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THE USE OF SCIENTIFIC EXPERTS IN ENVIRONMENTAL CASES BEFORE THE EUROPEAN COURT OF HUMAN RIGHTS

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Abstract This article argues that the current approach of the European Court of Human Rights (ECtHR) to evaluating scientific evidence is lacking and hampers its ability to properly handle cases involving questions of science, and particularly environmental cases which are replete with them. It identifies three problem areas in relation to the ECtHR's adjudication of such cases: the evaluation of evidence proving the causation of harm; the extent of the Court's deference to the determinations made by national authorities; and the Court's evaluation of evidence adduced by the respondent State in justifying its conduct as being in line with the standard of due diligence. Several cases that illustrate the recurring problem of the lack of science-based reasoning in the Court's judgments are then identified, highlighting the shortcomings of its approach. Such issues have an impact upon the legitimacy of the ECtHR, and it is therefore imperative that it engages more robustly with scientific evidence. The article suggests the best way to do this would be for the ECtHR to make more use of its power to seek assistance from independent scientific experts in environmental cases.

Keywords: human rights, environment, burden of proof, scientific fact-finding, judicial deference, expert evidence, European Court of Human Rights.

I. INTRODUCTION

Law governs the interface between humans and their environment on the basis of science,[1] or rather a range of sciences such as 'physics, chemistry, biology (including ecology) and interdisciplinary scientific fields such as meteorology

[1] This is not to say that non-scientific (or even unscientific) assumptions play no role in shaping the law, but almost all legal systems seek to enact laws and regulatory processes that are informed by science.

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and the medical sciences'.[2] Science pertaining to the human–environment interface involves not only understanding and explaining causal relationships, but also making predictions.[3] The range of disciplines, methods and objectives with which scientific knowledge is pursued (and the language with which it is expressed) makes it difficult for lawyers and judges to bridge the 'interdisciplinary divide' between science and law.[4] This has led to examinations of the prospects and trade-offs of specialized judicial bodies.[5] Where international courts lack a specialized chamber or division to address cases marked by complex scientific or technical issues, the need for assistance from independent scientific or technical experts has often been noted in scholarship.[6]

Judges seldom possess the relevant expertise or the time to stay abreast of developments in scientific concepts,[7] and yet conflicting or unclear factual claims backed by complex technical or scientific evidence are one of the main features of environmental cases.[8] This evidence typically addresses questions surrounding the foreseeability, imminence and significance of risks posed by certain actions or omissions, the appropriateness or adequacy of measures to prevent or remedy potential or actual environmental harm, the notorious issue of causal link, and the valuation of harm to legally protected interests. Admittedly, problems posed by complex scientific evidence[9] are not unique to environmental cases,[10] and similar problems arise, for example, in cases concerning the protection of public health.[11] The European Court of Human Rights (ECtHR or the Court) is often confronted by the Sisyphean challenge of adjudicating cases involving complex scientific evidence,[12] and

[2] E Fisher, 'Sciences, Environmental Laws, and Legal Cultures: Fostering Collective Epistemic Responsibility' in E Lees and J Viñuales (eds), *Oxford Handbook of Comparative Environmental Law* (OUP 2019) 750.

[3] This kind of science constitutes what Jasanoff describes as 'regulatory science', ie science which seeks to find truths relevant for regulatory or policy purposes (it may be contrasted with 'research science', whose apparent purpose is to seek 'truths' of originality or significance). See S Jasanoff, 'Procedural Choices in Regulatory Science' (1993) 4(2) RISK 143.

[4] Fisher (n 2) 754. [5] E Lees, 'Adjudication Systems' in Lees and Viñuales (n 2).

[6] CE Foster, *Science and the Precautionary Principle in International Courts and Tribunals* (CUP 2011) 108–23; G Gaja, 'Assessing Expert Evidence in the ICJ' (2016) 15(3) LPICT 409; D Shelton, 'Complexities and Uncertainties in Matters of Human Rights and the Environment' in J Knox and R Pejan (eds), *The Human Right to a Healthy Environment* (CUP 2018).

[7] JW Moore et al, 'Towards Linking Environmental Law and Science' (2018) 3(1) FACETS 375, 383. [8] Lees (n 5) 794.

[9] These include difficulties in gauging the credibility of scientific evidence presented to the court, understanding the implications of the scientists' choice of research methodology and expressions used to communicate the degree of certainty in research findings, and relating pieces of information arising from multiple sources. [10] Lees (n 5) 795.

