Something in the Air: Artificial Intelligence Air-Quality Monitoring for Cross-State Environmental Claims

Zachary Sinkiewicz

I. The Legal Context and Technological Parameters

The purpose of the Clean Air Act (CAA) is "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population."[1] To ensure adherence to this goal, the EPA works with states in enforcing National Ambient Air Quality Standards (NAAQS) through state-implementation plans (SIPs).[2] It is through these plans that the EPA (typically through the Office of Air Quality Planning and Standards or OAQPS) ensures that states monitor ambient air quality produced by emissions sources and ensures that these source pollutants comply with federal as well as state standards. This monitoring is a product of a system of cooperative federalism, wherein the states maintain a "cooperative" relationship with the EPA but are provided with a degree of discretion in the implementation of federal policies.

NAAQS are established with a few considerations and their predominant purpose is to protect human welfare pursuant to §108 of the CAA. Criteria pollutants are emissions that according to the EPA, "cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare…"[3] These pollutants emit from mobile and stationary sources and may be updated over time if new pollutants are deemed by the EPA to sufficiently meet the criteria and require closer regulation. NAAQS are established in an effort to regulate these criteria pollutants because of their effect on human health and the impact that they have on the environment around them. The most basic air monitoring program in the EPA is the Ambient Air Monitoring Program, which collects national air quality data on criteria pollutants: Carbon Monoxide (CO), Oxides of Nitrogen (NO2 and NO3), Ozone (O3), Lead (Pb), Particulate Matter

[1] 42 U.S.C §7401(b)(1)
[2] *Basic Information about Air Quality SIPs*, EPA (2020), https://www.epa.gov/sips/basic-information-air-quality-sips.
[3] 42 U.S.C. §7408(a)(1)(A)

(PM) - both particulates with aerodynamic diameters below 10 micrometers (PM-10) and particulates with aerodynamic diameters below 2.5 micrometers (PM-2.5), Sulfur Dioxide (SO2), and Volatile Organic Compounds (VOC).[4] The CAA also regulates hazardous emissions, a much longer list, which are beholden to stricter technological standards and require stricter regulation.[5]

The CAA additionally monitors pollutants through technology based standards, which ensure that systems are up to date with the required technological specifications.[6] The technology that industries must implement to minimize their emissions output depends on the emission itself and whether it is in an area of attainment or nonattainment.[7] Air-monitoring technology is governed in a way that serves a role of accountability rather than remedy. In a sense, air-monitoring provides the means for which challenges are properly issued and the solution thereafter is a product of the CAA's technology standards.

Speaking even more directly to interstate requirements is the Cross-State Air Pollution Rule (CSAPR) which addresses air pollution from upwind states that crosses state lines and affects air quality in downwind states.[8] This rule regulates the same criteria pollutants enumerated under the CAA but specify a particular set of factors that the state needs to examine in considering whether or not they are contributing to pollution within another state, which helps clarify the emissions analysis.[9]

Depending on the volume of the emissions and what the source pollutant is, a source or region may be in either attainment or nonattainment. If the air quality in a geographic area meets

---

[4] *Basic Information about Air Emissions Monitoring*, EPA (2020), https://www.epa.gov/air-emissions-monitoring-knowledge-base/basic-information-about-air-emissions-monitoring (last visited Apr 16, 2021).
[5] 42 U.S.C. § 7412
[6] *Setting Emissions Standards for Major Sources of Toxic Air Pollutants*, EPA (2021), https://www.epa.gov/clean-air-act-overview/setting-emissions-standards-major-sources-toxic-air-pollutants.
[7] *Id*.
[8] *Overview of the Cross-State Air Pollution Rule* (CSAPR), EPA (2020), https://www.epa.gov/csapr/overview-cross-state-air-pollution-rule-csapr (last visited Apr 16, 2021).
[9] *Id*.

or is cleaner than the national standard that is established by the EPA than, it is called an attainment area; areas that don't meet the national standard are called nonattainment areas.[10] Depending on the designated status of the area, a source may be forced to undertake measures to regulate its emissions pursuant to state and local governments' implementation plans, which outline how areas will attain and maintain appropriate standards in reducing air pollutant emissions.[11]

All of these regulatory frameworks serve to effectuate changes when necessary and identify the manner in which both the EPA and states work together to address emissions concerns. This note will address the ways in which AI sensors will affect that regulatory framework as they provide stronger evidentiary basis than current sensors. This change is a result of the enhanced technology that will provide greater accuracy and allow for the states to more effectively articulate claims under the CAA and common-law nuisance doctrine. Ultimately the implementation of AI sensors will strengthen this aspect of regulation in air-monitoring and allow for more effectively articulated cross-state claims.

A. Air Monitoring Requirements

The CAA requires every state to establish a network of air monitoring stations for criteria pollutants, and to utilize the criteria enumerated by the OAQPS in issuing operating standards.[12] Without proper air-monitoring protocols, the states and EPA cannot even consider acting upon implementation plans, since the lack of adequate information would render remedies stemming

[10] *NAAQS Designations Process*, EPA (2020), https://www.epa.gov/criteria-air-pollutants/naaqs-designations-process#:~:text=If%20the%20air%20quality%20in,standard%20are%20called%20nonattainment%20areas. (last visited Apr 16, 2021).
[11] *Id.*
[12] *Air Pollution Monitoring*, EPA (2020), https://www3.epa.gov/airquality/montring.html#:~:text=The%20Clean%20Air%20Act%20requires,Air%20Monitoring%20Stations%20(SLAMS) (last visited Apr 16, 2021).

from those plans to be inaccurate or misplaced. Monitoring stations exist primarily in two forms: State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS).[13] The states must provide the OAQPS with an annual summary of monitoring results at each SLAMS monitor, and detailed results must be available to OAQPS upon request. NAMS sites, which are part of the SLAMS network, are beholden to stricter monitoring criteria and must submit detailed quarterly and annual monitoring results to OAQPS.[14] The monitoring technology employed at both the state and national level has evolved drastically over the course of a few decades. Originally involving significant tubes and large monitoring control stations, air monitors now (at least for certain emissions) could fit into large briefcases.[15] The evolution of this technology has enhanced the ability for states and the EPA to monitor air-quality standards. Because of this increased efficiency, the government has had the ability to set up a website that allows the measurement of real-time air quality for two of the major criteria pollutants: ozone and particulate matter. [16]

