

*Section of Environment, Energy, and Resources  
American Bar Association*

# *Environment, Energy, and Resources Law: The Year in Review 2023*

## **Chapter S · Science and Technology**

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## Chapter S: SCIENCE AND TECHNOLOGY 2023 Annual Report<sup>1</sup>

### I. EPA'S SCIENCE ADVISORY BOARD—LITIGATION AND ENVIRONMENTAL JUSTICE COMMENTS

#### A. *Litigation: Suit challenging the selection and composition of the Science Advisory Board and related Clean Air Scientific Advisory Committee.*

In today's balkanized, political world, even the appointment process to EPA's Science Advisory Board becomes a hotly contested point between industry representatives and others. In March 2021, the new EPA Administrator Michael Regan indicated he was revising the Science Advisory Board (SAB) and would propose new members to it and related boards, essentially eliminating many Trump appointees to those boards.<sup>2</sup> Later, in August 2021, Administrator Regan announced a new group of appointees.<sup>3</sup>

Weeks later, Stanley Young, a Trump appointee to the SAB, filed a complaint rested on an obscure federal statute enacted in 1972, the Federal Advisory Committee Act (Advisory Act).<sup>4</sup> Young used this statutory baseboard to launch a broad attack on Administrator Regan's efforts to reconstitute the SAB and a separate advisory group, the Clean Air Advisory Committee. The political nature of this process was not lost on the press, with at least one commentator referring to Administrator Regan's moves as a "purge."<sup>5</sup> Anthony Cox, a statistician also appointed by Trump to the SAB, later joined the suit as a plaintiff.

Young's lawsuit claimed that EPA's appointment process violated Section 5 of the Advisory Act, which requires that when forming an advisory committee, agency heads should ensure that the appointed members be "fairly balanced in terms of the points of view represented."<sup>6</sup> The plaintiffs claimed that the new SAB and Clean Air Advisory Committee failed to meet this requirement, partly because each lacked industry representation. After

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<sup>2</sup>L. Friedman, [The E.P.A. administrator purges its scientific advisory boards, which included many Trump appointees](#), N.Y. TIMES (March 31, 2021) (subscription required).

<sup>3</sup>[Press Release](#), U.S. ENVTL. PROT. AGENCY, EPA Announces Selections of Charter Members to the Science Advisory Board (August 2, 2021).

<sup>4</sup>5 U.S.C. §§ 1001-1014.

<sup>5</sup>Friedman, *supra* note 2.

<sup>6</sup>5 U.S.C. § 1004 (b)(2) (specifying that authorizing legislation for an advisory committee must ensure in part that such law "require the membership of the advisory committee to be fairly balanced in terms of the points of view represented and the functions to be performed by the advisory committee. . ."); *Id.* at (c) (applying same standards is subpart (b) "to the extent that they are applicable" to agency heads appointed advisory committees).

both sides moved for summary judgment on the Clean Air Advisory Committee issues, [Judge Kelly of the District Court for the District of Columbia ruled for the Government.](#)<sup>7</sup>

Predictably, this case then moved upstairs to the Court of Appeals for the D.C. Circuit.<sup>8</sup> Although briefing was completed and oral argument was held, a strange thing happened next—the Court of Appeals for the D.C. Circuit issued a terse order asking for supplemental briefing “addressing whether appellants have standing.”<sup>9</sup> Given that standing is a jurisdictional prerequisite in any federal case, it appears that the Court of Appeals has determined that perhaps the advocates for both sides were putting the proverbial merits cart before the jurisdictional horse (i.e., standing).

The two sides predictably provided different answers to the Court’s question on standing. Appellants told the Court that standing is established by a doctrine that a person has a legal right to litigate whether there was a “legally valid selection process.”<sup>10</sup> EPA and other governmental entities reject this theory of standing. Instead, the Government argued that there was no evidence that appellants were denied an “equal footing” by EPA in evaluating their applications for positions on the SAB. Rather, the Government argued that the Appellants (like all other applicants) were given equal treatment because the evaluation process for selecting new candidates was fair and based on candidate merits.<sup>11</sup>

As of year-end, it is unclear how the Court of Appeals will rule. What is clear, however, is that the process of selecting individuals to serve on the Science Advisory Board will remain a political (and litigation) football.

