

# A place for people's knowledge in climate evidence: Exploring civic evidence in climate litigation

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## Abstract

This article examines the possibilities for data gathered by individuals and communities to demonstrate climate impacts on people's lives in domestic and international climate litigation, as well as the likely procedural constraints that such evidence may encounter. Building on recent decisions of domestic, regional and international courts and bodies, and looking in particular at cases related to climate displacement, we consider the potential for civic evidence to provide valuable testimony in climate litigation, for example, grounding abstract and diffuse harms in personal and locally relevant frames. The article concludes by advancing a research agenda to test, and support or disprove, the argument developed that civic evidence from climate-affected people could be more robustly deployed in climate litigation and could have a complementary and reinforcing, rather than competing, role alongside institutional evidence.

## 1 | INTRODUCTION

As litigation is increasingly being deployed to influence action on climate change, cases being brought have expanded in geographic range, invoked a range of legal theories and invited adjudication of climate change matters by courts at multiple levels. A unifying theme among these cases is that they often rely heavily on institutional science about the present and future effects of climate change, such as studies by the Intergovernmental Panel on Climate Change (IPCC), an intergovernmental body of the United Nations (UN) responsible for advancing knowledge on human-induced climate change. These scientific reports are often quantitative in nature and deeply technical, listing figures that are difficult for non-experts to understand (e.g., for civil society actors generally and for the climate-affected litigants in particular).

While reliance on institutional data is often necessary to make complex causal links and demonstrate future impacts, such data do not necessarily capture or reflect the lived experiences and related qualitative narratives of individuals and communities daily exposed to

the effects of climate change. Environmental data gathered by ordinary people with their own senses, or through forms of technology-enhanced civic monitoring (i.e., civic evidence), can have the potential to shed light on environmental and social wrongdoings in court, as demonstrated by empirical evidence collected within the framework of the *Sensing for Justice* research project,<sup>1</sup> led by author Anna Berti Suman, and as also recognised by the UN Environment Programme (UNEP).<sup>2</sup>

This article examines the possibilities for data gathered by civil society to demonstrate climate impacts on people's lives in domestic and international climate litigation, as well as the likely procedural

<sup>1</sup>*Sensing for Justice* <<https://sensingforjustice.webnode.it/>>; and Joint Research Centre, 'Civic Monitoring for Environmental Enforcement' <<https://joint-research-centre.ec.europa.eu/scientific-activities-z/innovations-public-governance/civic-monitoring-environmental-enforcement>>. The Marie Skłodowska-Curie Actions and Dutch Research Council-funded research project was hosted by the European Commission's Joint Research Centre from 1 June 2020 to 31 August 2023. It explored how citizen-gathered evidence can support law enforcement, in particular in the environmental field.

<sup>2</sup>UNEP, 'Environmental Rule of Law: Tracking Progress and Charting Future Directions' (2023) <<https://www.unep.org/resources/publication/environmental-rule-law-tracking-progress-and-charting-future-directions>> 79.

constraints such evidence may encounter. Building on recent decisions of domestic, regional and international courts and bodies, and looking in particular at cases related to climate displacement, we consider the potential for civic evidence to provide valuable testimony in climate litigation, for example, grounding abstract and diffuse harms in personal and locally relevant frames.

Civic evidence could enrich not only the evidentiary base from which courts navigate traditional doctrines like standing but also framing and priorities in parallel with socio-political discussions. Conversely, the absence of these lived experiences in climate evidence creates the risk of missing potentially compelling evidence on the ground and of creating a worrying gap between the affected people and the professionals litigating a court case. The separation of affected communities from the legal processes that could shape solutions may generate outcomes that are less attuned to environmental justice expectations of civil society. Incorporating a local perspective better allows remedies to take into account and address local impacts.

Our analysis starts with an assessment of the use of, and trend towards, scientific evidence in climate cases in general, relying on a literature review, in order to frame what we refer to when we talk about institutional climate science. Noting the absence of existing scholarship on the nexus of civic evidence and climate cases, we conduct a review of cases to locate trends on the manifestations of individual observations and narrative accounts of climate impacts in climate litigation (which we regard as a form of civic evidence). After describing what can be framed as early indications of receptivity from these cases towards individual observations, we then turn to the emerging field of civic evidence as a form of *technology* and its potential to contribute to climate litigation.

Drawing upon case studies, we use stories from those at the frontlines of climate harms to develop empirical and theoretical arguments supporting the inclusion of different kinds of civic evidence in climate litigation. We learned of these stories through two sets of interviews conducted with climate-affected people that, in various forms, gathered evidence to document accounts of the impacts experienced.

We also explore counterarguments that could push judges and practitioners not to rely on civic evidence. The article concludes by advancing a research agenda to test, and support or disprove, the argument developed here that civic evidence could be more robustly deployed in climate litigation and could have a complementary and reinforcing, rather than competing, role alongside institutional evidence.

## 2 | SCIENTIFIC EVIDENCE IN CLIMATE LITIGATION

As the effects of climate change have become more acute, and as the parties to climate change governance regimes and civil society have increasingly shifted their attention to averting its worst impacts, so too has the recognition grown of the role of litigation in shaping

climate action.<sup>3</sup> Particularly since the Paris Agreement came into force in 2016, there has been a global rise in litigation to induce more ambitious action on climate change.<sup>4</sup> Climate change litigation involves a vast array of cases, spanning various jurisdictions, legal systems, types of claims and objectives.<sup>5</sup>

Among these cases, individuals and non-governmental organisations (NGOs) have challenged the climate laws and policies that countries have enacted using a variety of legal grounds, such as human rights, tort and international law, among others.<sup>6</sup> Furthermore, impacted communities and individuals have turned to litigation to challenge specific projects and practices, such as those related to fossil fuel extraction and combustion, deforestation, or transportation policies, viewed as incompatible with climate mitigation and adaptation goals. Lastly, as climate-induced mobility also increases, cases with a factual nexus to climate displacement (internal and external) are becoming more common, whether in the context of immigration cases, human rights claims or other types of cases.<sup>7</sup>

Underpinning many of these cases is a reliance on traditional types of evidence from institutional science.<sup>8</sup> Indeed, the trajectory and growth in climate litigation have proceeded alongside, and benefited from, developments in climate science and technical modelling of future emission pathways and corollary impacts. This is especially evident in cases that push for more aggressive emissions reduction targets.<sup>9</sup> Multiple areas of sophisticated and complex climate science support litigation, from attributing responsibility for greenhouse gas emissions by countries, sectors and corporations to predicting the link between different emission pathways and warming scenarios, and forecasting where and how the impacts under warming scenarios might hit the soonest and hardest, dependent on

<sup>3</sup>J Peel and J Lin, 'Transnational Climate Litigation: The Contribution of the Global South' (2019) 113 *American Journal of International Law* 679, 681.

<sup>4</sup>This trend has been widely recognised. See, e.g., J Setzer and C Higham, 'Global Trends in Climate Change Litigation: 2023 Snapshot' (London School of Economics and Political Science, Grantham Research Institute 2023) 2 <[https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2023/06/Global\\_trends\\_in\\_climate\\_change\\_litigation\\_2023\\_snapshot.pdf](https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2023/06/Global_trends_in_climate_change_litigation_2023_snapshot.pdf)>; K Mitkidis and TN Valkanou, 'Climate Change Litigation: Trends, Policy Implications and the Way Forward' (2020) *Transnational Environmental Law* 6; G Ganguly et al, 'If at First You Don't Succeed: Suing Corporations for Climate Change' (2018) 38 *Oxford Journal of Legal Studies* 841.

<sup>5</sup>See M Golaraghi et al, 'Climate Change Litigation – Insights into the Evolving Global Landscape' (The Geneva Association 2021) 32; J Setzer and L Benjamin, 'Climate Litigation in the Global South: Constraints and Innovations' (2020) 9 *Transnational Environmental Law* 77.

<sup>6</sup>See F Sindico et al, 'Climate Change Litigation and the Individual: An Overview' in F Sindico and MM Mbengue (eds), *Comparative Climate Change Litigation: Beyond the Usual Suspects* (Springer 2021) 9. In Europe, for example, the *Urgenda* ruling of 2019, in which the Dutch Supreme Court found the Dutch State negligent for failing to set appropriate emissions reduction targets for 2020, is considered a milestone.

<sup>7</sup>Wewerinke and Antoniadis note, for example, the development of a 'distinct category' of climate litigation concerning 'people faced with deportation to locations where their rights may be compromised as a result of climate change'. M Wewerinke and M Antoniadis, 'Vessel for Drowning Persons? The Standard-Setting Potential of International Human Rights Litigation in Addressing Climate Displacement' (2022) 3 *Yearbook of International Disaster Law Online* 238, 28.

<sup>8</sup>P Beck et al, 'An Exploration of Science in Courts: How Science Supports the Enforcement of EU Law' (European Commission 2022) <<https://publications.jrc.ec.europa.eu/repository/handle/JRC132401>>, in particular for the parts discussing the key role science can play in climate cases.