The future of air quality monitoring seems to be geared towards more condensed technology that would require minimal maintenance and allow for fast and accurate results to ensure quality assurance. This is why having air monitoring devices that could continually self-update, incorporate older trends, examine new trends, and make realistic data projections could be instrumental in ushering air quality monitoring into the next step of its development. Artificial Intelligence (AI) monitoring would do exactly this and would permit not only more accurate

---

[13] *Id.*
[14] *Id.*
[15] *From Inner Tubes to Ultraviolet Rays: The Evolution of Air Quality Monitoring*, SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT, https://www.aqmd.gov/home/research/publications/the-evolution-of-air-quality-monitoring .
[16] *AirNow: Interactive Map of Air Quality*, https://gispub.epa.gov/airnow/ (last visited Apr 16, 2021).

results that would allow for better control of the environment, but also an evidentiary basis for parties bringing claims under the CAA and through other means, such as nuisance.

In understanding this regulatory framework, it is important to analyze how AI sensors could fit into the existing network or how states could be incentivised to adopt AI sensors over traditional air monitoring measures. Most of the ambient air monitoring networks supporting air quality management are designed and operated by tribal, state, or local governments. EPA develops requirements and guidance for various aspects of these networks which it publishes in the Code of Federal Regulations (CFR). The Clean Air Act requires every state to establish a network of air monitoring stations for criteria pollutants, using criteria set by OAQPS for their location and operation.[17] One of the obvious remedies would be to have the OAQPS set the requirements of air monitoring to require AI, although this tactic would likely result in delayed implementation and could be ineffective in ensuring state compliance. Another method would be through Congress's "spending power," which could occur through the passage of legislation that incentivised AI air monitoring or the reduction in certain federal expenses to environmental concepts, however this would require a coordinated and bipartisan effort to prevail and would not directly implicate the EPA's power (and may even been seen as an effort to contravene it). The most flexible and least onerous standard that the EPA could pursue would be incentivising the use of the EPA's multipurpose grants (MPG) to be spent on AI.[18] While not required to follow them, the EPA can issue suggestions on how states should spend the grant money, and prioritizing AI sensors would draw attention to states and enable them to consider this

[17] Air Pollution Monitoring, EPA, https://www3.epa.gov/airquality/montring.html#standards..
[18] Multipurpose Grants to States and Tribes, EPA (2020), https://www.epa.gov/grants/multipurpose-grants-states-and-tribes.

technology..[19] Regardless of the impact on the regulatory scheme, there are manners in which AI sensors could be incentivised in order to ensure state compliance.

B. Artificial Intelligence Air Monitoring Technology

AI Air Monitoring is a technology that is still relatively new and under development, however it has an incredible amount of potential because of its precision, ability to update in real time, and potential to project future air-pollutant levels with accuracy. At Loughborough University, a public university in the United Kingdom, computer scientists engaged in an assessment of AI Air monitoring technology. The researchers used AI to predict "PM2.5" which is particulate matter of less than 2.5 microns (10-6 m) in diameter, and one of the criteria pollutants regulated in the U.S.[20] The technology was identified as novel in numerous respects: it was able to calculate predictions for the levels in one hour to several hours' time, even 1-2 days ahead; it could interpret the various factors and data used for prediction, which could lead to a better understanding of the weather, seasonal and environmental factors that can impact PM2.5; and it could assess a range of values that the pollution could fall into, known as the "uncertainty analysis."[21] The sensor utilized "machine learning" which is a type of artificial intelligence technology that allows AI to analyze large amounts of data to learn rules and features, so that it can then make accurate predictions based on

---

[19] *Id*.
[20] *Computer scientists develop novel artificial intelligence system that predicts air pollution levels* (March 17, 2020), LOUGHBOROUGH UNIVERSITY https://www.lboro.ac.uk/news-events/news/2020/march/artificial-intelligence-system-air-pollution/ (last visited Apr 16, 2021).
[21] *Id*.

its historic analysis.[22] The project leader Professor Qinggang Meng, stated that, "We also explore the feasibility of linking the real-time information on carbon emission to end-to-end carbon credit trading, thus dedicating to carbon control and greenhouse gas emission reduction."[23] The developed system was going to next be tested on live data captured by sensors deployed in Shenzhen, China.[24]

In another capacity, Yann Boquillod, a French Entrepreneur founded the startup AirVisual in 2015 (and was later acquired by IQAir in 2017), which focused on applying AI and sensor technology to monitor air quality.[25] The company developed small, personalized air quality apparatuses that could measure pollutants in individualized settings such as offices, homes, etc. and has additionally created an interactive map that cross-references official data from each country's air quality measurement services, to produce a global image of particle pollution with the goal of "one day equipping the planet with an extensive network of sensors to create a real-time global pollution map with as much granularity as possible."[26] Currently there are 100,000 AirVisual sensors running worldwide, with indoor sensors in 120 countries and outdoor sensors in 80 countries.[27]

These developments highlight the capabilities of AI air-quality sensors and illustrate their contemporary development. Further implementation of these sensors would enhance accuracy and reliability and allow for projections about the future which could be utilized to more effectively forecast which type of pollutants would be in the air during certain times and how

---

[22] Thomas Barrett, *AI system to predict air pollution levels*, Air Quality News (March, 18, 2020), https://airqualitynews.com/2020/03/18/ai-system-to-predict-air-pollution-levels/ (last visited Apr 16, 2021).
[23] *AI Being Tapped to Help Improve Air Quality*, AI Trends (September 3, 2020), https://www.aitrends.com/ai-in-science/ai-being-tapped-to-help-improve-air-quality/ (last visited Apr 16, 2021).
[24] *Computer scientists develop novel artificial intelligence system that predicts air pollution levels* (March 17, 2020), Loughborough University.
[25] *Id*.
[26] *Id*.
[27] *Id*.

other, external factors could impact the potency of those pollutants. The reason these sensors are more effective than current air monitoring controls is evident: they would allow for more accurate data, more effective real-time updates, and more clear future projections. The development of this technology continues a trend within air-monitoring in effectuating more accurate, real-time results. In doing so, these monitoring systems can more readily be utilized by interested parties and as their reliability increases, they can be more effectively implemented to promulgate different legal claims.

