemiology 711, 718–19 (2008) (discussing short-term mortality displacement and how to infer it from data).

[19] Rupa Basu & Brian Malig, *High ambient temperature and mortality in California: exploring the roles of age, disease, and mortality displacement*, 111 Envtl. Res. 1286 (2011) (finding no short-term mortality displacement); McMichael et al., *supra* note 15, at 861 (noting estimate that 30–40% of American heat wave-related mortality appears attributable to short-term displacement); Fouillet et al., *supra* note 6 (finding no short-term mortality displacement).

[20] Shakoor Hajat et al., *Impact of high temperatures on mortality: is there an added heat wave effect?*, 17 Epidemiology 632 (2006) (examining summer mortality rates in three cities and finding that generally higher temperatures, rather than heat waves, accounted for most deaths).

stroke[21] or acute episodes of chronic ailments like cardiovascular or respiratory disease.[22]

The indirect effects of hotter weather on public health—such as those resulting from air pollution promotion—are no less alarming than the direct effects. One study of mortality rates in nine French cities found that each 10 µg/m^3 increment of increase in ozone level in heat-wave conditions was matched by a one percent increase in mortality rates.[23] Other studies have found that, as with

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[21] M. Boeckmann & I. Rohn, *Is heat adaptation in urban areas reducing heat stroke incidence and cardiovascular mortality? A systematic review of the literature*, 23 Eur. J. Pub. Health (Supp. 1) 198, 199 (2013) ("We do not know if current heat adaptation measures can protect health during extreme heat."); R. Sari Kovats & Shakoor Hajat, *Heat stress and public health: a critical review*, 29 Annual Rev. Pub. Health 41, 42, 47 (2008) (noting danger of and risk factors for heat stroke).

[22] *See* Helene G. Margolis, *Heat Waves and Rising Temperatures: Human Health Impacts and the Determinants of Vulnerability*, in *Global Climate Change and Public Health*, 85, 97–100 (Kent E. Pinkerton & William N. Rom eds., 2014) (summarizing relevant research and describing pathways through which high temperatures can lead to adverse health outcomes); McMichael et al., *supra* note 15, at 861 ("Most heatwave deaths occur in people with pre-existing cardiovascular disease (heart attack and stroke) or chronic respiratory diseases.").

[23] L. Filleul et al., *The relation between temperature, ozone and mortality in nine French cities during the heat wave of 2003*, 114 Envtl. Health Persps. 1344, 1345 (2006); *see also* Cizao Ren et al., *Ozone modifies associations between temperature and cardiovascular mortality: analysis of the NMMAPS data*, 65 J. Occupational & Envtl. Med. 255 (2008) (identifying similarly synergistic effect in different data set).

ozone, a given concentration of PM is made deadlier by a higher ambient temperature.[24] These examples illustrate the more general point that higher temperatures generally mean higher concentrations of ozone and PM,[25] and researchers have traced consistent relationships between those air pollutants and mortality.[26] It follows that the

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[24] Z. Qian et al., *High Temperatures Enhanced Acute Mortality Effects of Ambient Particle Pollution in the "Oven" City of Wuhan, China*, 116 Envtl. Health Persps. 1172 (2008); Cizao Ren et al., *Does particulate matter modify the association between temperature and cardiorespiratory diseases?*, 114 Envtl. Health Persps. 1690 (2006); K. Katsouyanni et al., *Evidence for interaction between air pollution and high temperature in the causation of excess mortality*, 48 Envtl. Health 235, 240 (1993).

[25] *See, e.g.*, Levinson & Fettig, *supra* note 9, at 36–39 (describing relationship between ozone and ambient temperature in NYC and Atlanta); Jacob & Winner, *supra* note 3; I.S.A. Isaksen et al., *Atmospheric composition change: Climate-Chemistry interactions*, 43 Atmospheric Env't 5138 (2009); Patrick L. Kinney, *Climate change, air quality, and human health*, 35 Am. J. Preventive Med. 459 (2008).