<sup>9</sup>See *ibid*, discussing scientific evidence in the *Urgenda* case regarding emission reduction targets in the Netherlands, the *People's Climate Case* relating to EU emission reduction targets, and *Giudizio Universale* challenging the insufficiency of Italy's emission reduction measures.

geography and other factors.<sup>10</sup> The increased availability of complex and technical climate science is itself a remarkable development<sup>11</sup> that has helped buoy climate litigation.<sup>12</sup>

Although the advances in climate science are making it possible to clear evidentiary hurdles, there are other types of compelling evidence that can help ground otherwise highly abstract and complex claims of present and future impacts.<sup>13</sup> This *other evidence* may be less technical and more experiential and may not involve scientific experts, understood in the traditional sense. While reliance on highly sophisticated complex science may be necessary for some evidentiary thresholds and may align well with largely technocratic views of the climate problem,<sup>14</sup> such a strategy also carries potential risks of overlooking evidence important to frame case narratives, communicate climate science and establish localised harms.<sup>15</sup>

For example, climate change often presents as a problem that is inherently global and with diffuse or generalised harms; however, adjudication with claims arising from personal or community harms may encounter a need to demonstrate how such a widespread problem is manifesting at local levels. Civic evidence, we posit, has the potential to ground abstract and diffuse harms in personal and locally relevant frames, enriching the evidentiary base from which courts navigate traditional doctrines like standing or view the link between injury and remedy. In other words, there can be strategic value in relying on personal accounts and observations of harm and injury. Furthermore, the choice to include civic evidence and qualitative narratives can connect with and support the framing of priorities and solutions in parallel socio-political discussions. Such discussions may be external to a particular case but part of broader community objectives.

<sup>10</sup>As an example, an online climate attribution database provides hundreds of scientific resources addressing climate change attribution, extreme event attribution, source attribution, and impact attribution. Climate Change Attribution Database, Sabin Center for Climate Change Law and Lamont-Doherty Earth Observatory <<https://climateattribution.org/>>. This database describes how 'science is central to legal debates on the causal links between human activities, global climate change, and impacts on human and natural systems' (ibid).

<sup>11</sup>See S Dillon and C Craig, 'Storylistening: How Narrative Evidence Can Improve Public Reasoning about Climate Change' (2023) 14 WIREs Climate Change e812, 4 (taking note of 'the impressive technical and scientific efforts that have produced measurement systems and simulation models that provide a global perspective on planetary change').

<sup>12</sup>See, e.g., M Burger et al, 'The Law and Science of Climate Change Attribution' (2020) 45 Columbia Journal of Environmental Law 57.

<sup>13</sup>Lloyd and Shepherd consider ways of incorporating observational evidence through the storyline approach. They note observational evidence of local impacts 'should be interpreted in light of the larger body of attribution research and assigned weight accordingly'. EA Lloyd and TG Shepherd, 'Climate Change Attribution and Legal Contexts: Evidence and the Role of Storylines' (2021) 167 Climatic Change 28, 11; M Burger et al, 'Climate Science and Human Rights: Using Attribution Science to Frame Government Mitigation and Adaptation Obligations' in C Rodríguez-Garavito (ed), *Litigating the Climate Emergency* (Cambridge University Press 2022) 226. Burger et al, ibid, 226, notes attribution science lends itself to advocating for collective or community rights, as 'evidence tends to be more robust when looking at impacts on broader geographic and temporal scale' as compared with the individual scale.

<sup>14</sup>Peel and Lin (n 3) 721. Peel and Lin note a 'more technocratic, science-based approach' in climate litigation in the Global North, where most climate litigation is occurring, and 'which feature extensive discussion of scientific studies and the economic costs of climate change, including – in some recent U.S. cases – the "social cost" of carbon'.

<sup>15</sup>Dillon and Craig (n 11) 4. While acknowledging the remarkable developments in climate science, Dillon and Craig note that these models are not sufficient alone for the purposes of communicating climate science and advocate for narrative evidence as a way to improve public reasoning about climate change. A similar line of reasoning can be applied to understand the limitations of technical evidence in climate litigation, where cases also often cohere around a narrative or story.

However, not all practitioners may see the strategic value of including these lived experiences in climate evidence, whether due to unease about their observational or qualitative nature and related credibility concerns or to a practical assessment that such evidence is difficult to adduce. Leaving out such evidence is not without consequence, as it risks creating a worrying gap between the affected people and court proceedings, which risks generating outcomes that are less representative of justice expectations from affected people.<sup>16</sup> In addition, as we argued above, disregarding the knowledge from climate-affected people could lead to missing potentially compelling evidence at the local scale. Such evidence could enrich the epistemic basis on which judicial decisions are taken, ultimately fostering 'epistemological pluralism', a concept that recognises that, on any given matter, there may be several valuable ways of knowing and that accommodating this plurality can lead to a better understanding of the issue at stake, promoting epistemic justice.<sup>17</sup>

The potential for individually sensed evidence in climate litigation appears largely unaddressed by existing literature. This article aims to explore the possible roles of various types of civic evidence in climate litigation, generally, and builds hypothetical scenarios of the kind of evidence that could be derived from case studies involving climate displacement. The aim is to encourage innovative thinking about the kinds of civic evidence that might be deployed in climate litigation and how to effectively continue expanding beyond the currently more technocratic approach to evidence. To frame these considerations, we first recount the emerging use of personal experiences and narrations in climate litigation as a promising trend that, to our knowledge, has not yet been the subject of considered analysis. Through highlighting these examples and discussing future possibilities, we hope to expand the contributions from ordinary people in climate litigation.

### 3 | INDIVIDUAL OBSERVATIONS OF CLIMATE IMPACTS IN CLIMATE LITIGATION

#### 3.1 | A trend of ordinary people recording the impacts and causes of climate change

Below, we locate existing trends in non-institutional science entering climate litigation and the ways that individual observations have been offered by litigants and are reflected in court decisions. From indigenous communities living around oil extraction wells or proposed coal mines, islanders facing displacement from sea-level rise, or communities experiencing first-hand impacts of extreme ice melt,<sup>18</sup> we see that

<sup>16</sup>See M Petersmann, 'Contested Indigeneity and Traditionality in Environmental Litigation' (2021) 21 Human Rights Law Review 1, 132, discussing the unintended consequences of legal experts' strategies in environmental litigation for the identity and (self-)perception of the peoples they represent. For further discussion, see Sections 3.2, 3.3, 4.1 and 4.2 of this article.

<sup>17</sup>T Miller et al, 'Epistemological Pluralism: Reorganizing Interdisciplinary Research' (2008) 13 Ecology and Society 2, 46; G Ottinger, 'Careful Knowing as an Aspect of Environmental Justice' (2023) 33 Environmental Politics 2, 1.

<sup>18</sup>See, for example, the *Lluya* case where an indigenous Peruvian farmer discusses the impact of melting glaciers on his hometown. *Luciano Lluya v RWE*, No-2-O-285/15, Statement of Claim (District Court of Essen, 23 Nov. 2015) <<http://climatecasechart.com/non-us-case/lluya-v-rwe-ag/>>.

personal narratives of impacts from climate change, and activities that contribute to it, are already being woven into court cases. As parties incorporate individual descriptions of impacts to support their cases, courts have begun to highlight those observations, even where a case may not ultimately prevail. Analysed together, these cases potentially reveal a promising advancement towards recognising individuals' recounted experiences of a changing climate and how this has affected their daily lives.

The incorporation of personal accounts and observations may be especially (although not exclusively) evident in rights-based cases, which tend to focus on individual or collectively localised injuries. A human rights framing in climate litigation has been recognised as a way to 'render potentially abstract concepts' about the harms induced by climate 'more locally relevant and personal'.<sup>19</sup> The standing declarations behind such cases can 'tell the powerful human story behind the lawsuit'.<sup>20</sup>

Indeed, the centrality of individual injury in this context featured recently in a case brought by elder women concerning the adequacy of the Swiss government's mitigation measures to combat global warming, where the European Court of Human Rights found that the individuals were not personally affected for the purpose of establishing victim status, which can be an especially high threshold in climate cases. The decision, however, also devised conditions for associational standing, cognisant of 'the common concern of humankind' in responding to climate change and the need to promote 'intergenerational burden-sharing', thus granting legal recourse to the association of elder women to act on behalf of those who may be subject to specific threats.<sup>21</sup>

Although these kinds of human rights cases may provide a natural entry point to evaluate personal observations of impact, civic evidence can support multiple types of cases, from claims based in tort to enforcement-style suits initiated by civil society actors.<sup>22</sup> The cases below, while not exhaustive, are illustrative of the personal observations and narrative accounts currently playing a role within climate

litigation. First-hand accounts may be used to establish present and localised harms and to counter frequently raised arguments that impacts are in the future or too speculative for adjudication. Establishing injury can support standing and, in some kinds of cases, may be relied upon in the merits, as evidence of a violation or damages. We use these early indicators of receptivity to expand in subsequent sections on the potential to further harness civic evidence in the context of climate-affected people.

### 3.2 | Recounting personal narratives in climate litigation

Personal observations featured in recent litigation brought on behalf of girls living near oil extraction sites where gas flaring occurs in the provinces of Sucumbíos and Orellana of the Ecuadorian Amazon.<sup>23</sup> In support of their case against the Government of Ecuador to challenge the practice of flaring, multiple personal accounts were entered, offering observations of damage to plants like papayas, bad odours, noise pollution and sickness that local people linked to contaminated water, and accounts of cancer in the communities.<sup>24</sup> These accounts were entered alongside expert evidence of contaminants from the combustion of gas flaring and associated health risks. In finding that gas flaring allowed by the government violated multiple rights under Ecuador's Constitution, including the rights to a healthy environment and health, the court ordered a multi-pronged injunction that required a phase down of flaring, environmental restoration activities, a plan for water supply replacement, and a study of health effects. Although this case focused on a particular practice (gas flaring) and its localised harms, the court also recognised the broader climate implications. Indeed, authorisation of gas flaring activities was not compatible with Ecuador's projected emissions reductions from the energy sector, in compliance with the Paris Agreement.

