

ANNA BERTI SUMAN<sup>(\*)</sup>

## VOICING CLAIMS TO GOVERNMENTAL ACCOUNTABILITY: THE CASE OF ENVIRONMENTAL CITIZEN SENSING

**ABSTRACT:** Forms of environmental monitoring ‘from below’, so-called ‘citizen sensing’, are manifesting ways of voicing demands for *a more accountable* environmental risk governance. Potentially, these practices could instil more accountability and transparency in the institutional system, and provide concerned citizens powerful mechanisms for ‘cross-checking’ governmental interventions. This contribution explores the practice under the lens of political sciences, public administration studies, legal doctrine and legislation for illustrating the accountability potential of citizen sensing in theory and in practice. Empirical insights from a number of citizen sensing case studies are also analysed in order to inspect whether and how accountability claims are *actually* voiced by the participating citizens.

SUMMARY: 1. Introduction. – 2. Accountability claims. – 2.1. Traditional accountability. – 2.2. Accountability and environmental justice during the Flint Water Crisis. – 2.3. Legal accountability. – 2.4. Social accountability. – 2.5. Case insight - Accountability claims expressed by Safecast and AiREAS participants; parallelisms with Petryna’s reflections. – 3. State obligations resulting from accountability demands. – 3.1. An obligation to transparently provide information. – 3.2. Case insight - State obligations in the Louisiana Bucket Brigade initiative. – 4. Environmental compliance assurance, link to accountability. – 5. Conclusions.

### 1. — *Introduction.*

As environmental governance scholars note, “demands for accountability continue because accountability procedures *do not respond* to environmental stakeholders expectations (those affected by environmental problems and those that claim to speak for the environment)” [emphasis added]<sup>(1)</sup>.

---

<sup>(\*)</sup> European Commission Joint Research Centre (JRC), Italy.

<sup>(1)</sup> T. KRAMARZ, S. PARK, *Accountability in Global Environmental Governance: A Meaningful Tool for Action?*, in *Global Environmental Politics* 16(2), 2016, p. 5.

Through this research article, I aim at investigating a response to this problem of (perceived) legitimacy and accountability gaps in the governance of environmental risks to public health. I will inquire whether practices of citizen sensing can be (part of) a possible solution to the mentioned accountability and legitimacy gaps in institutional (environmental) risk governance. Furthermore, as risk governance scholars note<sup>(2)</sup>, often conflicts over the governance of a risk are determined (also) by the mismatch between the risk perceived by the affected citizens and the risk that is object of institutional governance strategies. Exploring civic responses to alleged risk governance failures have to bear in mind such a ‘perceptual’ dimension of the risk.

The ‘expectations’ here considered are those of communities and individuals that are or feel to be exposed to environmental risks endangering their health. The response to these expectations take the form of a technology-mediated practice, that of ‘citizen sensing’, here understood as a form of grassroots-driven monitoring initiatives aimed at tracking environmental factors (*in alternative or in addition to* official governmental monitoring), making use of Information and Communication Technology (ICT), in general, and, in particular, of sensors. I also regard citizen sensing as ‘a technology, a social phenomenon and a method’ as well as ‘a form of (environmental) rights in action’. Several scholars have already discussed and defined these forms of monitoring surrounding environmental conditions by laymen with the use of some forms of technology<sup>(3)</sup>, considered manifestations of the broader ‘citizen science’ phenomenon.

---

<sup>(2)</sup> M. BOURRIER, C. BIEDER, *Risk Communication for the Future. Towards Smart Risk Governance and Safety Management*, SpringerBriefs in Applied Sciences and Technology, Heidelberg, 2018; O. RENN, A. KLINKE, *Risk Perception and Its Impacts on Risk Governance*, Oxford Research Encyclopedia of Environmental Science, Oxford, 2016.

<sup>(3)</sup> J. GABRYS, H. PRITCHARD, B. BARRATT, *Just good enough data: Figuring data citizenships through air pollution sensing and data stories*, in *Big Data & Society*, 2016, p. 1 ss.; M. HAKLAY, L. FRANCIS, *Participatory GIS and community-based citizen science for environmental justice action*, in J.G. Chakraborty and R. Holifield, *The Routledge Handbook of Environmental Justice*, Abingdon, 2018, p. 297 ss.; A. BERTI SUMAN, *Sensing the risk. In search of the factors contributing to the policy uptake of citizen sensing*, Doctoral Thesis discussed at Tilburg University, Tilburg, 2020b; the main takeaways from the doctoral thesis are available as an accessible booklet, A. BERTI

This contribution advances the idea that citizen sensing, as a manifestation of claims to a more accountable risk governance, could inject in the system an improvement in how transparently environmental risks are managed and communicated to affected citizens by authorities. Namely, I inquire: «How can citizen sensing trigger more accountability and transparency in environmental risk governance?». In answering to this question, this article lays the foundation for an argument supporting the practice from an environmental justice and accountability viewpoint<sup>(4)</sup>. As a ‘cross-checking’ practice, I defend that citizen sensing can be central for a healthy, functioning system. Arguably, claims for greater accountability in the governance of shared risks have been said to continuously increase<sup>(5)</sup>. Risk governance – in itself – has been framed as a way to make risk handling more *legitimate and acceptable* by the public<sup>(6)</sup>.

Nonetheless, the classic models of risk governance – based on risk assessment, management and communication – have often been criticized as obsolete. Renn, Klinke, and van Asselt<sup>(7)</sup> note that such models, resulting from an evolution dating back to decades ago, are outdated and insufficient

---

SUMAN, *Sensing the risk. A case for integrating citizen sensing into risk governance*, Tilburg, 2020d; see also forthcoming A. BERTI SUMAN, *The policy uptake of citizen sensing*, Cheltenham, 2021.

<sup>(4)</sup> Participatory or even fully grassroots-driven monitoring especially in relation to environmental risk is here regarded as a manifestation of a right to a safe environment from «a social and environmental justice perspective» (S. AHMED et al., *Participatory mapping and food centred justice in informal settlements in Nairobi, Kenya*, in *GEO: Geography and Environment* 6(1), 2019, p. e00077). These practices can indeed «bring fresh new evidence, which can trigger a social but also judicial debate and ultimately promote the respect of health and environmental human rights» (A. BERTI SUMAN, *Promoting health and environmental rights through participatory noise mapping in the city*, in *The Netherlands Network for Human Rights Research Blog, humanrightshere.com*). In the dedicated section, Section 2, the understanding of accountability for the aims of this research will be illustrated thoroughly.

<sup>(5)</sup> T. KRAMARZ, S. PARK, *Accountability in Global Environmental Governance: A Meaningful Tool for Action?*, cit., p. 5.

<sup>(6)</sup> R. GELLERT, *Understanding the risk-based approach to data protection: An analysis of the links between law, regulation, and risk*, Doctoral Thesis discussed at the Vrije Universiteit Brussel, Brussels, 2017. Currently in press: ID., *The risk-based approach to data protection*, Oxford, forthcoming, p. 51.

<sup>(7)</sup> O. RENN, A. KLINKE, M. VAN ASSELT, *Adaptive and integrative governance on risk and uncertainty*, in *Journal of Risk Research* 15(3), 2011, pp. 231-232.

to cope with the challenges posed by the risks of contemporary society. The classic models seem too narrow, when confronted with the proliferation of non-institutional stakeholders willing and having the capacity to monitor and communicate risks. The dominance of state agencies would miss the emergence of *informal actors* that, regardless the institutional acceptance thereof or desirability, want to play a role on the risk arena.

The 'reliance on expanded inclusion of stakeholders' in risk governance<sup>(8)</sup> is conceived here not only as a fact that governors have to cope with, but also as an *opportunity* for strengthening the current approaches to risk governance. It is indeed empirically proven that multi-stakeholder governance of risks has the potential to reduce the conflict surrounding a risky situation, to enhance accountability of the system, and to improve the perception of *legitimacy* of the final decision<sup>(9)</sup>.

This article is primarily situated the research field of the governance of environmental risk and in that of environmental monitoring and reporting. Rather than focusing on mainstream, institutionally or expert-led environmental control, I explore the original angle of when such a monitoring is run not by authorities or professional scientists, but by lay citizens. The research methodology that shaped this research is the following. First, the article begins with unpacking the notion of accountability in a number of sub-dimensions based on theoretical reflections. The methodology for this part is based on analysis of academic and grey literature dealing with the notion of accountability. In this phase, the literature sampling was systematic, involving theory-driven search. In addition, I explored – to the extent relevant for the research question – environmental law from national, international and European Union legislation available on public (online) repositories and archives. The sampling was purposive, adopting a topic-relevance criterion, and the sources have been analysed through a traditional legal review.

The discussion then moves to bringing in insights from an empirical

---

<sup>(8)</sup> *Ibid.*, p. 232.