[26] **Ozone:** Michelle L. Bell et al., *A Meta-Analysis of Time-Series Studies of Ozone and Mortality with Comparison to the National Morbidity, Mortality, and Air Pollution Study*, 16 Epidemiology 436, 442 (2005); Kazuhiko Ito et al., *Associations Between Ozone and Daily Mortality: Analysis and Meta-Analysis*, 16 Epidemiology 446, 455 (2005); *see also* Richard L. Smith et al., *Reassessing the relationship between ozone and short-term mortality in U.S. urban communities*, 21 Inhalation Toxicology 37 (2009) (noting inter-regional variation in ozone risk thresholds). **PM:** L. Perez et al., *Saharan dust, particulate matter and cause-specific mortality: A case-crossover study in Barcelona (Spain)*, 48 Env't Int'l 150, 152 (2012); Johanna Lepeule et al., *Chronic Exposure to Fine Particles and Mortality: An Extended Follow-up of the*

higher ambient temperatures expected to result increasingly from climate change will increase mortality rates in turn by promoting ozone and PM formation.[27] Furthermore, the mortality effects of this heat-and-pollution combination are synergistic, meaning that they do more damage together than either would do independently.[28]

Climate change also promotes potentially deadly air pollution by causing more frequent and intense wildfires. That is, climate change reduces precipitation and snowpack, and causes earlier snowmelts and longer hot seasons, all of which make wildfires more frequent and widespread.[29]

Harvard Six Cities Study from 1974 to 2009, 120 Envtl. Health Persps. 965, 968 (2012); U.S. Envtl. Prot. Agency, *Expanded Expert Judgment Assessment of the Concentration-Response Relationship Between $PM_{2.5}$ and Mortality: Final Report* vii, 3-20 to 3-24 (2006).

[27] Kim Knowlton et al., *Assessing Ozone-Related Health Impacts under a Changing Climate*, 112 Envtl. Health Persps. 1557, 1559–60, 1562 (2004) (estimating significant increase in mortality by 2050 as a result of increase in ground-level ozone attendant to climate change); Jonathan A. Patz, *Climate Change and Health: New Research Challenges*, 6 Ecosystem Health 52 (2000) (identifying strong positive association between ozone formation and ambient temperatures above 90°F/32°C).

[28] Rom & Pinkerton, *supra* note 6, at 11.

[29] X. Yue et al., *Ensemble projections of wildfire activity and carbonaceous aerosol concentrations over the western United States in the mid-21st century*, 77 Atmospheric Env't 767, 768, 779 (2013); A.L. Westerling & B.P. Bryant, *Climate change and wildfire in California*, 87 Climate Change (Supp. 1) S231, S231–32 (2008) (describing relationship between reduced precipitation and snowpack, earlier snowmelt, warmer spring and summer seasons, and fire frequency).

Those wildfires in turn generate enormous volumes of air pollution—specifically ozone precursors and highly toxic PM[30]—that drift tens, even hundreds of miles downwind from the actual blaze.[31] Research has tallied clear impacts on human health, including increased mortality, from fire-born pollution.[32] Given the wildfire-promoting

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[30] Daniel A. Jaffe & Nicole L Wigder, *Ozone production from wildfires: A critical review*, 51 Atmospheric Env't 1, 2, 7 (2012); Teresa C. Wegesser et al., *California Wildfires of 2008: Coarse and Fine Particulate Matter Toxicity*, 117 Envtl. Health Persps. 893, 895–96 (2009) (describing greater toxicity of PM generated by wildfire as comparable to breathing ten times the level of the PM found in California's ambient air under normal conditions); G.G. Pfister et al., *Impacts of the fall 2007 California wildfires on surface ozone: Integrating local observations with global model simulations*, 35 Geophysical Res. Letters L19814 (2008).

[31] Tim K. Takaro et al., *Climate change and respiratory health: current evidence and knowledge gaps*, 7 Expert Rev. Respiratory Med. 349, 350 (2013); Isabelle Bey et al., *Global modeling of tropospheric chemistry with assimilated meteorology: Model description and evaluation*, 106 J. Geophysical Res.: Atmospheres 23073 (2001).

[32] Ana G. Rappold et al., *Cardio-respiratory outcomes associated with exposure to wildfire smoke are modified by measures of community health*, 11 Envtl. Health, Sept. 24, 2012; Fay H. Johnston et al., *Estimated Global Mortality Attributable to Smoke from Landscape Fires*, 120 Envtl. Health Persps. 695 (2012) (estimating that inhalation of smoke from landscape fires worldwide leads to approximately 339,000 deaths annually); Otto O. Hänninen et al., *Population exposure to fine particles and estimated excess mortality in Finland from an East European wildfire episode,* 19 J. Exposure Sci. & Envtl. Epidemiology 414, 421–22 (2009).

trends that follow from climate change, those impacts are expected to grow.[33]

B. Children and the Elderly Will Feel Climate Change's Adverse Impacts Most Acutely

Children younger than five years and adults older than sixty-five are at greater risk than others for various adverse health impacts linked to climate change. In particular, these populations are both more susceptible to developing chronic illnesses as a result of climate-related environmental factors and are also more likely to experience acute episodes of illness.