Twice, the Supreme Court of Alaska in the United States has decided cases built partly upon personal accounts of climate impacts offered by young Alaskans.<sup>25</sup> In *Kanuk et al v State of Alaska*, an Alaskan Native, Nelson Kanuk, described erosion from ice melt and flooding and increasing temperatures, threatening the foundations of his 'home, village, native traditions, food sources, culture, and annual subsistence hunts'.<sup>26</sup> Nelson observed glaciers receding greatly and detailed how a later freeze and earlier thaw had caused flooding and erosion.<sup>27</sup> Another youth, Ananda Rose Ahtahkee Lankard, recounted glaciers receding and flooding, as well as dying forests, and

<sup>19</sup>J Setzer and LC Vanhala, 'Climate Change Litigation: A Review of Research on Courts and Litigants in Climate Governance' (2019) 10 WIREs: Climate Change e580, 11, citing social science research. Rights-based claims have been described as a way to put a 'human face' on the climate change problem; Peel and Lin (n 3) 684–685.

<sup>20</sup>K Matheson, 'The Case for Climate Visuals in the Courtroom' in Rodríguez-Garavito (n 13) 280 ('Standing declarations are the heart of many human rights cases brought against governments').

<sup>21</sup>*Verein KlimaSeniorinnen Schweiz and Others v Switzerland* App No 53600/20 (ECtHR 9 April 2024) paras 487, 499, 524, 527.

<sup>22</sup>The literature extensively addresses the use of civic evidence to substantiate environmental climate justice claims; see, e.g., ME Haklay and L Francis, 'Participatory GIS and Community-based Citizen Science for Environmental Justice Action' in J Chakraborty et al (eds), *The Routledge Handbook of Environmental Justice* (Routledge 2017) 297; and G Ottinger, 'Buckets of Resistance: Standards and the Effectiveness of Citizen Science' (2010) 35 Science, Technology, and Human Values 244, bringing in people's experiences of environmental distress and meeting participation rights enshrined in international conventions; see Berti Suman (n 2). Citizen science and civic evidence have been admitted and used in court to demonstrate pollution, especially in the United States and Latin America; see F Facchinelli et al, 'Extreme Citizens Science for Climate Justice: Linking Pixel to People for Mapping Gas Flaring in Amazon Rainforest' (2022) 17 Environmental Research Letters 1; A Berti Suman and S Schade, 'The Formosa Case: A Step Forward on the Acceptance of Citizen-Collected Evidence in Environmental Litigation?' (2021) 6 Citizen Science: Theory and Practice 16. In the United States, multiple environmental statutes allow individuals to take an enforcement role. See A Berti Suman and A Burnette, 'Exploring the Role of Civic Monitoring of Coal Ash Pollution: (Re)gaining Agency by Crowdsourcing Environmental Information' (2023) 17 Law & Ethics of Human Rights 227, 254.

<sup>23</sup>*Carrion et al v Ministry of the Environment et al*, Provincial Court of Justice of Sucumbío, Judgment No. 21201202000170 (29 July 2021) <<http://climatecasechart.com/non-us-case/herrera-carrion-et-al-v-ministry-of-the-environment-et-al-caso-mecheros/>>.

<sup>24</sup>*ibid*.

<sup>25</sup>In *Sagoonick et al v State of Alaska*, 503 P.3d 777 (Alaska 2022) <<https://climatecasechart.com/case/sinnok-v-alaska/>>, the court affirmed dismissal under the political question doctrine, and the claims in *Kanuk v Alaska* were dismissed on political question doctrine and prudential grounds. *Kanuk et al v State of Alaska*, 335 P.3d 1088 (Alaska 2014) <<https://climatecasechart.com/case/kanuk-v-alaska/>>.

<sup>26</sup>*Kanuk* (n 25) 7.

<sup>27</sup>Matheson (n 20) 281.

declines in wild salmon stocks in local rivers.<sup>28</sup> The Supreme Court of Alaska found these injuries sufficiently 'specific and personal' to support a direct injury for purposes of conferring standing,<sup>29</sup> although the court ultimately did not assess the merits of the case on political question and prudential grounds.<sup>30</sup>

Young Alaskans again sought recourse with the courts for Alaska's inadequate energy policies in *Sagoonick v State*.<sup>31</sup> This decision likewise brings in a narrative account of impacts that underlay the complaint, from coastal erosion due to loss of sea ice, to flooding from accelerating thaw, damage to traditional hunting practices, inadequate snow cover for winter travel and increased wildfires. While acknowledging the impacts alleged, the court again declined to reach the merits, deeming the relief sought as intruding into the legislative branches.<sup>32</sup> Although neither of these cases proceeded to the merits, they both show early receptivity towards observational evidence of injury.

Personal observations of climate impacts have also played a role in adjudication before regional and international bodies. In a petition before the UN Committee for the Rights of the Child, 16 youths included their personal experiences of climate change in support of their claims that several countries violated their rights under the UN Convention on the Rights of the Child,<sup>33</sup> by continuing to allow emissions that cause and perpetuate climate change. The Committee found the evidence of impacts submitted by the petitioners<sup>34</sup> from different parts of the world established victim status and impairment of their Convention rights, for jurisdictional purposes.<sup>35</sup> In so doing, the committee highlighted the children's personal accounts of smoke from wildfires, heat-related pollution and worsening asthma, personal experiences with intensifying vector-borne disease, drought, extreme storms and flooding, rising seas, and related impacts to these events, like threats to water security and subsistence practices and risks to the habitability of low-lying islands.<sup>36</sup> The Committee nonetheless dismissed the petition on procedural grounds for failure to exhaust domestic remedies and did not discuss whether or how these narrative accounts might support the consideration of the merits.

In 2018, the indigenous Sámi people from Sweden also asserted climate impacts affected their fundamental rights, as part of the landmark *People's Climate Case* before the Court of Justice of the European Union (EU). The case brought by 10 families from Portugal, Germany, France, Italy, Romania, Kenya, Fiji and the Swedish Sámi

Youth Association Sáminuorra, before the EU General Court sought to compel the EU to adopt a more stringent greenhouse gas emissions reduction target.<sup>37</sup> The plaintiffs shared their concerns in relation to insufficient water (e.g., drought), over-abundant water (e.g., floods), warm water (e.g., glaciers melting), frequency and intensity of heat-waves, causing actual health and economic damage (e.g., to small-scale agricultural and tourism).<sup>38</sup>

Sámi testimonials indicated a 'sense of concern' about the possibility of sustaining the reindeer husbandry practices central to Sámi culture, in light of the impacts of climate change. Deterioration of psychological well-being among the Sámi is reportedly a 'big issue' that is 'ever more present among reindeer herders, which affects entire families.'<sup>39</sup> The plaintiffs argued these personal concerns were attributable to climate change, linking their narrative accounts to institutional science, such as the reports of the IPCC, of the European Environmental Agency and of the European Commission.<sup>40</sup> For example, plaintiffs' experiences and climate science were linked with passages such as '[o]fficial data confirm the observations of Sámi people that winters have become milder'.<sup>41</sup>

In a decision by the European General Court, later affirmed the European Court of Justice,<sup>42</sup> the court dismissed the case on procedural grounds, ruling the plaintiffs did not have standing as they were not 'uniquely' affected at a direct, individual level, by the EU conduct. The General Court applied what plaintiffs characterised as an overly narrow interpretation of standing<sup>43</sup> in the context of climate harms, which required the harm experienced by them to be 'differentiated from all others'.<sup>44</sup> The plaintiffs argued that such a rigid application of the standard risked the perverse outcome that those experiencing more serious and widespread harms would be restricted from accessing the courts.<sup>45</sup> This case is a good example of existing legal doctrines that can be applied in a way that perpetuates a disconnect between recognised science, such as that of the IPCC, often quantitative in nature and *high level*, and *small-scale* civic scientific evidence that demonstrates actual impacts on individuals and communities. A rigid application of a constrained standard for assessing individual standing can create a very difficult evidentiary hurdle in the context of widespread and multi-dimensional climate-induced harms, which may likely discourage broader accounts of community harm that go beyond the directly affected individuals and include, for example, future generations.

<sup>28</sup>Kanuk (n 25) 8.

<sup>29</sup>ibid 9.

<sup>30</sup>For additional discussion of this case see Matheson (n 20) 281–283.

<sup>31</sup>*Sagoonick* (n 25).

<sup>32</sup>ibid 22–23.

<sup>33</sup>The youths alleged that Argentina, Brazil, France, Germany and Turkey violated their rights to life (Article 6), health (Article 24) and culture (Article 30) under the Convention on the Rights of the Child. *Sacchi et al v Argentina*, Communication to the Committee on the Rights of the Child No. 104/2019 (23 September 2019) <<https://climatecasechart.com/non-us-case/sacchi-et-al-v-argentina-et-al/>>.

<sup>34</sup>See *ibid*, 'Appendix A: Child Petitioner Narratives' A.1–A.16.

<sup>35</sup>E.g., *Sacchi et al v Argentina et al*, Communication No 105/2019, and Committee on the Rights of the Child 'Decision Adopted by the Committee under the Optional Protocol to the Convention on the Rights of the Child on a Communications Procedure, Concerning Communication No. 104/2019' UN Doc CRC/C/88/D/104/2019 (11 November 2021) para 10.14.

<sup>36</sup>ibid para 10.13.

<sup>37</sup>Case T-330/18, *Armando Ferrão Carvalho and Others v The European Parliament and the Council of the European Union*, ECLI:EU:T:2019:324 (*Carvalho*) para 18.

<sup>38</sup>G Winter, 'Armando Carvalho and Others v. EU: Invoking Human Rights and the Paris Agreement for Better Climate Protection Legislation' (2020) 9 *Transnational Environmental Law* 137, 138–139.

<sup>39</sup>L Nordlander, 'Litigating Climate Change in the Arctic: The Potential of Sámi Human Rights Claims' (2022) 13 *Journal of Human Rights and the Environment* 416, 429.

<sup>40</sup>*Carvalho* (n 37) para 9–10.

<sup>41</sup>ibid para 25–26.