<sup>(9)</sup> T.C. BEIERLE, J. CAYFORD, *Democracy in practice: Public participation in environmental Decisions*, Washington, 2002.

analysis where accountability demands are described as emerged in selected case studies qualitatively analysed. In a dedicated paragraph, the voices of the participants are reported, to convey their interpretation and understanding of the claims theoretically discussed. The empirical data illustrated in the ‘case insights’ derive, in part, from secondary data analysis on selected cases, such as for the Flint Water crisis. These data are represented by case law on environmental matters, especially relevant for citizen sensing initiatives and for the use of citizen-sensed data in accountability-related processes. These data are found in public (online) repositories and archives, and have been selected according to purposive sampling method, adopting a topic-relevance criterion, and analysed through traditional case law review.

Furthermore, data have been extracted from the content analysis performed on the responses collected (in English and Japanese) through the exploratory questionnaire and follow-up interviews conducted with the participants of two citizen sensing cases, the “Safecast” and “AiREAS” initiatives<sup>(10)</sup>. Here, the data are represented by the responses of key informants (primary data) elicited through an (exploratory and targeted) web surveys<sup>(11)</sup> and through in depth follow-up semi-structured interviews. The data sampling for this part is purposive, adopting a topic-relevance criterion. This way collected data have been explored by means of qualitative analysis. These surveys and interviews were performed in the framework of my doctoral research project<sup>(12)</sup> and

---

<sup>(10)</sup> See *safecast.org* and *aireas.com*.

<sup>(11)</sup> An example of the survey is available at *tilburglawschool.eu.qualtrics.com*.

<sup>(12)</sup> Doctoral thesis titled *Sensing the risk. In search of the factors contributing to the policy uptake of citizen sensing*, defended at Tilburg University on May 8, 2020. PhD project hosted by the Tilburg Institute for Law, Technology, and Society (TILT), Tilburg Law School, and supervised by Prof. dr. R.E. Leenes, Prof. dr. J.M. Verschuuren and dr. T. Broer. Members of the doctoral committee: Prof. dr. J. Gabrys; Prof. dr. M.L.P. Groenleer; Prof. dr. H.C.O. Renn; dr. F. Sindico; dr. S. Schade and dr. L.E.M. Taylor. See A. BERTI SUMAN, *Sensing the risk. In search of the factors contributing to the policy uptake of citizen sensing*, Doctoral Thesis discussed at Tilburg University, Tilburg, 2020b; the main takeaways from the doctoral thesis are available as an accessible booklet, A. BERTI SUMAN, *Sensing the risk. A case for integrating citizen sensing into risk governance*, Tilburg, 2020d; see also forthcoming A. BERTI SUMAN, *The policy uptake of citizen sensing*, Cheltenham, 2021.

have been granted ethical clearance<sup>(13)</sup>.

This unusual ‘participants-based’ approach is chosen to bridge theory and practice by engaging in a ‘dialogue’ with the researched reality. Furthermore, the case insights are a useful tool to analyse citizen sensing in practice. In the conclusion, the answer to the research question is summarized, based on the reflections developed in the preceding sections, and sparks for future research are outlined.

## 2. — *Accountability claims.*

### 2.1. — *Traditional accountability.*

The concept of ‘accountability’ is extremely broad. Thus, here only selected sparks for reflection are chosen to the extent that they matter for this work of ‘grounding’ citizen sensing. Overall, it can be noted that numerous authors have stressed the ‘buzzword nature’ of the concept of accountability. Curtin affirmed: «the concept of accountability often appears to be used rather vaguely, [...] filled with good intentions, loosely defined concepts and vague images of good governance»<sup>(14)</sup>. Traditionally, in the public sector, the idea of accountability evokes the fact that, in numerous democratic states, the government is accountable to the parliament<sup>(15)</sup>. This classical form of accountability, which can be named ‘political accountability’, operates within the principal-agent relationship<sup>(16)</sup>. Such a relationship takes place through

---

<sup>(13)</sup> Ethical clearance issued by the Ethical Review Board of Tilburg Law School (TLS-ERB #2018/01) on June 12, 2018.

<sup>(14)</sup> D. CURTIN, *Delegation to European Union Non-Majoritarian Agencies and Emerging Practices of Public Accountability*, in D. GERARDIN, R. MUNOZ, N. PETIT, *Regulation Through Agencies in the European Union: A New Paradigm of European Governance*, Cheltenham, 2005, p. 87.

<sup>(15)</sup> M. JAATUN, S. PEARSON, F. GITTLER, R. LEENES, M. NIEZEN, *Enhancing accountability in the cloud*, in *International Journal of Information Management*, 2020, p. 3.

<sup>(16)</sup> M. BOVENS, *Analysing and Assessing Accountability: A Conceptual Framework*, in *European Law Journal* 13(4), 2007, p. 455.

delegation: in parliamentary democracies, voters delegate their sovereignty to elected representatives (the parliament) who, in turn, delegate the majority of their authorities to a cabinet of ministers (the government)<sup>(17)</sup>. The ministers also delegate a number of their powers to civil servants and administrative bodies. The delegated bodies are accountable to the delegating authorities (in the case of the ministers, for example, political account is rendered to parliament).

Bovens argues that «people's representatives render account to the voters at election time. Thus viewed, each of the links in the chain is, in turn, not only principal and agent, but also forum and actor»<sup>(18)</sup>. The subsequent sub-section on legal accountability will dive into the *forum-actor relationship*. However, it is worth stressing here that, increasingly, traditional political accountability based on elections and delegation of powers is becoming insufficient to achieve the necessary 'public oversight' over governments' conducts. Scandals in environmental governance, such as the Monsanto Papers or the Glyphosate Saga<sup>(19)</sup>, have stimulated a debate on the need of more pervasive public control over (environmental) decision-making. Bovens captures this trend by noting that «informal political forums [such as] the media are fast gaining power as informal forums for political accountability»<sup>(20)</sup>. Citizen sensing practices may fit within these *informal forums* described by Bovens.

The concept of accountability has been often object of efforts of categorization. Curtin categorizes the concept into three aspects: a 'standard' meaning which entails that those exercising power must be able to show to have properly exercised their power, often referred to as 'political accountability' (the above discussed traditional understanding of accountability); a more 'technical' meaning referring to the set of arrangements securing conformity between the values of a delegating body and those to whom powers are delegated, which would correspond to 'administrative accountability';

---

<sup>(17)</sup> *Ibid.*

<sup>(18)</sup> *Ibid.*

<sup>(19)</sup> See *corporateeurope.org*; and *orporateeurope.org*.

<sup>(20)</sup> M. BOVENS, *Analysing and Assessing Accountability: A Conceptual Framework*, cit., p. 455.

and a more rigorous notion, ‘public accountability’, which evokes «the *open process* of explaining and justifying actions or omissions by public servants or those exercising public authority to an *accountability forum*» [emphasis added]<sup>(21)</sup>. Especially this latter category is considered here particularly fitting as it suggests an intersection between openness and accountability, where a forum may be represented by a plethora of sensing citizens cross-checking environmental data and demanding an explanation from competent authorities if discrepancies or concerning results are found.

Also in the context of data protection and privacy-related accountability, a number of categorization and definition efforts have been produced. The Paris project (“Accountability Phase II”), building on the Galway Project (“Accountability Phase I”), describes accountability as:

«A demonstrable acknowledgement and assumption of responsibility for having in place appropriate policies and procedures [...]. It is a concept that has governance and ethical dimensions. It envisages an infrastructure that fosters *responsible decision-making*, engenders answerability, enhances *transparency* and considers liability» [emphasis added]<sup>(22)</sup>.

Later on, the A4Cloud Project, going beyond the Galway model, focused on the commitment to norms, the need of explaining and demonstrating compliance to stakeholders and remedying failures. This need to properly explain and demonstrate compliance to stakeholders seems particularly relevant here. The A4Cloud Project defined accountability as «*the state of accepting allocated responsibilities, explaining and demonstrating compliance to stakeholders and remedying any failure to act properly; responsibilities being derived from law, social norms, agreements, organizational values and ethical obligations*» [emphasis added]<sup>(23)</sup>. The link between accountability and

---

<sup>(21)</sup> D. CURTIN, *Delegation to European Union Non-Majoritarian Agencies and Emerging Practices of Public Accountability*, cit., p. 87, quoting M. BOVENS, *Public accountability*, in E. FERLIE, I. LYNNE, C. POLLITT, *The Oxford Handbook of Public Management*, Oxford, 2004.

<sup>(22)</sup> THE CENTRE FOR INFORMATION POLICY LEADERSHIP, *Demonstrating and Measuring Accountability: Discussion Document*, Accountability Phase II – The Paris Project, October 2010, p. 2.

