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# Exploring the Role of Civic Monitoring of Coal Ash Pollution: (Re)gaining Agency by Crowdsourcing Environmental Information

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**Abstract:** Citizen-gathered evidence (CGE) gathered by individuals organized in collectives have the potential to demonstrate environmental and social wrongdoings in court. We identify (collective) agency and resistance in how individuals and communities that have been exposed to socio-environmental stressors turn to gather CGE. We explore the modes through which people gather scientific data, produce CGE, alert authorities to environmental harm, and the methods by which data can be shared with communities, beginning with the case studies of civic environmental monitoring addressing coal ash pollution in North Carolina. We analyze the case studies through a theoretical lens built on (1) the theory of civic monitoring “as resistance;” (2) the argument that CGE can embody “collective intelligence;” and (3) the concept of “crowd science” through a decentralized yet coordinated network. In the first part of the article, we introduce the case studies. Then, we illustrate our theoretical frame as applied to the analysis of the cases. We discuss the cases and in particular the CGE at issue through the prism of the frame. We demonstrate how CGE can be valuable not only for civil society and civic organizations, but also for competent authorities. In our conclusion, we identify critical junctures of our case studies, such as that of “knowledge crowdsourcing” to demand justice that triggers the government to take action and the existence of a “coordinated” yet decentralized crowd to capture the full extension of the problem. Lastly, we outline the limitations of our study, a future research agenda, and still open questions.

**Keywords:** civic monitoring; crowdsourcing; environmental information; coal ash; water and air pollution

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## Introduction

Citizen-gathered evidence (CGE) collected by individuals organized in collectives can have the potential to demonstrate environmental and social wrongdoings in court, as shown by research conducted by the ongoing Sensing for Justice project.<sup>1</sup> We understand CGE as a body of facts or information collected by ordinary people (neither experts nor institutionally appointed) indicating that a certain environmental harm exists. We identify (*collective*) *agency* in how individuals and communities exposed to socio-environmental stressors turn to gathering CGE, as a way to integrate their (often unique) local knowledge into official evidence of environmental harms. We explore the modes through which people produce CGE, how collective efforts can amplify the strength of CGE, and the potential role of CGE in regulatory and judicial enforcement. We demonstrate the potential for utilizing *platforms* to display and disseminate data gathered or collated by civic actors.

CGE stems from civic environmental monitoring. We can define civic monitoring as “grassroots-driven environmental monitoring initiatives” which can be based “simply” on human senses or on sensor technologies (which can be framed as “citizen sensing”).<sup>2</sup> In this article, we discuss civic monitoring as a distinctive form of “crowdsourcing,” aligning with the parallelisms identified among the practices by recent literature in the field.<sup>3</sup> We understand crowdsourcing as

the act of an *organization* taking a *function* traditionally performed by a designated agent, i.e., an *internal member of the organization* and outsourcing it to an undefined, generally large group or *network* of people in the form of an open call (where the italics stands for our adaptations of Howe’s original definition).<sup>4</sup>

We frame environmental monitoring from the grassroots as a form of crowdsourcing data collection and analysis, for example on environmental causality and noxious impacts on human health.

Kreiczer-Levy and Megiddo in introducing the “Crowdsourcing and the Decline of the Individual” symposium at the College of Law & Business, Israel,<sup>5</sup> argued that the rise of collaborative platforms to harness knowledge from crowds have

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1 *Sensing for Justice*, WEBNODE (Nov. 10, 2021, 11:04 AM), <https://sensingforjustice.webnode.it/>.

2 ANNA BERTI SUMAN, *SENSING THE RISK* (2021).

3 Lea Shanley et al., *Policy Perspectives on Citizen Science and Crowdsourcing*, 4 CSTP 30 (2019).

4 Jeff Howe, *Crowdsourcing: A Definition*, *Crowdsourcing: Tracking the Rise of the Amateur*, TYPEPAD (June 2, 2006), [https://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing\\_a.html](https://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html).

5 Shelly Kreiczer-Levy & Tamar Megiddo, *Call for Papers – Crowdsourcing and the Decline of the Individual*, THE FACULTY LOUNGE (Aug. 2, 2022) <https://www.thefacultylounge.org/2021/08/cfp-crowdsourcing-the-decline-of-the-individual.html>.

been accompanied by a social cost, that is, the “decline of the individual.” Whereas (often privately or governmentally owned) platforms “served to connect people and build new communities across the boundaries of political, national, geographic, class, and other divisions,” such platforms also progressively took away agency from people, as crowds from producing and curating content, collecting information, and even providing services, *became the product* and progressively lost agency as individuals and collectives.

In this article, we posit that – in parallel – an opposite trend is ongoing, that is, the (auto)empowerment of individuals and communities through engagement in civic monitoring, gathering and disseminating scientific data. These actors may be exposed to socio-environmental stressors or have unique environmental knowledge and gather with their own senses or with basic sensing equipment. We demonstrate how such monitoring can be valuable not only for civil society and civic organizations, but also for those authorities competent for risk governance and policy intervention,<sup>6</sup> and even for law enforcement. Indeed, the data produced by the monitoring citizens can even become evidence accepted in court, as the groundbreaking Formosa case demonstrates.<sup>7</sup> All this, in our view, signals *collective agency*.

This article explores two case studies to demonstrate how collective agency through use of CGE can occur in practice. We choose our case studies from a series of legal actions prompted by civic environmental monitoring targeted to addressing coal ash pollution in North Carolina,<sup>8</sup> a state in south-eastern United States (U.S). We focus on this matter as it was one of the longest and largest sustained advocacy efforts targeting coal ash (also through civic monitoring) in the U.S. Our analysis juxtaposes a traditional case law review to theoretical landscaping. We analyze the cases through a theoretical lens built on (I) the theory of civic monitoring “as resistance;” (II) the argument that CGE can embody “collective intelligence;” and (III) the concept of “crowd science” through a decentralized yet coordinated network. We discuss how local individuals (coordinated to a certain degree by “middle ground” actors, *e.g.*, environmental non-governmental-organizations, ENGOs) can regain (collective and individual) *agency* and resist environmental injustices through civic monitoring.

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6 ANNA BERTI SUMAN, *THE POLICY UPTAKE OF CITIZEN SENSING* (2021).

7 Anna Berti Suman & Sven Schade, *The Formosa Case: A Step Forward on the Acceptance of Citizen-Collected Evidence in Environmental Litigation?* 6 CSTP 16 (2021).

8 See, *e.g.*, Elizabeth Ouzts, *How Duke and Its Foes Agreed to the Largest Coal Ash Cleanup in U.S. History*, ENERGY NEWS NETWORK (Jan. 13, 2020), <https://energynews.us/2020/01/13/how-duke-and-its-foes-agreed-to-the-largest-coal-ash-cleanup-in-u-s-history/>; *Cleaning Up Coal Ash Pollution*, SOUTHERN ENVIRONMENTAL LAW CENTER (OCT. 2, 2023 3:15 PM), <https://www.southernenvironment.org/topic/coal-ash-cleanup/>.

In the first part of the article, we introduce the case studies. Then, we illustrate our theoretical frame as applied to our case analysis. Then, we discuss the cases and in particular the CGE considering this frame. We demonstrate how CGE can be valuable not only for civil society and civic organizations, but also for competent authorities. In our conclusion, we identify critical junctures of our case studies, such as that of “knowledge crowdsourcing” for demanding justice that triggers government to act and the existence of a “coordinated” crowd yet decentralized enough to capture the full extent of the problem. Lastly, we outline the limitations of our study, a future research agenda, and remaining open questions.

In the U.S. cases analyzed, civic conservation groups collected samples from local waters to look for an indication of pollution leaking from large coal ash impoundments. With this information, they then informed of their intent to sue and pursued lawsuits against the alleged responsible party, Duke Energy. Water quality samples were collected by individuals in coordination with an ENGO and processed by laboratories for analysis. The results indicating unlawful pollution were then sent to public authorities and Duke Energy. These efforts to gather and disseminate potential evidence of pollution informed the lawsuits which culminated in the cleanup of 14 North Carolina coal ash sites and acted as an impetus for U.S. regulators to reduce or eliminate water pollution from coal ash. After years of sustained legal and public advocacy, what began with individuals sampling seeps and creeks eight years earlier, ended in 2020 in a *historical cleanup* of over 120 million tons of ash.<sup>9</sup> In the intervening years, CGE in the form of ongoing water quality monitoring for coal ash pollution and the collection and dissemination of scientific data to communities through online mapping platforms played multiple roles – from formal input in legal proceedings to informing the public’s engagement in regulatory decisions on the long-term management of coal ash. This *judicial* and *regulatory uptake* of civic monitoring demonstrates the individual and collective agency that civic monitoring and crowdsourcing environmental information can unleash.

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<sup>9</sup> See *NC Settlement Results in Largest Coal Ash Cleanup in America*, SOUTHERN ENVIRONMENTAL LAW CENTER, (Jan. 2, 2020), <https://www.southernenvironment.org/news-and-press/news-feed/n.c-settlement-results-in-largest-coal-ash-cleanup-in-america>; *Coal Ash Excavation: Closure Determination*, NORTH CAROLINA ENVIRONMENTAL QUALITY (Oct. 2, 2023, 3:27 PM), <https://deq.nc.gov/news/key-issues/coal-ash-excavation> (last visited Dec. 15, 2021).