[11] M Mbengue, 'International Courts and Tribunals as Fact-Finders: The Case of Scientific Fact-Finding in International Adjudication' (2011) 34(1) LoyLAIntl&CompLRev 53; JE Alvarez, 'Are International Judges Afraid of Science? A Comment on Mbengue' (2011) 34(1) LoyLAIntl&CompLRev 81.

[12] This challenge is not unique to the ECtHR, however, and there is a wealth of scholarship on how other international courts have fared in confronting the same issue; see Mbengue ibid; Foster (n 6); L Malintoppi, 'Fact Finding and Evidence before the International Court of Justice (Notably in

the significance of this challenge was recently brought to the fore by Judge Eicke in his dissenting opinion in *Verein KlimaSeniorinnen Schweiz and Others v Switzerland*,[13] in which he noted:

> After all, the necessary (and detailed) engagement with scientific evidence in the context of what the Court in *Powell and Rayner v. the United Kingdom* … described (in the context of the arguably simpler issue of aircraft noise) as 'this difficult social and technical sphere' is not currently part of the Court's working practices.[14]

With the aim of highlighting the need for the ECtHR to make more frequent recourse to independent scientific experts in the adjudication of environmental cases, this article critically analyses how the Court engages with complex scientific evidence in such cases.[15] The 'black box' in which judicial assessment of proof submitted by the applicants operates, the problems caused by the Court's deference to scientific fact-finding at the national level, and the lacunae in the Court's reasoning in its judgments in environmental cases are symptomatic of a significant issue which could be addressed if the Court were to better utilize its power to consult experts. The role of such experts is not to assume the task of the Court in assessing evidence and making findings of fact, but rather to assist the Court in understanding the science involved and enable the judges to make their own educated evaluation of the evidence. The use of the power to consult independent experts could provide the means to ensure that the Court's understanding of scientific evidence is accurate and enable it to provide reasoned evaluation of the evidence in its judgments. Since environmental cases thus far have exclusively been brought

Scientific Related Disputes)' (2016) 7(2) JIDS 421; K Sulyok, *Science and Judicial Reasoning: The Legitimacy of International Environmental Adjudication* (CUP 2020) 241–60.

[13] *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* App No 53600/20 (ECtHR, 9 April 2024).

[14] Dissenting opinion of Judge Eicke in *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* ibid, para 11 (citations omitted).

[15] The authors recognize that there is also a need to analyse critically how the Court engages with social science. While litigating parties rarely place emphasis on social science evidence to justify the State conduct which is impugned in environmental cases, it is arguable that the Court should not take social science-based rationality of State conduct for granted. This article does not specifically comment on the Court's engagement with the underlying social aspects of environmental cases during its adjudication. However, the discussion in Section V of this article is relevant to this issue, as it sheds light on how the Court assesses compliance with positive obligations, which requires judicial reflection on social science. It may be argued that where appropriate, the Court should engage in a constructive dialogue with social science experts in order to enhance the epistemic legitimacy of their judgments. For an extensive discussion on the merits of consultation with social science experts in cases before the World Trade Organization Dispute Settlement Body and the International Court of Justice, see CE Foster, 'Social Science Experts and Amicus Curiae Briefs in International Courts and Tribunals: The WTO Biotech Case' (2005) 52 NILR 433.

by individual applicants, a discussion of the unique evidentiary difficulties arising in inter-State cases is outside the scope of this article.[16]

The structure of the article is as follows. Section II presents the Court's approach to fact-finding in environmental cases. Section III explores how the Court has shaped its evidentiary rules through its case law in response to the 'evidentiary difficulties' that arise in environmental cases. First Section III.A. examines the topic from the applicant's perspective, noting that despite the adjustment of rules concerning the burden and standard of proof to reflect the asymmetrical position of the applicants and respondent States, evidentiary issues remain due to the 'black box' assessment of evidence of a scientific nature, while Section III.B explains the burden and standard of proof applicable to the respondent State in environmental cases. Section IV problematizes the Court's deferential approach to science-based determinations made by national authorities and highlights its unwillingness to engage in an assessment of their merit. Section V exposes the problem with how the Court's reasoning is presented in its judgments in environmental cases where it is not aided by prior evaluations of the state of the environment and robustness of protection measures by competent authorities at the national level. Compliance with obligations of due diligence in cases involving environmental risks depends on whether the respondent State properly appraised those risks and responded adequately. With the help of examples, it is argued that in cases where the Court should explain the failure by the respondent State to exercise due diligence, it instead draws its conclusion based on the occurrence of harm or other adverse outcomes (which, while relevant, are not dispositive). This reveals the Court's inability to provide clear science-based reasoning on the protection gaps or flaws in the respondent State's conduct. Section VI underlines the importance of the Court properly engaging with scientific evidence when adjudicating environmental cases for the sake of maintaining its legitimacy. Section VII presents a possible solution, operationalizing Rule A1 of the Annex to the Rules of the Court concerning investigations,[17] which permits the Court to consult independent experts.