<sup>42</sup>Case C-565/19 P, *Armando Ferrão Carvalho and Others v The European Parliament and the Council of the European Union*, ECLI:EU:C:2021:252.

<sup>43</sup>The court applied the *Plaumann* test (Case C-25/62, *Plaumann v Commission of the European Economic Community*, ECLI:EU:C:1963:17) to establish the existence of 'individual concern' with regards to an EU legal provision and thus standing. *Carvalho* (n 37) paras 28, 48, 50.

<sup>44</sup>*Carvalho* (n 37) para 45. See Winter (n 38) 147.

<sup>45</sup>Winter (n 38) 158.

### 3.3 | Climate change through the eyes of climate displaced persons

Multiple recent cases have considered the climate harms experienced by persons facing internal or external displacement. These cases demonstrate an awareness of evidentiary value beyond the physical conditions that might be predicted by scientific models (e.g., flooding, inundation, erosion and changes to marine ecosystems) as extending to impacts that cannot be relayed by complex science models, like cultural impacts, inundated gravesides, withering gardens and loss of knowledge and connection to traditional indigenous practices.

For example, climate impacts were presented through the eyes of displaced persons in two recent cases before the UN Human Rights Committee.<sup>46</sup> The Committee evaluated whether New Zealand and Australia, respectively, violated rights under the International Covenant on Civil and Political Rights by failing to protect inhabitants of low-lying islands in the Pacific Ocean from climate harms. In *Teitiota*, the applicant claimed that the effects of climate change and sea level rise had forced him to migrate to New Zealand and that the subsequent denial of asylum by New Zealand violated his right to life.<sup>47</sup> Although not successful on the merits, the *Teitiota* case, which was the first climate case to go before a UN human rights treaty body that resulted in a decision,<sup>48</sup> was generally regarded as a landmark decision.<sup>49</sup> While ultimately finding on the facts presented that a 'time frame of 10 to 15 years' before sea-level rise renders an island inhabitable is sufficient time to allow the State to take measures to protect the applicants,<sup>50</sup> *Teitiota* also confirmed the availability of protection under the right to life for people displaced across international borders for climate change impacts.<sup>51</sup> In *Daniel Billy*, the islanders alleged Australia's insufficient action on climate change failed to ensure the long-term habitability of the islands, violating their rights to life and culture.<sup>52</sup> The islanders asserted that climate change 'already compromises the authors' traditional way of life and threatens to displace them from their islands' and that 'displacement would result in egregious and irreparable harm to their ability to enjoy their culture'.<sup>53</sup> The Committee found, relying on personal and actual experiences of the islanders, that the inhabitants of the low-lying islands have been adversely affected in multiple ways, from 'flooding and inundation of their villages and ancestral burial lands' and 'withering of their

traditional gardens through salinification caused by flooding or seawater ingress' to the 'decline of nutritionally and culturally important marine species'.<sup>54</sup> Although unsuccessful in establishing a violation of the right to life, the Committee found that Australia's failure to respond to climate change through adaptation measures violated the applicants' right to culture.

In a recent challenge to a proposed coal mining complex in Australia, the objectors urged the Land Court of Queensland to reject the application on account of the project's contribution to climate change, which would pose a limitation on several protected rights.<sup>55</sup> In addition to relying on complex climate science for projecting future climate impacts in Australia and calculating emissions from the project, the objectors relied on evidence from First Nations witnesses to establish the ways that they are already experiencing the effects of climate change. In what advocates termed 'a legal first',<sup>56</sup> the Land Court of Queensland travelled around the country to hear oral evidence about how climate change is currently affecting First Nations witnesses and their 'ability to practice and develop culture, live on Country and protect their Country'.<sup>57</sup> The court concluded climate change is having a 'profound impact on cultural rights and, for some peoples who will be displaced from ... their country, it risks the survival of their culture'.<sup>58</sup> Against this evidentiary backdrop, the court determined that development of the project would unjustifiably limit multiple rights, including the right to life, the protection of children and the right to culture of First Nations people.<sup>59</sup> The court paid particular attention to the impact of displacement, noting 'displacement has the potential to destroy culture' and 'displacement of people from their property, and the associated grief and health impacts of that, must also be considered'.<sup>60</sup>

### 3.4 | Reflecting on the current trends

Through a case law analysis, we have demonstrated both the receptivity and utility of incorporating individually sensed evidence of climate impacts. Already, people affected by climate change are enriching the epistemic basis discussed in legal proceedings with personal accounts of climate harms, individual observations of impacts that threaten traditional ways of life and testimonial evidence of the attendant cultural

<sup>46</sup>Human Rights Committee 'Views Adopted by the Committee under Article 5 (4) of the Optional Protocol, Concerning Communication No. 3624/2019' UN Doc CCPR/C/127/D/2728/2016 (7 January 2020) (*Teitiota*); Human Rights Committee 'Views Adopted by the Committee under Article 5 (4) of the Optional Protocol, Concerning Communication No. 3624/2019' UN Doc CCPR/C/135/D/3624/2019 (22 September 2022) (*Daniel Billy*).

<sup>47</sup>The *Teitiota* case (n 46) involved a Kiribati citizen defending his entitlement to asylum due to climate change that made his land uninhabitable.

<sup>48</sup>Wewerinke and Antoniadis (n 7) 240.

<sup>49</sup>*Ibid* 251; F Rosignoli, *Environmental Justice for Climate Refugees* (Routledge 2022) 21.

<sup>50</sup>*Teitiota* (n 46) paras 9.9, 9.12. The Committee decided on the record before it that sending the applicant back to Kiribati would not result in a serious individualised risk to the rights invoked, as opposed to more general conditions of the receiving State; *ibid* para 9.9. See R Loporini and Annalisa Savaresi, 'International Human Rights Bodies and Climate Litigation: Don't Look Up?' 32 *Review of European, Comparative & International Environmental Law* 267, 274.

<sup>51</sup>Wewerinke and Antoniadis (n 7) 251.

<sup>52</sup>*Daniel Billy* (n 46).

<sup>53</sup>*Ibid* para 3.5.

<sup>54</sup>*Ibid* para 8.12. The Committee found that Australia's failure to protect the indigenous islanders against adverse impacts of climate change was a violation of their rights to enjoy their culture and be free from arbitrary interferences with their private life, family and home.

<sup>55</sup>*Waratah Coal Pty Ltd v Youth Verdict Ltd & Others* (No 6) [2022] QLC 21 <<https://climatecasechart.com/non-us-case/youth-verdict-v-waratah-coal/>>.

<sup>56</sup>See Environmental Defenders Office, 'Galilee Coal Project Dead in the Water after Waratah Coal Drops Appeal against Historic Land Court Refusal' (13 February 2023) <<https://www.edo.org.au/2023/02/13/galilee-coal-project-dead-in-the-water-after-waratah-coal-drops-appeal-against-historic-land-court-refusal/>>.

<sup>57</sup>The court's decision recalls the testimony gathered for illustrative purposes explaining, 'I have focussed on what country and caring for country means, the impacts the First Nations witnesses are already observing, and their fears for the future of the environment, their culture, and for their children'; *Waratah Coal Pty Ltd* (n 55) para 1564.

<sup>58</sup>*Ibid* para 1565.

<sup>59</sup>Based on the court's evaluation of evidence, 'First Nations peoples in the north of Australia are experiencing the effects of climate change impacts on their ability to enjoy, maintain, control, and develop culture. More severe impacts mean greater interference with cultural rights'; *ibid* para 1568.

<sup>60</sup>*Ibid* paras 1568 and 1622.

harms that cannot be captured through scientific modelling and predictions alone. While promising, these early developments do not harness the full realm of possibilities of civic evidence as a form of *technology*—an area that has itself deepened and developed from multiple perspectives, including in the disciplinary areas of sociology, political science and—particularly relevant for this article—environmental law studies.<sup>61</sup> Using a case study approach, below, we outline the possibilities for civic evidence in this context and suggest an agenda for further research, in the hope of inspiring innovation within the fast-moving field of climate litigation.

## 4 | IN SUPPORT OF CIVIC EVIDENCE OF CLIMATE HARMS

### 4.1 | The potential of climate-affected people to gather civic evidence through data as technology

Although recent cases exemplify some initial receptivity towards incorporating civic evidence gathered through sound methodologies in climate litigation, there are many more possibilities for this practice (often referred to as environmental *citizen science* and *citizen sensing*, which are forms of public engagement with monitoring the environment, respectively, through scientific analyses and the use of sensors or own senses).<sup>62</sup> In this section, we argue that gathering civic evidence on climate impacts can be considered as a manifestation of a broader trend of people mobilising technology to advance their arguments and at times also to defend their rights. For this aim, we review theories on technological progresses, on data governance and data activism, and on citizen science and sensing.

The tendency of people to use their bodies and senses to monitor the environment and—specifically for this context—changes in the climate dates long back in history, basically since the origin of humanity.<sup>63</sup> One may think, for example, about the development of the human ability to detect the quality of water and food by using taste, smell and sight. In recent history, this ability was amplified by technological developments and by the transformative potential of big data, which changed substantially our ability to ‘sense’ and share the collected data on accessible platforms.<sup>64</sup> This ability has indeed gained a considerable boost in recent years—in particular from 2010—mostly due to the evolution of sensing technologies such as mobile devices and the associated multiplication of data collection possibilities.<sup>65</sup>

But what exactly is *technology* in the context of civic evidence? A definition of technology can be derived from the juxtaposition between things that occur naturally and those that are human made. A technology in this context would be the product of a reasoned act of human or even animal intelligence. The analysis of civic evidence as *technology* can be explored further by engaging with Volti's definition of technology as a ‘system created by humans that uses knowledge and organization to produce objects and techniques for the attainment of specific goals’.<sup>66</sup> In the context of advancing environmental, climate and epistemic justice claims, the gathering of civic knowledge through some forms of technology can fall within this definition.