# I From Riverkeepers' Monitoring to a Historical Cleanup

## A A Disaster Reveals the Dangers of Coal Ash

In 2008, an impoundment holding back a slurry of coal ash burst following heavy rainfall and caused a catastrophic release near Kingston, Tennessee,<sup>10</sup> burying houses and dumping slurry into the Emory River.<sup>11</sup> Coal ash, or waste leftover when coal is burned to generate electricity at powerplants, contains an array of toxic pollutants, such as arsenic, boron, cadmium, chromium, cobalt, selenium, and thallium.<sup>12</sup> For decades, the management strategy for this large waste stream in parts of the U.S. involved mixing the ash with water and directing the resulting polluted slurry into massive unlined basins<sup>13</sup> that were separated from rivers and lakes by large earthen impoundments or dams.<sup>14</sup>

Although the Kingston disaster exposed the structural hazard of leaving coal ash, steeping in a wet slurry against an earthen impoundment adjacent to rivers and lakes, this was only the beginning. The ensuing attention to coal ash basins would soon reveal that leaving coal ash steeping in a slurry would not just risk a catastrophic failure of the earthen dikes but would also allow pollution to migrate, leak, and seep into groundwater, rivers, and streams. Remarkably, it took an

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**10** *EPA in Tennessee: EPA Response to Kingston TVA Coal Ash Spill*, EPA, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (Oct. 2, 2023, 3:29 PM), <https://www.epa.gov/tn/epa-response-kingston-tva-coal-ash-spill>.

**11** Joel K. Bourne, Jr., *Coal's Other Dark Side: Toxic Ash that Can Poison Water and People*, NATIONAL GEOGRAPHIC (Feb. 19, 2019), <https://www.nationalgeographic.com/environment/article/coal-other-dark-side-toxic-ash>.

**12** Coal combustion waste includes fly ash, bottom ash, boiler slag, and flue gas desulfurization (FGD) products and typically includes toxic elements such as arsenic, boron, selenium, and mercury. See, e.g., Laura S. Ruhl, Gary S. Dwyer, Heileen Hsu-Kim, James C. Hower, & Avner Vengosh, *Boron and Strontium Isotopic Characterization of Coal Combustion Residuals: Validation of New Environmental Tracers*, 48 ENV'T SCI. & TECH. 14790 (2014); *Coal Ash Basics*, U.S. EPA, (Oct. 2, 2023, 3:40 PM), <https://www.epa.gov/coalash/coal-ash-basics> (indicating coal ash contains contaminants like mercury, cadmium and arsenic); D. Kosson, F. Sanchez, P. Kariher, L. H. Turner, R. Delapp, & P. F. A. B. Seignette, *Characterization of Coal Combustion Residues from Electric Utilities – Leaching and Characterization Data*. U.S. EPA, OFFICE OF RSCH. & DEV., EPA-600/R-09/151 (2009), [https://cfpub.epa.gov/si/si\\_public\\_record\\_report.cfm?Lab=NRML&dirEntryId=216684](https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRML&dirEntryId=216684).

**13** There the ash settles, and the polluted wastewater that remains discharges through an “outfall” into a river.

**14** See, e.g., LINDA LUTHER, CONG. RESEARCH SERV., R41341, EPA'S PROPOSAL TO REGULATE COAL COMBUSTION WASTE DISPOSAL: ISSUES FOR CONGRESS 8–9 (updated Oct. 7, 2011); Keaston Hall, *Uncontainable Threat: The Nation's Coal Ash Ponds*, 69 EMORY L. J. 163, 171–72 (2019).

additional seven years after the Kingston disaster before the U.S. Environmental Protection Agency released a federal rule targeting coal ash.<sup>15</sup> This delayed response could be considered a governmental “failure” to which civic monitoring tried to respond.

In those intervening years, ENGOs whose missions included protecting rivers from pollution (often termed “riverkeepers”), began investigating coal-burning powerplants in their communities, including through civic monitoring. This article focuses on the role that scientific information collected by civic environmental organizations played in bringing about the cleanup in North Carolina of vast amounts of coal ash from 14 powerplants across the state. For years, ENGOs organized the collection of samples of potentially impacted streams and seeps. They also obtained and reviewed public records to ensure transparency and disclosure of contamination. They utilized online platforms to map risks revealed by the public data.<sup>16</sup> These ENGOs also worked to educate communities about the risks of coal ash and turned to courts and other legal venues to compel compliance with water protection laws. Information they collected and provided to decision-makers was key in bringing to light the extent of the problem – ensuring the cleanup to address past contamination and mitigate future harm.

Although the broader cleanup spanned across 14 powerplants, this article examines two case studies as a basis to frame and explore the roles that scientific information collected by civic environmental organizations can play in prompting and sustaining enforcement actions in court and in exposing the magnitude of an environmental problem. The first case involves a coal-fired powerplant located along the French Broad River near Asheville, North Carolina, a small city in the Appalachian Mountains. The second is the Allen Powerplant, along Lake Wylie, near Gastonia, North Carolina.

The detailed accounts that follow aim to deconstruct our case studies regarding the manner environmental information was observed and gathered by individuals and civic organizations, how data visualization played a role in translating the scope of the problems to the wider public, and how these types of information can inform regulation and adjudication.

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<sup>15</sup> Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 80 Fed. Reg. 21,301 (April 15, 2015) (codified at 40 C.F.R. pt. 257, 261).

<sup>16</sup> See, e.g., North Carolina Drinking Water Contamination Near Duke Energy Coal Ash Sites Map, G.G. Allen, SELC, <https://selcgis.maps.arcgis.com/apps/MapSeries/index.html?appid=95ddc8ae572b4e539fd8d4be07733e6c> (content last updated Aug. 20, 2015) [hereinafter North Carolina Drinking Water Contamination Map].

## B An Insight into the Asheville Powerplant: The Investigation by Civic Groups and Pursuit of Enforcement

In January 2013, local community organizations<sup>17</sup> notified Duke Energy, the largest utility in the United States, of their intent to commence a civil lawsuit for violations of the federal Clean Water Act<sup>18</sup> at the Asheville powerplant.<sup>19</sup> These organizations asserted that the company had stored a wet slurry of coal ash in large and unlined basins which was polluting streams, rivers and groundwater.<sup>20</sup> A letter, giving notice of intent to commence a lawsuit is required as a pre-requisite to enforcing violations under the Clean Water Act's citizen-suit provisions.<sup>21</sup> This was the first in a series of such notices, sent by environmental and community groups in North Carolina based on sampling by local riverkeepers and information gathered through public records, that would allege Duke Energy's handling of coal ash across its powerplants was violating the Clean Water Act.

Before pursuing enforcement, the community groups had reviewed public data and collected water samples to determine whether the powerplant's coal ash basins were leaking pollutants. Potential polluted discharges were identified by visually observing riverbanks below the coal ash waste pits for indications of seepage, sometimes visible as orange discharge, indicative of iron-oxidizing bacteria in coal ash. At the Asheville powerplant, the French Broad Riverkeeper<sup>22</sup> collected water samples from streams and seeps flowing from the impoundments toward the

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17 The Southern Environmental Law Center (SELC), a non-governmental organization acting as counsel, sent the letter on behalf of MountainTrue, Sierra Club, and Waterkeeper Alliance. These are non-governmental organizations with missions that include protecting streams, rivers, and groundwaters from contamination.

18 The legal notices invoked section 505 of the Clean Water Act, 33 U.S.C. § 1365.

19 See Legal Notice of Intent to Progress Energy Carolinas (Jan. 24, 2013) [hereinafter Asheville Powerplant CWA Notice of Intent], accessible in public records at <https://files.nc.gov/ncdeq/Public%20Records%20Jump%20Drive%20201-24-2013%20Notice%20of%20Intent%20-%20reduced.pdf>. The notice was directed to Progress Energy Carolinas, which became Duke Energy Carolinas following a merger in 2012.

20 See *id.*; Coal Combustion Waste Impoundment Dam Assessment Rep., Progress Energy Carolinas, 2–2 (June 2009) [hereinafter CCW Rep.], [https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/pdf/pec\\_asheville\\_final1.pdf](https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/pdf/pec_asheville_final1.pdf).

21 33 U.S.C. § 1365 (b)(1)(A).

22 The French Broad Riverkeeper is dedicated to protecting streams and rivers in the French Broad watershed and is a member of the larger Waterkeeper Alliance, an organization at the national level that works with local riverkeepers. The riverkeeper is part of MountainTrue, a non-profit community organization dedicated to protecting the environment. See French Broad Riverkeeper, MOUNTAINTRUE, <https://mountaintrue.org> (last visited Oct. 3, 2023).

French Broad River.<sup>23</sup> The process involved collecting samples of surface water in bottles, recording geographic coordinates, and delivering samples to private laboratories for analysis.<sup>24</sup> Analysis revealed elevated levels of pollutants indicating coal ash, such as boron, cobalt, iron, and nickel.<sup>25</sup>

In addition to investigating seepage, community groups obtained monitoring data from government authorities related to groundwater.<sup>26</sup> This data also showed that unlined coal ash basins were polluting groundwater with pollutants like boron, iron, manganese, selenium, thallium, chloride, sulfate, and total dissolved solids.<sup>27</sup> Despite years of data documenting groundwater contamination around the ash basins at Asheville, the agency was not requiring Duke Energy to take action to address the source of pollution.

Based on sampling results obtained, data in public records, and the inadequate enforcement by regulating authorities, the groups sent a notice of their intent to commence their own enforcement action against Duke Energy under the citizen-suit provisions of the Clean Water Act.<sup>28</sup> Therefore, we can identify a clear link between the civic-collected evidence and the *compliance failures* that the groups aimed to demonstrate. The open disclosure of these failures, through the notice letters sent to the energy company and federal and state authorities, served as fora to confront and resist, ultimately embodying forms of agency from concerned citizens.