<sup>(23)</sup> M. JAATUN, S. PEARSON, F. GITTLER, R. LEENES, M. NIEZEN, *Enhancing accountability in the cloud*, cit., p. 3.



responsibilities, and the breadth of the source of such obligations are evident in this definition. The interplay of the concept of accountability with compliance will be discussed *infra*. The discussion on the need to properly explain and demonstrate compliance creates a bridge to a more specific understanding of accountability, i.e. that of legal accountability, which will be discussed in the following section.

## 2.2. – *Accountability and environmental justice during the Flint Water Crisis.*

Demands for a more accountable environmental risk governance, understood in a broad sense, are often associated with claims to environmental justice. An outstanding case of citizen science and sensing voicing desires of environmental justice is that of the Flint water crisis. When the city of Flint, Michigan, changed its municipal water source from Lake Huron to the Flint River, the local citizens were reassured by the authorities on the safety of the new water streams. Yet, soon the residents discovered contaminants in the water, including lead in worrisome concentrations, also thanks to a citizen science project launched by Flint residents, in collaboration with the Virginia “Flint Water Study” team and other actors<sup>(24)</sup>. As a result, in January 2016, a Federal Emergency was declared and more than \$600 million were provided in relief funding. Perceiving to be victim of an “environmental injustice”<sup>(25)</sup>, the citizen scientists started sharing information and public statements contradicting the public health messaging from scientific authorities, which cause a “general state of science anarchy, [...] distrust and confusion”<sup>(26)</sup>.

Scholarship discussing the case uncovers even possible «abuses of citizen science» in the case as the claims of a lack of accountability in the Flint water crisis voiced by the citizen scientists went ‘beyond’ the admissible

---

<sup>(24)</sup> S. ROY, M. EDWARDS, *Citizen Science During the Flint, Michigan Federal Water Emergency: Ethical Dilemmas and Lessons Learned*, in *Citizen Science: Theory and Practice* 4(1), 2019, p. 1 ss.

<sup>(25)</sup> *Ibid.*, p. 12.

<sup>(26)</sup> *Ibid.*

contestation, for example sharing «non-representative data that created unjustified fear among residents about the safety of water»<sup>(27)</sup>. In “Flint Fights Back”, Pauli examines the water crisis and the political activism that it inspired, arguing that Flint’s struggle for safe and affordable water was part of a broader struggle for democracy<sup>(28)</sup>. Pauli focuses on the positive side of the citizens’ struggle, framing it as a manifestation of democracy which uncovered the limitations of standard environmental justice frameworks and challenged scientific expertise claiming for *a more accountable and transparent* handling of the risk. The case is relevant as it illustrates the challenges to citizen science and sensing associated with emergencies and disasters involving environmental injustice<sup>(29)</sup>.

### 2.3. – *Legal accountability.*

The concept of legal accountability is differentiated from the ‘traditional accountability’ above discussed and from the concept of social accountability (*infra*) on the basis of the ‘nature of the forum’<sup>(30)</sup>. Five different typologies of accountability are distinguished based on this criterion (in italics the categories here relevant): political accountability; *legal accountability*; administrative accountability; professional accountability; and *social accountability*. This section will focus on the legal accountability aspect of citizen sensing.

Bovens<sup>(31)</sup> stresses, when discussing the ‘accountability forums’, that – in a number of accountability relations – the forums are not the ‘principals’ of the actors. For example, in the case of legal accountability relations, courts

---

<sup>(27)</sup> *Ibid.*

<sup>(28)</sup> B. PAULI, *Flint Fights Back. Environmental Justice and Democracy in the Flint Water Crisis*, Cambridge MA, 2019.

<sup>(29)</sup> S. ROY, M. EDWARDS, *Citizen Science During the Flint, Michigan Federal Water Emergency: Ethical Dilemmas and Lessons Learned*, cit., p. 12.

<sup>(30)</sup> M. BOVENS, *Analysing and Assessing Accountability: A Conceptual Framework*, cit., p. 460 («Box 2. Types of Accountability»).

<sup>(31)</sup> *Ibid.*, p. 451.

are the forums. The competent courts have the authority to oblige the actor to give account, but on the basis of laws and regulations rather than on a principal-agent relation<sup>(32)</sup>. Such courts can be ‘ordinary’ civil courts, specialised administrative courts, or – in cases of particularly serious administrative deviance – also criminal courts<sup>(33)</sup>. The legal accountability scrutiny is mostly based on specific responsibilities that have been formally or legally conferred upon authorities. This scrutiny is indeed focused on the legality of the actor’s conduct<sup>(34)</sup>. Bovens defines it as «the most unambiguous type of accountability, as the legal scrutiny will be based on detailed legal standards, prescribed by civil, penal or administrative statutes, or precedents»<sup>(35)</sup>. Environmental standards would qualify as a possible benchmark for this scrutiny. Overall, in the majority of Western democracies, legal accountability mechanisms are crucial for public institutions either for the growing formalisation of social relations or «because of the greater *trust* which is placed in courts than in parliaments» [emphasis added]<sup>(36)</sup>.

Before reflecting on citizen sensing as a source of social accountability, it is worth inquiring the consequences of the juxtaposition of citizen sensing and the concept of legal accountability. The investigation is here focused on the rather ‘speculative’ possibility that such non-institutional environmental monitoring efforts ‘find their way’ to courts as legal evidence. The topic is here only outlined briefly and flagged as an aspect deserving further and targeted research<sup>(37)</sup>.

---

<sup>(32)</sup> *Ibid.*, p. 460.

<sup>(33)</sup> *Ibid.*, p. 456.

<sup>(34)</sup> *Ibid.*, p. 459.

<sup>(35)</sup> *Ibid.*, p. 456.

<sup>(36)</sup> *Ibid.*, p. 456.

<sup>(37)</sup> Towards this research direction goes the current NWO Rubicon project and the forthcoming Marie Curie Individual Fellowship that dr. Anna Berti Suman launched in summer 2020 at the European Commission Joint Research Centre (JRC), in cooperation with the Milan Arbitration Chamber and Systasis - Research Centre for the Prevention and the Management of Environmental Conflicts, Milan, on the project titled ‘*SENSJUS - Citizen Sensing as a source of evidence in environmental justice litigation and as a tool for environmental mediation*’.

In the U.S. context, researches are ongoing along this line, also thanks to the stimulus that the creation in 2019 of a Law and Policy Working Group<sup>(38)</sup> (based in Washington D.C.) within the Citizen Science Association (CSA)<sup>(39)</sup> has given to the field. One of the remarkable initiatives of the newly formed working group is the launch of a tool<sup>(40)</sup> through which the citizen scientists' community can submit questions about relevant laws and policies raised by citizen science projects. These questions will be addressed thanks to the volunteer help of students from the Emmett Environmental Law & Policy Clinic at Harvard Law School. Interestingly, in a webinar organized for the launch of the tool, the coordinators of the initiative stressed that the idea of the creation of such a platform came after witnessing the Wyoming case<sup>(41)</sup> curtailing citizen science actions through adverse laws<sup>(42)</sup>. It is expected that the provision of this tool will stimulate a reflection, both theoretical and applied, on the interplay between citizen science/sensing and the law, also including the court setting and evidentiary rules.

U.S.-based scholars such as Smith<sup>(43)</sup> and Wyeth et al.<sup>(44)</sup> postulate that citizen-generated data can be used by agencies even for enforcement purposes as the U.S. legal framework allows it and the sensing citizens are increasingly able to provide data *fit* for such purposes. Yet, this doctrine also acknowledges that citizen science groups may struggle to have their data up to the standards for court admissibility. The Wilson Center<sup>(45)</sup>, a policy forum for

---

<sup>(38)</sup> See *citizenscience.org*.

<sup>(39)</sup> See *citizenscience.org*.

<sup>(40)</sup> See *citizenscience.org*, *citizenscience.member365.com*.

<sup>(41)</sup> See *outsideonline.com*.

<sup>(42)</sup> See *youtube.com*.

<sup>(43)</sup> B. SMITH, *Agency Liability Stemming from Citizen-Generated Data*, The Wilson Center Policy Memo Series, 3, Washington D.C., 2014: *wilsoncenter.org*.

<sup>(44)</sup> G. WYETH, L.C. PADDOCK, A. PARKER, R.L. GLICKSMAN, J. WILLIAMS, *The Impact of Citizen Environmental Science in the United States*, in *The Environmental Law Reporter* 3(49), 2019, p. 10237 ss.

<sup>(45)</sup> See *wilsoncenter.org*.

tackling global issues through independent research and open dialogue, in a project led by Kim and Shanley<sup>(46)</sup>, for example, is investigating the possibility that citizen science data are used in courts. Although the authors acknowledge that, to present, there is no lawsuit that *only relied* on citizen science data (apart, I add, from the recent U.S.-based Formosa case)<sup>(47)</sup>, they note that a good number of environmental lawsuits were *initiated* by citizen science data. In these lawsuits, the data collected by citizens stimulated a further investigation conducted by government or companies, which then led to enforcement actions. The authors stress the importance of rigorous scientific methodologies and data standards (to be established by federal and state agencies) to ensure court acceptance of the citizen science data.