This tendency to harness knowledge production and organisation towards the achievement of certain objectives is also at the origin of ordinary people's drive to gather evidence that, in this regard, can be classified itself as technology. Milan and van der Velden, referring to Braman, suggest that data should also be considered a technology. They discuss the ancient origin of the word. The word ‘technology’ has indeed its roots in the ancient Greek *techne* (to create) and *logos* (order, logic), which combined means the creation of order. The authors argue that the word technology does not refer only to physical tools that we generally regard as technologies but also to the process of *human engagement* in response to specific matters (as, in our case, climate stressors), connecting art and engineering to gather information, find creative responses and deploy adaptive strategies.

Carroll defines technology as ‘something that is organized [thus implying the creation of order] whose aspects function with a purpose that can provide some benefit’.<sup>67</sup> In this sense, sensing as a technology can become an *act of care* for an individually perceived or shared problem. Care under this perspective indicates a form of engagement with a matter of concern that entails taking responsibility for an issue and at the same time resisting mainstream ways to address the issue at stake.<sup>68</sup>

In conclusion of this reflection, the engagement component of the word technology and the use of people's creative abilities in response to matters of concern are particularly relevant dimensions to frame the trend of civic evidence-gathering discussed in this article. Furthermore, this conceptualisation suggests that not only the tools used by the monitoring people but also the data produced through civic monitoring can be regarded and discussed as technology.<sup>69</sup>

Climate-affected people could significantly contribute with several types of evidence, aided in part by the widespread availability of digital technologies, like smartphones and apps that assist in data integration.<sup>70</sup> This increasing accessibility of technologies

<sup>61</sup>On the environmental law dimension of civic-gathered data, see A Berti Suman, ‘Civic Monitoring for Environmental Enforcement: Exploring the Potential and Use of Evidence Gathered by Lay People’ (European Commission 2023) <<https://publications.jrc.ec.europa.eu/repository/handle/JRC132206>>.

<sup>62</sup>A literature review and organisation of the various typologies can be found in A Berti Suman and M van Geenhuizen, ‘Not Just Noise Monitoring: Rethinking Citizen Sensing for Risk-related Problem-solving’ (2020) 63 *Journal of Environmental Planning and Management* 3, 546.

<sup>63</sup>For a review of civic sensing in history, see A Berti Suman and E Alblas, ‘Exploring Citizen Science over Time: Sensing, Technology and the Law’ (2023) 15 *Sustainability* 1.

<sup>64</sup>*ibid* 5–7.

<sup>65</sup>MNK Boulos et al, ‘Crowdsourcing, Citizen Sensing and Sensor Web Technologies for Public and Environmental Health Surveillance and Crisis Management: Trends, OGC Standards and Application Examples’ (2011) 10 *International Journal of Health Geographics* 1.

<sup>66</sup>R Volti, *Society and Technological Change* (Worth Publishers 2009).

<sup>67</sup>L Carroll, ‘A Comprehensive Definition of Technology from an Ethological Perspective’ (2017) 6 *Social Sciences* 6.

<sup>68</sup>A Berti Suman, ‘The ‘Caring Community’: Recognizing and Shielding Civic Environmental Monitoring’ (2022) 64 *Psychology in Society* 5, 5–6. GC Barnwell et al, ‘Nothing Green Can Grow without Being on the Land: Mine-affected Communities’ Psychological Experiences of Ecological Degradation and Resistance in Rustenburg, South Africa’ (2020) 6 *Community Psychology in Global Perspective* 2.

<sup>69</sup>As discussed in Berti Suman and Alblas (n 63).

<sup>70</sup>M Cardoso-Andrade et al, ‘Understanding Technological, Cultural, and Environmental Motivators Explaining the Adoption of Citizen Science Apps for Coastal Environment Monitoring’ (2022) 77 *Global Environmental Change* 102,606, 3. According to the authors, the ‘widespread dispersal of internet-capable mobile phones ... paired with the evolution of Global Positioning Systems (GPS), qualify them as scientific instruments for [citizen science] initiatives’.

to gather visual evidence opens up multiple possibilities of engagement *with* and *through* technology for supporting climate litigation strategies and agendas and could help secure legal accountability.<sup>71</sup>

The kinds of information that could be observed and documented by climate-affected people range from static captions of events (e.g., digital photos taken before and after a flood) or dynamic narrations of changes over time (e.g., time lapses; recordings of environmental memories from the elderly), including testimonies like those incorporated into the evidentiary record from First Nations witnesses. In addition to capturing events real-time, nearly every person with access to a smartphone and the Internet also has a potential means to store, preserve and communicate information.<sup>72</sup> This enables collection, preservation and communication of very site-specific and individual- or community-specific evidence that could be proffered into the evidentiary record with (broader) scientific, statistical and historical data on a given climate issue.<sup>73</sup> People living in climate hotspots could be on the leading edge of this trend, supported by lawyers and NGOs.<sup>74</sup>

Below, we rely upon specific scenarios based on case studies arising from two sets of interviews conducted with climate-affected people to explore emerging possibilities for civic evidence in this context. We then turn to the practical considerations in finding and utilising such evidence and propose a future research agenda. Researchers must be able to navigate this field if they truly want to support innovation.

## 4.2 | Gathering civic evidence in the context of climate displacement

Climate change, environmental degradation and natural disasters are increasingly interacting with people's mobility.<sup>75</sup> As the effects of climate change continue to escalate in the coming decades, these impacts are expected to amplify existing factors affecting displacement,<sup>76</sup> leading to a growing trend towards migration induced

in part by climate change.<sup>77</sup> Climate change 'substantially contributes to human rights harms and related human movement'.<sup>78</sup>

Climate-induced environmental changes, such as desertification, increased flooding or sea level rise, may force or compel people to migrate abroad or to relocate within their own countries. However, there is still scientific uncertainty and disagreement on the extent to which people situated in so-called climate 'hot spots'—regions whose climate is especially exposed to the impacts of global warming<sup>79</sup>—will be vulnerable to climate change, and which mobility patterns they will adopt as an adaptation strategy or will not be able/willing to (i.e., forced or voluntary climate *immobility*<sup>80</sup>).

Tackling knowledge gaps on the matter is a priority, especially in those climate 'hot spots'.<sup>81</sup> The role of civil society in contributing to this knowledge was recognised by influential institutions in the field. The IPCC, for example, notes that 'civil society is the only reliable motor for driving institutions change at the pace required'<sup>82</sup> in the face of challenges such as that of climate displacement. Also, the Global Compact on Migration of 2018 contains a commitment to strengthen the global evidence base on climate displacement.<sup>83</sup>

The knowledge and more specifically *evidence* of the impact of climate distress gathered by ordinary people exposed to climate change could be pivotal to understand dynamics of climate change-induced harms and displacement. In addition, as social discourses on climate are becoming *existential* and centred on whose model of life can (or should) survive,<sup>84</sup> not only evidence but also those *perceptions* and associated *values* of climate-affected people could enable scientists and decision makers to better address such challenges.

However, institutions often failing to establish 'systematic respectful collaborations between scientists and traditional ... knowledge-holders is more serious than a "missed opportunity"; [this] is damaging ... aspirations to resilient and sustainable governance of climate'.<sup>85</sup> Furthermore, even when there is an institutional willingness to valorise such evidence, the knowledge held by climate-affected people may be lost or missed for multiple reasons. People

<sup>71</sup>Matheson (n 20) 285: '[C]ourtroom environments – one of the last bastions of oral tradition – are morphing into cinematic display environments in an effort to better communicate with judges.'

<sup>72</sup>R Gallmetzer, 'Providing Evidence to Support Strategic Climate Enforcement and Litigation' in Rodríguez-Garavito (n 13) 258.

<sup>73</sup>On a related point, Luporini and Savaresi (n 50) 275, discuss climate litigation before international courts as a place for pioneering 'a combination of scientific evidence, legal argumentation and testimonies that has been replicated by climate litigants all over the world'.

<sup>74</sup>Can the story be told in a different way that better connects with people and their lived experience? For climate litigation, this involves reflecting with allies on the potential claimants and spokespeople for a case, as well as on the facts it will present.' L Gyte et al, 'The Story of Our Lives: Narrative Change Strategies in Climate Litigation' in Rodríguez-Garavito (n 13) 292.

<sup>75</sup>Rosignoli (n 49).

<sup>76</sup>Climate displacement has been defined as "the involuntary movement of people, caused by the effects of climate change". It is understood that displacement in the context of climate change is often multi-causal, and much movement related to environmental factors is not entirely forced or voluntary, but rather falls somewhere on a continuum between the two.' Wewerinke and Antoniadis (n 7) 240.

<sup>77</sup>Current policies that could lead to around 2.7°C global warming could effectively lead to one-third (22–39%) of people living outside the 'human-climate niche', where exposure 'could result in increased morbidity, mortality, adaptation in place or displacement (migration elsewhere)'. TM Lenton et al, 'Quantifying the Human Cost of Global Warming' (2023) 6 Nature Sustainability 1237, 1237–1238.

<sup>78</sup>United Nations Office of the High Commissioner on Human Rights (OHCHR), 'Frequently Asked Questions on Human Rights and Climate Change' (OHCHR 2021) <[https://www.ohchr.org/sites/default/files/Documents/Publications/FSheet38\\_FAQ\\_HR\\_CC\\_EN.pdf](https://www.ohchr.org/sites/default/files/Documents/Publications/FSheet38_FAQ_HR_CC_EN.pdf)> 26. The OHCHR recognises that the relationship between climate change and human mobility is complex, with human mobility resulting both from 'sudden-onset events and slow onset processes or the interaction between them' (ibid).