C. Affected Cross-state Environmental Claims

The development and materialization of AI air-monitoring technology would predominantly support two types of legal claims: those brought under the Clean Air Act and under common-law nuisance. Section 110 of the CAA, known as the "good neighbor provision" ensures that states' air quality measures protect other states and do not interfere with maintenance by any other state with respect to NAAQS.[28] Specifically, the Act prevents states from "contribut[ing] significantly to nonattainment in, or interfere with maintenance by, any other State with respect to any such national primary or secondary ambient air quality standards."[29] These actions are typically brought by states under §126 of the CAA which "gives a state the authority to ask EPA to set emissions limits for specific sources of air pollution in other states that significantly contribute to nonattainment or interfere with maintenance of one or more National Ambient Air Quality Standard in the petitioning state."[30] The EPA then examines

[28] *Clean Air Act Section 126 Petitions - Environmental and Energy Law Program*, HARVARD LAW SCHOOL (January 22, 2021), https://eelp.law.harvard.edu/2020/01/clean-air-act-section-126-petitions/#:~:text=The%20Clean%20Air%20Act's%20%E2%80%9Cgood,Air%20Quality%20Standards%20(NAAQS).
[29] 42 U.S.C §7410(a)(2)(D)(i)(I)
[30] *Ozone National Ambient Air Quality Standards (NAAQS) Section 126 Petitions*, EPA (2018), https://www.epa.gov/ground-level-ozone-pollution/ozone-national-ambient-air-quality-standards-naaqs-section-126.

the complaint submitted by the downwind state and, if it finds a violation, the polluting source from upwind must cease operations within three months of that finding.[31] Because of the coordination between states and the federal agency on these implementation plans, a defining feature of the statute is its reliance on "cooperative federalism."[32]

This standard was further elaborated upon in *EPA v. EME Homer City Generation*, where the Court held that the EPA's Transport Rule, which required that if an upwind state "contributed significantly" to a downwind nonattainment to the extent its exported pollution both: (1) produced one percent or more of a NAAQS in at least one downwind state and (2) could be eliminated cost-effectively then those upwind states would eliminate emissions found other both of these criteria.[33] The Supreme Court here found that the EPA's decision was a reasonable interpretation of a statute set forth by Congress that would result in better control measures (and was permitted so long as the EPA did not over-control or under-control).[34] Succinctly put, states can file actions against other states if that other state affects the suing party's NAAQS. The EPA's rule requires the elimination of violating emissions when they qualify under the Transport Rule.

Nuisance claims have a unique place in the history of environmental enforcement actions, typically through public nuisance. A public nuisance is an unreasonable interference with a right common to the general public.[35] In environmental law, one of the original nuisance claims was *Georgia v. Tennessee Copper Co.*, where the Court found the state of Georgia to have a valid

---

[31] 42 U.S.C. § 7426(c)
[32] *Genon Rema, LLC v. United States EPA*, 722 F.3d 513, 516 (3d Cir. 2013) citing *Appalachian Power Co. v. EPA*, 249 F.3d 1032, 1046, 346 U.S. App. D.C. 38 (D.C. Cir. 2001).
[33] *EPA v. EME Homer City Generation, L.P.*, 572 U.S. 489, 501 (U.S. 2014).
[34] *Id*. at 512.
[35] RESTATEMENT (SECOND) OF TORTS § 821B.

nuisance claim when emissions from a Tennessee copper mine encroached into their airspace.[36] The success of the state in this case was quintessential in establishing the reasonableness of state claims against private polluters that operated in other states, and the holding still maintains relevance in state common-law nuisance claims today. While federal common law claims have essentially been eliminated through case law, these state common-law claims do still have some merit, as evidenced in *North Carolina ex rel. Cooper v. TVA*, where the Court found that waiver of Supremacy Clause existed for state claims regarding nuisance under the Clean Air Act under certain conditions.[37]

The cross-play between AI sensors and these concepts may not be evidently clear at first. How would enhanced AI sensors impact these claims and cases beyond the status quo? There are a few reasons, some alluded to previously, as to why artificial intelligence specifically would substantially alter cross-state air quality claims. Principally is in its ability to predict current and future pollution levels with more effective accuracy. In updating in real time and being able to forecast into the future, AI sensors have the potential to be even more accurate than conventional sensors, with one AI model being able to predict future air levels with 92% accuracy.[38] More accurate results and future projections can be invaluable to states seeking to assert claims either under the CAA or through state tort law. The projection of future emissions levels with accuracy also establishes trends which can be identified and potentially demonstrative in showing whether or not there is pollution is only a temporary increase (perhaps caused by inclement conditions) or a more severe, continuing contribution based on the ongoing presence of a source pollutant.

---

[36] *Georgia v. Tennessee Copper Co*., 206 U.S. 230 (U.S. 1907)

[37] *North Carolina ex rel. Cooper v. TVA*, 515 F.3d 344 (4th Cir. 2008)

[38] John Koetsier, *AI For Air Pollution: New York High School Student Builds Prediction Model With 92% Accuracy*, Forbes (August 14, 2020), https://www.forbes.com/sites/johnkoetsier/2020/08/14/ai-for-air-pollution-new-york-high-school-student-builds-prediction-model-with-92-accuracy/?sh=31548e942a82.