In a policy brief recently released by the Emmett Environmental Law & Policy Clinic recommendations are provided to the aims of enhancing the impact of citizen science in environmental litigation<sup>(48)</sup>. By extensive interpretation, also the “Citizen’s Guide to Using Federal Environmental Laws to Secure Environmental Justice” released in 2002 by the U.S. Environmental Law Institute could be applied to the use of citizen sensing for environmental justice action and for claiming rights. The document is a «practical guide for community residents who want to know how the environmental laws can be used to promote environment justice in their communities»<sup>(49)</sup>. Providing a panorama of opportunities, legal rules, and tools available to the citizens, the guide provides a useful set of resources to potential claimants. A similar guide has been identified in the European Union (EU) context, although with a less wide scope than the U.S. resource, in the «Citizen’s guide

---

<sup>(46)</sup> D. KIM, L. SHANLEY, *The use of Citizen Science to influence decision-making in courts*, The Wilson Center Policy Memo Series, Washington D.C., Forthcoming.

<sup>(47)</sup> Conviction of the petrochemical company Formosa Plastics Corporation based almost exclusively on volunteered citizen data, *San Antonio Bay Estuarine Waterkeeper et al. vs. Formosa Plastics Corporation et al.* Case 6:17-cv-00047 Document 155 Filed on 06/27/19.

<sup>(48)</sup> EMMETT ENVIRONMENTAL LAW AND POLICY CLINIC, *Using Citizen Science Evidence in Litigation – DRAFT*, Harvard Law School, 2019.

<sup>(49)</sup> ENVIRONMENTAL LAW INSTITUTE, *A Citizen’s Guide to Using Federal Environmental Laws to Secure Environmental Justice*, 2002, in *epa.gov*.

to access to justice in environmental matters»<sup>(50)</sup>. The guide, summarizing the European Commission's (EC) «Notice on access to justice in environmental matters»<sup>(51)</sup>, explains what members of the public can expect from national judges when bringing legal challenges against decisions, acts or omissions of public authorities of the Member States that affect the environment. However, similarly to the U.S. document, the guide does not mention explicitly citizen science or sensing.

Nonetheless, literature and institutional actors have been reflecting on the potential of citizen science and sensing for demonstrating environmental wrongdoings, even in courts' settings. Scholars also have stressed «the evidence-generation potential of geo-web technologies»<sup>(52)</sup> and their conceivable potential for environmental justice action<sup>(53)</sup>. Haklay<sup>(54)</sup> timely identifies as source of legitimacy for the use of the practice for environmental justice action in Principle 10 of the Rio Declaration<sup>(55)</sup> later enshrined into the three pillars of the Aarhus Convention<sup>(56)</sup>. Citizen science has also been framed as a «social movement for empowerment, *compliance*, and action» [emphasis added]<sup>(57)</sup>. From the institutional side, a recent video released by the EU Environment illustrates the promises of using citizen-run technologies to combat environmental crimes<sup>(58)</sup>.

---

<sup>(50)</sup> EUROPEAN COMMISSION, *Citizen's guide to access to justice in environmental matters*, Luxembourg, 2018.

<sup>(51)</sup> *Commission Notice on access to justice in environmental matters* (18 August 2017), 2017/C 275/01.

<sup>(52)</sup> M. GUTIÉRREZ, *Maputopias: Cartographies of knowledge, communication and action in the big data society - The cases of Ushabidi and InfoAmazonia*, in *GeoJournal*, 2018, p. 1.

<sup>(53)</sup> M. HAKLAY, L. FRANCIS, *Participatory GIS and community-based citizen science for environmental justice action*, cit.

<sup>(54)</sup> M. HAKLAY, *Public environmental information: understanding requirements and patterns of likely public use*, in *AREA* 34(1), 2002, p. 17 ss.

<sup>(55)</sup> *Rio Declaration on Environment and Development* (12 August 1992), A/CONF.151/26 Vol. I.

<sup>(56)</sup> *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters* (25 June 1998), 38 ILM 517.

<sup>(57)</sup> See [povesbam.wordpress.com](http://povesbam.wordpress.com).

<sup>(58)</sup> See [youtube.com](http://youtube.com).

Berti Suman<sup>(59)</sup>, explored exactly this avenue. Specifically, she inquired whether unconventional and non-institutional maps (in part from lay people, in part from environmental non-governmental organizations) of the haze pollution phenomenon in Southeast Asia could provide *legally acceptable evidence*. This way such maps would act as an enabling factor for civil society and non-governmental organizations to make governors and companies accountable for the mismanagement or causation of the haze before judicial bodies. Although the case discussed is fairly specific to the Southeast Asian context, the conditions can be similar in some citizen sensing instances. There is a pressing risk to public health, a citizen-led (though not fully grassroots-driven as supported by the international environmental non-governmental organization Greenpeace) monitoring system which challenges the institutional risk tracking approach, and the question is whether and under which conditions this alternative system can provide acceptable court evidence to support citizens' claims. The answering of this question is extremely rooted in domestic procedural laws, whereas most of the citizen sensing initiatives analysed here span across jurisdictions. Consequently, an exhaustive answer cannot be provided here as a case-by-case, jurisdiction-by-jurisdiction analysis should be conducted. Future research on the topic may consider this observation as a starting point for inquiry.

In the impossibility to perform such domestic procedural law review, this sub-section can shed some light on a 'model' attempt to use citizen-sensed data on the Southeast Asian haze in courts (as discussed by Berti Suman)<sup>(60)</sup>. The 'alternative' mapping of the haze phenomenon in the case at issue could find legitimization in courts as acceptable evidence on the basis of the Transboundary Haze Pollution Act (THPA) of 2014<sup>(61)</sup>, aimed at preventing and punishing the causation of transboundary haze pollution. The THPA

---

<sup>(59)</sup> A. BERTI SUMAN, *Making visible politically masked risks: the haze case of bottom-up data visualization*, in H. KENNEDY, M. ENGBRETSSEN, *Data visualization in society. The relationships between graphs, charts, maps and meanings, feelings, engagement*, Amsterdam, 2020a, p. 425 ss.

<sup>(60)</sup> *Ibid.*

<sup>(61)</sup> SINGAPORE, *Transboundary Haze Pollution Act*, No. 24 of 2014, published in the *Government Gazette*, Electronic Edition, on 25 September 2014.

recognizes the use of digital maps to enforce justice against haze-causing actors. Specifically, 'Part II - Liability for Transboundary Haze Pollution, Subsection 8 - Presumptions', suggests that such haze presumptions can be based on *satellite information*. Any satellite information applies, thus arguably including *also* unofficial maps. Part II affirms that ownership/occupation of the land shall be presumed on the basis of *maps* which can derive from governmental sources but also from *any prescribed person* through *any prescribed means*. What is here defended is that this very open clause in terms of maps' admissibility would leave room for unconventional haze mapping evidence to be considered valid before courts.

Within the local academic discussion, attention has been devoted to the recent developments on the use in courts of (unconventional) electronic evidence. For example, Low<sup>(62)</sup> discussed Art. 116A of the Singaporean Evidence (Amendment) Bill 2012<sup>(63)</sup>, which states that the Minister of Justice may institute regulations aimed to define a *certified process* for generating digital evidence from e.g. tracking tools. Pursuant to this provision, it should be necessary to have the unconventional maps recognized as resulting of a certified process in order to grant them validity in courts. Yet the admission of electronic evidence may be also dependent on the technology involved, and it is acknowledged that unconventional maps' validity could be undermined by alleged measuring bias and inaccuracies<sup>(64)</sup>.

Timely for the present research, in the Southeast Asian context the need to rely on laypersons-produced maps in court proceedings over the haze problem has become increasingly pressing due to the *reluctance* of institutional stakeholders to release official maps, often supported by the judiciary. For example, in February 2017, the Indonesian Administrative High Court ruled in favour of the Environment and Forestry Ministry, judging as lawful

---

<sup>(62)</sup> W. LOW, *A Commentary on the Amendments to the Electronic Evidence Provisions in the Singapore Evidence Act*, in *Singapore Law Gazette* 191, 2012, p. 11 ss.

<sup>(63)</sup> SINGAPORE, *The Evidence (Amendment) Bill 2012*, No. 4 of 2012, published in the *Government Gazette*, Electronic Edition, on 16 April 2012.

<sup>(64)</sup> D. SENG, S. CHAKRAVARTHI, *Computer Output as Evidence: Final Report*, Singapore Academic of Law, Technology Law Development Group, Singapore, 2003.



the government's decision *not to disclose* forest and concessions maps, denying the request of Greenpeace Indonesia<sup>(65)</sup>. This ruling was highly criticized by local and international organizations clearly as undermining a governance of the haze risk<sup>(66)</sup>.