Several researchers have identified likely climate change-related impacts on children's health. Some of those impacts, including chronic respiratory illness,[34] chronic non-respiratory illness,[35] and hospitalizations prompted by asthma attacks,[36] owe to children's greater susceptibility to

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[33] *See* Yue et al., *supra* note 29, at 779.

[34] Parinaz Poursafa et al., *The relationship of air pollution and surrogate markers of endothelial dysfunction in a population-based sample of children*, 11 BMC Pub. Health 115 (2011).

[35] Roya Kelishadi & Parinaz Poursafa, *Air pollution and non-respiratory health hazards for children*, 6 Archives Med. Sci. 483 (2010).

[36] *See, e.g.*, Roya Kelishadi & Parinaz Poursafa, *The Effects of Climate Change and Air Pollution on Children and Mothers' Health*, in *Global Climate Change and Public Health* 273, 275–76 (Kent E. Pinkerton & William N. Rom eds., 2014) (listing acute and chronic ailments likely to become more incident in children as a result of climate change and

pollutants in the ambient air. That susceptibility arises, in turn, from children's behavior (they generally spend more time outdoors than adults) and physiology (they have higher rates of respiration and immature organs and immune systems).[37] Other impacts relate to children's greater susceptibility to high temperatures and heat waves,[38] which is consistent with their relative inability to regulate body temperature as well as adults younger than sixty-five.[39]

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attendant air pollution promotion); N. Mireku et al., *Changes in weather and the effects on pediatric asthma exacerbations*, 103 Annals of Allergy, Asthma, & Immunology 220, 223–24 (2009) (identifying relationship between weather and frequency of hospital visits by pediatric asthma patients).

[37] J.J. Kim et al., Am. Acad. of Pediatrics Comm. on Envtl. Health, *Ambient Air Pollution: Health Hazards to Children*, 114 Pediatrics 1699 (2004); Kelishadi & Poursafa, *supra* note 35, at 484.

[38] Xiaofang Ye et al., *Ambient Temperature and Morbidity: A Review of Epidemiological Evidence*, 120 Envtl. Health Persps. 19, 26 (2012) (noting that rates of hospital admissions reflect greater temperature-related risks for children and elderly); Kim Knowlton et al., *The 2006 California Heat Wave: Impacts on Hospitalizations and Emergency Department Visits*, 117 Envtl. Health Persps. 61 (2009) (observing greater risk of heat-related emergency department visits for children ages 0–4); Rupa Basu & Bart D. Ostro, *A multicounty analysis identifying the populations vulnerable to mortality associated with high ambient temperature in California*, 168 Am. J. Epidemiology 632, 634 (2008) (identifying heightened mortality risk for infants younger than one year).

[39] Margolis, *supra* note 22, at 100–103. At least one study has also identified a clear relationship between ambient temperature and the onset of premature labor. Rupa Basu et al., *High Ambient Temperature and the Risk of Preterm Delivery*, 172 Am. J. Epidemiology 1108 (2012).

Even more than young children, adults aged sixty-five and older face a number of heightened health risks owing to climate change. They are more likely to be hospitalized or to die as a result of high temperatures and heat waves.[40] They are expected to experience more frequent acute cardiovascular and respiratory illnesses, as well as strokes, as a result of the heat and pollution promotion attendant to climate change.[41] Climate change is, therefore, expected to inflict greater health risks and costlier medical care on older Americans.

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[40] Janet L. Gamble et al., *Climate Change and Older Americans: State of the Science*, 121 Envtl. Health Persps. 15 (2013); Antonella Zanobetti et al., *Summer temperature variability and long-term survival among elderly people with chronic disease*, 109 Proc. Nat'l Acad. Sci. 6608 (2012); Rupa Basu, *High ambient temperature and mortality: a review of epidemiologic studies from 2001 to 2008*, 8 Envtl. Health, Sept. 16, 2009; M. Stafoggia et al., *Factors affecting in-hospital heat-related mortality: a multi-city case-crossover analysis*, 17 Epidemiology 315 (2006).