*B. Litigation: Scientific peer review criticism of EPA on PFAS and related compound health advisories.*

In June 2022, EPA issued a new series of “health advisories” for four PFAS-related compounds.<sup>12</sup> Two of the health advisories were termed “interim” and related to PFOA and PFOS.<sup>13</sup> The levels recommended for individuals exposed to those two compounds in drinking water were “near zero and below EPA’s ability to detect at this time.”<sup>14</sup> The other set of health advisories were termed final by the EPA and dealt with perfluorobutane sulfonic acid and its potassium salt (PFBS) and for hexafluoropropylene oxide (HFPO) dimer acid and its ammonium salt (“Gen X” chemicals).<sup>15</sup> EPA cited its broad authority under the Safe Drinking Water Act to set these “advisories” which are not formal regulations.<sup>16</sup>

Two lawsuits followed shortly thereafter, with the plaintiff in each claiming that EPA disregarded science in setting the health advisories. Both suits raise interesting and

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<sup>7</sup>Young v. EPA, 633 F. Supp. 3d 181 (D.C. Cir. 2022).

<sup>8</sup>Notice of Appeal, Young v. EPA, No. 22-5305 (filed Nov. 22, 2022).

<sup>9</sup>Young v. EPA, No. 22-5305 (D.C. Cir. filed Sept. 12, 2023) (per curiam).

<sup>10</sup>Supplemental Brief for Appellants at 1, Young v. EPA, No. 22-5305 (D.C. Cir. filed Sept. 22, 2023).

<sup>11</sup>Supplemental Brief for Appellees, Young v. EPA, No. 22-5305 (D.C. Cir. filed Sept. 22, 2023).

<sup>12</sup>U.S. ENVTL. PROT. AGENCY, [TECHNICAL FACT SHEET: DRINKING WATER HEALTH ADVISORIES FOR FOUR PFAS \(PFOA, PFOS, GENX CHEMICALS, AND PFBS\)](#) (June 2022).

<sup>13</sup>*Id.* at 2-3.

<sup>14</sup>[Press Release](#), U.S. Env'tl. Prot. Agency, EPA Announces New Drinking Water Health Advisories for PFAS Chemicals, \$1 Billion in Bipartisan Infrastructure Law Funding to Strengthen Health Protections (June 15, 2022).

<sup>15</sup>*Id.*

<sup>16</sup>[Drinking Water Health Advisories \(HAs\)](#), U.S. ENVTL. PROT. AGENCY (last updated May 30, 2023).

direct challenges to EPA’s scientific decision-making process based in part upon its alleged disregard of peer-review comments and the SAB process of review.<sup>17</sup>

First, the American Chemistry Council filed a petition for review of the EPA’s advisories in the D.C. Circuit. In January 2023, that the Court determined that the Council, an association of various members, could not establish the required jurisdictional standing based on any quantifiable harm to any of its members.<sup>18</sup>

In a separate suit, a major manufacturer of PFAS compounds, The Chemours Company FC, LLC (Chemours), filed suit in the U.S. Court of Appeals for the Third Circuit challenging EPA’s health advisory for the Gen X chemicals. Chemours alleged that EPA’s advisory violated sound scientific methodology, noting that one of EPA’s own scientific peer review members, a professor from the University of South Carolina, criticized the Agency’s reference dose calculation as “extreme” and “excessive.”<sup>19</sup> Unlike the D.C. Circuit, the Third Circuit denied a government motion to dismiss the *Chemours* case for lack of standing and thereby allowed the lawsuit to proceed before that Court.<sup>20</sup> Recently, that Court has requested additional letter briefs on the potential impacts of three pending U.S. Supreme Court cases on the *Chemours* suit. The Third Circuit sought letter briefs on whether it should hold any decision until after opinions by the Supreme Court were issued in two cases dealing with the scope of administrative deference due to a federal agency and in a third case raising the question of the scope of congressional delegation to an administrative agency.<sup>21</sup> The Third Circuit has set oral argument for January 29, 2024.

