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# Scientific Uncertainty and the Regulation of Greenhouse Gases under the Clean Air Act

## INTRODUCTION

In *American Farm Bureau v. Environmental Protection Agency* (*Am. Farm*), the court held that the EPA may not disregard findings based on insufficient evidence without adequate reasoning.<sup>1</sup> Thus, the court in *Am. Farm* upheld the principle that while science may only provide imperfect and limited information, the EPA may not justify lack of action with such uncertainty if there are logical or qualitative means to set standards under the Clean Air Act (CAA). Establishing regulations for greenhouse gases under the CAA will push the EPA into uncomfortable territory because it will be required to set standards despite inherent uncertainties regarding the impacts of climate change on human health and welfare.<sup>2</sup> The EPA has not yet established National Ambient Air Quality Standards (NAAQS) for greenhouse gasses under the CAA. However, once NAAQS for greenhouse gases are set, the principles enumerated by the court in *Am. Farm* should guide courts when reviewing the regulation of greenhouse gases under the CAA in light of scientific uncertainty.

## I. BACKGROUND

The purpose of the CAA is to protect human health and welfare by reducing air pollution through NAAQS.<sup>3</sup> The EPA is charged with setting NAAQS, and during this process, it considers information from its staff and the recommendations of the Clean Air Scientific Advisory Committee (CASAC), an independent scientific review committee.<sup>4</sup> The EPA must establish two NAAQS for each pollutant: a primary standard, based on public health, and a secondary standard, based on public welfare.<sup>5</sup> The EPA must review and revise NAAQS every five years.<sup>6</sup>

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1. See *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512, 525–26 (D.C. Cir. 2009).
2. See Janine Manely, *Carbon Dioxide Emissions, Climate Change, and the Clean Air Act: An Analysis of Whether Carbon Dioxide Should Be Listed As a Criteria Pollutant*, 13 N.Y.U. ENVTL. L.J. 298, 375–76 (2005).
3. See 42 U.S.C. § 7408(a)(1)(A) (2006).
4. *Am. Farm*, 559 F.3d at 516.
5. *Id.*

Unfortunately, regulation under the CAA suffers because of the EPA's reluctance to strengthen regulations in the face of what the agency claims is a lack of sufficient scientific data.<sup>7</sup> The congressional purpose of the CAA, though, is to set standards which are precautionary, forward-looking, and based upon projected technological advances.<sup>8</sup> This purpose necessarily results in regulating amidst uncertainty. Despite this precautionary goal, the EPA often uses uncertainty as a facade to hide difficult legal and policy issues.<sup>9</sup> However, regulation under the CAA require the agency to make public health policy judgments despite "gaps and uncertainties" in scientific findings.<sup>10</sup> It is these judgments that the EPA has struggled to formulate without hard scientific evidence.<sup>11</sup>

In 2006, the EPA issued the 2006 standards for particulate matter (PM)<sup>12</sup> despite numerous objections by its staff and the CASAC.<sup>13</sup> *Am. Farm* was a consolidation of the various legal challenges to the update.<sup>14</sup> The EPA stated that a key factor in setting the NAAQS was its decision to rely on some scientific information while discounting other findings due to scientific uncertainties.<sup>15</sup> The court responded by critically reviewing the EPA's decision-making process. It held that the 2006 standards for fine PM were "contrary to law and unsupported by adequately reasoned decision making."<sup>16</sup> However, the court upheld the EPA's NAAQS for coarse PM because the EPA's reasoning for setting the standard based on a logical outcome rather than on a quantitative measure was valid.<sup>17</sup> The court applied prior case law, which indicated

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6. *Id.*

7. HOLLY D. DOREMUS ET AL., ENVIRONMENTAL POLICE LAW: PROBLEMS, CASES AND READINGS 610 (5th ed. 2008).

8. 42 U.S.C. §§ 7401(a)–(c) (stating that the goal of the CAA is to take actions to prevent and control air pollution, including promoting research and creating implementation programs, because air pollution is a danger to human health and welfare); Manely, *supra* note 2, at 348.