[41] G. Brooke Anderson et al., *Heat-related Emergency Hospitalizations for Respiratory Illnesses in the Medicare Population*, 187 Am. J. Respiratory & Critical Care Med. 1098 (2013); Youn-Hee Lim et al., *Effects of diurnal temperature range on cardiovascular and respiratory hospital admissions in Korea*, 417–418 Sci. Total Env't 55, 56–57, 60 (2012).

C. Sufferers of Allergies and Asthma Will Experience Greater Difficulties and Health Risks as a Result of Climate Change

GHG emissions and the temperature changes attendant to climate change are causing plants to generate more pollen.[42] Urban heat islands magnify this effect in and around cities.[43] More frequent and severe thunderstorms, which can cause sudden pollen releases, are another way that climate change promotes pollen in the ambient air. [44]

More pollen, in turn, causes more allergic and non-allergic diseases.[45] Ragweed, for instance,

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[42] Ziska et al., *supra* note 4; Ilginc Kizilpinar et al., *Pollen counts and their relationship to meteorological factors in Ankara, Turkey during 2005–2008*, 55 Int'l J. Biometeorology 623, 629–30 (2011); Julie Wolf et al., *Elevated atmospheric carbon dioxide concentrations amplify Alternaria alternata sporulation and total antigen production*, 118 Envtl. Health Persps. 1223 (2010).

[43] Rom & Pinkerton, *supra* note 6, at 12.

[44] Shuaib M. Nasser & Thomas B. Pulimood, *Allergens and Thunderstorm Asthma*, 9 Current Allergy & Asthma Rep. 384, 387–88 (2009); A.E. Dennis Wardman et al., *Thunderstorm-associated asthma or shortness of breath epidemic: A Canadian case report*, 9 Canadian Respiratory J. 267 (2002).

[45] *See, e.g.*, L.A. Darrow et al., *Ambient pollen concentrations and emergency department visits for asthma and wheezing*, 130 J. Allergy & Clinical Immunology 630 (2012); Léa Héguy et al., *Associations between grass and weed pollen and emergency department visits for asthma among children in Montreal*, 106 Envtl. Res. 203 (2012) (linking pollen to asthma exacerbation); Perry E. Sheffield et al., *The Association of Tree Pollen Concentration Peaks and Allergy*

produces allergenic pollen at a rate that rises and falls with ambient CO_2 levels,[46] which are increasing apace.[47] Ragweed also spurs a chemical response from human cells that tends to stimulate lung inflammation[48] and can thereby cause upper and lower respiratory tract symptoms even in people who do not normally suffer allergic asthma, allergic rhinitis (hay fever), or allergic conjunctivitis (pink eye).[49]

Increasing pollen counts and longer allergy seasons have significant impacts on the health and wellbeing of the roughly 16.9 million American adults and 6.7 million American children who have been diagnosed with hay fever.[50] (Other less

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Medication Sales in New York City: 2003–2008, 2011 ISRN Allergy, no. 537194, at 1, 4–6 (identifying clear relationship between consumption of allergy medication and local pollen concentrations); C. Porsbjerg et al., *Allergen sensitization and allergen exposure in Greenlander Inuit residing in Denmark and Greenland*, 96 Respiratory Med. 736 (2002) (identifying increased incidence of allergic reactions following greater allergen exposure).

[46] Peter Wayne et al., *Production of allergenic pollen by ragweed (Ambrosia artemisiifolia L.) is increased in CO_2-enriched atmospheres*, 88 Annals Allergy Asthma & Immunology 279 (2002).

[47] Rom & Pinkerton, *supra* note 6, at 1–2.

[48] Aliz Varga et al., *Ragweed pollen extract intensifies lipopolysaccharide-induced priming of NLRP3 inflammasome in human macrophages*, 138 Immunology 392 (2013).

[49] Anthony M. Szema, *Asthma, Hay Fever, Pollen, and Climate Change*, in *Global Climate Change and Public Health* 155, 156 (Kent E. Pinkerton & William N. Rom eds., 2014).