### C. *Regulatory: The Science Advisory Board and Environmental Justice*

In November 2023, the SAB issued a final report entitled “Review of the Updated Methodology of Environmental Justice Screening and Mapping Tool (EJ Screen Version 2.1).”<sup>22</sup> The EPA “screening tool” for Environmental Justice (EJ) was initially launched in 2019 as version 2.0 and further revised in October 2022 with version 2.1.<sup>23</sup> As EPA describes it, the EJ screening tool is designed to provide a preliminary assessment of

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<sup>17</sup>See [Order, Am. Chemistry Council v. EPA](#), No. 22-1177 (D.C. Cir. Jan. 23, 2023) (per curiam); see also [Petition for Review, The Chemours Company FC, LLC v. EPA](#), No. 22-2287 (3rd Cir. July 13, 2022).

<sup>18</sup>[Order, Am. Chemistry Council v. EPA](#), No. 22-1177 (D.C. Cir. Jan. 23, 2023) (per curiam).

<sup>19</sup>[Petition for Review at 18, The Chemours Company FC, LLC v. EPA](#), No. 22-2287 at 6 (3rd Cir. 2022) (citing EPA, RESPONSE TO ADDITIONAL FOCUSED EXTERNAL PEER REVIEW OF DRAFT HUMAN HEALTH TOXICITY VALUES FOR HEXAFLUOROPROPYLENE OXIDE (HFPO) DIMER ACIDS AND ITS AMMONIUM SALT (GENX CHEMICALS) (Oct. 2021) (Comments of Professor Warren on calculation of reference dose; Professor Warren was one of seven external peer reviewers who evaluated the EPA draft report)).

<sup>20</sup>[Order, The Chemours Company FC, LLC v. EPA](#), No. 22-2287 (3rd Cir. 2022) (subscription required).

<sup>21</sup>[Order, The Chemours Company FC, LLC v. EPA](#), No. 22-2287 (3rd Cir. Dec. 7, 2023), Doc. No. 70 (text order only). The order referenced three pending Supreme Court cases: *Relentless v. Department of Commerce*, No. 22-1219, *Loper Bright Enterprises v. Raimondo*, No. 22-451 (both dealing with application of the *Chevron* doctrine) and *SEC v. Jarkesy*, No. 22-859 (involving a challenge to administrative action based in part on the “non-delegation” doctrine).

<sup>22</sup>Sci. Advisory Bd., EPA-SAB-24-002, [Transmittal of the Science Advisory Board Report Review of the Updated Methodology of EPA’s Environmental Justice Screening and Mapping Tool](#) (EJScreen version 2.1) (November 20, 2023) [hereinafter SAB Report].

<sup>23</sup>[Technical Information about EJScreen](#), U.S. ENVTL. PROT. AGENCY (last updated March 5, 2024).

communities that may require further consideration under EJ criteria, including socioeconomic standards such as income, racial composition, and five other factors such as relative age of the community, relative education levels and other items.<sup>24</sup>

The SAB set up a subcommittee to evaluate the revised (2.1) model used by EPA for screening on environmental justice areas and published its report in November 2023. The SAB made recommendations on expanding the utility of the EJ Screen and its supporting documentation and commented on at least one key socioeconomic factor—low income. SAB reported that the EJ Screen’s measurement of low-income “should be reconsidered because the current indicator does not account for geographic differences and may not match current economic realities confronting many households across the nation.”<sup>25</sup> The SAB also cautioned that as to the various environmental factors used in an EJ Screen, “[SAB] does not support any systematic weighting scheme for combining environmental indicators, as there is insufficient scientific basis for determining such weights.”<sup>26</sup>

EPA did not wait for SAB’s final report. Instead, in June 2023 EPA issued a further revision, model 2.2, to its EJ Screen.<sup>27</sup> While the new version (2.2) may not make any fundamental changes from the prior 2.1 version, it is, at best, a problematic use of the established scientific review to publish new versions of a document which is currently undergoing a review based on a prior version.