<sup>79</sup>F Giorgi, 'Climate Change Hot-spots' (2006) 33 Geophysical Research Letters.

<sup>80</sup>I Boas et al, 'Climate Mobilities: Migration, Im/mobilities and Mobility Regimes in a Changing Climate' (2022) 48 Journal of Ethnic and Migration Studies 3370.

<sup>81</sup>The Platform on Disaster Displacement, 'Platform on Disaster Displacement, Follow-up to the Nansen initiative: Addressing the Protection Needs of Persons Displaced across Borders in the Context of Disasters and Climate Change' in R McLeman and F Gemenne (eds), *Routledge Handbook of Environmental Displacement* (Routledge 2018) 421, 421.

<sup>82</sup>IPCC, *Global Warming of 1.5°C* (Cambridge University Press 2018) 352.

<sup>83</sup>International Organization for Migration 'Global Compact for Safe, Orderly and Regular Migration' UN Doc A/RES/73/195 (11 January 2019).

<sup>84</sup>M Grasso, *From Big Oil to Big Green: Holding the Oil Industry to Account for the Climate Crisis* (MIT Press 2022).

<sup>85</sup>D Romero Manrique et al, 'Arctic Knowledge: Echoes from the North' (Publications Office of the European Union 2021) 9.

may leave their countries of origin and move to new lives, while those who remain may not interpret stressors such as extreme weather-induced disasters or gradual loss of livelihood as a climate change problem. The elderly members of a community—often the keepers of precious ‘context-specific perspectives’<sup>86</sup> on a certain land—either may not realise the threats as climate-induced or may not have a younger generation that remains to pass on historical or cultural knowledge to, further undermining the community's ability to engage in climate change mitigation and adaptation.

Below, we consider the potential of evidence that could be gathered from those migrating, in part, on account of climate impacts, based on two sets of interviews previously conducted. The interviews were collected in the scoping phase of the present article, also inspired by the participation of one of its authors, Anna Berti Suman, in the scientific and practitioners' discussions that led to the project titled *Le Rotte del Clima* (‘climate routes’),<sup>87</sup> launched in January 2023 by the Italian association *Systasis – Centro studi per la prevenzione e la gestione dei conflitti ambientali*.

The initiative is funded by the Italian Foundation Cariplo and gathers researchers, lawyers, other professionals and associations in the field of climate justice and migration. The project aims to respond to the knowledge gap around the notion of ‘climate-displaced person’ through qualitative data collection on the experiences of people personally affected by extreme events linked to or aggravated by climate change. The project aims to valorise these experiences, both to promote social awareness but also to develop new strategies for legal protection.

For this analysis, we selected interviews from subjects that could qualify as climate-displaced persons and that had some experience in gathering evidence of climate impacts individually or within their communities.<sup>88</sup> The interviewees were selected through purposive sampling, on the basis that their origins, sociocultural backgrounds and lived experiences could be illuminating for our research question.

### 4.3 | Interview 1: Migrating and moving (also) due to climate change

First, we consider the interview of two economic migrants that had obtained higher education, who may also have a climate determinant in their migration pathway. The interviewed persons are a young couple from Bangladesh that moved to Europe for studying before finding a job. They also performed field research in Bangladeshi urban areas exploring internal displacement of former farmers that can no longer rely on agriculture, documenting their conditions with pictures.

<sup>86</sup>World Wide Fund for Nature (WWF), ‘Living Planet Report’ (WWF 2020) 109.

<sup>87</sup>*Le Rotte del Clima* launch event, Triennale di Milano <<https://triennale.org/eventi/rotte-clima-crisi-climatica-migrazioni-diritti>>. One of the authors of this article participates in the project as an expert of civic environmental monitoring and member of the association *Systasis*.

<sup>88</sup>These interviews were performed virtually and in person, with informed consent given, lasted approximately two hours each, and were documented through written records. Interview 1 took place virtually in winter 2022 and has been accompanied by a follow-up meeting in person in Amsterdam, the Netherlands, in spring 2022. Interview 2 took place virtually in winter 2022, followed by an in-person meeting in Milan, Italy, in spring 2022.

Farmers move to the cities where ‘their previously acquired knowledge is useless, and they often have to accept degrading jobs’ (citing an interview passage). In readapting to a new life in the city, such internally displaced people will likely lose their environmental historical memory of the land that they abandoned.

Half of the people now living in Bangladesh's urban slums were forced to flee their rural homes due to floods. Studies predict that by 2050, one in every seven people in Bangladesh will be displaced due to climate change.<sup>89</sup> Bangladesh ranks very high in climate change vulnerability and has low resilience to associated challenges.<sup>90</sup> Rare but noteworthy examples show that local lawyers are joining forces to ensure that the rights of climate-displaced people are protected,<sup>91</sup> but this effort to our knowledge does not foresee a structural analysis of how their memories and observations of a changing climate could be used as scientific evidence (in court). Further responses, both in terms of research and of interventions (aimed, e.g., at offering avenues where climate-affected people can transfer their experiences to climate scientists), would be helpful to understand the climate and displacement nexus and the related evidentiary possibilities that personal narratives of climate impacts can offer.

### 4.4 | Interview 2: Climate disruption comes closer

Migration and displacement also manifest closer to Europe. To get an insight into this fact, we interviewed a farmer from Sicily, Italy. He produces olive oil and wine, and he is an active member of a network, *FuoriMercato*,<sup>92</sup> for promoting sustainable farming and combating illegal recruitment of migrant workers. Over the last years, he and other members of his farming community witnessed extreme weather events such as recurring heatwaves, droughts and floods. On a daily basis, they witness the pace at which products would become ripe out of season, the insistent ‘tropicalisation’ of the region and the ever-increasing invasive species never seen before on their land.<sup>93</sup> They captured specimens, photos and footage of such transformations.

Sicily's changing climate has featured widely in news coverage, with reports describing a situation of ‘the desert and the tropics’ and ‘thirst and floods’.<sup>94</sup> Official science confirms all this: the temperature in Sicily in 50 years, according to data collected by the

<sup>89</sup>Climate Reality Project, ‘How the Climate Crisis is Impacting Bangladesh’ (9 December 2021) <<https://www.climateRealityProject.org/blog/how-climate-crisis-impacting-bangladesh>>.

<sup>90</sup>Notre Dame Global Adaptation Initiative, ‘Country Index’ <<https://gain.nd.edu/our-work/country-index/>>.

<sup>91</sup>See, e.g., Young Power in Social Action, ‘Launching and Installation Ceremony for Lawyers Initiative for Displacement Solutions Held’ (4 January 2016) <<https://ypsa.org/2016/01/launching-and-installation-ceremony-for-lawyers-initiative-for-displacement-solutions-held/>>.

<sup>92</sup>*FuoriMercato* <<https://www.fuorimercato.com/agroecologia-lavoro-migrante.html>>.

<sup>93</sup>This is a verbatim quote taken from the response that the interviewed farmer gave to a questionnaire performed by the *FuoriMercato* network (February 2022). The *FuoriMercato* network shared these results with author Anna Berti Suman and she could discuss them with the consulted farmer.

<sup>94</sup>T Filippone and A Puglia, ‘Il deserto e i Tropici: che Sicilia sarà tra sete e alluvioni’ (Repubblica, 28 September 2021) <[https://palermo.repubblica.it/cronaca/2021/09/28/news/longform\\_cambiamento\\_climatico\\_sicilia-319659469/](https://palermo.repubblica.it/cronaca/2021/09/28/news/longform_cambiamento_climatico_sicilia-319659469/)>.

European Copernicus programme, has risen 1.89°C.<sup>95</sup> The farmer's neighbours already left the cultivated lands and relocated to cities. They carry memories of a changing territory that, however, are fading in the relocation to city life. With no opportunities and channels to collect and systematise them, such evidence will be soon lost.

To our direct question, the farmer replied that they measure since years these small-scale changes, trying to connect what they are experiencing in their local reality to global trends. They joined a citizen science initiative, *Scienza Radicata*,<sup>96</sup> a project that offers to local communities a network of scientists for training in environmental monitoring techniques. They are learning how to systematically perform scientific data collection to identify climate change trends and impacts. These communities aim to independently understand how to scientifically read certain phenomena and build strategies to combat them, including through court cases. However, they lack the resources to access legal advice to understand whether the data they are collecting is not only scientifically sound but also legally admissible and meaningful.

Zooming out from this situated reality to take stock of broader trends, we can confidently note that climate change impacts for Europeans are no longer faraway conditions for other peoples (often in the southern hemisphere). Multiple court decisions recognise climate impacts as a present problem also in the western world, including Europe (see, e.g., the cases in Section 3, where the present nature of climate impacts is often acknowledged).

Studies demonstrate how heatwaves in Europe had increased in frequency and intensity over the past four decades.<sup>97</sup> In the spring of 2023, severe floods (6 months' worth of rain fell in 36 h) hit central Italy after a prolonged period of drought, causing enormous damages and several deaths.<sup>98</sup> In the summer of 2022, the extreme temperatures and the drought in Europe seemed a warning for darker future scenarios.<sup>99</sup> The summer of 2021 saw intense floods caused by heavy rains that suddenly hit Germany and neighbouring countries, causing deaths and displacement. Climate scientists warned that those events were a tangible evidence of human-induced climate change.<sup>100</sup> Lands earlier considered safe from extreme weather events become (although often just temporarily) arenas of displacement. The information collected in relation to climate-induced mobility by people affected by such occurrences has the potential to illuminate our understanding of dynamics that scientists still struggle to grapple with.