[50] Jeannine S. Schiller et al., Centers for Disease Control (CDC), Nat'l Ctr. for Health Stats., *Summary Health Statistics for U.S. Adults: National Health Interview Survey,*

conservative estimates put the number of American hay fever sufferers somewhere between 30 to 90 million, including as many as forty percent of American children.[51]) Hay fever symptoms, which range from inconvenient to debilitating, not only impair the quality of life of millions of Americans, but also impose substantial costs on the health care system.[52]

Longer, more potent allergy seasons also promise difficulties for the 25.7 million Americans (8.4 percent) who suffer from asthma—a number that includes 7.0 million children or 9.5 percent of Americans under eighteen.[53] Asthma inflames and

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2011, Vital Health Stats. ser. 10, no. 256, at 22, tbl. 3 (2012); Barbara Bloom et al., CDC, Nat'l Ctr. for Health Stats., *Summary Health Statistics for U.S. Children: National Health Interview Survey, 2011*, Vital Health Stats. ser. 10, no. 254, at 11, tbl. 2 (2012).

[51] Patrick L. Kinney et al., *Climate, Air Quality, and Allergy: Emerging Methods for Detecting Linkages*, in *Global Climate Change and Public Health* 121, 130 (Kent E. Pinkerton & William N. Rom eds., 2014).

[52] Susan M. Schappert & Elizabeth A. Rechtsteiner, CDC, Nat'l Ctr. for Health Stats., *Ambulatory medical care utilization estimates for 2007*, Vital Health Stats., ser. 13, no. 169, at 23 tbl.7 (2011) (tallying ambulatory care visits owing to allergic rhinitis); Robert A. Nathan, *The burden of allergic rhinitis*, 28 Allergy & Asthma Proc. 3 (2007) (describing symptoms, impacts on quality of life, and costs of treatment).

[53] *See* Jeanne E. Moorman et al., CDC, Nat'l Ctr. for Health Stats., *National Surveillance of Asthma: United States, 2001–2010*, Vital Health Stats. ser. 3, no. 35, at 3–4 (2012); *see also* Lara J. Akinbami, CDC, Nat'l Ctr. for Health Stats., *The State of Childhood Asthma, United States: 1980–2005*, Advance Data from Vital and Health Stats., no. 381 (2006) (reporting growing asthma prevalence); David M. Mannino et

narrows airways in the lungs, making it difficult to breathe.[54] An asthma attack (or "exacerbation") is dangerous and painful, often requires medical attention—if not emergency medical treatment—and can debilitate its victim for several hours or days after the acute episode passes.[55] Recurrent exacerbations can cause permanent airway damage and often require expensive medical care.[56] Several studies have traced higher numbers of asthma-related emergency department visits to higher temperatures and pollen counts.[57] As those underlying factors increase as a result climate change, the prevalence and severity of asthma attacks are expected to increase as well.[58]

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al., *Surveillance for Asthma: United States, 1960–1995*, 47 Morbidity & Mortality Weekly Rep. 1 (1998) (same).

[54] Nat'l Heart, Lung, and Blood Institute, Nat'l Insts. of Health, *At a Glance: Asthma*, Pub. No. 09-7429, at 1 (2009).

[55] Susan M. Pollart et al., *Management of acute asthma exacerbations*, 84 Am. Family Physician 40 (2011); Mary E. Strek, *Difficult asthma*, 3 Proc. Am. Thoracic Soc'y 116 (2006); E.R. McFadden, Jr., *Acute Severe Asthma*, 168 Am. J. Respiratory & Critical Care Med. 740 (2003).

[56] Gary S. Rachelefsky, *From the page to the clinic: Implementing new National Asthma Education and Prevention Program guidelines*, 9 Clinical Cornerstone 9, 9–10 (2009); Stuart W. Stoloff & Homer A. Boushey, *Severity, control and responsiveness in asthma*, 1 J. Allergy & Clinical Immunology 544 (2006).

[57] Y. Chen et al., *Atmospheric Temperature & Pollen Counts Impact New York City Asthma ER Visits*, 125 J. Allergy & Clinical Immunology (Supp. 2), Ab208 (2010).

[58] L. Cecchi et al., *Projections of the effects of climate change on allergic asthma: the contribution of aerobiology*, 65 Allergy 1073 (2010).