While the SAB was reviewing the revised EPA EJ screening model, SAB reported that it was self-initiating a review of materials to support rulemaking in the EJ field. In its report, SAB indicated that its staff “will form a panel comprised of the members of the SAB Environmental Justice Science Committee, other SAB members, and additional scientific experts selected from a pool of candidates nominated by the public” with an anticipated deliverable by the fall of 2024.<sup>28</sup> Of course, the next Presidential election will occur in the fall of 2024, and the results of that election may determine whether SAB’s report is either accepted or placed in the trash pile of unread and unconsidered scientific documents.

## II. APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN ENVIRONMENTAL MODELING

The public release of OpenAI’s ChatGPT in November 2022 pushed the issue of artificial intelligence (AI) to the forefront of public consciousness. ChatGPT, like other large language models, possesses language processing capabilities that enable it to assist with tasks ranging from research to drafting documents to creating computer code. [Like the legal community](#)<sup>29</sup>, the scientific community is grappling with the opportunities and risks associated with AI. 2023 saw an incredible surge in AI-related scholarly output -- 8% of all research papers published worldwide mention “AI” or “Machine Learning” in the

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<sup>24</sup>U.S. ENVTL. PROT. AGENCY, [EJSCREEN: ENVIRONMENTAL JUSTICE MAPPING AND SCREENING TOOL: EJSCREEN TECHNICAL DOCUMENTATION FOR VERSION 2.2](#) (July 2023).

<sup>25</sup>SAB Report, *supra* note 22 at 2.

<sup>26</sup>*Id.* at 3.

<sup>27</sup>U.S. ENVTL. PROT. AGENCY, [EJSCREEN FACT SHEET \(June 2023\)](#) at 1 (“What’s New in EJScreen 2.2”).

<sup>28</sup>Sci. Advisory Bd., EPA-SAB-24-007, [Science Advisory Board \(SAB\) Consideration of: \(1\) A Proposed Self-Initiated Project on Environmental Justice Analyses to Support EPA Regulations, and \(2\) Ten Planned Regulatory Actions Listed on EPA’s 2023 Spring Regulatory Agenda and Discussed During the Chartered SAB Meeting on September 21 - 22, 2023](#) at 1-2 (September 29, 2023).

<sup>29</sup>Am. Bar Ass’n, [Resolution 604](#) (adopted Feb. 6, 2023).

title or abstract.<sup>30</sup> An informal poll of 1,600 researchers conducted by the scientific journal *Nature* in 2023, captured the sentiment of the scientific research community. A majority of these respondents harbored optimism regarding AI's potential to speed data processing, computation, and enhance writing quality. However, this optimism was counterbalanced by concerns over the possibility of AI perpetuating biases, and its role in propagating misinformation, plagiarism, and academic fraud.<sup>31</sup>

The environmental science and engineering field is also witnessing a surge in AI research. While environmental research applying generative AI such as ChatGPT is still in its infancy,<sup>32</sup> many applications of machine learning<sup>33</sup> are being actively researched. Some of the most potentially impactful applications of AI in environmental science and engineering are related to the development and improvement of environmental models. The remainder of this section examines modeling advancements in two areas: water quality and toxicology.

#### A. *AI in Water Quality Modeling*

Predictive modeling of harmful bacterial and algal impacts to recreational waters is a technical challenge, as the magnitude of these impacts is a function of numerous biological, physical, and chemical parameters. The accuracy and forecast range of these models are not merely academic concerns; they have tangible implications for public health and regulatory compliance. Two studies released in 2023 report improvements in these water quality models by applying AI and machine learning.

A research team from Iowa State University presented a study on one-week-ahead prediction of cyanobacterial harmful algal blooms in Iowa lakes.<sup>34</sup> The study focused on identifying factors associated with hazardous microcystin (a toxin produced by cyanobacteria) levels and developing predictive classification models. The study utilized water samples from thirty-eight Iowa lakes collected between 2018 and 2021. Three machine learning models were employed to produce seven-day forecasts of microcystin exceedances. The machine learning models were successful in identifying which factors were associated with microcystin exceedances and produced strong predictions of microcystin exceedances on a one-week forecast basis. Furthermore, a comprehensive review article published by a research team from Los Alamos National Laboratory suggested that more comprehensive and sophisticated machine learning approaches may result in further improvements in the forecasting of harmful algal blooms.<sup>35</sup> Such advancements will assist public health authorities and regulators in managing regulatory compliance.