This technology would also allow upwind states to more effectively remedy such issues. When upwind states are aware of sources within their borders that are forecasted to be continuous polluters of air quality in downwind states, they have the opportunity to engage in proactive measures. As this technology develops and certain claims evolve, AI sensors would also prevent frivolous suits as states and industries could be more certain about various data which would better inform the judiciary and help render decisions with more certainty.

The overall purpose of AI sensors is to more effectively measure air quality standards. Their evidentiary value is tremendous as they have the ability to more effectively dispel the need to establish pollutant sources from upwind to downwind states. If states utilized AI sensors effectively, they could not only better monitor their ambient air quality standards, but could also act proactively in limiting emissions from encroaching upon their territory. The sensors also render states more publicly accountable for enforcing environmental standards since the public, who would be aware of this technology and its effectiveness, would have the ability to rally behind environmental monitoring and pressure states into enforcing claims if pollutants rise to an unhealthy standard. This technology has the potential to alter the legal landscape of cross-state air quality in environmental cases and render the future more beholden to technological projections and datasets.

II. Establishing Liability in Cross-state Claims

The two principal claims to be explored in this paper are those brought under the Clean Air Act pursuant to the “good neighbor” provision and common-law nuisance claims. Both provide an avenue for which states can seek enforcement against other states and remedy problems of spillover environmental emissions. Underpinning both is the need for data stemming from air monitoring sources. The reliability of this data and its accuracy and accessibility are paramount in ensuring that these claims have a proper legal foundation. Additionally, more effective air monitoring technology can examine the potential of long-term emissions intrusions. Therefore, the accuracy of air-monitoring sensors and air quality standards more broadly, is reliant upon information extracted from data-sets gathered by air monitoring sensors. Inaccurate data or inadequate monitoring can lead to the failure of enforcement against emissions producers and prevent states from seeking proper remedies or establishing liability.

A. Clean Air Act & CSAPR: Enforceability and Monitoring Problems

Beginning with the CAA claim, the importance of the "good neighbor" provision ensures that states do not disregard other states when mapping out the implementation of their industries. Specifically, upwind states tend to release pollutants that would, because of the wind, not impact their own jurisdiction, but instead affect downwind states.[39] The transportation of these pollutants across state borders is referred to as "interstate air pollution transport" and can make it difficult for downwind states to meet health-based air quality standards for PM2.5 and ozone as these pollutants can travel up to hundreds of miles.[40] Typically, the assessment as to whether an upwind state contributes to the pollution of a downwind state is a four-step process:

> At Step One, it identifies downwind areas projected to have trouble attaining the relevant air quality standard. At Step Two, the EPA determines which upwind states are 'linked' to the downwind nonattainment sites. At Step Three, it calculates the optimal level of pollution control, considering the marginal cost of emission reductions and anticipated downwind air quality improvements. The EPA then formulates an emissions budget for each state, accounting for achievable reductions. Finally, at Step Four, the EPA typically promulgates federal implementation plans that require upwind states' participation in a regional cap-and-trade program to bring about compliance with their Good Neighbor obligations.[41]

---

[39] *Interstate Air Pollution Transport*, EPA (2021), https://www.epa.gov/interstate-air-pollution-transport.
[40] *Id*.
[41] *Maryland v. EPA*, 446 U.S. App. D.C. 405, 408 (App. D.C. 2020).

This inquiry does not examine any particular source pollutant in determining who is responsible, but rather considers the states holistically, with the remedy stemming from both the polluting state and the EPA and is the set of criteria enumerated under CSAPR. If found in violation after a Section 126 claim is filed against the offending state, Section 126(c) provides that a source for which such a finding is made must, within specified timeframes, either cease operation or comply with emissions limitations established by EPA to bring about compliance with the good neighbor provision.[42] The monitors involved do not need to be within a state's terrestrial boundaries; the EPA could not ignore Delaware's evidence of non-attaining receptors in the Philadelphia-Wilmington-Atlantic City nonattainment area in making its case as to how it was impacted.[43]

The wide breadth of authority provided to these various states from this decision would seem to indicate that claims would be effective and that air monitoring technology would allow for the litigation of cross-state claims. The problem however is that despite the improvements in air-monitoring over a period of time, there are still significant shortcomings within the industry itself.

One of the major problems in calculating emissions rests with the actual calculation itself. The EPA measures air quality using emissions factors which are "representative value[s] that attempt[] to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant."[44] These factors are typically calculated as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity

---

[42] *What Does the Clean Air Act Say about the Interstate Transport of Air Pollution?*, EPA (2019), https://www.epa.gov/interstate-air-pollution-transport/what-does-clean-air-act-say-about-interstate-transport-air#what-does-the-clean-air-act-say.
[43] 446 U.S. App. D.C. at 421.
[44] *Basic Information of Air Emissions Factors and Quantification*, EPA (2019), https://www.epa.gov/air-emissions-factors-and-quantification/basic-information-air-emissions-factors-and-quantification.

emitting the pollutant (e.g., kilograms of particulate emitted per megagram of coal burned).[45] Despite the intuitive nature of a formula utilized to calculate emissions, the number of emission factors utilized by the EPA to measure emissions is exorbitant , with 22,693 being utilized since 1996.[46]

The EPA itself admits that many of the formulas are unreliable, rating 62% as "below average" or "poor" with 17% earned grades of "average" and 22% never receiving a grade at all while only one in six have ever been updated.[47] The problems range from poor accounting for emissions to aging equipment but the result is the same: unreliable data that allows for large polluters to harm the environment to an even greater extent because of improper monitoring.[48] And that's only for areas that have the ability to calculate emissions. Janice E. Nolen, the vice president of the American Lung Association, stated that there were not enough monitors and remarked that, "Of about 3,000 counties" in the United States only eight or nine hundred have air quality monitors at all."[49] It follows that the detection of downwind emissions is difficult if not impossible in some regions, presenting a persistent health risk and identifying that the developed infrastructure is seriously lacking in some areas.