Notably, research suggests not only that climate change will make life harder for people with allergic diseases, such as hay fever and asthma, but also that such diseases will likely become ever more prevalent, if current climate change trends persist.[59]

D. Sufferers of Cardiovascular and Cardiopulmonary Diseases, Diabetes, and Kidney Disease Will Also Experience Greater Health Risks as a Result of Climate Change

Non-respiratory diseases are also expected to become more difficult to endure and more dangerous as a result of climate change. The chief factors linking climate change to those diseases include high temperatures and heat waves, wildfires, and air pollution promotion.

Multiple studies have traced jumps in hospital admissions for myocardial infarctions and acute episodes of congestive heart failure to higher ambient temperatures and heat waves.[60] One British study, which examined that pattern on an

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[59] *Id.*; G. D'Amato & L. Cecchi, *Effects of climate change on environmental factors in respiratory allergic diseases*. 38 Clinical & Experimental Allergy 1264 (2008).

[60] *See, e.g.*, Lim et al., *supra* note 41, at 60; Rochelle S. Green et al., *The effect of temperature on hospital admissions in nine California counties*, 55 Int'l J. Pub. Health 113, 118 (2010); Joel Schwartz et al., *Hospital admissions for heart disease: the effects of temperature and humidity*, 15 Epidemiology 755 (2004).

hourly basis, found that the incidence of myocardial infarction rose within one to six hours of ambient temperature exceeding twenty degrees Centigrade (sixty-eight degrees Fahrenheit).[61] Furthermore, as well as spurring more frequent exacerbations of heart disease, hotter weather generally makes heart disease deadlier for older people.[62]

Several studies of climate-driven changes in rates of hospital visits have also identified a list of other diseases that appear to flare up amid higher temperatures and heat waves, whether because of the heat alone or because of the additional air pollution generated in higher temperatures, or both.[63] Those diseases include diabetes, chronic obstructive pulmonary disease (COPD), stroke, and kidney failure.[64]

Wildfires, which are expected to increase due to climate change, have also been identified as a likely cause of increased hospitalization for acute

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[61] Krishnan Bhaskaran et al., *Heat and risk of myocardial infarction: hourly level case-crossover analysis of MINAP database*, 345 British Med. J., Dec. 13, 2012 (observing 1.9% increase in risk of heart attack for each degree above 20°C in ambient air temperature).

[62] Zanobetti et al., *supra* note 40, at 6611.

[63] Knowlton et al., *supra* note 38, at 64 (noting that usual rate of visits prompted by diabetes-related symptoms increased by about eight percent during heat wave); Rupa Basu et al., *The effect of high ambient temperature on emergency room visits*, 23 Epidemiology 813, 817–18 (2012); Kim Knowlton et al., *supra* note 27.

[64] Knowlton et al., *supra* note 38, at 62–65; Basu et al., *supra* note 63, at 817.

episodes of COPD[65] and of congestive heart failure.[66]

II. BY ADDRESSING THE GHG EMISSIONS BEHIND CLIMATE CHANGE, EPA CARRIES OUT THE CLEAN AIR ACT'S MANDATE TO PROTECT PUBLIC HEALTH

As this Court has recognized, anthropogenic GHG emissions are air pollutants that harm public health. *See Massachusetts v. EPA*, 549 U.S. 497, 521, 528–29 (2007) ("The harms associated with climate change are serious and well recognized"; "The Clean Air Act's sweeping definition of 'air pollutant' includes . . . [GHGs]"). GHGs are, therefore, subject to the Clean Air Act, which requires EPA to regulate pollutants that endanger public health and welfare. 42 U.S.C. § 7602(g) (defining "air pollutant"); 74 Fed. Reg. 66,496 (Dec. 15, 2009) (endangerment and causation findings); 75 Fed. Reg. 17,004 (Apr. 2, 2010) (explaining when GHGs became subject to regulation under Clean Air Act). Nothing in Part C of the Act—which includes the Prevention of Significant Deterioration (PSD) program—exempts GHGs from regulation.

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[65] Sarah B. Henderson & Fay H. Johnston, *Measures of forest fire smoke exposure and their associations with respiratory health outcomes*, 12 Current Opinion in Allergy & Clinical Immunology 221 (2012).

[66] Ana G. Rappold et al., *Peat Bog Wildfire Smoke Exposure in Rural North Carolina is Associated with Cardiopulmonary Emergency Department Visits Assessed through Syndromic Surveillance*, 119 Envtl. Health Persps. 1415, 1415–18 (2011).