9. See Susannah Weaver, *Setting Air Quality Standards: Science and the Crisis of Accountability*, 22 TUL. ENVTL. L.J. 379, 391 (2009).

10. *Id.* at 391.

11. Susan Smith & Scott Sauls, *State Programs to Attain and Maintain Ambient Standards*, in ENVIRONMENTAL LAW PRACTICE GUIDE 33–34 (Michael B. Gerrard ed., 2009).

12. Particulate matter includes a wide range of substances "that exist as discrete particles (liquid droplets or solids)." Final Rule: National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg. 61,143, 61,146 (2006). The EPA divides PM into two groups based on size: fine and coarse. *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512, 515 (D.C. Cir. 2009). Fine PM is produced by combustion and atmospheric reactions and coarse PM comes from mechanical processes or dust. *Id.*

13. *Am. Farm*, 559 F.3d at 528–29; Weaver, *supra* note 9, at 380.

14. *Am. Farm*, 559 F.3d at 515.

15. Weaver, *supra* note 9, at 394.

16. *Am. Farm*, 559 F.3d at 515.

17. *Id.* at 533.

that the EPA must set regulations pursuant to the CAA despite imperfect knowledge.<sup>18</sup>

## II. CLIMATE CHANGE AND SCIENTIFIC UNCERTAINTY

Anthropogenic emissions of greenhouse gases occur from burning fossil fuels and through certain chemical reactions.<sup>19</sup> Amplified concentrations of greenhouse gases in the atmosphere increase the Earth's temperature, which will impact human "health, food production, and well-being."<sup>20</sup> Additionally, climate change will likely raise the number of occurrences of respiratory illnesses, diseases carried by insects and rodents, heat waves, and floods.<sup>21</sup> These impacts will disproportionately impact the poor, sensitive members of the population, and the elderly.<sup>22</sup> Further, different regions of the country will experience more intense changes in weather conditions than others.<sup>23</sup> A NAAQS for greenhouse gases should address all casual effects of the air pollutant to effectively protect human health and welfare.

Despite over a century of scientific research on the impact of greenhouse gas emissions on the Earth's climate,<sup>24</sup> uncertainty remains about what impacts will be realized, how extensive they will be, and

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18. *Lead Indus. Ass'n. v. EPA*, 647 F.2d 1130, 1162 (D.C. Cir. 1980) (holding that the EPA must set standards based on policy decisions and cannot simply refrain from setting standards due to scientific uncertainty); *Natural Res. Def. Council v. EPA*, 655 F.2d 318, 335 (D.C. Cir. 1981) (holding that the EPA can make projections which contain inherent uncertainty, subject to the restraints of reasonableness); *Ethyl Corp. v. EPA*, 541 F.2d 1, 24–25, 29 (D.C. Cir. 1979) (holding that while environmental issues are "particularly prone to uncertainty," the EPA may draw conclusions and set regulations from "suspected, but not completely substantiated, relationships between facts, from trends among facts, from theoretical projections from imperfect data, from probative preliminary data not yet certifiable as 'fact,' and the like" to set precautionary standards under the CAA).

19. Joshua Steinberg, *The Bone-Chilling Effects of Global Warming and the EPA's Cold-Shoulder Response to Pleas for Help, a Case Note on Massachusetts v. EPA*, 26 TEMP. J. SCI. TECH. & ENVTL. L. 169, 174 (2007).

20. Manely, *supra* note 2, at 309; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FOURTH ASSESSMENT REPORT: CLIMATE CHANGE 2007: SYNTHESIS REPORT, SUMMARY FOR POLICYMAKERS 7, 11–13 (2007) [hereinafter IPCC REPORT, SUMMARY FOR POLICYMAKERS], available at [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf).