Even when the technology is present, it may not be functioning properly. A study undertaken by Reuters examined the viability of these air sensors. In one instance, explosions ripped through a Philadelphia oil refinery last year and polluted the nearby area with a heavy,

---

[45] *Id*.
[46] Rachel Leven, *Bad Science Underlies EPA's Air Pollution Program*, SCIENTIFIC AMERICAN (January 29, 2018), https://www.scientificamerican.com/article/bad-science-underlies-epa-rsquo-s-air-pollution-program/ (last visited Apr 16, 2021).
[47] *Id*.
[48] *Id*.
[49] Nellie Bowles, *Do You Know What You're Breathing?*, THE NEW YORK TIMES (November 30, 2018), https://www.nytimes.com/2018/11/30/style/air-quality-pollution-monitors.html.

dense black smoke that polluted the environment.[50] "One of the explosions was so large that a National Weather Service satellite captured images of the fireball from space."[51] Yet despite this, air monitoring sensors, which updated the federal air quality index (AQI) and were comprised of a federal network of air quality monitoring devices that were operated by the city of Philadelphia (with oversight from state regulators and the EPA), showed day as one of the year's cleanest, with no significant pollution recorded in the area.[52]

The incident was not isolated to this lone situation in Philadelphia. The AQI identified no risks from ten of the biggest refinery explosions over the past decade despite the refineries reporting the release of toxic emissions to regulators and thousands of people being hospitalized as a result of these incidents.[53] Furthermore, "the government network of 3,900 monitoring devices nationwide has routinely missed major toxic releases and day-to-day pollution dangers, the data show[s]."[54] The continued inaccuracies of a nationwide system defeat the purpose of air-monitoring and undermine its quality and efficacy.

The failure of these systems not only heightens health risks, but it also illustrates yet another flaw within the EPA's ability to monitor air effectively. The shortcomings of this system were evident in the Philadelphia incident because of the magnitude of the unfortunate catastrophe that struck the region. In other situations, it is undoubtedly less apparent, given the more minute or insidious nature of air pollution within various air sheds. The various problems here lead to inaccurate assessments of air quality and harm the ability for downwind states to

---

[50] Tim McLaughlin, Laila Kearney & Laura Sanicola, *Special Report: U.S. air monitors routinely miss pollution - even refinery explosions*, Reuters (December, 1, 2020), https://www.reuters.com/article/usa-pollution-airmonitors-specialreport/u-s-air-monitors-routinely-miss-pollution-even-refinery-explosions-idUSKBN28B4RT.
[51] *Id*.
[52] *Id*.
[53] *Id*.
[54] *Id*.

properly regulate their air quality. While relying on the tenants of cooperative federalism, air-monitoring nonetheless relies on the EPA's federal oversight and there is a certain inherent trust within air-monitoring measures. Artificial intelligence has the potential to cure many of these persistent defects in the air-monitoring system.

Artificial intelligence air-monitoring has the ability to provide more accurate results and assess trends as they develop. AI is considered the best technique to predict and forecast air pollution due to its increased capability to analyze the environment.[55] AI has benefits that not only extend to better environmental surveillance, but rather that also create an incentive that helps numerous economic markets as well by ensuring that industries can model their business to operate effectively.[56] The introduction of AI into these marketplaces would inject a breadth of accuracy in an area that is severely lacking and help offer projections that could inform the future of air-quality within many of these regions. AI design of various infrastructure and determining optimal placement could assist in ensuring the maximization of financial capital.[57] In other words, AI's presence in the sensors and mapping of various models could also lead to an optimization of placement regarding future sensors and could also discover methods that could lead to more effective emissions calculations. In this way, air monitoring essentially sustains itself and improves its ability to measure national ambient air-quality and cross-state pollution.

An example of the potential of this technology is evident in the creation of an air quality map in the United Kingdom that uses satellite technology, remote sensing, and artificial

[55] *Environmental Technology and Innovation*, ELSEVIER (2020), https://www.journals.elsevier.com/environmental-technology-and-innovation/call-for-papers/artificial-intelligence-for-prediction-air-pollution.
[56] David G. Victor, *How artificial intelligence will affect the future of energy and climate*, BROOKINGS INSTITUTE (2019), https://www.brookings.edu/research/how-artificial-intelligence-will-affect-the-future-of-energy-and-climate/
[57] *Id*.

intelligence to uncover links between pollution and health.[58] Developed by the London School of Hygiene & Tropical Medicine (LSHTM), the research "combined data from Earth observation satellites with readings from ground-based pollution monitors, as well as other information such as population density, road density and the location of airports" which were then utilized with machine learning algorithms to produce estimates of ground-level concentration of fine particulate matter (less than 2.5 microns, PM2.5) for the whole of Great Britain from 2008-2018.[59] Antonio Gasparrini, Professor of Biostatistics and Epidemiology at LSHTM and senior author of the study, remarked how, "This study demonstrates how cutting-edge techniques based on artificial intelligence and satellite technologies can benefit public health research."[60] The ability for machine-learning to incorporate data gathered from sensors in these fields would allow for a better understanding of the health-effects that poor air-quality has on various regions and can again provide a basis for state action.

The technological basis upon which AI operates underpins the legal claims under the CAA and CSAPR. Section 110's requirement of a coherent SIP in response to NAAQS rests heavily upon the ability to "include enforceable emission limitations and other control measures, means, or techniques (including economic incentives such as fees, marketable permits, and auctions of emissions rights), as well as schedules and timetables for compliance, as may be necessary..."[61] It also requires that states "provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to… monitor, compile, and analyze data on ambient air quality.[62] AI allows for these statutorily prescribed standards that a state must

[58] *AI-driven map could link UK air quality to health*, THE ENGINEER (2020), https://www.theengineer.co.uk/ai-driven-map-uk-air-quality/.
[59] *Id*.
[60] *Id*.
[61] 42 U.S. Code § 7410(a)(2)(A).
[62] 42 U.S. Code § 7410(a)(2)(B)(i).

incorporate within their air monitoring plan, to be satisfied effectively. AI sensors would allow for states to more clearly track pollution changes to ensure that they are in compliance with NAAQS. AI also permits the projection of future trends, meaning that states can be adaptive in reacting to the periods, provisions, and deadlines established by the EPA regarding various air quality issues. For example, §110 also requires, if requested by the Administrator "periodic reports on the nature and amounts of emissions and emissions-related data from such sources" and "correlation of such reports by the State agency with any emission limitations or standards established pursuant to this chapter, which reports shall be available at reasonable times for public inspection."[63] With AI sensors, this information is more readily accessible for the state which in turn makes it more accessible for the EPA.