## C North Carolina Initiates an Enforcement Action

In response to the groups' legal notices, the State of North Carolina elected to initiate its own enforcement against Duke Energy in court.<sup>29</sup> Federal law however

23 See Asheville Powerplant CWA Notice of Intent, *supra* note 19.

24 Motion to Intervene by Sierra Club, Waterkeeper Alliance and Western North Carolina Alliance, Ex. 1–2, *Asheville Coal Ash Case* (N.C. Super. Ct. April 12, 2013); see Laura S. Ruhl, Gary S. Dwyer, Heileen Hsu-Kim, James C. Hower, & Avner Vengosh, *Boron and Strontium Isotopic Characterization of Coal Combustion Residuals: Validation of New Environmental Tracers*, 48 ENV'T SCI. & TECH. 14790 (2014).

25 See *id.*

26 These were considered public records under the N.C. Public Records Act. N.C. Gen. Stat. § 132–1.

27 See Asheville Powerplant CWA Notice of Intent, *supra* note 19, at 7.

28 See *id.* The facility's Clean Water Act discharge permit had expired in 2010 but had been administratively extended, which meant any modifications would require a new permit. The groups also maintained that failure to properly renew the facility's permit deprived the public an opportunity to comment on the permitting approach and the structural problems the outfall relocation sought to address. See Asheville Powerplant CWA Notice of Intent, *supra* note 19.

29 North Carolina, through its state agency the Division of Water Quality, administers the state's NPDES permitting and compliant program, pursuant to authority delegated to the state from EPA under section 402 of the Clean Water Act. 33 U.S.C. § 1342(b).



precludes community groups from proceeding with their own citizen suit if, during that 60-day notice period, the “[s]tate has commenced and is diligently prosecuting” a civil action to require compliance with the same standard.<sup>30</sup> However, groups and individuals can seek to join as parties in such enforcement actions (under the applicable rules civil procedure), and federal regulations implementing the Clean Water Act forecast this, in requiring states to allow for intervention as part of the Act’s public participation requirements.<sup>31</sup> Relying on these authorities, the community groups sought to intervene in the state’s enforcement case and to participate in assuring enforcement addressed the violations identified by the community groups.<sup>32</sup>

In support of their request to participate in the state’s lawsuit, the community groups presented their sampling results and observations of seeps and streams around the Asheville powerplant, and the results of groundwater monitoring data collected from public records.<sup>33</sup> The groups tendered an expert opinion establishing that polluted groundwater was reaching the French Broad River, which was important in connecting migrating pollution to the interests of the community groups.<sup>34</sup> The state’s inaction on coal ash despite years of monitoring data, they argued, demonstrated that the state would *not* adequately represent their interests in its enforcement case.<sup>35</sup> This is another crucial passage for our argument that engaging with civic monitoring *returned agency* to the affected communities vis-à-vis the state’s inaction.

## D The Abandoned Settlement and the Dan River Disaster

After initiating an enforcement case, and while the community groups were waiting for the court to decide their participation in the case, the state agency and Duke

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**30** 33 U.S.C. § 1365 (b)(1). Literature provides accounts of states initiating their own enforcement cases as a shield against citizen enforcement cases. See, e.g., Peter A. Appel, *The Diligent Prosecution Bar to Citizen Suits: The Search for Adequate Representation*, 10 WIDENER L. REV. 91, 103 (2003); David Hodas, *Enforcement of Environmental Law in a Triangular Federal System: Can Three Not Be a Crowd When Enforcement Authority is Shared by the United States, the States, and Their Citizens?* 54 MD L. REV. 1552, 1648 (1995).

**31** See 40 C.F.R. 123.47 (d).

**32** See N.C. R. Civ. P. 24(a) (governing generally intervention as of right in civil lawsuits). This standard required the groups to establish an interest at stake in the litigation, that the interest is not adequately represented by the state, and that disposition of the action may impair that interest.

**33** Motion to Intervene, *Asheville Coal Ash Case*, *supra* note 24.

**34** *Id.*

**35** *Id.*

Energy negotiated a settlement to conclude the case at the earliest stage.<sup>36</sup> The groups noted, in comments to the court, that the settlement agreement – negotiated without input from those community groups that had identified the violations – would not address the core problems of wet storage of coal ash in unlined lagoons and would perpetuate the ongoing violations of the law,<sup>37</sup> requiring “years of study but little action.”<sup>38</sup> In addition, the proposed settlement ignored structural concerns associated with the impoundments holding back wet coal ash – as EPA had rated Asheville’s impoundments as “High Hazard” because of the likely loss of human life if they were to fail<sup>39</sup> and that the seeps could be indicators of structural problems.<sup>40</sup> While review of the state’s settlement with Duke Energy was under consideration, the court granted permission for the groups to join the lawsuit.

Two things then happened that significantly expanded the scope of the lawsuits and catapulted them into the national spotlight (arguably enhancing civic agency on the matter). First, following similar notices sent by community groups for violations at two more facilities, the state decided to expand its enforcement strategy to cover *all fourteen* of Duke Energy’s powerplants across North Carolina.<sup>41</sup> Civil society groups with local interests in each of these powerplants subsequently were allowed to participate in all of these cases. Second, as the swiftly negotiated settlement between Duke Energy and the state was pending consideration, in February 2014 a pipe ruptured beneath a coal ash basin. The rupture continued for days, causing a catastrophic release of 39,000 tons of ash and 27,000 gallons of polluted wastewater into the Dan River, with contaminants detected 70 miles downstream.<sup>42</sup>

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36 See Associated Press, *Emails Show Close Ties Between Duke, N.C. Regulators*, CBS NEWS (Mar. 13, 2014, 6:52 PM), <https://www.cbsnews.com/news/emails-show-close-ties-between-duke-nc-regulators/>.

37 Joint Suppl. Mot. Intervene, *Asheville Coal Ash Case* (N.C. Super. Ct. July 26, 2013).

38 *Environmental Groups Join Coal Ash Lawsuit Against Duke Energy*, WFAE (Nov. 18, 2013, 4:02 PM) <https://www.wfae.org/science-environment/2013-11-18/environmental-groups-join-coal-ash-lawsuit-against-duke-energy>.

39 See, e.g., CCW Rep., 2–2, *supra* note 20.

40 See State of N.C., *Rep. of Comments Received Based on Public Posting of Proposed Consent Order*, 5 (Sept. 13, 2013).

41 Following the Asheville Clean Water Act Notice in January 2013, and the initiation of the first state enforcement action, on March 26, 2013, community groups sent notices for contamination at the Riverbend Steam Station in Gaston County. State regulators again intervened with their own enforcement case. On June 19, the SELC once again sent a 60-day notice to sue Duke over coal ash pollution leaking from Duke’s Sutton Power Plant near Wilmington. Once again, state regulators filed an enforcement action against Duke, but this time, the state also filed enforcement actions for all of Duke’s remaining coal-ash sites in North Carolina.

42 See *Case Summary: Duke Energy Agrees to \$3 Million Cleanup for Coal Ash Release in the Dan River*, U.S. EPA, <https://www.epa.gov/enforcement/case-summary-duke-energy-agrees-3-million-cleanup-coal-ash-release-dan-river#site> (content last updated Apr. 10, 2023); *Dan River Coal Ash Spill*, U.S. DEPT OF INTERIOR, [https://www.cerc.usgs.gov/orda\\_docs/CaseDetails?ID=984](https://www.cerc.usgs.gov/orda_docs/CaseDetails?ID=984) (last visited Dec. 15, 2021).

The Dan River disaster made clear that the risks of storing coal ash impounded in large pits beside rivers was anything but speculative and underscored the concerns being voiced by community groups. The state immediately withdrew from the proposed settlement, and the trajectory of the cases shifted away from the quick settlement originally envisaged by regulators.<sup>43</sup> These cases would continue for several years, through 2020, before all of them were fully resolved. In the end, each community secured a commitment by the energy company to excavate coal ash from basins that were leaking into groundwater and rivers and streams.<sup>44</sup> Neighbors living beside coal ash basins and using well water would have drinking water provided by new water lines.<sup>45</sup> This successful outcome is a crucial element in our analysis as it demonstrates the potential to use CGE to demand and secure interventions and, ultimately, environmental justice.

## II Civic Monitoring as Resistance

In this section, we elaborate on the theoretical frame that we use for the analysis of the case studies. Civic monitoring pertains to the broader “citizen science” realm. Citizen science can be defined as scientific research conducted, in whole or in part, by amateur (or non-professional) scientists, who are ordinary people participating in the scientific processes and becoming able to produce reliable scientific knowledge.<sup>46</sup> Citizen science discourses often emphasize the learning opportunity that engagement in science represents for participants and also the support ordinary people can provide to scientists. However, these practices are rarely discussed in light of an emerging trend of civic agency through knowledge, platforms, and at times technology (as in the case of use of self-built monitoring sensors). A few

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43 *E.g.*, Associated Press in Raleigh, *North Carolina to Withdraw Duke Energy Settlement Over Coal Ash Spill*, THE GUARDIAN (Mar. 21, 2014, 21:55 GMT), <https://www.theguardian.com/world/2014/mar/21/north-carolina-duke-energy-settlement-coal-ash-spill>

44 See Consent Order, *State of N.C. ex rel. N.C. Dep’t Env’t Quality et al v. Duke Energy Progress*, Nos. 13 CVS 11032, Wake County, 13 CVS 14661, Mecklenburg County (N.C. Super. Ct. Feb. 5, 2020) (resolving six powerplants and referring to prior resolution of two powerplants); Order Granting Motion for Partial Summary Judgment, *State of N.C. ex rel. N.C. Dep’t Env’t Quality et al v. Duke Energy Progress*, Nos. 13-CVS-4061, Wake County [hereinafter “*Asheville Coal Ash Case*”], 13-CVS-9352, Mecklenburg County (N.C. Super. Ct. June 1, 2016) (resolving enforcement cases at Duke Energy’s Asheville, Riverbend, Sutton and Dan River facilities).