See 42 U.S.C. § 7479(1) (defining "major emitting facility" subject to PSD program as one that emits "any air pollutant" in excess of statutory thresholds).

EPA's approach to regulating GHGs under the PSD program—the Tailoring Rule—satisfies the Act's mandate to protect Americans' public health by limiting GHG emissions as well as EPA is administratively able. *See* 75 Fed. Reg. 31,514, 31,517 (June 3, 2010). Under the Rule, PSD review reaches approximately eighty-six percent of the GHG emissions attributable to major new and modified facilities in regions subject to the PSD program. *Id.* at 31,571. Consequently, even though EPA does not impose PSD review on the millions of sources that emit GHGs in excess of statutory thresholds, it requires the largest GHG emitters to satisfy the requirements of a PSD permit, including use of the best available control technology (BACT) to limit those GHG emissions. *See* 42 U.S.C. §§ 7475(a)(4) (requiring BACT use), 7479(3) (defining BACT).

A. Subjecting GHG Emitters to the PSD Program Both Regulates GHGs and Delivers Co-Benefits for Public Health

EPA's approach regulates stationary facilities that emit enormous volumes of GHGs[67]—a

[67] *See* James E. McCarthy, Cong. Res. Serv., R43127, *EPA Standards for Greenhouse Gas Emissions from Power Plants: Many Questions, Some Answers* 2 (2013) (noting that EPA

category of sources that no effective effort to address climate change can ignore. Notably, EPA's approach also expands PSD review to encompass sources of criteria pollutants that, because they are located in regions plagued by relatively little ambient air pollution, would not otherwise be subject to PSD permitting.[68] In this way, EPA achieves the benefits of regulating GHG emissions and the co-benefits of reducing emissions of pollutants like ozone and PM. *See* EPA, EPA-547/B-11-001, PSD and Title V Permitting Guidance for Greenhouse Gases, 21, 41–46 (2011) (anticipating achievement of GHG emissions reductions chiefly through energy efficiency improvements and noting that such improvements generally reduce co-pollutants). Researchers have long argued that this type of indirect benefit is a compelling reason to impose GHG emission controls on mobile and stationary sources.[69] Their argument is no less valid here.

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had issued 110 GHG permits to stationary sources as of September 2013).

[68] Clean Air Act Advisory Committee, *Air Permitting Streamlining Techniques and Approaches for Greenhouse Gases: Final Report* 10 (2012) (discussing "anyway" sources that must seek PSD permits regardless of GHG emissions levels and "not-anyway" sources that would not have to seek PSD permits but for Tailoring Rule's GHG limitations).

[69] *See* J. Jason West et al., *Co-benefits of mitigating global greenhouse gas emissions for future air quality and human health*, 3 Nature: Climate Change 885 (2013); Douglas Crawford-Brown et al., *Ozone and PM related health co-benefits of climate change policies in Mexico*, 17 Envtl. Sci. & Pol'y 33 (2012); Ying Li & Douglas J. Crawford-Brown, *Assessing the co-benefits of greenhouse gas reduction: Health*

B. Adopting the American Chemistry Council's Proposal Would Curtail EPA's Authority to Regulate *All* Non-Criteria Pollutants

The American Chemistry Council (ACC) asks this Court to rewrite the Clean Air Act rather than adopt the interpretation of the Act espoused by EPA, state agencies, and federal courts for 35 years. Specifically, ACC proposes that only emissions of a criteria pollutant[70] should trigger the requirement that an emitting facility seek EPA's review under the PSD program. (*See* ACC Br. 15–18, 29 n.12.) ACC does not acknowledge that the effects of its proposal extend well beyond EPA's treatment of GHG emissions. Indeed, ACC's proposal is actually a revision of the PSD program that excludes *all* non-criteria pollutants—not only the GHGs discussed in ACC's brief—from the list of

benefits of particulate matter related inspection and maintenance programs in Bangkok, Thailand, 409 Sci. Total Env't 1774 (2011); G.F. Nemet et al., *Implications of incorporating air-quality co-benefits into climate change policymaking*, 5 Envtl. Res. Letters, Jan. 2010, at 1 (surveying 37 peer-reviewed studies that estimate air quality co-benefits of GHG emissions reduction); J. Jason West et al., *Global health benefits of mitigating ozone pollution with methane emission controls*, 103 Proc. Nat'l Acad. Sci. 3988 (2006).