The value of this accessibility has numerous legal implications. It ensures more effective compliance with the CAA. With AI, states will have greater access to air-quality trends within their jurisdiction and more accurate data that would inform decisions they make regarding their own air quality. Additionally, this information and data will ensure state accountability. When the downwind states and the EPA have the ability to more readily identify pollutants from upwind states, they can better articulate a claim and exert pressure on the upwind state to correct any emissions before litigation ensues. It also serves to deter frivolous litigants from either states or industries who are seeking to challenge an assessment of their NAAQS. If it can be identified, with a high percentage of accuracy, that a violation is occurring, then there would be no point in launching an evidentiary challenge if compliance would be required regardless because of the strength of the data.

[63] 42 U.S.C § 7410(a)(2)(F)(ii); 42 U.S. Code § 7410(a)(2)(F)(iii).

Regarding the four step analysis of CSAPR, AI can again serve an effective purpose. AI sensors can more efficiently identify downwind areas projected to have trouble attaining the relevant air quality standard and can determine, with more precision than current air-monitoring, which upwind states are 'linked' to the downwind nonattainment sites. It can also calculate the optimal level of pollution control and map out various costs because of the manner in which AI can consider both economic factors and give weight to them, perhaps even highlighting areas that could utilize economic development.[64] AI sensors would allow for greater consideration of the factors that go into such claims and can better map out the projections required for this basis.

While many cases in the status quo tend to challenge the implementation of CAA on other basis, the evidentiary element herein ensures that this prong of litigation is essentially subject to the data-set extracted via machine-learning and is streamlined more efficiently. It eliminates the need for evidence or the ability to credibly challenge data gathered through air-quality monitors. It furthermore ensures that cooperative federalism between the SIPs and the EPA is properly adhered to. Regarding cross-state action, the closer adherence to §110 through better monitoring would allow for states filing claims under the CAA, through Section 126, to more clearly articulate and identify the source of downwind pollution and to file actions in response to that movement. The result from *Maryland v. EPA* in allowing the utilization of air sensors in other states to prove downwind pollution assists states even more in pursuing this objective.[65] The ability to utilize a national network of AI sensors that are constantly monitoring trends and improving their capabilities through machine learning would assist in broadening

[64] David G. Victor, *How artificial intelligence will affect the future of energy and climate*, BROOKINGS INSTITUTE (2019).
[65] 446 U.S. App. D.C. at 408.

accountability, thus leading to more effective enforcement actions because of an enhanced understanding. Only through these enhanced monitoring protocols can the AI be truly effective.

B. Cross-state Environmental Nuisance Claims

Outside of the remedies articulated under the CAA, states also have the ability to pursue claims under common law nuisance doctrine. This type of claim was especially relevant prior to the passage of the CAA as there was no cause of action that permitted states to sue others for emissions violations. Nuisance doctrine permits states to file claims against other states when their emissions interfere with the health of their citizens:

> The Restatement defines public nuisance as follows: (1) A public nuisance is an unreasonable interference with a right common to the general public. (2) Circumstances that may sustain a holding that an interference with a public right is unreasonable include the following: (a) whether the conduct involves a significant interference with the public health, the public safety, the public peace, the public comfort or the public convenience; or (b) whether the conduct is proscribed by a statute, ordinance or administrative regulation; or (c) whether the conduct is of a continuing nature or has produced a permanent or long lasting effect, and, as the actor knows or has reason to know, has a significant effect upon the public right.[66]

In the context of environmental law, this doctrine is present because of the unique position in which states operate and seek to protect their borders. These elements resonate throughout, states seek to protect the health and safety of their citizens by preventing the continuous air pollution by an actor in another state. States, as quasi-sovereigns, are typically in a more unique position to address these types of nuisance claims and the foundation for this legal authority can be traced to cases in the early 20th century, most notably *Georgia v. Tennessee Copper Co*.[67] In that case, the State of Georgia filed suit, seeking an injunction, against Tennessee Copper Company for running a mine where a discharge threatened the wholesale

---

[66] Jill D. Jacobson & Rebecca S. Herbig, *Public Nuisance Law: Resistance to Expansive New Theories*, 8 Mass Torts 1 (Fall 2009).
[67] *Georgia v. Tennessee Copper Co.*, 206 U.S. 230 (1907).

destruction of forests, orchards and crops, among other injuries, and threatened five counties of the State.[68] The Court granted the injunction, stating "It is a fair and reasonable demand on the part of a sovereign that the air over its territory should not be polluted on a great scale…. whatever domestic destruction they have suffered, should not be further destroyed or threatened by the act of persons beyond its control."[69] The Court was "satisfied by a preponderance of evidence that the sulphurous fumes cause and threaten damage on so considerable a scale to the forests and vegetable life, if not to health, within the plaintiff State."[70] In rendering its decision, the Court enshrined nuisance law as a primary avenue for which stakes could seek relief.