45 N.C. GEN. STAT. § 130A-309.211(c).

46 ALAN IRWIN, CITIZEN SCIENCE: A STUDY OF PEOPLE, EXPERTISE AND SUSTAINABLE DEVELOPMENT (1995).

authors, such as Kullenberg<sup>47</sup> and Ottinger<sup>48</sup> have pointed to citizen science as a form of “resistance” (to mainstream environmental governance), on which we build our theoretical frame.

We posit that it is exactly this resistance that is critical for producing (also as a means for accessing) environmental information. We argue that by producing environmental information when appointed institutions or responsible companies fail to, and using such information as evidence even in judicial fora, monitoring citizens demonstrate *agency* through resistance. The cases discussed are illustrative of these arguments. The gaps in official data on coal ash pollution pushed the concerned local ENGOs, including waterkeepers and other community groups, to “crowdsource” environmental information. Such ENGOs coordinated the collection of information on coal ash sites, engaging with local individuals with unique knowledge, gained access to and reviewed public records, and worked with existing maps – and created new ones.<sup>49</sup> All of these efforts worked toward filling institutional gaps in data, transparency, or enforcement (in a way also crowdsourcing a public task). We defend that such an approach can be considered a form of *crowdsourcing legal evidence* and even of *collective law enforcement* as a coordinated crowd of decentralized actors mobilize to fulfill an (institutional) task.

Under this theoretical frame, citizen sensing can be understood as “a social tipping point intervention”<sup>50</sup> or, in other words, a small, situated series of actions that can trigger larger and rapid social and institutional changes, for example *returning agency* to disempowered individuals and collectives. Rejecting the status of “powerless victims” subjected to environmental harm, locals with the support of ENGOs mobilized to *claim justice through information*. Our study advances a need to rethink how these practices are represented in different social orders and discourses. In particular, we argue that appointed institutions should start taking into account these informal social movements and their role in shaping evidence and intervention.

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47 Christopher Kullenberg, *Citizen Science as Resistance: Crossing the Boundary Between Reference and Representation*, 1 (1) J. RES. STUD. 50 (2015).

48 Gwen Ottinger, *Buckets of Resistance: Standards and the Effectiveness of Citizen Science*, 35 SCI., TECH. & HUMAN VALUES 244 (2010).

49 See North Carolina Drinking Water Contamination Map, *supra* note 16. See also parallel initiatives: The Ash Tracker, ENVIRONMENTAL INTEGRITY PROJECT, <https://ashtracker.org/explore> (last visited Oct. 3, 2023), and *Mapping the Coal Ash Contamination*, EARTH JUSTICE (Nov. 3, 2022), <https://earthjustice.org/features/coal-ash-contaminated-sites-map>.

50 Ilona M Otto et al., *Social Tipping Dynamics for Stabilizing Earth's Climate by 2050*, 117 PROC. NAT. AC. SCI. 2354 (2020).

### III Collective Intelligence Through Civic Monitoring

The coal ash series of cases are also a good example of joining forces to face shared threats. Albrecht in his provocative piece “Exiting the Anthropocene and entering the Symbiocene”<sup>51</sup> argues that environmental stressors call for synchronize human efforts to achieve shared objectives, such as collective survival or, more simply, wellbeing. Albrecht argues that we should no longer delegate environmental monitoring tasks to governmental agencies but rather embrace new foundations. He envisages a new era in human history, i.e., the Symbiocene (from the Greek *symbiosis* or companionship), that is, a societal status where people decide to live together for mutual benefit in a harmonious interaction between humans and all other living beings. In this era, human intelligence(s) join forces to establish symbiotic and mutually supportive relationships among humans, and with non-human beings, which also include collective gathering of knowledge to orient decision-making.<sup>52</sup> This vision embraces more than an environmentalist drive (that is, a concerned attitude for environmental protection which can still “exist” within the system). It rather embraces *ecologism* (an approach that radically challenges the entire economic and social structure, proposing a new value system and morality that also embraces non-humans).<sup>53</sup>

We argue that the engagement of local people in mapping coal ash pollution and monitoring is a response that turns the individualism of suffering (i.e., for being exposed to an environmental stressor) into a synchronized, joint, and collectively organized response. Eventually, this transformation could be viewed as acquiring an “environmental” and “ecological” citizenship, the first pertaining to the right to participate in environmental decision-making and to promote sustainable arrangements<sup>54</sup> and the second involving a commitment to the common good which radically changes our relation with human and not-human beings.<sup>55</sup> Through coordinated actions, local inhabitants with a unique knowledge of the environment that they live in can gather data that could fill institutional knowledge gaps. Such evidence can build a type of “collective intelligence” (a term used by Levy to reference the promises of the Internet back in the 90s),<sup>56</sup> i.e., the enhanced capabilities created when people work together for a shared goal. Collective intelligence in the case studies is represented by

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51 Glenn Albrecht, *Exiting the Anthropocene and Entering the Symbiocene*, 9 MIND. NAT. 12 (2016).

52 *Id.* at 14.

53 John Barry, *Green Political Theory. Political Ideologies: An Introduction*, in POLITICAL IDEOLOGIES: AN INTRODUCTION 153 (Vincent Geoghegan & Rick Wilford eds., 2014).

54 Derek Bell, *Liberal Environmental Citizenship*, 14 ENV. POL. 179 (2005).

55 Andrew Dobson, *Environmental Citizenship: Towards Sustainable Development*, 15 SUST. DEV. 276 (2007).

56 PIERRE LÉVY, COLLECTIVE INTELLIGENCE: MANKIND'S EMERGING WORLD IN CYBERSPACE (1999).

evidence of the coal ash pollution and of causality patterns (i.e., the “facts”), expectations and values (i.e., environmental justice “claims” from concerned people).

Collective intelligence works in a manner similar to models used to explain social insects which respond to challenges by quickly gathering information and collaboratively creating solutions, with a decentralized approach.<sup>57</sup> Thus, collective intelligence represents not only a strategy to produce information but also a swift approach to work together toward a goal. In our article, this theorization serves both to identify the *modes* of collaboration among riverkeepers, community organizations, and ordinary people and assess their *actual contribution* to tackle the coal ash challenge. We argue that such forms of decentralized responses through data “from below” is not only valuable for peer citizens and civic organizations, but also for competent institutions. By contributing data, time, and other resources, people demonstrate that a certain “crisis” matters to them (this can be a persistent stressor like coal ash pollution or an exogenous and sudden shock like an environmental disaster) because it affects them directly or it threatens shared values in which they believe. Understanding and even embracing such forms of agency could be useful for institutions addressing environmental conflicts.

## IV Crowd Science Through a Coordinated Decentralization

The cases discussed exemplify the concept of “crowd science” through decentralized yet coordinated networks. The local individuals and organizations performing the monitoring and recording observations are not “random” participants on a platform but rather decentralized actors. Although the role of CGE in addressing pollution are the two case studies that are unpacked here, similarly situated individuals and organizations collected data in other communities where over a dozen powerplants with coal ash lagoons were located, with ENGOs providing guidance. This decentralization makes this form of civic monitoring and citizen science closer to the notion of “crowd science” discussed in this section. ENGOs as “middle-ground” actors giving *a meaning* to the crowd is a distinctive factor discussed here – turning civic monitoring and collective intelligence into impact. However, their coordination makes the discussed form of crowdsourcing different from more traditional understandings of the notion.

A recent article by Franzoni et al.<sup>58</sup> interestingly connects the bodies of literature on “crowd science” (i.e., projects in which the “lead investigators” involve “crowds”

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<sup>57</sup> Hasan Glucu, *Collective Intelligence in Ant Colonies*, THE FOUNTAIN (Oct. 1, 2004) <https://fountainmagazine.com/2004/issue-48-october-december-2004/collective-intelligence-in-ant-colonies>.

<sup>58</sup> Chiara Franzoni et al., *Crowds, Citizens, and Science: A Multi-Dimensional Framework and Agenda for Future Research*, IND. & INNOV. 1 (2021).

of individuals – including non-experts – who self-select in response to open calls for participation) with that on (above defined) citizen science, demonstrating several points of contacts. Crowd science, compared to citizen science, is more focused on the research management aspect, i.e., the fact that project participants come from outside a research organization and respond to open calls for contributions, being ordinary people or also experts themselves, generally not paid. Yet, the authors argue that closer integration could potentially enrich research on both practices.