[70] "Criteria pollutants" are six commonly occurring chemicals or compounds for which EPA establishes health-based thresholds, embodied in National Ambient Air Quality Standards *See* 42 U.S.C. § 7409. They are ozone, PM, carbon monoxide, several forms of nitrogen oxide, sulfur dioxide, and lead. 40 C.F.R. part 50.

pollutants that trigger PSD review. In sum, ACC's proposal would put human health at risk, ignore the Clean Air Act's plain meaning, and depart from decades of settled legal interpretation and regulatory practice.

ACC's blanket exemption of non-criteria pollutants from PSD review could jeopardize public health. The adverse health effects of non-criteria pollutants currently subject to PSD review, such as fluorides and hydrogen sulfide, are well documented. Symptoms of hydrogen fluoride inhalation range from irritation of the mucous membranes and bronchoconstriction to pulmonary edema, partial or complete lung collapse, and even death.[71] Hydrogen sulfide inhalation can cause eye and throat irritation, headache, and delirium, and both high- and low-level exposures have been linked to lasting neurobehavioral effects.[72] PSD permits condition emissions of such non-criteria pollutants on the use of BACT and thereby limit

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[71] *The Emergency Response Safety and Health Database: Hydrogen Fluoride/Hydrofluoric Acid*, CDC (June 18, 2013), http://www.cdc.gov/niosh/ershdb/EmergencyResponseCard_29750030.html.

[72] *Medical Management Guidelines for Hydrogen Sulfide*, Agency for Toxic Substance and Disease Registry (2013), http://www.atsdr.cdc.gov/MMG/MMG.asp?id=249&tid=46#bookmark2; Kaye H. Kilburn, *Effects of Hydrogen Sulfide on Neurobehavioral Function*, 96 Southern Med. J. 639 (2003) (describing lasting neurological symptoms following both residential and workplace exposures); Thomas H. Milby & Randall C. Baselt, *Hydrogen Sulfide Poisoning: Clarification of Some Controversial Issues*, 35 Am. J. Indust. Med. 192, 192 (1999) (describing lasting effects from low-level exposures).

the concentration of those pollutants in the ambient air. Adopting ACC's proposal would, therefore, do much more than simply carve GHGs out of the PSD program; it would hobble EPA in its effort to follow the Clean Air Act's mandate to "protect public health and welfare from any actual or potential adverse effect," 42 U.S.C. § 7470(1), with respect to harmful non-criteria air pollutants.

ACC's proposal also ignores EPA and state-agencies' longstanding view that, under the Clean Air Act, emissions of non-criteria pollutants trigger PSD permitting obligations. Those agencies have acted accordingly by requiring PSD review of hundreds of sources of these pollutants in service to public health and welfare. *See, e.g.*, Ohio EPA, Staff Determination for the Application to Construct Under the Prevention of Significant Deterioration Regulations, App. No. 16-02379, at 2–3 (Jan. 11, 2005) (noting that any "regulated pollutant" could trigger PSD permitting requirements and that hydro chlorofluorocarbon (HCFC) emissions did so here); Illinois EPA, Approval of Permit No. 0103002, at 1 (Dec. 12, 2001) (PSD permitting requirement triggered by facility's HCFC emissions); EPA, Approval to Construct/Modify A Stationary Source, Permit No. NC-79-08, at 3, 5 (July 15, 1981) (PSD permitting requirement triggered by hydrogen sulfide emissions); *see also* 67 Fed. Reg. 80,186, 80,240 (Dec. 31, 2002) (identifying 21 categories of air pollutant, including 15 non-criteria pollutants, that "are subject to Federal PSD review and permitting requirements."); EPA, RACT / BACT / LAER

Clearinghouse, http://cfpub.epa.gov/rblc/ (listing for 1980–2014 time period 439 facilities in receipt of permits for sulfuric acid mist emissions, 128 for hydrogen sulfide emissions, among others). ACC's suggested change would eliminate the basis for those actions and others like them—not because ACC objects to those actions, but as an incidental consequence of cabining EPA's authority to address GHG air pollutants under the PSD program. Put another way, ACC improperly asks this Court to legislate and to do so notwithstanding significant collateral consequences.

CONCLUSION

For the foregoing reasons, *amicus* American Thoracic Society urges this Court to protect the health of millions of Americans by affirming the D.C. Circuit's decision.

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