21. Patricia McCubbin, *EPA's Endangerment Finding for Greenhouse Gases and the Potential Duty to Adopt National Ambient Air Quality Standards to Address Global Climate Change*, 33 S. ILL. U. L.J. 437, 438 (2009); U.S. GLOBAL CHANGE RESEARCH PROJECT, GLOBAL CLIMATE CHANGE IMPACTS IN UNITED STATES 12 (2009), available at <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts>.

22. Manely, *supra* note 2, at 354; IPCC REPORT, SUMMARY FOR POLICYMAKERS, *supra* note 20, at 9, 19.

23. Manely, *supra* note 2, at 354.

24. SPENCER WEART, A HYPERLINKED HISTORY OF CLIMATE CHANGE SCIENCE (2009), available at <http://www.aip.org/history/climate/summary.htm>.

whether mitigation will be effective.<sup>25</sup> These uncertainties exist because the carbon cycle is complex and scientists are continually studying anthropogenic carbon dioxide emissions to determine “correlations between fossil fuel burning and . . . atmospheric” carbon dioxide levels.<sup>26</sup> In addition, studies of climate change involve predictive modeling which contains variables regarding future human conduct.<sup>27</sup> However, the Intergovernmental Panel on Climate Change (IPCC), composed of over 2000 scientists, is conducting large-scale research projects which include various future scenarios to account for unknowns and uncertainties.<sup>28</sup> As scientific knowledge accumulates, the IPCC is able to measure the level of certainty with which it predicts future impacts of climate change.<sup>29</sup> Despite scientific uncertainty about the link between greenhouse gas emissions and climate change impacts, the IPCC has determined that it is very likely that climate change is occurring due to the anthropogenic release of greenhouse gases.<sup>30</sup>

In April 2009, the EPA issued a final endangerment finding that carbon dioxide from new cars and light trucks poses a threat to human health and welfare. However, the EPA’s previous stance on the regulation of greenhouse gases indicates that there will likely be many more “scientific uncertainty” hurdles to jump before the EPA issues NAAQS for greenhouse gases.<sup>31</sup> Thus, it will be important for courts to utilize sound principles regarding regulation under the CAA to ensure that the EPA establishes NAAQS which are sufficiently precautionary and meet CAA standards.<sup>32</sup>

### III. AMERICAN FARM BUREAU V. EPA: AN ANALYSIS

The decision in *Am. Farm* provides guidance for courts to assess future legal challenges if, and when, the EPA establishes NAAQS for greenhouse gases. First, the court in *Am. Farm* affirmed that the EPA

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25. Manely, *supra* note 2, at 313.

26. *Id.* at 373; IPCC REPORT, SUMMARY FOR POLICYMAKERS, *supra* note 20, at 5.

27. Manely, *supra* note 2, at 311–13.

28. *Id.* at 372, 375; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FOURTH ASSESSMENT REPORT: CLIMATE CHANGE 2007: WORKING GROUP I: THE PHYSICAL SCIENTIFIC BASIS: SUMMARY FOR POLICYMAKERS 2 (2007) [hereinafter IPCC, PHYSICAL SCIENTIFIC BASIS], available at <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>.

29. See generally IPCC REPORT, PHYSICAL SCIENTIFIC BASIS, *supra* note 28, at 10; IPCC REPORT, SUMMARY FOR POLICYMAKERS, *supra* note 20, at 2.

30. IPCC REPORT, PHYSICAL SCIENTIFIC BASIS, *supra* note 28, at 10.

31. Cf. McCubbin, *supra* note 21, at 439–40, 442, 445 (evidence of past reluctance by the EPA to regulate carbon dioxide shows that the EPA may be hesitant to set NAAQS for carbon dioxide in the future).