## 5 | DISCUSSION: POSSIBILITIES AND HURDLES FOR CIVIC EVIDENCE IN CLIMATE LITIGATION

### 5.1 | Civic evidence being admitted, from environmental to climate litigation

We argue that civic evidence on climate change and actual impacts at the individual and collective level could be admitted in climate litigation under the category of factual evidence. This practice already occurs with civic-gathered data on environmental pollution; in particular, authors in the field bring as examples the Formosa case, and the case of gas flaring in the Amazon rainforest, discussed earlier.<sup>101</sup> Customary laws in several jurisdictions accept local knowledge in court, and formal rules of civil procedure also allow for taking evidence based on personal knowledge in many places.<sup>102</sup> UNEP acknowledges this trend affirming that 'data collected by citizens can enhance environmental rule of law by supporting decision-making processes and assisting in the identification of violations through monitoring air and water quality, biodiversity and other environmental indicators'.<sup>103</sup>

Furthermore, some legal systems allow individuals and civil society organisations to participate in government decision-making through statutory mechanisms, including through public comment processes, especially in the context of environmental review.<sup>104</sup> Conceivably, as governments consider projects and practices in the context of climate change mitigation and adaptation, these legal or regulatory pathways for public engagement with government decisions can also provide opportunities for individuals to submit civic evidence directly to decision makers, which becomes part of a formalised record of decision and part of the record in judicial review.<sup>105</sup>

Beyond these formal paths for evidentiary uptake, informal spaces are multiplying that could provide interesting room for civic evidence. One experience that appears like a promising forum to gather climate evidence potentially usable in court is the People's Conference of the Parties (COP),<sup>106</sup> a movement aimed to provide a space for activists on the frontlines to share stories and video reporting on climate impacts in their communities. Through its digital platforms, the People's COP solicited public input to inform global decision makers at COP27 in Sharm el-Sheikh, Egypt. The results of this consultation were a series of advocacy statement delivered to COP27 delegates. The People's COP27, which took place virtually on 1 November 2022, highlighted a 'moral imperative' to listen to those on the frontlines of climate impacts and 'made it simple for world

<sup>95</sup>Ibid.

<sup>96</sup>*ScienzaRadicata* <<https://scienzaradicata.github.io/>>.

<sup>97</sup>E Rousi et al, 'Accelerated Western European Heatwave Trends Linked to More-persistent Double Jets over Eurasia' (2022) 13 Nature Communications 3851.

<sup>98</sup>A Giuffrida, 'Roads Have Disappeared: Italy Begins Cleanup after Catastrophic Floods' (The Guardian, 21 May 2023).

<sup>99</sup>O Milman et al, 'The Climate Disaster Is Here' (The Guardian, 14 October 2021).

<sup>100</sup>J Watts, 'Climate Scientists Shocked by Scale of Floods in Germany' (The Guardian, 16 July 2021).

<sup>101</sup>Facchinelli et al (n 22); Berti Suman and Schade (n 22).

<sup>102</sup>See Berti Suman and Burnette (n 22) discussing the uptake of civic evidence in US environmental enforcement cases initiated by individuals and civil society organisations. The US Federal Rules of Evidence contemplate witness testimony based on 'personal knowledge' and contrast matters that are subject to expert opinion. US Fed. R. Evid. 602, 703.

<sup>103</sup>UNEP (n 2) 78, citing UNEP, 'Environmental Rule of Law: First Global Report' (2019) <<https://www.unep.org/resources/assessment/environmental-rule-law-first-global-report>> 134.

<sup>104</sup>As an example from the United States, see USC §4321ff (National Environmental Policy Act) and implementing regulations, e.g., 40 CFR §1506.6 (public participation).

<sup>105</sup>These mechanisms are explored in more detail in Berti Suman and Burnette (n 22).

<sup>106</sup>Environmental Justice Foundation, 'The People's COP' (2022) <[https://ejfoundation.org/resources/downloads/EJF\\_One-Pager\\_The-Peoples-COP.pdf](https://ejfoundation.org/resources/downloads/EJF_One-Pager_The-Peoples-COP.pdf)>.

leaders to listen. Featuring films, interviews, key note speakers and expert panellists, this event represented the voices of the unheard.<sup>107</sup>

The platform asks: 'How have you noticed the climate changing where you live? Have there been any extreme weather events near you in recent years? If so, how did it impact you and your family or friends? Do you have any videos or photos of this event which you would be happy to share with us?'<sup>108</sup> All this suggests activities involving the gathering of civic evidence. The platform is intended for advocacy purposes but one day—conceivably—such knowledge gathered could even be used for court action.

## 5.2 | Challenges for the acceptance of civic evidence in climate litigation

Despite the promises, there are several possible hurdles to the acceptance of civic evidence in climate litigation. A report by UNEP captures these challenges by affirming:

Although authorities increasingly recognize the importance and role of citizen science, there may be legal barriers to its use. For example, there may be requirements to use only data and publications that have undergone formal peer-review processes. Accordingly, in certain countries and contexts, it may be necessary to amend the law to enable the use of citizen science in administrative decisions and judicial processes.<sup>109</sup>

While UNEP acknowledges the considerable progress in the incorporation of civic evidence into the environmental rule of law, as demonstrated by the *Sensing for Justice* project and related research,<sup>110</sup> it also affirms the need for additional research into civic contributions in the form of evidence gathering in environmental litigation.<sup>111</sup>

In this section, we illustrate a few (non-exhaustive) barriers to accepting the credibility and admissibility of this evidence. These include hurdles on the side of the receiving professionals: lawyers and judges themselves may be reticent to embrace the value of civic evidence in the context of climate cases and discard it based on the assumption that climate evidence is complex and necessitates technical handling from experts. In addition, judges may view this evidence as partial and biased as coming from emotionally vulnerable and 'interested' parties. Judges may view official sources as more objective and reliable, and lawyers may thus view unofficial sources as riskier to rely upon, fearing that these would be regarded by courts as anecdotal and not systematic.

Even so, as a lawyer litigating the Formosa case based on civic evidence stated,<sup>112</sup> evidence is evidence *regardless* of who brings it. Judges assess credibility and relevance of the evidence in the context of specific litigation and in light of the applicable legal framework and case law within a jurisdiction. This shows another challenging aspect: the context-dependency of the credibility and admissibility of civic evidence. Lessons from successful cases in which civic evidence has been admitted in climate litigation may not be immediately transferable to different legal contexts. Researchers may tackle this hurdle by choosing case studies that are diversified enough to be representative of a multifaceted reality and extract overarching insights for each type of case.

Challenges may also be on the litigants' side: civic actors may disregard the judicial relevance of their data and therefore end up presenting them in a way that does not represent the scientific soundness behind the data gathering. Complexity also stems from the diversity of evidence that a person may have collected over their life, to the difficulty in systematising this evidence in a legally meaningful way, and the challenge of having it 'fit' applicable procedural laws of a certain court. Lawyers will have to carefully engage litigants in disentangling this evidence and in explaining and justifying how it was collected, in a way that can be credible and convincing. In practice, this could become a practical barrier for lawyers to compile such evidence.

Where such evidence is viewed as beyond the ordinary gate-keeping function of the court, an alternative could be tribunal-appointed experts, which is a growing practice, so far mostly witnessed in arbitrations (in particular, enshrined in the Rules on the Efficient Conduct of International Arbitration).<sup>113</sup> Tribunal-appointed experts are regarded as having a greater capacity to remain impartial; therefore, their advice on whether to valorise civic evidence could ameliorate the concern of biased evidence. Furthermore, as their duty is to support judges' decision making by streamlining the analysis of primary evidence and data, they can assist in 'making sense' of the multifaceted nature and formats of civic evidence, responding to the second set of hurdles outlined.

Another interesting development concerns the growing trend of creating specialised environmental courts and tribunals (ECTs) or dedicated environmental 'benches' within existing courts, as detailed recently by UNEP.<sup>114</sup> These experiments are regarded as a 'way of improving the accessibility and expertise of courts in environmental cases', providing 'a mechanism for improving adjudication of environmental cases that complement the usual courts and tribunals'.<sup>115</sup> However, the UNEP report also highlights challenges with these mechanisms, notably 'a lack of government and stakeholder support, competing needs, limited information technology', and enforcement failures.<sup>116</sup>

<sup>107</sup>Environmental Justice Foundation, 'The People's COP' <<https://ejfoundation.org/what-we-do/climate/the-peoples-cop27>>.

<sup>108</sup>Contribution form accessible at <[https://docs.google.com/forms/d/e/1FAIpQLSemQl-ZjPTrgkf43iVeTgHw9Bss1OVhISiIXqyWtPd\\_uezpA/viewform](https://docs.google.com/forms/d/e/1FAIpQLSemQl-ZjPTrgkf43iVeTgHw9Bss1OVhISiIXqyWtPd_uezpA/viewform)>.

<sup>109</sup>UNEP (n 103) 134.

<sup>110</sup>UNEP (n 2) 79; see also *Sensing for Justice* (n 1).

<sup>111</sup>*ibid* 79–80.

<sup>112</sup>Berti Suman and Schade (n 22).

<sup>113</sup>See <<https://expertsdirect.com/party-appointed-experts-v-tribunal-appointed-experts-in-international-arbitration/>> and <<https://expertsdirect.com/party-appointed-experts-v-tribunal-appointed-experts-in-international-arbitration/>>.

<sup>114</sup>UNEP (n 2) 123–125.

<sup>115</sup>*ibid* 123.

<sup>116</sup>*ibid* 125.