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<sup>30</sup>Richard Van Noorden & Jeffrey M. Perkel, [AI and science: what 1,600 researchers think](#), NATURE (Sept. 28, 2023) (subscription required).

<sup>31</sup>*Id.*

<sup>32</sup>Jun-Jie Zhu et al., [ChatGPT and Environmental Research](#), 57 ENVTL. SCI. & TECH. at 17667-70 (Mar. 21, 2023).

<sup>33</sup>Machine learning is a subset of AI that specifically involves algorithms that analyze and interpret patterns and structures in data to enable learning, decision-making, and predictions; *See, e.g.*, Shixuan Cui et al., [Advances and Applications of Machine Learning and Deep Learning in Environmental Ecology and Health](#), 335 ENVTL. POLLUTION (Aug. 9, 2023).

<sup>34</sup>Paul Villanueva et al., [One-Week-Ahead Prediction of Cyanobacterial Harmful Algal Blooms in Iowa Lakes](#) 57 ENVTL. SCI. & TECH. at 20,636-46. (Nov. 27, 2023).

<sup>35</sup>Babetta L. Marrone et al., [Toward a Predictive Understanding of Cyanobacterial Harmful Algal Blooms Through AI Integration of Physical, Chemical, and Biological Data](#), ACS ES&T WATER (2023).

In a second study, a Stanford University team developed a data-driven framework for predicting bacterial standard exceedances at marine beaches up to three days in advance.<sup>36</sup> Utilizing historical data sets from two California sites, they trained nearly 400 forecast models using statistical and machine learning techniques and screened these models for performance based on a comparison with two traditional models akin to what is currently employed by California authorities. Forecast model performance of the top-performing models was similar to “nowcast” models (i.e., models that do not forecast the future), suggesting that the machine learning approach is an effective predictive tool for bacterial standard exceedances for at least three-day forecasts and is a significant improvement to current methods. Forecasting of this nature may help public health authorities manage beach closures.

#### B. *AI in Toxicology and Risk*

A research team from the Swiss Federal Institute of Aquatic Science and Technology (Eawag) applied machine learning to screen thousands of possible anthropogenic pollutants, identified in high-resolution chemical analyses, for potential toxicity. The study by Arturi and Hollender (2023) introduces a machine learning framework that is designed to prioritize environmental pollutants based on their toxicity.<sup>37</sup> Such a screening framework may be employed to identify potentially toxic molecules for additional study. Utilizing molecular fingerprints from high-resolution mass spectrometry data, this framework classifies thousands of unidentified features as toxic or non-toxic. It leverages a large database of *in vitro* toxicity data and known chemical structures to train models that have demonstrated high predictive accuracy. While the authors identify several limitations, foremost that the model was trained on cellular rather than organism toxicity endpoints, this method represents an advancement in the screening and prioritization of yet-uncharacterized environmental compounds.

Overall, the studies highlighted in this section represent but a small sample of the extensive research output in the environmental field employing AI and machine learning. Although the enhancements over traditional modeling methods vary, with some being relatively modest, these initial improvements portend a potentially exciting future for the research community. As methodologies continue to evolve and refine, we can anticipate further performance improvements in the years ahead. Meanwhile, regulators and lawyers will have to keep abreast of these developments to ensure that applicable rules and standards continue to incorporate the most accurate analytical techniques.

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<sup>36</sup>Ryan T. Searcy & Alexandria B. Boehm, [\*Know Before You Go: Data-Driven Beach Water Quality Forecasting\*](#), 57 ENVTL. SCI. & TECH. at 17,930-39 (Dec. 6, 2022).

<sup>37</sup>Katarzyna Arturi & Juliane Hollender, [\*Machine Learning-Based Hazard-Driven Prioritization of Features in Nontarget Screening of Environmental High-Resolution Mass Spectrometry\*](#), 57 ENVTL. SCI. & TECH. at 18,067-79 (June 6, 2023).