Franzoni et al. discuss citizen science projects – thus including civic monitoring – that aim and managed to involve “crowds” (i.e., beyond the “usual suspects,” citizens science amateurs), thus diversifying the array of knowledge available. The authors write about the *Curieuzeneuzen*<sup>59</sup> project, entailing the collection of data on air quality and the engagement of over 2000 participants in data analysis, interpretation, and diffusion of results in the city of Antwerp. The data collected and processed throughout the project were used to predict nitrogen dioxide concentrations in cities beyond the Antwerp area and to test and refine existing computer models. The promoters of the initiative used its results to advocate for stricter traffic and air pollution regulations, both in the city of Antwerp and elsewhere.<sup>60</sup>

According to Franzoni et al.,<sup>61</sup> both citizen science and crowd science find their roots in *radical science* movements of the 1960s and ‘70s that contested academic and corporate science, often aligned in promoting innovations that were perceived as the source of threats, such as pesticides.<sup>62</sup> Citizen science, before and more than crowd science, was born to place science at the service of ordinary people’s needs and concerns. Lay citizens started advocating for their own (scientific) knowledge to be considered by the system. Beyond the generation of scientific knowledge as such, citizen science’s primary purpose was to push for societal change.<sup>63</sup>

Relevant here are the elements of convergence between citizen science and crowd science, identified by Franzoni et al., in that both concepts draw on the idea of “crowdsourcing” knowledge and of openly sharing results and eventual benefits stemming from the research with the crowd of participants. According to Franzoni et al., the two terms would just be different analytical lenses used to study the same general phenomenon.<sup>64</sup> We endorse this argument and stress this convergence especially in those projects in which crowd members have a significant degree of involvement and influence on the scientific process, on the analysis of results, and their dissemination for

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59 CURIEUZE NEUZEN, <https://curieuzeneuzen.be/> (last visited Oct. 3, 2023) (Be).

60 Franzoni et al., *supra* note 58.

61 *Id.*

62 Bruno Strasser et al., *Citizen Science? Rethinking Science and Public Participation*, 32 *SCI. & TECH. STUDIES* 52 (2019).

63 Ottinger, *supra* note 48.

64 Franzoni et al., *supra* note 58.

advocacy. Based on the case studies, we demonstrate how decentralization of the individuals and communities involved in gathering data and engaged in public comment processes was instrumental in advocating for a complete cleanup of all impacted communities. Yet, at the same time, coordination by existing, resourced, and knowledgeable ENGOs, including those with legal expertise, played an essential role in utilizing CGE, assuring transparency in actions taken by decision-makers, and bringing about and sustaining the legal actions over the years that led to the historical cleanup.

## V Returning to the Case Studies and the Role of Citizen-Collected Evidence

The discussion below tracks the role of CGE in the initial enforcement case, the Asheville powerplant, as well as one of the last resolved cases, involving the Allen powerplant, near Gastonia, North Carolina, all in light of the theoretical frame sketched above.

### A The Asheville Powerplant: Civic Evidence of Violations

The foundation for the Clean Water Act Notice of Intent sent in January 2013 for violations at the Asheville powerplant was citizen-collected evidence. The notice itself relied on sampling results from streams and seeps collected by the local riverkeeper, combined with the results of groundwater monitoring data obtained through public records and reviewed by the community groups (Image 1).<sup>65</sup> When the state brought its first enforcement case in March 2013, the riverkeeper and other community groups relied on the sampling to demonstrate their stake in the outcome and justify their participation.<sup>66</sup> Their sampling data and assessment of groundwater data, supported by an expert affidavit, also informed their opposition to the quick settlement that was proposed by Duke Energy and North Carolina – which the state eventually abandoned.

Following the Dan River spill in early 2014, federal authorities launched a criminal investigation into Duke's handling of coal ash.<sup>67</sup> Federal charges in 2015 recognized that Duke Energy discharged pollutants through seeps at the Asheville powerplant, which were also observed by regulators in March 2013,<sup>68</sup> following the

<sup>65</sup> See Asheville Powerplant CWA Notice of Intent, *supra* note 19.

<sup>66</sup> See Motion to Intervene, *Asheville Coal Ash Case*, *supra* note 24.

<sup>67</sup> See, e.g., Wilson Dizard, *Subpoena Caps Bad Week for Fossil Fuel*, AL JAZEERA AMERICA (Feb. 13, 2014, 7:00 PM), <http://america.aljazeera.com/articles/2014/2/13/north-carolina-coalashspill.html>.

<sup>68</sup> Joint Factual Statement, *United States of America v. Duke Energy Carolinas et al.*, Nos. 5:15-CR-62-H, 67-H, 68-H (E.D.N.C. May 14, 2015), ¶¶ 156–61, <https://www.justice.gov/file/438651/download>.



riverkeepers notice. In 2015, Duke Energy entered a guilty plea for criminal violations of the Clean Water Act, including those committed at the Asheville powerplant, and was fined \$102 million for violations at six facilities.<sup>69</sup> Federal prosecutors, noted “repeated failures by Duke Energy’s subsidiaries to exercise controls over coal ash facilities” in North Carolina.<sup>70</sup>



**Image 1:** A snap of riverkeeper sampling at Asheville from CWA notice of intent (by SELC, used with permission).

A year after community groups had prompted the state’s enforcement case, Duke Energy announced plans to excavate the coal ash at four facilities, including the Asheville powerplant. Duke’s commitment to excavate the coal ash basins at the Asheville powerplant were subsequently the foundation for a summary judgment order issued in the state enforcement case in favor of the community

<sup>69</sup> News Release, Duke Energy Subsidiaries Plead Guilty and Sentenced to Pay \$102 Million for Clean Water Act Crimes, U.S. DEPT JUSTICE (May 14, 2015), <https://www.justice.gov/opa/pr/duke-energy-subsidiaries-plead-guilty-and-sentenced-pay-102-million-clean-water-act-crimes>.

<sup>70</sup> *Id.*

groups in 2016.<sup>71</sup> The requirement to excavate the ash basins at Asheville also was cemented into a law passed by the North Carolina legislature in September 2014, the Coal Ash Management Act (CAMA).<sup>72</sup>

The Asheville powerplant illustrates the potentially powerful role of CGE in triggering an enforcement action by authorities. Although the state agency at first attempted to cut enforcement short through a quick settlement, ultimately, the violations identified by the environmental organizations laid a foundation for federal criminal charges under the Clean Water and a complete excavation of coal ash from the ash basins, to address groundwater contamination and ongoing seepage. Due to their participation as parties in the state's enforcement case, a move supported by their collection of evidence that precipitated the lawsuit, the community groups also were afforded an ongoing role in collecting evidence in the resulting injunction and were able to use the continued court jurisdiction to oversee the injunction.<sup>73</sup> All of this is an excellent demonstration of the gained civic agency on the matter (Image 2).



**Image 2:** A snap of Asheville coal ash site on well water contamination sites (by Southern environmental law center – SELC, used with permission).

71 Consent Order, *Asheville Coal Ash Case*, *supra* note 44.

72 Coal Ash Management Act of 2014, 2014 N.C. Sess. Laws 122.

73 Consent Order, *Asheville Coal Ash Case*, *supra* note 44, paras.74, 77, 83.

## B The Allen Powerplant: Evidence Gathering and Advocacy Contexts

Although the ash basins at four powerplants were to be fully excavated,<sup>74</sup> Duke requested flexibility to consider alternatives at the other 10 powerplants, including leaving the ash in place and covered with a cap, essentially plastic sheeting and an added layer of soil.<sup>75</sup> The state's 2014 coal ash law, CAMA, deferred the closure and cleanup at the other ten powerplants to a risk-based legislative framework that would allow everything from leaving the ash adjacent to rivers with a cap, to partial excavation and partial capping, to complete removal of the coal ash from the basins.<sup>76</sup> Although the community groups in Asheville (discussed above), found early resolution in a full cleanup, the scope of cleanup for the community around the Allen powerplant near Gastonia remained an open question. In the multiple administrative processes that followed, related to implementation of CAMA and amending Clean Water Act permits, community group efforts to gather evidence and disclose information obtained in public records played a key role leading toward the 2020 settlement.

At the Allen powerplant, the Catawba Riverkeeper and the Waterkeeper Alliance for many years actively monitored the riverfront beneath massive coal ash basins,<sup>77</sup> which sprawl 293 acres alongside Lake Wylie – a large lake in the Catawba River system that serves as a drinking water source for communities and is used for fishing and recreation.<sup>78</sup> A residential neighborhood abuts one side of the powerplant and its coal ash basins (Image 3). As described by one Duke Energy engineer, for some homes, “literally their backyard is the ash pond.”<sup>79</sup> The

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74 The Coal Ash Management Act ranked four sites as high priority, 2014 N.C. Sess. Laws 122 § 3 (b), requiring the excavation of ash from the three facilities where environmental groups sent Clean Water Act notices of intent (Asheville, Riverbend, and the Sutton facilities) and the Dan River facility.

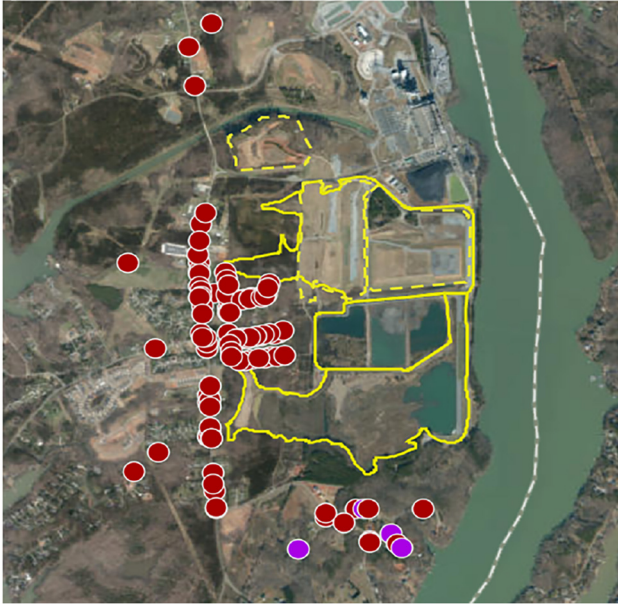
75 See Associated Press in Raleigh, *EPA Reaches Deal with Duke Energy Over Coal Ash Spill*, THE GUARDIAN (May 22, 2014, 22:40 BST), <https://www.theguardian.com/environment/2014/may/22/epa-deal-duke-energy-coal-ash-spill>.