A success has instead been obtained in 2017 by the local environmental organization Walhi which managed to have the Indonesian government condemned for negligence in the management of the 2015 haze crisis<sup>(67)</sup>. Remarkably, the evidence presented during the trial in part derives from maps compiled by Walhi and local civil society, which suggests that unofficial mapping may eventually succeed in courts<sup>(68)</sup>. However, as stressed above, it seems that, in order to have data from unofficial mapping/general citizen sensing initiatives recognized as valid evidence in courts, citizen sensing collectives may need to engage in a 'certification procedure' in each jurisdiction where they seek judicial relief. Arguably, this certification procedure, although risking to overturn the grassroots-nature of the initiative, may be a first step for a 'judicial uptake' of citizen-sensed data.

Moreover, once addressed the 'admissibility' issue, another possible obstacle could be how citizen sensing collectives could financially sustain the burden of a lawsuit. A creative way to finance lawsuits is here identified in the 'CrowdJustice' platform<sup>(69)</sup>, which has often been used to support legal actions aimed at environmental protection. The platform has the goal of fundraising causes in order to allow potential plaintiffs to find the necessary resources to stand in court. The plaintiffs set an 'ideal' target. When the target is met, the platform sends the collected funds directly to the appointed lawyer(s). On the platform, individuals or collectives can share their cause,

---

<sup>(65)</sup> INDONESIA, *State Administrative High Court (PTUN)* [2017]. See *news.mongabay.com* and *thejakartapost.com*.

<sup>(66)</sup> H.N. JONG, *Forest cover maps to remain confidential: Court*, in *The Jakarta Post*, 2017 (*thejakartapost.com*).

<sup>(67)</sup> INDONESIA, *State Court of Palangkaraya* [2017] Putusan PN PALANGKARAYA Nomor 118/Pdt.G/LH/2016/PN Plk Tahun.

<sup>(68)</sup> FRIENDS OF THE EARTH EUROPE, *Up in Smoke*, 2015 (*foeeurope.org*).

<sup>(69)</sup> More information at *crowdjustice.com*.

be advised on how to finance it, and mobilise other actors, within and outside their own network.

The acceptance of citizen-sensed evidence in courts could have as possible consequence the obligation for the competent authority to take action based on the citizens' claims, as ruled by a judge. However, whereas the analysis of the policy adoption of citizen-sensed data has been widely explored<sup>(70)</sup> the realization of a judicial uptake of citizen sensing is still mostly speculative, apart from some U.S.-based case such as the mentioned Formosa ruling<sup>(71)</sup>. The latter analysis would require an in depth analysis of notions from criminal law, administrative law, civil law, environmental law and legal procedure. This debate – for its relevance, its rapid developments and complexity – calls for a more specific analysis, to be performed in future research<sup>(72)</sup>.

#### 2.4. – *Social accountability.*

The 'political accountability' discussed previously has been presented as often insufficient to achieve a proper oversight over (environmental) governance. The category of 'public accountability' seems instead more apt to include in this oversight also informal forums. Such a notion appears linked

---

<sup>(70)</sup> See A. BERTI SUMAN, *Sensing the risk. In search of the factors contributing to the policy uptake of citizen sensing*, cit., Tilburg, 2020b.

<sup>(71)</sup> In the ruling, Formosa Plastics Corporation was convicted for environmental wrongdoings based almost exclusively on volunteered citizen data, *San Antonio Bay Estuarine Waterkeeper et al. vs. Formosa Plastics Corporation et al.*, Case 6:17-cv-00047, Document 155 Filed on 06/27/19.

<sup>(72)</sup> Towards this research direction goes the current NWO Rubicon project and the forthcoming Marie Curie Individual Fellowship that dr. Anna Berti Suman will start in summer 2020 at the European Commission Joint Research Centre (JRC), in cooperation with the Milan Arbitration Chamber and Systasis - Research Centre for the Prevention and the Management of Environmental Conflicts, Milan, on the project titled '*SENSJUS - Citizen Sensing as a source of evidence in environmental justice litigation and as a tool for environmental mediation*'.

to the concept of social accountability, which is the gaining of awareness by lay people on how environmental issues are and should be governed. I noted that citizen sensing has the potential to create *awareness* in the participating citizens which, through monitoring, become (more) knowledgeable on the environmental conditions of their surroundings. This way, they can better understand phenomena that are often perceived as obscure as information on causation and extent is hardly accessible. By cross-checking, the citizens become more conscious of existing standards of environmental protection, of the actual status of the environment and of possible mismatch between the two. As they become more aware, the ‘accountability forum’ also gets more informed and demanding. Consequently, it can be affirmed that awareness *feeds* accountability and generates a greater accountability demand. This outcome is framed as ‘social accountability’ and is particularly evident in the words of the interviewed citizen sensing participants<sup>(73)</sup>.

Social accountability has been framed by Bovens as a manifestation of «more direct and explicit accountability relations between public agencies, on the one hand, and clients, citizens and *civil society*» as a «reaction to a perceived *lack of trust in government* in many Western democracies» [emphasis added]<sup>(74)</sup>. The idea of the concept of social accountability is that «agencies or individual public managers should feel obliged to account for their performance to the public at large or, at least, to civil interest groups», where collective of sensing citizens could actually be included. Bovens identifies a push in this direction in the institution of public reporting and the establishment of public panels. In addition, timely for this discussion, «the rise of the [I]nternet has given a new dimension to this form of accountability» as a growing number of accountability ‘products’, such as the results of inspections, assessments and benchmarks, are made public on this medium<sup>(75)</sup>. Yet Bovens poses a relevant question: «to what extent these groups and panels [...] are full ac-

---

<sup>(73)</sup> See case insight below, but also the case insight above where the AiREAS participants discuss the awareness-generation potential of citizen sensing.

<sup>(74)</sup> M. BOVENS, *Analysing and Assessing Accountability: A Conceptual Framework*, cit., p. 457.

<sup>(75)</sup> *Ibid.*

countability mechanisms, because the possibility of judgement and sanctioning often are lacking»<sup>(76)</sup>. In addition, another weakness identified is that not all these accountability relations provide for «clearly demarcated, coherent and authoritative forums that the actor reports to and could debate with»<sup>(77)</sup>.

Under a social accountability lens, I defend that citizen sensing practices activate *feelings but also actions* in the observing citizens, both those participating and those external to the initiative, which configure forms of ‘accountability through engagement’. The concept of ‘accountability through engagement’ adopted in this research as an outcome of citizen sensing is inspired by the conceptualization of Bovens<sup>(78)</sup> and Bovens, Goodin and Schillemans<sup>(79)</sup> of public and social accountability; the reflections on the ‘court of public opinion’ in Moore<sup>(80)</sup>; the work on protest and accountability of Hughes and Mellado<sup>(81)</sup>, on public officers and accountability of Roberts<sup>(82)</sup>, and on media and (or ‘as’) social accountability of Bonner<sup>(83)</sup>. In addition, it is shaped on the results from early empirical analysis conducted for this research inasmuch as it builds on the discourses that the participants used to refer to accountability generated by citizen sensing (for example, the idea of “making the invisible visible” expressed by a participant from the AiREAS citizen sensing initiative).

Citizen sensing can indeed trigger a change in traditional institutional risk mapping, demonstrating that also civil society actors are capable of

---

<sup>(76)</sup> *Ibid.*

<sup>(77)</sup> *Ibid.*

<sup>(78)</sup> *Ibid.*

<sup>(79)</sup> M. BOVENS, R.E. GOODIN, T. SCHILLEMANS, *The Oxford Handbook of Public Accountability*, Oxford, 2014.

<sup>(80)</sup> M.H. MOORE, *Accountability, legitimacy, and the court of public opinion*, in M. BOVENS, R.E. GOODIN, T. SCHILLEMANS, *The Oxford Handbook of Public Accountability*, Oxford, 2014, p. 632 ss.

<sup>(81)</sup> S. HUGHES, C. MELLADO, *Protest and Accountability without the Press: The Press, Politicians, and Civil Society in Chile*, in *The International Journal of Press/Politics* 21(1), 2016, p. 48 ss.

<sup>(82)</sup> N.C. ROBERTS, *Keeping Public Officials Accountable through Dialogue: Resolving the Accountability Paradox*, in *Public Administration Review* 62(6), 2002, p. 658.

<sup>(83)</sup> M.D. BONNER, *Media as social accountability: The case of police violence in Argentina*, in *International Journal of Press/Politics* 14(3), 2009, p. 296.

monitoring risks. The often parallel development of (at least) two or multiple systems, the institutional and the non-institutional, has the potential to stimulate a constructive discourse on the appropriateness of the government's approach to the risk, which again is identified as a manifestation of accountability. The cross-checking potential of these grassroots' tracking efforts, when the main source of information is undermined by a lack of *trust*, could trigger a social accountability outcome in the sense of multiplying the 'eyes' watching over the government. Traditional patterns of environmental governance facilitated by restricted access to strategic information are challenged. Technology under this point of view becomes an opportunity to 'watch over' the actions of the government to promote accountability. Safecast participants' responses described above referred to this act of "looking over government's shoulder", and of providing "an example of openness and objectivity" to the government (which, however, could be contested from a governmental perspective) as a strategy to counter a lack of transparency in institutional risk governance.