Furthermore, also, the nature of the questions to be answered in climate litigation may pose hurdles to the relevance of civic evidence. The evidentiary needs of litigation against a national or subnational government's legislative or policy responses to climate change, a type of case occurring in multiple jurisdictions in the field of climate litigation, may have a more obvious nexus with highly technical evidence, as opposed to civic evidence, because of its focus on climate mitigation targets.<sup>117</sup> For example, the *Giudizio Universale* case,<sup>118</sup> filed by a group of associations and citizens against the Italian government, claims that the Italian State failed to take sufficient measures to meet Paris Agreement's goals. It is an example of strategic litigation built on institutional science. The legal team was supported by Climate Analytics, a non-profit aimed at synthesising science and policy to tackle climate change. They produce open access tools that make climate projections easily available to interested publics. So far, they did not include evidence gathered by ordinary people.<sup>119</sup> The case was dismissed due to alleged lack of jurisdiction by the Tribunal of Rome in February 2024, but the legal team of the civic parties affirmed that there are grounds for appeal.<sup>120</sup>

The object of the judgement in the *Giudizio Universale* case is the adequacy of a State's climate policies with respect to the climate emergency. This case focuses on answering the following questions: (1) Are we in a climate emergency? (2) What should be done to counter/mitigate/reduce this emergency? (3) Has the defendant State (or company) taken adequate measures? The entry point for civic evidence may be less obvious in cases built around these questions, and lawyers may be of the view that civic evidence is, under these circumstances, not necessary or useful (although establishing standing in some jurisdictions might yet invite evidence closer to individual observations of impacts).<sup>121</sup>

Lawyers may more readily recognise (and are actually recognising)<sup>122</sup> the potential for civic evidence to prove actual climate impacts at an individual level for obtaining humanitarian protection for climate displaced people. An outstanding example of a case of this type occurred in 2015 when the Tribunal of Bologna granted asylum to an immigrant from Pakistan who came to Italy in the aftermath of a flood, in a decision that was confirmed on appeal.<sup>123</sup>

In both humanitarian type cases and those against governments or corporations, researchers, practitioners and civic actors wishing to rely on civic evidence will have to consider the conditions for ensuring the admissibility, but also probative efficacy, of such evidence based on existing case law and hypothetical scenarios. For example, it may be open to discussion whether the questions above applying to litigation against States and companies should be answered only by technical experts and scientists with special qualifications, or also by affected people on the ground by allowing the inclusion of their knowledge and evidence.

## 6 | CONCLUSION: TOWARDS A RESEARCH AGENDA

In this article, we introduced civic evidence and its relation to climate-affected people as potential 'collectors' of such evidence which may become useful in climate litigation. We noted that this trend is promising but as of yet does not realise the full potential of civic evidence. We posited that institutional science at present mostly dominates climate litigation evidence and relatedly is more extensively covered in legal scholarship. And we discussed how such evidence is often quantitative and complex in nature and hard to understand by ordinary people, including those directly affected by climate change.

The first gap that we believe further research should address is our argument that over-reliance on highly technical evidence in climate litigation may augment some existing problems with both science (public distrust in scientific outcomes) and litigation (low awareness of legal resorts; detachment from court cases). We also invite socio-legal researchers to explore whether a gap persists between climate-affected people and the scientists and lawyers acting on their behalf in climate litigation, and how this gap takes shape in different contexts. Researchers could explore through ethnographic and other empirical approaches (e.g., the 'climate diaries'<sup>124</sup>) how people view opportunities for engagement in, or whether they feel excluded from, scientific and judicial processes on climate matters that often involve highly complex issues and protracted technical proceedings. This should be explored in the context of 'environmental legal mobilisation'<sup>125</sup> occurring both in large, strategic climate litigation and in smaller-scale instances, such as in the case of demands for protection filed from an individual actor displaced by climate change.

To ascertain how personal observations are currently being integrated in multiple contexts, we surveyed existing climate cases for instances of reliance on civic evidence. This trend shows the importance of convincingly demonstrating how generalised climate impacts affect precisely the plaintiffs. In certain legal contexts, evidence of harm sufficient to sustain a claim may require demonstrating highly specific and differentiated harm at the individual level. This requirement may present an opening for judicial consideration of personal

<sup>117</sup>Researchers have referred to these types of cases as 'government framework litigation' cases and note the emergence of similar cases against corporations. C Higham et al, 'Challenging Government Responses to Climate Change Through Framework Litigation' (London School of Economics and Political Science, Grantham Research Institute 2022) 2, 18.

<sup>118</sup>A Sud et al v Italy, case n.39415-2021, Tribunale di Roma (seconda sez. civile), <<https://climatecasechart.com/non-us-case/a-sud-et-al-v-italy/>>.

<sup>119</sup>Yet, on their blog, they discuss a research project relying on citizen science input, involving rural communities in the Horn of Africa Drylands, highly dependent on seasonal rainfalls and thus deeply affected by climate change; see Climate Analytics, 'Down2Earth' <<https://climateanalytics.org/projects/down2earth/>>.

<sup>120</sup>As stated in a press release published after the verdict, there are 'all the conditions to appeal the decision', <<https://giudiziouniversale.eu/2024/03/06/arrivata-la-sentenza-il-tribunale-di-roma-decide-di-non-decidere-non-ce-justizia-per-il-clima/>>.

<sup>121</sup>A semi-structured interview simultaneously performed in winter 2022 by author Anna Berti Suman with two lawyers involved in the *Giudizio Universale* case confirmed these concerns, but more interviews are needed to generalise conclusions.

<sup>122</sup>An example is the *Le Rotte del Clima* initiative cited in Section 4.2.

<sup>123</sup>F Vona, 'Environmental Disasters and Humanitarian Protection: A Fertile Ground for Litigating Climate Change and Human Rights in Italy?' (2021) Italian Review of International and Comparative Law 146.

<sup>124</sup>E Giacomelli and S Walker, 'Challenging Eurocentric Perceptions of Mobility Justice through Climate Diaries' (2022) 64 The Sociological Review 121.

<sup>125</sup>L Vanhala, 'Environmental Legal Mobilization' (2022) 18 Annual Review of Law and Social Science 101, 101.

observations of more individualised harm. Therefore, a second area where we envisage a need for further research is the exploration of how climate evidence derived from official sources would be enriched by qualitative narratives that could be offered by individuals directly exposed to climate change, such as by a systematic data collection on a persistent stressor affecting them. This knowledge could find synergies with and be strengthened by existing citizen science and civic monitoring initiatives acting on climate matters, such as flood-related civic observatories.<sup>126</sup> Third, we believe that experiences such as those of tribunal-appointed experts and specialised environmental courts could offer promising spaces for discussing civic evidence, especially on climate matters. In our opinion, these judicial spaces should be an object of inquiry in future research.

We also explored more in-depth the potential of civic evidence for climate litigation. We illustrate what we mean by civic evidence, and we frame civic evidence production through the gathering of data as 'technology'. We believe that this framing could also offer inspiration for further research, especially for theorisation from science and technology studies and critical data studies. Relying also on interview data, we present thematic foci to build the case for civic evidence, for example, on its use especially from climate-displaced people. We consider this distinctive field of climate litigation a particularly promising area for further study.

We advance the argument that the growing reliance on personal observation in climate litigation is promising but that this does not realise the full potential of civic evidence. We illustrate how—despite promising trends of inclusion of personal narratives in climate court cases—civic knowledge that becomes evidence in court at present is limited, missing out an opportunity to better understand climate impacts and account for harms. People exposed to climate stressors often gather valuable data from below even if they have not joined any official civic monitoring initiative, but the data that they collect may be relevant to frame standing or harm in litigation. We invite researchers and experts to explore ways to support these actors in making their data collection more systematic and closer to scientific methods, as a way to enhance our knowledge but also as an instrument of recognition. The envisaged synergies between affected people, researchers and legal practitioners can enhance the inclusion of a plurality of knowledge and of knowledge peripheries, understood in the physicality of the term, that is, situated at the borders of our countries, but also in the symbolic meaning at the outskirts of our decision system. However, the question on how civic and expert ways of knowing and gathering evidence on climate change can be intertwined remains still largely open.

Our study is limited in several ways. We did not include within this article a deep study into lawyers' and judges' attitudes to climate evidence, which would be indispensable to evaluate the viability of our proposition (this could be useful to assess barriers such as lawyers' resistance to change and judges' scepticism). Furthermore, we acknowledge that most of the successful cases of civic knowledge

accepted in court as evidence revolve around evidence of more localised environmental contamination, which differs from the type of evidence that may be needed in climate litigation (e.g., evidence deriving from climate attribution science) in a number of respects. This is a matter that requires deeper scrutiny.

We hope that our contribution will spark scientific and professional debates that will engage with some of the compelling questions that our contribution raises. This includes the following questions: Are we able to valorise civic climate evidence at a societal, judicial and scientific level? How are judges dealing with unconventional evidence? Who decides which evidence counts? Should we change the criteria for validity to make space for civic evidence or should we adapt it to the criteria? To what extent are experts and civic actors able to find a common language and cooperate for releasing the potential of civic evidence in litigation? The rapid evolution of the climate litigation field but also technological evolutions shaping the production of civic evidence may give some answers to these questions. In particular, an area where we expect to see rapid changes that could also have effects on the evidence presented in climate litigation is that of citizen *data* science powered by artificial intelligence. Ongoing developments could improve the capabilities of non-expert users to collect and analyse large quantities of data, therefore also enhancing people's ability to augment, or confront and challenge as it may be, official data sources, for example, about the on-the-ground impacts of climate change or the implementation and effectiveness of climate adaptation measures.

## DATA AVAILABILITY STATEMENT

Data Availability Statement: anonymised transcripts from the cited interviews can be shared upon request. No other primary data have been produced for this study.

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<sup>126</sup>M Ferri et al, 'The Value of Citizen Science for Flood Risk Reduction: Cost–Benefit Analysis of a Citizen Observatory in the Brenta-Bacchiglione Catchment' (2020) 24 *Hydrology and Earth System Sciences* 5781.

environmental conflicts in Europe, Latin America, the United States and Japan.

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