76 N.C. GEN. STAT. § 130A-309.214.

77 The Catawba Riverkeeper is a non-profit organization that works to improve water quality through monitoring and conservation advocacy and to increase public awareness and is a member organization of the Waterkeeper Alliance. See HISTORY, CATAWBA RIVERKEEPER, <https://www.catawbariverkeeper.org/history/> (last visited Oct. 3, 2023).

78 See Consent Order, *State of N.C. ex rel. N.C. Dep't Env't Quality et al v. Duke Energy Progress*, No. 13 CVS 14661, Mecklenburg County [hereinafter *Allen Coal Ash Case*], ¶13 (N.C. Super. Ct. Feb. 5, 2020); Motion to Intervene, *Allen Coal Ash Case* ¶¶ 8, 15 (N.C. Super. Ct. Aug. 29, 2013).

79 John Marks, *Here's the Latest Duke Energy Plan for Lake Wylie Coal Ash. And What to Do About It*, THE HERALD (Feb. 26, 2020, 10:13 AM), <https://www.heraldonline.com/news/local/article240511606.html> (internal quotations omitted).



**Image 3:** A snap of Allen coal ash site on the well water contamination sites map (by SELC, used with permission).

riverkeeper successfully joined the state's enforcement action in 2013, alleging that its own inspections had identified discharges and flows from the coal ash lagoons.<sup>80</sup>

Following the passage of CAMA, a years-long administrative process for closing the remaining coal ash basins and an effort to evaluate seepage at all of Duke Energy's facilities began to unfold, alongside the pending enforcement cases.<sup>81</sup> At various decision points, the state agency was required to consider public comments. Throughout, community groups continued to engage the legal processes with their own observations and data.

During this period of sustained advocacy, the riverkeeper continued to inspect the riverfront below the Allen coal ash basins and compare observations with the discharges being disclosed by Duke Energy. Duke Energy had indeed confirmed multiple areas of seepage from the ash basins into Lake Wylie,<sup>82</sup> but the parties continued to disagree on the scope of seepage, its significance, and the appropriate

<sup>80</sup> Motion to Intervene, Ex. 2 ¶31, *Allen Coal Ash Case*, *supra* note 79.

<sup>81</sup> See N.C. GEN. STAT. § 130A-309.212 (Identification and assessment of discharges; correction of unpermitted discharges).

<sup>82</sup> See, e.g., NPDES Fact Sheet, Duke Energy Carolinas, Allen Steam Station NC0004979 (May 10, 2016), at 3 <https://deq.nc.gov/media/8228/download>.

regulatory response. As Duke Energy and state regulators proposed various mechanisms that would authorize ongoing leaks,<sup>83</sup> the community groups, in opposing the approach as ineffectual, repeatedly pointed out polluted seepage being missed, with guidance from legal counsel (also an ENGO). These efforts included alerting authorities at multiple intervals to seepage problematically overlooked,<sup>84</sup> including an old, corrugated pipe found during discovery in the enforcement case,<sup>85</sup> and seepage unaddressed by a proposed consent order. Increasingly these efforts incorporated technology to pinpoint the environmental problems, for example, hyper-linking to online mapping spatially showing the location of overlooked seeps and providing video footage of ongoing seepage.<sup>86</sup>

In addition to informing regulators of ongoing seepage from the ash lagoons at Allen, which had continued years after the initiation of the enforcement cases,<sup>87</sup> community groups also worked to educate the community about the risks of coal ash.

For example, in addition to requiring the basins to close, the state's coal ash law required Duke Energy to sample residential groundwater wells around its facilities and to provide alternate water supplies to impacted households.<sup>88</sup> Dozens of houses adjacent to the Allen powerplant and reliant on well water received “do not drink” letters, some indicating the presence of pollutants like hexavalent chromium at levels that exceeded state health screening levels.<sup>89</sup> In the absence of a comprehensive explanation from state authorities regarding the scope of the problem, community groups pushed to understand the broader importance of the notifications. After obtaining data from the results of testing hundreds of homes, the groups utilized interactive online mapping to visualize the households that were affected around each of the coal ash basins across the state.<sup>90</sup> This collection and then dissemination of scientific data in a spatially oriented format was one of many steps taken to assist

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**83** See NPDES Fact Sheet, Duke Energy Carolinas, Allen Steam Station NC0004979 (May 10, 2016), at 3 <https://deq.nc.gov/media/8228/download>.

**84** See Letter from Thomas Lodwick, SELC, to Jay Zimmerman, N.C. DEQ (Dec. 7, 2016) (attaching seep sampling results and map). Public comments and other documents on the Allen powerplant NPDES permits can be viewed via the state's publicly maintained Laserfiche files: <https://deq.nc.gov/about/divisions/water-resources/duke-energy-mpdes-wastewater-permitting>.

**85** Letter from Thomas Lodwick, SELC, to Jay Zimmerman, N.C. DEQ (Jan. 4, 2017).

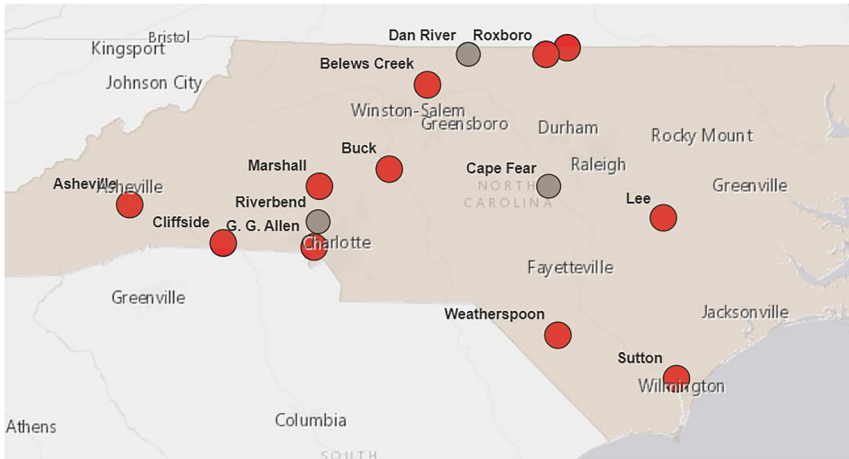
**86** See seepage missed by authorities as mapped in Google maps [https://www.google.com/maps/d/viewer?mid=1EpprLdPkqPZL8nJnDU\\_xC7tYicaWTNGS&ll=35.17969882598165%2C-81.00629498808291&z=15](https://www.google.com/maps/d/viewer?mid=1EpprLdPkqPZL8nJnDU_xC7tYicaWTNGS&ll=35.17969882598165%2C-81.00629498808291&z=15), linked in Letter from Amelia Burnette, SELC, to Bob Sledge, N.C. DEQ, Draft Special Order by Consent for Duke Energy's Allen Facility (EMC SOC WQ S17-009) (Feb. 14, 2018).

**87** *Id.*

**88** N.C. GEN. STAT. § 130A-309.211(c).

**89** See North Carolina Drinking Water Contamination Map, G.G. Allen, *supra* note 16.

**90** See North Carolina Drinking Water Contamination Map, *supra* note 16.



**Image 4:** A snap of drinking water contamination near Duke Energy sites map (by SELC, used with permission).

communities' understanding of the complex scientific data about the coal ash basins. Such an action shows the role of platforms in promoting agency (Image 4).

Following years of additional study into the extent of seepage and groundwater contamination at the sites, in 2019, the state agency proposed classifying Allen's coal ash lagoons as a low risk and eligible to be capped, with the ash to be left stored beside Lake Wylie. Community groups, opposing this plan, noted that the risk assessments for closing the basins that had been prepared by Duke Energy ignored the potential health and structural risks indicated by its seeping basins.<sup>91</sup> Beyond their own sampling efforts, community groups relied on experts who critiqued Duke Energy's environmental reports. Using their technical expertise, these professionals were able to reinforce the observations of civic actors. The circle of concerned citizens engaging in the closure of the ash basins also expanded, as neighborhoods and communities that had learned of the effects of coal ash turned out for public hearings and submitted thousands of written comments.<sup>92</sup>

<sup>91</sup> Letter from Austin D. Gerken, Jr., SELC, to Debra Watts, N.C. DEQ, Comments on Closure Options – G.G. Allen Steam Station (Feb. 15, 2019).

<sup>92</sup> See, e.g., *Marvin Beach, Coal Ash Neighbors Voice Concerns Ahead of NCDEQ Decision*, WCCB CHARLOTTE (Jan. 29, 2019) (reporting on hundreds that turned out for the Allen powerplant meeting) <https://www.wccbcharlotte.com/2019/01/29/coal-ash-neighbors-voice-concerns-ahead-of-ncdeq-decision/>. Thousands of public comments received on “closure determinations” are available for viewing on the state agency's website, <https://www.deq.nc.gov/news/key-issues/coal-ash-excavation/allen-steam-station-coal-ash-closure>; [www.deq.nc.gov/water-quality/npdes-coal-ash/2014-duke-energy-renewals-and-modifications/allen/allen-public-comments/download](https://www.deq.nc.gov/water-quality/npdes-coal-ash/2014-duke-energy-renewals-and-modifications/allen/allen-public-comments/download).