At this point, it seems worth questioning why this 'cross-checking' is needed. Numerous authors have stressed the existence of worrisome accountability gaps both at the EU level and in global environmental governance. Respectively, Bovens affirmed that «the EU suffers from serious accountability deficits», associated with a European policy-making that is not «matched by an equally forceful creation of appropriate accountability regimes».<sup>(84)</sup> This accountability gaps which «exist and even grow» compromise «the legitimacy of the European polity»<sup>(85)</sup>. Kramarz and Park, discussing global environmental governance, point out an *accountability paradox*: «Processes for holding those governing the global environment to account have grown, while environmental deterioration continues across a range of indicators»<sup>(86)</sup>. The authors also note that accountability mechanisms have

---

<sup>(84)</sup> M. BOVENS, *Analysing and Assessing Accountability: A Conceptual Framework*, cit., p. 447.

<sup>(85)</sup> *Ibid.*

<sup>(86)</sup> T. KRAMARZ, S. PARK., *Accountability in Global Environmental Governance: A Meaningful Tool for Action?*, cit., pp. 1, 4.

been mostly focused on «functional requirements like monitoring and compliance, leading accountability to be viewed as an end in itself», as an «end-of-pipe» concern, somehow missing the real goals and values of the concept of accountability which also include *input* concerns<sup>(87)</sup>.

As noted in the opening of this article, it is clear that such (only) procedural accountability mechanisms «do not respond to environmental stakeholders' expectations»<sup>(88)</sup>. What they demand is rather an *input accountability*, rather than an output one, based on a «pluralist approach to accountability»<sup>(89)</sup>. Input accountability would entail the opportunity to provide input for and shape policy decisions at an early stage, which strongly resonates with the aims of this research. The mere 'output' accountability seems closer to the concept of compliance and compliance assurance. The meaning of environmental compliance and its link to the notion of accountability is discussed *infra*. Kramarz and Park also note «accountability [is] a weak tool for environmental action» when only «conceived as a monitoring, compliance and enforcement device»<sup>(90)</sup>. Under this point of view, citizen sensing should not only be a tool to cross-check environmental compliance *ex post* but should rather be included as one of the sources of knowledge on which decision-makers will take decisions over the environment. The discussion on a *structural* integration of citizen sensing in the environmental risk governance system, with its challenges and limitations, have been thoroughly discussed in Berti Suman 2020b.

### 2.5. – *Case insight - Accountability claims expressed by Safecast and AiREAS participants; parallelisms with Petryna's reflections.*

The participants of a number of citizen sensing cases studied also expressed claims to accountability, more or less directly. The two cases dis-

---

<sup>(87)</sup> *Ibid.*, pp. 1, 2.

<sup>(88)</sup> *Ibid.*, p. 5.

<sup>(89)</sup> *Ibid.*, p. 14.

<sup>(90)</sup> *Ibid.*, p. 14.

cussed here are the Safecast citizen sensing initiative, a civic monitoring project on radiations launched after the 2011 Fukushima Daiichi disaster, and the AIREAS air quality monitoring project run by concerned citizens in the city of Eindhoven. The accountability outcome resulting from Safecast and AiREAS monitoring activities is identified in a number of survey and interview responses deployed in an exploratory empirical research phase with volunteers and project's founders<sup>(91)</sup>. The responses are here structured around thematic clusters.

*Shifting risk governance through civic responsabilization*

First, a theme is the theory of change leading to an almost revolutionary transformation in the monitoring of the risk. A participant, for example, affirmed: «Before Safecast it was normal for averages to be published and *without any info on how the data was collected*, now only specifics with details down to the device level are demanded by everyone. The *entire scope of radiation monitoring shifted* because of our efforts». Another theme is the sense of responsibility, also mentioned before, for informing fellow citizens against the attempts of the state to hide information (again, this can be contested from an institutional perspective). One of the Safecast project leaders stated: «I feel we have had several significant impacts [such as demonstrating that] sensational, purposeful *misinformation* can be countered in the Internet Age». However, if one considers cases such as the Flint Case of abuse of citizen-gathered information, this idea of misinformation could be reversed.

*Accountability through visibility*

Participants also connected their claims to a more accountable governance of the risk with the right to access environmental information. For example, a participant noted: «I believe that *neutral organization* like Safecast can provide *more understandable information than the authorities*»<sup>(92)</sup>, also showing

---

<sup>(91)</sup> This section of the research has been granted ethical clearance by the *Ethical Review Board of Tilburg Law School* (TLS-ERB #2018/01, issued on June 12, 2018).

<sup>(92)</sup> Translated from Japanese: «誰に対する影響力かにもよりますが、まったく放射線についての知識のない人にとっては、中立の立場でいる pro-data のセーフキャストの情報は、原発の Pros、Cons に関係なく理解しやすいものだと思います。」

a sense of scepticism and fear for misinformation. Although, I argue that no form of monitoring can be considered neutral, it is interesting here to see how the respondent linked (the lack of) neutrality with their demands to a more understandable (and accountable) governance of the nuclear risk. Understanding the real risk that you are facing is considered the first step to then act. This idea of a transparent release of understandable information is also found in the AiREAS case, where the theme of transparency and accountability emerged in a number of responses. A volunteer, for example, claimed that the contribution of AiREAS was of «data processing and visualization targeted [at] *making the invisible visible* and *creating awareness*», which recalls dichotomy emerged in a response from Safecast between authorities hiding information (‘the invisible’) and the sensing citizens making it visible. Making information visible creates awareness and thus triggers even more accountability.

*Spotting actual impact on the handling of the risk*

Another theme is that of having a factual accountability outcome in terms of pushing for adoption of concrete decisions, more aligned with the citizens’ claim. An interviewee<sup>(93)</sup>, for example, said: «I believe we had *a profound impact* on how the government *redrew* the no-go zone in Fukushima» (these are zones interdicted to the public for their radioactive levels). This identified ‘policy uptake outcome’ demonstrates a trend of oversight and pressure over governmental decisions, which leads to a consequent adjustments thereof. The feeling of having impacted through the initiative on decisions taken by the government makes the respondent believe in an accountability-generation potential of their action.

*An emerging sense of distrust*

Safecast potential for enhancing accountability emerges also from a number of other responses, which show also another theme, i.e. high distrust

---

<sup>(93)</sup> Safecast participant responding to the web survey performed during winter 2019 with the initiative’s volunteers. An example of the survey is available at [tilburglawschool.eu](http://tilburglawschool.eu).



towards the competent authorities. For example, a participant noted: «[Safecast has] been a *game changer*, just watching the online map mature and the way all data can be downloaded and used by anyone but still retaining data history had never happened on the same scale before. [...] You only have to look to *what Governments are doing to control data outputs* from institutions to be concerned about data quality[; the government] places embargoes on data release and basically *wants to vet data to make sure it matches their position on the topic*». Another respondent, this time in the targeted survey, noted that «in Japan, *secrecy laws* may interfere with our operations (as these are opaque, not possible to assess their actual risk)». To the question «Would you classify Safecast as citizen-driven (in the sense of being primarily led and shaped by citizens) and if so, why?» a respondent answered: «Most certainly, I can't see any government organizing this type of project, in either the timeframe or budget. It would be over budget and *provide patchy data at best* and *the minute it told them (the government) something they didn't like would get shut down or hidden from view*». Distrust, again, is high. Providing 'patchy data' and 'shutting down' attempts to promote proper information illustrates an un-transparent governmental attitude.

*Facilitating access to data as a first step to accountability*

The importance of transparency and openness is found in another cluster of responses. An interviewee stated: «I support citizen's collecting data and making that data *accessible and open*». Other respondents pointed out: «[Safecast] made data *more accessible and easily understood*», «data was collected and catalogued for *easy access without impediments*» and «made [...] *more transparent*». Along this line, a participant argued: «Involvement of volunteers for data collection [...] could be of value and *serve as a comparison for government-collected data*». The idea of providing a benchmark to which to compare institutional data recalls the idea of cross-checking, proper of the accountability mechanisms afore-discussed. Also the importance to 'stay independent' to ensure a transparent information was acknowledge by a participant who noted: «There is *no 'official' oversight by any government agency, nor is there any form of censorship*».