The doctrine of nuisance in the air pollution context has, of course, evolved considerably since 1907. The Courts have largely recognized that "federal common law enunciated by this Court assured each State the right to be free from unreasonable interference with its natural environment and resources when the interference stems from another State or its citizens."[71] In *Massachusetts v. EPA*, a landmark case fors its decision on standing, reflected in dicta, on the values of these earlier cases. The Court there harkened back to *Georgia v. Tennessee Copper Co.*, stating that, "Just as Georgia's independent interest 'in all the earth and air within its domain' supported federal jurisdiction a century ago, so too does Massachusetts' well-founded desire to preserve its sovereign territory today."[72]

Another supporting decision, perhaps one of the most important in re-asserting nuisance doctrine in contemporary history, was *North Carolina ex rel. Cooper v. TVA*.[73] In that case, North Carolina sued the Tennessee Valley Authority ("TVA") for operating coal-fired power

[68] *Id*. at 236
[69] *Id.* at 238.
[70] *Id*.
[71] *Milwaukee v. Illinois*, 451 U.S. 304, 335 (1981).
[72] *Massachusetts v. EPA*, 549 U.S. 497, 519 (2007).
[73] *North Carolina ex rel. Cooper v. TVA*, 515 F.3d 344 (4th Cir. 2008).

plants in Tennessee, Alabama, and Kentucky whose emissions encroached on North Carolina's territory.[74] TVA attempted to refute the claim on two basis, stating it was: (1) barred by the discretionary function doctrine; and (2) the Supremacy Clause.[75] The Court found against TVA, stating that the discretionary function did not apply because the activities were commercial in nature and the Supremacy Clause was waived under the CAA.[76] In articulating its position, the Court stated that the CAA provides that federal facilities such as the Tennessee Valley Authority:

> Shall be subject to, and comply with, all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of air pollution in the same manner, and to the same extent as any nongovernmental entity. The preceding sentence shall apply (A) to any requirement whether substantive or procedural (including any recordkeeping or reporting requirement, any requirement respecting permits and any other requirement whatsoever), (C) to the exercise of any Federal, State, or local administrative authority, and (D) to any process and sanction, whether enforced in Federal, State, or local courts, or in any other manner. This subsection shall apply notwithstanding any immunity of such agencies, officers, agents, or employees under any law or rule of law.[77]

The Court defined requirements by examining the plain language of the statute and found that TVA's argument that the CAA does not mandate compliance with state "requirements" enforced through a common-law tort suit was improper.[78] *North Carolina ex rel. Cooper v. TVA* thus preserved the possibility of common law tort suits through nuisance, enabling states to take advantage of such law to hold cross-state polluters accountable.

While these decisions would seem to indicate a broad framework from which states can operate out of, the reality is much more limiting. Courts have found that the discretionary function exception does apply and even applied it to another case involving the TVA.[79]

---

[74] *Id*. at 347.
[75] *Id*.
[76] *Id*.
[77] *Id*. at 346 citing 42 U.S.C. § 7418(a).
[78] *Id*. at 352-53.
[79] *See Mays v. TVA*, 699 F. Supp. 2d 991, 1009 (E.D. Tenn. 2010).

Additionally, *federal* common-law public nuisance claims have all but evaporated after the decision rendered in *Am. Elec. Power Co. v. Connecticut*.[80] The issue in that case was whether the plaintiffs, which included several States, the city of New York, and three private land trusts, could maintain federal common-law public nuisance claims against carbon-dioxide emitters which were four private power companies and the federal Tennessee Valley Authority.[81] The Court held that the Clean Air Act and the Environmental Protection Agency displaced the claims the plaintiffs sought to pursue, stating that the abatement of carbon-dioxide emissions from fossil-fuel fired power plants had been alluded to as a province of the EPA in *Massachusetts*.[82] Summarily, Congress "delegated to EPA the decision whether and how to regulate carbon-dioxide emissions from power plants; the delegation is what displaces federal common law."[83] Despite the defeat of the federal common-law nuisance claim here, the state law claim was left for consideration upon remand, demonstrating the potential for state law tort claims in this field to still be rendered valid.

The complexities in comprehending nuisance when it comes to cross-state air pollution are numerous. In one respect the purpose of the claim seems demonstrably straightforward: if a state's commercial industries emissions are polluting the air in another state, the polluted state has a claim. Yet, despite this, the carve outs for polluters along with the elimination of a federal common-law cause of action make such claims demonstrably more difficult. States do still have a considerable degree of flexibility in operating within the CAA for federal claims. The states' rights savings clause of the CAA expressly preserves the state common law standards on which plaintiffs sue. The clause saves from preemption "the right of any State or political subdivision

[80] *Am. Elec. Power Co. v. Connecticut*, 564 U.S. 410 (2011).
[81] *Id*. at 415.
[82] *Id*. at 424.
[83] *Id*. at 426.

thereof to adopt or enforce (1) any standard or limitation respecting emissions of air pollutants or (2) any requirement respecting control or abatement of air pollution," except that the "State or political subdivision may not adopt or enforce any emission standard or limitation that is 'less stringent' than a standard or limitation under an applicable implementation plan or specified federal statute."[84] Therefore states can adopt policies that would allow them to construct their nuisance law in such a way that could allow for a permissive standard of nuisance regarding air-quality pollution. This would allow states to furnish provisions enacting stricter measures. The applicability of this law to external, non-state actors may lead to additional questions on case law, but the ultimate objective of ensuring one's own state's territory is protected from an external pollutant, has been repeatedly emphasized.

The incorporation of AI in air sensors as the potential to greatly enhance the ability for such actions. Prevailing predominantly through state-law claims, nuisance efforts moving forward will be exceedingly reliant on demonstrating proper air pollution to prove nuisance. In *Georgia v. Tennessee Copper Co.*, the Court was satisfied based on a preponderance of evidence, but did not feel the need to have to thoroughly discuss the precise extent of the pollutant material.[85] However, nuisance claims, if they are to have some consistency, require some sort of evidentiary basis, it is required that it be proven that a nuisance exists because air pollution has been regulated as a nuisance in fact, not a nuisance per se.[86] In an era where environmental regulation is becoming increasingly partisan, with massive division between certain state policies and enforcement protocols and federal implementation of appropriate standards, accuracy and

---

[84] *Merrick v. Diageo Ams. Supply, Inc.*, 805 F.3d 685, 690 (6th Cir. 2015)
[85] *Georgia v. Tennessee Copper Co.*, 206 U.S. at 238.
[86]W. A. Quebedeaux Jr. Ph.D. *Prosecution of Air Pollution Cases under Common Law Nuisance*, Journal of the Air Pollution Control Association 187-208.