The state agency subsequently issued an order that rejected capping in place and required that coal ash basins be fully excavated.<sup>93</sup> Although Duke Energy appealed this determination, and community groups again intervened in proceedings,<sup>94</sup> in 2020 a settlement was reached finally cementing a requirement to excavate ash from the remaining basins, including the Allen powerplant. Seven years *after* the first enforcement case was initiated in court, coal ash at all fourteen of Duke Energy's powerplants would be removed from leaking basins beside waterways in North Carolina.

The story of the Allen powerplant illustrates how citizens can utilize science to powerfully challenge the narratives and scientific information being proffered by decision-makers, not just in judicial, but also in administrative contexts. Whereas citizen-collected water samples prompted enforcement in the case of the Asheville powerplant that ended in criminal charges and a quick resolution, information gathered at the Allen powerplant contributed to a longer advocacy thread, and ultimately reinforced the need for a durable solution that would halt the ongoing pollution. Throughout, the civic monitoring efforts utilized technologies that were readily available to enhance what they could observe and how they communicated about it. All this shows constructive forms of collective resistance.

## VI Searching for a Legal Basis Grounding Civic Monitoring

We asked ourselves how the U.S. system potentially offers a legal base for the actions of the monitoring citizens. In the U.S., multiple environmental statutes allow citizens to take on an enforcement role and bring civil lawsuits against those in violation of laws designed to protect shared resources. These “citizen-suit provisions” can be invoked, for example, for unlawful pollution discharges to air and water, disposing of solid waste in a way that creates an imminent danger, releases of hazardous substances, ocean dumping, and harming of endangered species.<sup>95</sup> In this sense, the U.S.

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93 NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DEQ COAL COMBUSTION RESIDUALS SURFACE IMPOUNDMENT CLOSURE DETERMINATION, ALLEN STEAM STATION (April 1, 2019), [https://files.nc.gov/ncdeq/Coal%20Ash/2019-april-decision/allen/Allen\\_FINAL\\_ImpoundmentClosureDeterminationReport\\_20190401.pdf](https://files.nc.gov/ncdeq/Coal%20Ash/2019-april-decision/allen/Allen_FINAL_ImpoundmentClosureDeterminationReport_20190401.pdf).

94 See, e.g., Press Release, Judge Issues Ruling in Favor of DEQ in Coal Ash Closure Appeal, N.C. DEP'T ENV'T QUALITY (Aug. 2, 2019), and text of Order Granting Respondent's Partial Motion to Dismiss, 8-2-2019, <https://files.nc.gov/ncdeq/Coal%20Ash/2019-08-02-Order-Granting-Partial-MTD.pdf>.

95 See, e.g., *Notices of Intent to Sue the U.S. Environmental Protection Agency (EPA)*, U.S. EPA, <https://www.epa.gov/ogc/notices-intent-sue-us-environmental-protection-agency-epa> (last updated Oct. 2, 2023) (listing several citizen-suit provisions in U.S. federal statutes, including the Clean Water Act, Clean Air Act, Resource Conservation and Recovery Act, the Endangered Species Act, among others).

system builds a pathway for citizen participation into environmental protection. These lawsuits often are supported by data or evidence collected by civil society organizations and typically reflect a failure to act by authorities. The trigger for these enforcement mechanisms is a legal notice, sent prior to the initiation of a court proceeding, notifying both the alleged violator and the federal authority primarily tasked with enforcement of the intent to bring a lawsuit for the violation.

Although a federal or state agency<sup>96</sup> may elect to initiate its own enforcement action – which, in turn, may eliminate the basis for the citizen suit, providing that the agency diligently prosecutes for the same violation – community groups and/or individuals can potentially *join* judicial proceedings initiated by federal or state authorities if they meet the requirements under the applicable rules of civil procedure.<sup>97</sup> This was the case in North Carolina, where community groups first sent notice of their intent to bring enforcement cases for violations of the federal Clean Water Act, and then successfully joined the state’s resulting legal action. The latter action entailed participation of civil society organizations in the gathering of potential evidence relevant to coal ash impacts on the environment and in conveying experiences and observations of ordinary people in impacted communities.

Lastly, the U.S. system allows individuals and civil society organizations to take part in the decisions of federal agencies through statutory mechanisms, including the Administrative Procedures Act (APA)<sup>98</sup> and the National Environmental Policy Act.<sup>99</sup> The APA enables civic actors to submit public comments on proposed federal rules and provides a mechanism for those adversely affected by an agency decision, like federal approvals for project permits, to seek judicial review in court. Many states have similar processes for taking citizen comments on proposed rulemakings or decisions on permits for projects or operations affecting the environment.<sup>100</sup> These statutory and regulatory paths for citizen engagement with federal and state decisions affecting the environment afford opportunities for

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96 States that enforce parts of federal programs under authority that has been delegated – for example an approved program for issuing Clean Water Act permits – may also initiate enforcement for the violation.

97 For example, precedent exists for citizens to intervene as of a party into a lawsuit to protect an interest at stake under ordinary rules governing intervention, *see, e.g.*, Fed. R. Civ. P. 24 (a).

98 *See* 5 U.S.C. § 551 *et seq.*

99 *See* 42 U.S.C. §4321 *et seq.* and implementing regulations, *e.g.*, 40 C.F.R. § 1506.6 (public participation).

100 *See, e.g.*, public comment provisions within N.C. Gen. Stat. § 150B *et seq.* (N.C. Administrative Procedures Act); N.C. Gen. Stat. § 143–215.4 (procedures for public comment in matters involving air and water resources); *see also* Sanne Akerboom & Robin Kundis Craig, *How Law Structures Public Participation in Environmental Decision Making: A Comparative Law Approach*, 32 (3) ENVIRONMENTAL POL’Y AND GOVERNANCE 232 (2022) (discussing environmental public participation rights under the U.S. federal and state APAs and comparing with the laws of the EU).



individuals to submit CGE directly to decisionmakers, which becomes part of the agency's formal record of decision and part of the record in the case of judicial review. Although a primary focus of this article is the role of CGE in triggering enforcement of water pollution laws against large-scale coal ash pollution, new CGE gathered after the initial enforcement trigger continued to play a role through public comments submitted in administrative processes in informing state decisions about the long-term fate of coal ash that was being stored in wet lagoons and polluting adjacent rivers and lakes.

The availability of these legal pathways allowing individuals and ENGOs to engage in governmental decisions and enforcement was crucial in ensuring the opportunities for regulatory and judicial uptake of CGE.

## Conclusions

### A The Case Studies in Light of Our Theoretical Frame

Our analysis of civic monitoring for cleanup of coal ash offers a perspective on crowdsourcing environmental information as a form of resistance, of collective intelligence and of crowd science. The civic groups studied responded to a diffuse and long-lasting environmental distress, to a persistent problem of lack of environmental information that they felt as urgent, and to governmental failures (both at a regulatory and at an enforcement level), rejecting the status of “powerless victims.” The absence of adequate pollution data and perceived lackadaisical response of government authorities to a widespread and languishing problem convinced the people and ENGOs to start crowdsourcing local knowledge, getting public records, working with existing maps and creating new ones,<sup>101</sup> turning to collecting their own data in order to fill an institutional gap. These actions all show to a different extent an increased *agency* by ordinary people organized in decentralized but coordinated agents of change. Thus, a critical juncture of our case studies can be identified in “*knowledge crowdsourcing*” for demanding justice that triggers the government to take action.

Civic monitoring was successfully utilized in responding to the problem of coal ash pollution, as it managed to find a “space” within the various apparatuses in place (legal, governmental, social, and scientific). Furthermore, although technology enhanced people's ability to gather, collate, and visualize data, the civic efforts were not built around an app and platform. Instead, the technology was shaped around the

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101 See North Carolina Drinking Water Contamination Map, *supra* note 16. See also The Ash Tracker, *supra* note 16.

community that affirmed a rather sensorial, social, and even political “experience of sensing,” as a collective and de-centralized action. Technology was not the foundation of an initiative but rather a way to expand a community’s ability to sense, observe, and communicate. The sensing activities took place within a network of actors that were coordinated by the “right people” to do so. Indeed, the riverkeepers and other organizations, supported by ENGOs with legal expertise, were exactly those actors that had knowledge of the problem and resources and strategies to address it. Therefore, another critical juncture is a “*coordinated*” crowd yet *decentralized* enough to capture the full extension of the problem with enough granularity.

## B The Coal Ash Series Compared to the Formosa Case

In conclusion, it is useful to compare the discussed cases to a landmark victory for CGE as judicial evidence, a 2019 landmark court decision in Texas finding the petrochemical company Formosa liable for violating the U.S. Clean Water Act based on citizen-collected evidence involving volunteer observations of plastic discharge in the water over years.<sup>102</sup> While in the Formosa case, citizens fought against a private company, the coal ash cases involved both the energy company responsible for the pollution and the governmental agencies that citizens asserted were failing to responsibly address the pollution. Differently from the Formosa case, which centered around the pollution from one facility in Texas, the coal ash cases were of larger scope and scale, spanning multiple powerplants adjacent to rivers and lakes in different locations, operated by one of the largest utility companies in the United States, and involving input from community groups and individuals across the state. There, achieving a successful outcome across all of the polluted sites followed several years of legal battles and advocacy. Furthermore, the type of evidence at stake is quite different. The Formosa case involved very visible plastic powder and pellets in water; monitoring of coal ash included water quality sampling to detect chemicals associated with coal combustion waste; while seepage itself was often visible, technical lab analyses was needed to characterize the pollutants within it. The cases – despite some differences – also share several similarities. For example, in both cases attribution was possible considering that both the plastic pollution in the Formosa case and the pollutants indicative of coal ash could be clearly attributed to the companies at issue, respectively Formosa Plastics Corporation Texas and Duke Energy.