The extent to which the initiative contributed to (local) policy-making is also acknowledged in the AiREAS case's responses, as emerges in the answer of an AiREAS participant: «The initiative has generated *a positive impact on the organizational bodies* like the city council and some administrative bodies». However, one of the project's founders offered a different view, pointing out: «I am afraid that there is *insufficient visibility* of our work to those that are the stakeholders». The participant referred to frustration in not seeing the hoped policy uptake of the initiative, mainly due to institutional mechanisms not prone to innovation. Another cluster emerged in AiREAS is the link between the initiative and the stimulus to a more resilient system through cross-checking. A participant mentioned the 'resilience' aspect affirming: «[AiREAS] stimulated me to continue and apply the method also in other priorities for *regional resilience*».

*Drawing parallelism with literature*

Accountability plays an important role also in a book by Petryna, titled *Life Exposed*<sup>(94)</sup>, which provides an anthropological account of citizenship claims, and everyday forms of survival after the Chernobyl nuclear disaster. For example, she calls *society* to bear the responsibility for the claimants' health burdens<sup>(95)</sup>. Only a proper understanding and account of "biomedical truths" can lay the foundations for more preparedness in future responses<sup>(96)</sup>. Yet the author acknowledges the limits of accountability and notes how interventions often reflect such limits<sup>(97)</sup>. New tipping points deriving from uncertain environmental phenomena tackled with a "technologies of hubris" approach that focuses on the known «at the expense of the unknown»<sup>(98)</sup> make the chances to achieve alternatives to a «technocratic monopoly» even slimmer. Norms do not provide an answer in the

---

<sup>(94)</sup> A. PETRYNA, *Life Exposed: Biological Citizens after Chernobyl*, Princeton, 2013.

<sup>(95)</sup> *Ibid.*, p. xxi.

<sup>(96)</sup> *Ibid.*, p. xxii.

<sup>(97)</sup> *Ibid.*, p. xxii-xiii.

<sup>(98)</sup> *Ibid.*, p. xxvi.

view of the author. The risk then becomes just an individual problem<sup>(99)</sup>. The «randomness of the law» manifested in «denials of access, exclusions, postponements» is at the source of the author's critique<sup>(100)</sup>. In this article, I stressed the need for an environmental law that reflects people's desires and claims. Remarkably, Petryna mentions freedom of expression and the right to information<sup>(101)</sup> as being at stake in such «technogenic catastrophes»<sup>(102)</sup>.

Timely to this analysis, Petryna notes that «technological resources [...] can shift the frames of what is considered evidence of the physical impact of the disaster»<sup>(103)</sup>. Citizen sensing may be seen as a technology that contributes to shift such frames. The author also refers to an «emerging democracy» after the disaster and a stimulus to new forms of civic organizing<sup>(104)</sup>, of which citizen sensing may be seen as a manifestation, but in relation to Fukushima. Still from the field of nuclear radiations, Abe in analysing a form of civic measurement initiative originated in post-Chernobyl Japan, the R-DAN, which boosted after Fukushima, draws links to accountability<sup>(105)</sup>. Abe, quoting Fujita<sup>(106)</sup>, notes that this initiative derived from scepticism about the Japanese government's information transparency and stresses its potential for making the Japanese government *more accountable*.

---

<sup>(99)</sup> *Ibid.*, p. 3.

<sup>(100)</sup> *Ibid.*, p. 107.

<sup>(101)</sup> *Ibid.*, p. 7.

<sup>(102)</sup> *Ibid.*, p. 9.

<sup>(103)</sup> *Ibid.*

<sup>(104)</sup> *Ibid.*, p. 25.

<sup>(105)</sup> Y. ABE, *Citizen before Science: R-DAN and its monitorial ethic after Chernobyl*, in M. FATHISALOUT-BOLLON, A. BERTI SUMAN, *Legal, social and ethical perspectives on Health & Technology*, Paris, 2020.

<sup>(106)</sup> Y. FUJITA, *R-DAN undō wa doko ni mukaouto shite irunoka: Ogino shi no bihan ni kotaete*, Kagaku, Gijutsu, Ningen, 1987, p. 35.

3. — *State obligations resulting from accountability demands.*

3.1. — *An obligation to transparently provide information.*

If citizen sensing expresses claims to a more accountable environmental risk governance and governing, it is worth exploring here the consequent obligations for the State to respond to such demands for accountability, manifested through grassroots-monitoring practices. The reliance of authorities *also* on citizen sensing can be regarded as opposite to a ‘top-down’ approach, where the designated institutions are the only actors both responsible and entitled to provide environmental data for policy decisions (including policy design, implementation and compliance assurance). Adopting the first approach, governments are both legitimized and obliged to use the data produced by the citizens if such data would allow better, more accountable and transparent protection of the environment.

The accountability demands above discussed, in turn, generate for the State an obligation to transparently provide information to the public on which data inform the decisions affecting human health and the environment and which procedures underpin such decisions, in line with the obligations enshrined in the Aarhus Convention<sup>(107)</sup>. A case is detailed here to illustrate the State’s obligations in connection with citizen sensing practices. The case regards the Louisiana Bucket Brigade, a non-profit environmental health and justice organization based in New Orleans, Louisiana<sup>(108)</sup>, which managed to compel the government to obey to its duties of protection towards the affected citizens. The case has been analysed on the basis of the initiative’s web page. This approach has the clear limitation that the information reported here is solely the initiative’s public account of their actions. Further research could deepen the analysis of the case, through empirical and literature research.

---

<sup>(107)</sup> *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters* (25 June 1998) 38 ILM 517.

<sup>(108)</sup> See [labucketbrigade.org](http://labucketbrigade.org).

### 3.2. – *Case insight - State obligations in the Louisiana Bucket Brigade initiative.*

The Louisiana Bucket Brigade was founded in 2000 with the aim to work with communities exposed to air quality issues due to proximity to oil refineries and chemical plants. The organization provided to concerned communities “buckets” (already in the early 1995) that could sample air quality to detect noxious fumes, as a response to the ‘unsatisfactory’ monitoring conducted by government authorities<sup>(109)</sup>. Among the actions of the Brigade, particularly timely for this discussion is the intervention of the community of Mossville, Louisiana, living in the proximity of the industrial facilities of Calcasieu Parish (where vinyl plastic manufacturers, a coal-fired power plant, oil refineries, and chemical production facilities are located).

The residents of Mossville formed a ‘bucket brigade’ and started sampling their air, detecting *violations of Louisiana standards* for vinyl chloride, ethylene dichloride, and benzene. It is reported that «one sample found carcinogenic benzene in excess of 220 times the State’s standard»<sup>(110)</sup>. This violation of Mossville residents’ right to a healthy environment, after gaining substantial media attention (the social uptake), was *confirmed* by the Environmental Protection Agency (a first step for the policy uptake). The State took action by fining some facilities and installing new official monitoring devices. This is a clear example of an initiative ‘from below’ that manages to impose compliance ‘from above’.

The Bucket Brigade not only obtained a considerable social uptake, but is also clearly targeted to a legislative and policy change. For example, in November 2017, the group reported that they were «working with General Honoré’s ‘GreenARMY’<sup>(111)</sup> on *[their] legislative agenda* for 2018, including *air monitoring legislation and a plan to gather data about women’s health* in communities

---

<sup>(109)</sup> See *en.wikipedia.org*.

<sup>(110)</sup> *Ibid.*

<sup>(111)</sup> See *generalbonore.com*.

most impacted by pollution» [emphasis added]<sup>(112)</sup>. A clear link to accountability demands and related State's obligations is also evident in the group's discourses, such as the following statement:

«In October [2017], we joined with 13 environmental, health, and science groups *at the U.S. Court of Appeals for the District of Columbia Circuit in challenging the EPA's* [the U.S. Environmental Protection Agency] *decision to delay implementation* of an important chemical safety rule. Our brief, filed jointly with the United Steelworkers Union, argues that the delay violates federal law» [emphasis added]<sup>(113)</sup>.

Accountability interventions seem to target also the private sector, as detailed by the Brigade in June 2017. The Brigade acted in St. Rose, Louisiana, against a proposal from Shell that would have substantially increased the load of air pollution per year. The group *obtained* from the Louisiana Department of Environmental Quality the permission to hold a *public hearing*, where residents could detail the impacts of the increased pollution. It is reported that, as a consequence, the company cancelled its plans to expand<sup>(114)</sup>. Other accomplishments are detailed on the Brigade's platform. In March 2017, for example, the concerned communities won a Clean Air Act citizen suit, forcing the U.S. EPA to «*review the health threats – cancer risks, chronic respiratory, neurological harm – of short term exposure, as well as install better emission control technology*» [emphasis added]<sup>(115)</sup>.

In addition, in September 2015, the group succeeded in a five-year long battle to obtain the EPA Refinery Rule that requires air monitoring for carcinogen benzene in communities neighbouring refineries as well as a reduction in refinery pollution. The group celebrates the «tremendous policy accomplishment [...] born from the grassroots» in enthusiastic terms. «We had community representatives in these meetings for the last six years *giving insight into what aspects of the proposed rule would and would not work*», they affirm

---

<sup>(112)</sup> See <http://labucketbrigade.org/content/about-us>. Accessed October 12, 2018.