compelling evidence is essential to prevent inaction.[87] AI air-quality monitoring provides the level of accuracy necessary to ensure that the factual basis for the nuisance and while, "there is no precise test applicable in all cases by which to determine whether smoke or soot constitutes a nuisance," each case is typically a "question in fact, depending on the circumstances surrounding the particular case, and is governed by general principles."[88]

The role AI plays in the realm of nuisance is similar to that within the CAA: establishing an undeniable polluting impact and properly identifying and forecasting the potential harms of that impact. AI sensors have the potential to be integrated into existing emission control programs, perhaps even allowing environmental regulators the option of "on-demand" emission reductions, operational planning, or even emergency response.[89] With the increasing threat of global warming, expediency is key and forecasters at the EPA and state and local air quality offices, are already utilizing computer models to predict air quality.[90] AI has the potential to ensure these forecasts are more accurate and to enable nuisance claims to be effectively pursued. Machine-learning allows for enhanced processing which permits AI to "process very fast huge amounts of data, refine information, and find connections that have made AI a game-changer across industries."[91] If utilized properly within this context, AI has the potential to revitalize the aspects of cooperative federalism by ensuring that the state common-law nuisance claim for air pollution is preserved. The implementation of this technology would ensure that the federal

---

[87] https://www.americanbar.org/groups/public_education/publications/insights-on-law-and-society/volume-19/insights-vol--19---issue-1/environmental-law---politics/

[88] https://www.tandfonline.com/doi/pdf/10.1080/00022470.1962.10468063

[89] Mauro Castelli et al., *A Machine Learning Approach to Predict Air Quality in California*, 2020 COMPLEXITY 1–23 (2020).

[90] Holli Reebeek, *Why Monitor Air Quality* NASA (2019), https://terra.nasa.gov/citizen-science/air-quality#:~:text=Pollution%20and%20Health,things%20from%20humans%20to%20plants.&text=Particle%20pollution%2C%20or%20aerosols%2C%20has,plants%2C%20fires%2C%20and%20industry.

[91] Can we rely on machine intelligence to fix our climate? EURONEWS, https://www.euronews.com/programs/climate-now (last visited Apr 16, 2021).

government still exercised sufficient oversight over states, especially when it came to technological standards, but would allow states to more effectively monitor others and provide an evidentiary basis for their own claims.

Even beyond the value to states, industries could benefit from an understanding of AI sensors and utilizing them properly. Rather than simply relying upon case law exceptions like the discretionary function, companies could be proactive in ensuring that their emissions do not amount to a level that would contribute significantly to downwind locations. "Implementing innovative technology can help the energy industry get more competitive under the conditions of an unstable economy and develop better operational methods than those currently available."[92] The implementation of AI sensors could enable industries, much like states would be enticed to do under the CAA with AI sensors, to be proactive in monitoring emissions rather than reactive. While industries may be reluctant to front the cost to install equipment, they may do so if the hopeless inevitably of a difficult case awaits them in litigation otherwise. The strength of evidence and projections from AI air-monitoring could assuage companies to look towards stabilizing emissions before they rise to the level of nuisance.

Ultimately, the value AI in nuisance claims rests with their accuracy and ability to work with state-law policy. State common-law nuisance claims can be crafted in a manner that would allow states to pursue action against out-of-state polluters. Through AI sensors, states can more effectively monitor exactly where the pollution is coming from and provide a strong evidentiary basis. Additionally, industry polluters can use the data from sensors to proactively adjust their

---

[92]Olesia Martynova, *AI is the new electricity, Opportunities and Challenges of Artificial Intelligence in the Energy Sector* INTELLIAS (2021), https://www.intellias.com/opportunities-and-challenges-of-artificial-intelligence-in-the-energy-sector/#:~:text=AI%20can%20help%20transform%20data,catch%20up%20with%20the%20times.&text=Energy%20companies%20have%20a%20lot,time%2D%20and%20cost%2Defficiently.

emissions flow to prevent the possibility of states engaging in nuisance claims. While the backdrop for nuisance claims in environmental law has faced some difficulty in recent years, especially with the federal level conceding full discretion to the EPA, the use of air sensors can nonetheless aid in ensuring that states still have the ability to enforce their own standards and effectuate positive change.

III. Conclusion: Public Accountability and the Future of Air-Monitoring

AI air-monitoring is a concept that is still very much within its infancy. However, the ability to operate such sensors effectively would allow for states to supplement environmental claims in a manner that would enable better future projections that would inform current action. Machine-learning will enhance the way that air-quality operates and will create assurances that will enhance the capabilities of monitoring techniques. AI cannot change the existing case law. Nor will it serve as a restorative mechanism to bring back previously dispelled legal basis. However AI does ensure that when claims are pursued that they are being done so accurately and effectively. The use of this technology extends beyond just establishing an even more credible basis since it addresses a global problem, "Air pollution is a long-term accumulated challenge faced by the whole world, and especially in many developing countries. The project aims to measure and forecast air quality and pollution levels."[93] In its ability to map out projection and resolve issues with unprecedented accuracy, AI has the ability to ensure that environmental law and legal claims between states is ushered into another era with increased accountability and proactive resolutions. These changes further implicate industries who have the opportunity to curb their emissions before litigation ensues. The introduction of AI to this field will not completely revolutionize the nature of these cases or change evidentiary practices in emissions

[93] *AI Being Tapped to Help Improve Air Quality*, AI TRENDS (September 3, 2020).

law on a fundamental level. What it does do however, is ensure that cases that are pursued are backed by scientific data-sets and enable states to analyze and forecast trends with regards to that pollution with increased accuracy. As a result, there are more substantiated claims that rely on accurate data sets that are difficult to refute. Because of the potentiality of AI air-monitoring sensors to supplement and improve upon existing monitoring methods, they can be integrated into the existing network of monitoring systems and ensure the ushering in of an era of increased transparency, accuracy, and effective emissions monitoring.