Both cases resorted to the citizen suit provisions of the Clean Water Act, a federal statute governing water pollution, as the basis for demanding law enforcement

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102 Berti Suman & Schade, *supra* note 7.

against polluters. In both cases the environmental monitoring activities were primarily conducted by riverkeeper organizations, i.e., structured civil society. In the coal ash cases, residents living near facilities were also involved, which is similar to what occurred in the Formosa case but where the powerful character of a local fisherwoman became the symbol of the struggle from the very early stage. In both cases, lawsuits were possible thanks to pro bono representation or legal aid provided in a non-for-profit fashion (in the case of Formosa, the Texas RioGrande Legal Aid and in the coal ash cases, SELC). This shows the potential of *free legal aid*, with funding coming from grants and donations, or potentially from crowdsourcing financial and human resources. This can be considered another critical juncture enabling the impact of CGE in judicial arena.

As in the Formosa case, in the coal ash cases the government ultimately took responsibility for and oversight of the coal ash problem. State action was triggered by civic monitoring; the state entered the debate with its own monitoring and requirements for the energy company to expand monitoring. The state was better situated to require the energy company to investigate and disclose the full extent of contamination, as they could use existing authorities to require monitoring to thoroughly investigate coal ash facilities without risking trespass, whereas access and information that could be gathered was more limited for local communities. Similar to events of the Formosa case, civic monitoring managed to prompt – and then steer – legislative and regulatory actions (leading to the Coal Ash Management Act in 2014 and engagement in its implementation) and shaped the litigation results (triggering an historical clean-up of coal ash powerplants in the area). Resulting of regulatory interventions and judicial decisions, both cases caught the attention of other potentially impacted companies, having *positive spill-over effects* in the sector and even driving innovation. Furthermore, aspects of both cases attracted considerable media attention, thus spreading awareness among the public of the wider problems stemming from plastic pellet and coal ash pollution.<sup>103</sup> Such *judicial, regulatory and media attention* can be considered other critical junctures of the discussed cases.

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**103** See, e.g., Valerie Bauerlein, *Duke Energy Agrees to Coal-Ash Cleanup Settlement*, WALL ST. J. (Jan. 2, 2020 4:36 pm ET), <https://www.wsj.com/articles/duke-energy-agrees-to-coal-ash-cleanup-settlement-11577994126>; Peter Moskowitz, *Duke Energy to Hand Out Bottled Water in North Carolina After Wells Polluted*, THE GUARDIAN (Apr. 28, 2015, 20:23 BST), <https://www.theguardian.com/us-news/2015/apr/28/duke-energy-bottled-water-north-carolina-wells-polluted>; Trip Gabriel, *Ash Spill Shows How Watchdog Was Defanged*, N.Y. TIMES (Feb. 28, 2014), <https://www.nytimes.com/2014/03/01/us/coal-ash-spill-reveals-transformation-of-north-carolina-agency.html>.

## C Lessons for Other Concerned Communities

If we were to reflect on possible lessons for communities based in countries in other parts of the world, especially in Europe where one of the authors is based, we need to reflect on parameters that make such considerations applicable in different legal contexts.

Crucial to the uptake of CGE was the availability of legal pathways for the engagement of individuals and ENGOs in governmental decisions and enforcement. These include, in the U.S. context, multiple environmental statutes that allow citizens to take an enforcement role, for example, against polluters in the case of unlawful polluted discharges to air or water, or against federal agencies that fail to perform their duty as required by law.<sup>104</sup> While much of the discussion focuses on lawsuits and uptake into judicial proceedings promoted under such citizen suit provisions, additional legal apparatuses exist – and were utilized – to incorporate the unique knowledge and observations of ordinary individuals and community groups into public comment processes that would inform regulatory decision-making.

Also of note, the kind of information, or crowd science, that could be aggregated across multiple polluted sites, for consideration in regulatory or judicial proceedings, and which ranged from technical to experiential and individual. From water quality monitoring and analysis for coal ash constituents in areas overlooked by authorities, to the observations of visible polluted seepage escaping coal ash impoundments near landowner properties, to the collection and visualization through web-based mapping of pollution data relevant to residential drinking wells – multiple types of CGE found “space” in legal, governmental, social and scientific settings that were working to understand coal ash pollution.

## D Limitations of Our Study

A limitation of this article may be an U.S.-biased perspective as our data comes mainly from there. One of the authors was involved in the coal ash cases, formerly as a lawyer, while the other intensively researched the Formosa case<sup>105</sup> – including interviewing plaintiffs and legal team – but from the perspective of a European

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<sup>104</sup> See, e.g., *Notices of Intent to Sue the U.S. Environmental Protection Agency (EPA)*, *supra* note 95; see also UN Office of the High Commissioner for Human Rights, Summaries Of Good Practices: USA Citizen Suits, [https://www.ohchr.org/sites/default/files/Documents/Issues/Environment/GoodPractices/E/National%20courts/USA\\_-\\_citizen\\_suits.docx](https://www.ohchr.org/sites/default/files/Documents/Issues/Environment/GoodPractices/E/National%20courts/USA_-_citizen_suits.docx) (last visited Oct. 3, 2023) (discussing citizen-suit provisions that enable members of the public to initiate lawsuits in federal court against actors, including corporations, that violate federal laws).

<sup>105</sup> *Id.*

scholar. We started exploring coal ash civic monitoring on the European side and found interesting results especially in Eastern Europe, but so far not comparable in terms of impact and relevance to the cases here illustrated.<sup>106</sup> Furthermore, this article intentionally highlights instances where community gathered evidence was introduced into judiciary and regulatory proceedings, with success, in that the outcomes aimed to address the pollution that had been identified in collective efforts. The hope is that these examples help to inform a discussion in the types of CGE that might be gathered and the roles such evidence could play where pathways exist, to inform the considerations of where and how to best gain and translate knowledge that community-grounded evidence can provide to decisions, as a form of gaining agency. A limitation is that this discussion does not explore counterexamples, where such evidence was rejected by courts or disregarded by regulators, and whether crowd science plays other roles like framing society's understanding of environmental problems,<sup>107</sup> and how that intersects the potential for resisting the decline of the individual through collective action in this context.

We see a potential for a future engagement specifically with coal ash in a series of participatory initiatives focused on air quality associated with solid fuel burning in Kosovo, a country where coal-burning is still prevalent.<sup>108</sup> Bulgaria's reliance on coal is one of the cause for the country regularly breaching European pollution limits for air quality.<sup>109</sup> Also in Hungary the problem exists; this country also has a growing culture of engaging ordinary people in monitoring environmental issues. An ongoing participatory monitoring and intervention campaign was launched, but in a quite institutional manner.<sup>110</sup> The European Environmental Bureau, which is the largest network of environmental citizens' organizations in Europe, is also active in providing an alternative to institutional mapping of industrial pollution, including

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**106** See EUROPE BEYOND COAL CAMPAIGN, CHRONIC COAL POLLUTION, <https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf>. For readers' sake, we note that coal is a pressing issue also in Israel. The issue formerly handled by a national body, National Coal Ash Board, <http://www.coal-ash.co.il/english/about.html>, which is now disbanded.

**107** See Elizabeth Fisher, *Environmental Law as "Hot" Law*, 25 J. ENV. L. 347 (2013) (discussing the process of framing and reframing around complex environmental problems occurring in multiple fora [legislative, judicial, regulatory, scholarship]).

**108** See Dan McQuillan, *Science for Change Kosovo*, DATA SHIFT and Change is in the Air, see their X (Twitter) page, <https://twitter.com/sfckmovement>.

**109** See <https://www.nationalgeographic.com/environment/article/as-the-eu-targets-steep-emissions-cuts-this-country-has-a-coal-problem>.

**110** See [https://cinea.ec.europa.eu/news-events/events/hungairy-webinar-air-pollution-2021-11-09\\_en](https://cinea.ec.europa.eu/news-events/events/hungairy-webinar-air-pollution-2021-11-09_en), <https://www.budapesttimes.hu/hungary/government-official-hungairy-project-aiming-to-improve-air-quality-at-half-way-point/> and [https://cinea.ec.europa.eu/news-events/events/hungairy-webinar-air-pollution-2021-11-09\\_en](https://cinea.ec.europa.eu/news-events/events/hungairy-webinar-air-pollution-2021-11-09_en).

that associated with coal production.<sup>111</sup> The EEB's Industrial Plant Data Viewer (IPDV) "allows the public to access and compare data on industrial emissions from large combustion plants across the EU." This information could eventually trigger agency from below, similar to what witnessed in the U.S. coal ash cases.<sup>112</sup>

Several questions remain open for future research, such as: are there similar initiatives in Europe – i.e., entailing the monitoring of coal ash by ordinary citizens – which could be comparable to the one described here? More generally, what CGE is already being used across Europe and what is its future potential as evidence in court for grounding environmental law claims? Which legal structures need to be in place to ensure that collective processes of evidence-gathering can have an impact on judicial and regulatory outcomes? We hope that future research will explore these and further avenues also inspired by our study.

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<sup>111</sup> See *New Tracking Tool Maps the Reality of Industrial Pollution in Europe*, INDUSTRY & HEALTH (Sept. 9, 2020), <https://eeb.org/new-tracking-tool-maps-the-reality-of-industrial-pollution-in-europe/>.

<sup>112</sup> See European Industrial Production Information Exchange, *Industrial Plant Data Viewer*, <https://eipie.eu/projects/ipdv/> (last visited Oct. 3, 2023).