<sup>(113)</sup> *Ibid.*

<sup>(114)</sup> *Ibid.*

<sup>(115)</sup> *Ibid.*

[emphasis added]<sup>(116)</sup>. Earlier on, the group obtained the implementation of factual measures from the State. In 2005, they refer to an intervention from the Louisiana Department of Environmental Quality, which *installed air monitoring tools* around the ExxonMobil's Chalmette Refining in response to legislation developed by the Brigade (in partnership with another local organization). Another concrete step was adopted by the EPA Inspector General, which – in response to the Brigade's petition on the lax enforcement of the Louisiana Department of Environmental Quality– *began an investigation* of Louisiana's environmental programs.

The case timely shows which kind of obligations can exist for the State in relation to environmental grassroots-monitoring initiatives. In consideration of the fact that not always the State will be as responsive as in the illustrated case, the need to create an institutional framework facilitating the institutional uptake of citizen sensing initiatives seems pressing (see extensively Berti Suman 2020b).

#### 4. — *Environmental compliance assurance, link to accountability.*

The concept of accountability has been discussed especially with regards to environmental governance. It seems here worth spending few lines on the concept of 'environmental compliance assurance' and on how it differentiates from that of (environmental) accountability. The European Commission (EC) describes environmental compliance assurance as «all the ways in which public authorities promote, monitor and enforce compliance with such rules»<sup>(117)</sup>. It is considered part of *environmental governance*. The EC also offers a specific discussion of the main components of the concept of compliance assurance: «[To m]onitor means using inspections and other checks to collect information about levels of compliance and provide solid evidence for enforcement; [...] stopping those who disregard the rules,

---

<sup>(116)</sup> *Ibid.*

<sup>(117)</sup> See [http://ec.europa.eu/environment/legal/compliance\\_en.htm](http://ec.europa.eu/environment/legal/compliance_en.htm). Accessed December 2, 2018.

sanctioning them and obliging them to rectify the damage»<sup>(118)</sup>. The EC further specifies, «monitoring covers routine environmental inspections, police investigations and environmental audits by public audit bodies [;] examination of complaints from the public [;] audit recommendations, official warnings, cease-and-desist orders, administrative fines, criminal prosecutions and demands to take remedial action»<sup>(119)</sup>.

A number of implementation actions have been adopted by the EC to guide and enhance compliance assurance at the EU level, among which can be quoted the Communication (COM) on ‘European Union (EU) actions to improve environmental compliance and governance’, the Staff Working Document (SWD) providing details of each action, and the Decision establishing the Environmental Compliance and Governance Forum<sup>(120)</sup>. A very ‘down-to-the-citizen’ mechanism is the opportunity given to each EU citizen to directly file a complaint against a breach of EU law by a Member State on a dedicated platform<sup>(121)</sup>. If a breach is found, an infringement procedure against the Member State may be initiated. This seems a trigger for Member States to take EU law seriously and an ‘easy’ avenue for compliance assurance. I will investigate whether citizen sensing can also contribute to environmental compliance assurance, as emerging from the EC study<sup>(122)</sup>.

What seems important to stress here is the difference between the concepts of compliance assurance and of accountability. Compliance assurance is a more ‘legal’ terms, whereas accountability seems belonging more

---

<sup>(118)</sup> *Ibid.*

<sup>(119)</sup> *Ibid.*

<sup>(120)</sup> EC COM(2018)10 final on ‘EU actions to improve environmental compliance and governance’, preceded by the EC SWD(2018)10 which provides details of each action; Decision C(2018)10, establishing the Environmental Compliance and Governance Forum.

<sup>(121)</sup> See *ec.europa.eu*.

<sup>(122)</sup> BIO INNOVATION SERVICE, *Citizen science for environmental policy: development of an EU-wide inventory and analysis of selected practices*, Final report for the European Commission, DG Environment under the contract 070203/2017/768879/ETU/ENV.A.3, in collaboration with Fundacion Ibercivis and The Natural History Museum, 2018.



to political science. Whereas compliance assurance entails *ensuring* and *monitoring* that norms are respected, accountability seems going beyond complying, but also *explaining* to the public or to dedicated accountability forums how compliance was performed or the reasons for non-compliance, if that is the case. Environmental monitoring at the EU level seems very much linked to compliance, whereas accountability discourses seem more used in the public debate over environmental governance.

Compliance assurance acts mostly through set mechanisms: whenever there is non-compliance with the norms, they can be *enforced in official courts*; states have to ensure that (EU) standards are met and if this is not the case they can be brought to court, which in general will ask the authority to comply if a reasonable justification for non-compliance is not provided. Accountability mechanisms seem instead including a broader plethora of *formal and informal courts* (thus including the ‘court of public opinion’) which can intersect the legal domain (e.g. legal accountability) or depart from it (e.g. social accountability). In cases where the public ‘resists’ existing norms, compliance assurance may be deprived of its meaning in the eyes of the citizens as it focuses on compliance with existing norms. Differently, accountability goes beyond existing norms. Consequently, if norms are not (sufficiently) in place, only accountability can operate, and not compliance assurance. In addition, policy-makers only focused on complying with existing environmental legislation may still incur in public dissatisfaction if the people do not feel represented by existing norms.

Achieving the accountability goal could mean drawing *new rules* that better reflect civic aspirations. In this sense, accountability would encompass compliance but going *beyond* it to also include overarching rights and normative considerations. Whereas environmental compliance assurance mechanisms are constantly resorted to by competent authorities, legal accountability avenues through court scrutiny are a very limited percentage of environmental legislation uses. Thus, it can be concluded that, at present, the possible compliance assurance outcome of citizen sensing is definitely more developed than its (legal) accountability potential.

### 5. — *Conclusions.*

As a final reflection, I wish to note that – throughout this article – I showed what Gabrys argued, i.e. that when «citizens take up environmental monitoring as a way to address [a] perceived absence of care, and to evidence harm», they ultimately «express[...] care about environments, communities and individual and public health»<sup>(123)</sup>. Citizen sensing practices can indeed «make relevant [...] unrecognised and overlooked considerations of the need for care»<sup>(124)</sup>, which – in other words – can be seen as claims to accountability in environmental governance and government.

The present article sought to answer the question «How can citizen sensing trigger more accountability and transparency in environmental risk governance?». From an environmental justice and accountability theoretical angle, and bringing in empirical data on accountability claims ‘in practice’, this contribution demonstrated that citizen sensing is essentially a ‘cross-checking’ practice that can instil (more) transparency and accountability in the system. I illustrated how the dimensions of accountability at stake span from social to legal accountability outcomes, including also a narrower compliance assurance outcome. In being a trigger for accountability, I affirmed that citizen sensing could be central for a healthy, functioning system, responding to growing claims for more accountability in environmental risk handling<sup>(125)</sup>.

At instances, such as in the case of the Flint Water crisis, these claims are associated with higher demands of *environmental justice*. From a legal standpoint, the mechanisms to ensure environmental quality are mostly framed as *compliance assurance*, to which citizen sensing seems apt to contribute as well. This potential of citizen science (and sensing) to support institutional enforcement mechanisms has been recognized by the European Commission, as discussed in the article.

---

<sup>(123)</sup> J. GABRYS, *Citizen sensing, air pollution and fracking: From ‘caring about your air’ to speculative practices of evidencing harm*, in *The Sociological Review* 65(2\_suppl), 2017, p. 172.

<sup>(124)</sup> *Ibid.*

<sup>(125)</sup> T. KRAMARZ, S. PARK., *Accountability in Global Environmental Governance: A Meaningful Tool for Action?*, cit., p. 5.

The main ‘take-away’ message from this article thus is that citizen sensing manifests specific accountability claims. This accountability outcome is identified both under a social accountability and under a legal accountability perspective. Citizen sensing volunteers from Safecast and AiREAS voice these demands in their discourses and believe that, by providing to fellow citizens an alternative source of environmental information, they can stimulate more transparency and accountability in governing environmental matters. Citizen sensing is framed by the sensing citizens themselves as a way to claim a more accountable environmental governance, although participants often do not use the specific legal terminology. Further research should explore the legal accountability potential of citizen sensing, focusing specifically on the acceptance of citizen-sensed data in environmental litigation as an innovative source of evidence<sup>(126)</sup>.

---

<sup>(126)</sup> Towards this research direction goes the current *NWO Rubicon project* and the forthcoming *Marie Curie Individual Fellowship* that dr. Anna Berti Suman will start in summer 2020 at the European Commission Joint Research Centre (JRC), in cooperation with the Milan Arbitration Chamber and Systasis - Research Centre for the Prevention and the Management of Environmental Conflicts, Milan, on the project titled ‘*SENSJUS - Citizen Sensing as a source of evidence in environmental justice litigation and as a tool for environmental mediation*’.