32. Manely, *supra* note 2, at 351.

must thoroughly explain its reasoning and consider all available scientific information.<sup>33</sup> Next, the court stated that the EPA must use studies on sensitive populations.<sup>34</sup> The court also held that the EPA must set standards for protecting the public welfare, but did not address whether standards based on studies of subjective values are adequate.<sup>35</sup> Finally, the court upheld the EPA's decision to set regulations based on a qualitative rather than a quantitative standard.<sup>36</sup> Due to the high level of scientific uncertainty surrounding climate change, and the normative judgments inherent to climate change mitigation, the *Am. Farm* decision will help courts assess the adequacy of NAAQS for greenhouse gases.

Individual studies on greenhouse gas emissions may only address one aspect of climate change. However, scientific evidence as a whole does show, with high levels of certainty, the likely consequences of climate change.<sup>37</sup> Studies on climate change require predicting population growth and economic development to assess increases in the Earth's temperature.<sup>38</sup> At first glance, these studies appear to be hindered by uncertainty. However, studies by both the IPCC and U.S. State Department produced complementary findings—although the findings were not identical, they were also not contradictory.<sup>39</sup> The *Am. Farm* court held that if the EPA found that a particular study did not provide adequate certainty to set regulations, the agency must consider related studies, even if the studies differ in some respect.<sup>40</sup> The court also insisted that the EPA assess both short-term and long-term studies when setting annual NAAQS standards, not just the more relevant long-term studies.<sup>41</sup> Thus, *Am. Farm* provides precedent that will help ensure that the EPA evaluates *all* pertinent studies when setting NAAQS for greenhouse gases. Doing so will result in final decisions that are well-reasoned and comprehensive.<sup>42</sup>

Another challenge associated with the regulation of greenhouse gases is the likelihood that climate change will impact some subsets of the population more severely than others.<sup>43</sup> The 1970 Senate Report on the

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33. *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512, 521–23 (D.C. Cir. 2009).

34. *Id.* at 525–26.

35. *Id.* at 530.

36. *Id.* at 535.

37. Manely, *supra* note 2, at 313–14; IPCC REPORT, PHYSICAL SCIENTIFIC BASIS, *supra* note 28, at 8.

38. Manely, *supra* note 2, at 311–12.

39. *See generally id.* at 312–16.

40. *Am. Farm*, 559 F.3d at 524–25.

41. *Id.* at 521–22.

42. *See id.*

43. Manely, *supra* note 2, at 354. *See generally* IPCC REPORT, SUMMARY FOR POLICYMAKERS, *supra* note 20.

CAA stated that sensitive populations should be protected by the CAA and taken into consideration when the EPA establishes primary NAAQS.<sup>44</sup> In *Am. Farm*, the EPA did not account for disparate impacts on sensitive populations because it did not review studies which specifically focused on these populations when it set the 2006 fine PM standard.<sup>45</sup> The court in *Am. Farm* held that the EPA must consider sensitive populations when setting standards.<sup>46</sup> Courts should use this holding when reviewing EPA regulation of greenhouse gases because effects will vary depending on region, livelihood, and socio-economic class.<sup>47</sup> Disparities in impacts will pose a special challenge for the EPA, and future courts must ensure that the EPA does not neglect to protect adversely impacted population subsets.<sup>48</sup>

Additionally, many impacts from climate change affect the public welfare.<sup>49</sup> Under the CAA, the EPA is required to regulate pollutants which “may reasonably be anticipated to endanger public health or welfare.”<sup>50</sup> Since the CAA requires the EPA to set standards which it “judges are necessary” to protect human health and welfare, the statute itself indicates that although the standard must be based on scientific evidence, there is inherent uncertainty in standards which protect the public welfare.<sup>51</sup> In *Am. Farm*, the EPA argued that the studies its staff and CASAC relied upon were too subjective because the studies measured the acceptable level of visibility based on each participant’s personal preferences.<sup>52</sup> The court responded by holding that the EPA must establish a secondary NAAQS to protect human welfare and that scientific uncertainty did not allow the EPA to avoid its responsibilities.<sup>53</sup> While the court did not decide whether the EPA could reasonably rely on these subjective studies, the EPA should consider the possibility that protecting human welfare may include subjective judgments.<sup>54</sup>

Finally, regulation of greenhouse gases will necessarily involve choosing subjective goals based upon scientific evidence that does not

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44. S. Rep. No. 91-1196, at 10 (1970); Manely, *supra* note 2, at 353.

45. *See Am. Farm*, 559 F.3d at 526.

46. *Id.*

47. Manely, *supra* note 2, at 354; IPCC REPORT, SUMMARY FOR POLICYMAKERS, *supra* note 20, at 9, 19.

48. Manely, *supra* note 2, at 354.

49. *Id.* at 367.

50. 42 U.S.C. § 7408(a)(1)(A) (2006).

51. 40 C.F.R. § 50.2. (2009).

52. *Am. Farm*, 559 F.3d at 528–29.

53. *Id.* at 530 (noting that while the court did not address whether the EPA could have relied on subjective studies, the court did not allow the EPA to fail to set standards due to the uncertainty associated with available information).

54. 42 U.S.C. §7408(a)(1)(A).

provide precise guidelines.<sup>55</sup> For example, the EPA must determine what magnitude of sea level rise will not greatly impact human welfare, and then prevent additional sea level rise through regulation. The EPA has a tendency to circumvent making decisions which require normative judgments by citing great scientific uncertainty as a justification.<sup>56</sup> However, in *Am. Farm*, the EPA explained its choice to set a measure for coarse PM that included fine PM because coarse PM caused the greatest number of health problems when levels of fine PM were high.<sup>57</sup> The EPA reasoned that requiring lower levels of coarse PM in areas with high fine PM levels, reducing the health impacts of coarse PM when it is most dangerous.<sup>58</sup> The court ruled that even though the EPA used a qualitative, rather than quantitative measure, its reasoning was valid.<sup>59</sup> Thus, while the EPA must set a standard to regulate greenhouse gases based on available scientific information, that standard may also include reasonable judgments or logical decision making.<sup>60</sup>

#### CONCLUSION

Although the general standard of review for EPA decisions is to assume validity, *Am. Farm* required the EPA to rethink and explain its reasoning when it failed to update NAAQS due to a lack of scientific information.<sup>61</sup> Given the great uncertainties surrounding climate change and the corresponding need for a precautionary outlook, judicial oversight will be critical to the regulation of greenhouse gasses.<sup>62</sup> The EPA will be required to make logical, qualitative, and policy judgments when it cannot rely on scientific findings alone to establish NAAQS.<sup>63</sup> Additionally, the EPA should be mindful of the *Am. Farm* decision, by establishing NAAQS for greenhouse gases which take into account all relevant studies, sensitive populations, and the public welfare despite uncertain or qualitative aspects of the underlying science. The holding in *Am. Farm* provides guidance for courts reviewing EPA decisions, by reaffirming that the EPA must assess all scientific evidence when it sets precautionary standards under the CAA, and by asserting that the EPA

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55. See McCubbin, *supra* note 21, at 446.

56. See, e.g., *id.* at 444–47.

57. *Am. Farm*, 559 F.3d at 535.

58. *Id.*

59. *Id.*

60. *Id.*

61. Karen Blakemore, *Better Documentation for Decision-Making Process*, 57 LA. BAR J. 124, 124 (2009).

62. McCubbin, *supra* note 21, at 460.

63. *Id.* at 456.

cannot use scientific uncertainty or insufficient information as a scapegoat for maintaining the status quo.<sup>64</sup>

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64. See *Am. Farm*, 559 F.3d at 525–26 (demonstrating careful judicial review of the EPA’s decision-making process); *Lead Industries Ass’n v. EPA*, 647 F. 2d 1130, 1152–53 (D.C. Cir. 1980); Manely, *supra* note 2, at 345–46.

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