II. FROM EVIDENCE TO FACT-FINDING

The Court's mandate is to ensure the parties to the European Convention on Human Rights (ECHR) observe the international legal obligations they have

[16] For an extensive discussion on the challenges faced by the Court in obtaining and assessing evidence in inter-State cases, see P Leach, 'On Inter-State Litigation and Armed Conflict Cases in Strasbourg' (2021) 2(1) EurConvHumRtsLRev 27, 43–55.

[17] Council of Europe (CoE), 'Rules of the Court' (30 October 2023) <https://www.echr.coe.int/documents/d/echr/rules_court_eng>.

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assumed under that Convention.[18] The Court does not execute this mandate in abstraction, but rather through the adjudication of cases brought before it.[19] These cases entail the assessment by the Court of claims brought by applicants alleging a violation by the respondent State(s) of obligations under the ECHR and the Protocols thereto[20] through specific conduct which has been established as 'fact'.[21] Evaluation of a legal claim in a given case is preceded by the process of 'fact-finding', ie a judicial process in which the facts are established and then classified as relevant or irrelevant for the case.[22] It is worth clarifying that the term 'fact-finding' is also used in scholarship in a narrower sense, referring specifically to that part of the process described above where specific mechanisms envisaged in Rule A1 of the Annex to the Rules of the Court concerning investigations are used, in order to establish or bring clarity to the facts. This article refers to fact-finding in its broader understanding, involving the examination of evidence adduced by both parties to the case, as well as that which has been obtained by the Court of its own volition.

In the *Nachova v Bulgaria* case[23] the ECtHR described its approach to evidence as follows:

> [I]n the proceedings before the [Court], there are no procedural barriers to the admissibility of evidence or pre-determined formulae for its assessment. It adopts the conclusions that are, in its view, supported by the free evaluation of all evidence, including such inferences as may flow from the facts and the parties' submissions.[24]

This freedom aligns with the discretion granted by the ECHR to the Court on procedural matters. However, the ECtHR's freedom to admit and evaluate evidence is nuanced given its vertical relationship with domestic courts in the Council of Europe (CoE) Member States.[25] The fact-finding process in the ECtHR is typically much shorter than in cases before other international courts, because the admissibility requirement of the exhaustion of domestic

[18] European Convention for the Protection of Human Rights and Fundamental Freedoms 1950, as amended by Protocol Nos 11 and 14 (adopted 4 November 1950, entered into force 3 September 1953) ETS 5 (ECHR) art 19.

[19] Although this not the only way in which the Court performs its mandate—it also has the power to issue advisory opinions upon request by national courts of CoE Member States pursuant to Protocol No 16 to the ECHR, ibid.

[20] ECHR, ibid, arts 33, 34.

[21] The proposition is intentionally silent as to who must prove to the Court that the claims are factual, since the Court has specifically declared that 'the burden of proof is not borne by one or the other party because the Court examines all material before it irrespective of its origin, and because it can, if necessary, obtain material of its own motion'. *Merabishvili v Georgia* App No 72508/13 (ECtHR, 28 November 2017) para 311.

[22] Definition proposed by A Hansen, *Facts Before the European Court of Human Rights* (Nomos 2022) 28–9.

[23] *Nachova v Bulgaria* App Nos 43577/98 and 43579/98 (ECtHR, 6 July 2005).

[24] ibid, para 147.

[25] L Glas, *The Theory, Potential and Practice of Procedural Dialogue in the European Convention on Human Rights System* (Intersentia 2018) 82.

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remedies means the case has already been through the national courts of the respondent State.[26] The Court generally takes advantage of this, relying to a great extent on the facts as they have been established by national authorities or 'pre-digested' by domestic courts, as well as on their evaluation of those facts.[27] The subsidiary role of the ECtHR naturally suggests that it should place heavy reliance on such factual determinations. The Court has recognized that its reliance on prior fact-finding at the domestic level for the purposes of its own fact-finding is of particular importance in 'cases concerning the environment' owing to certain 'evidentiary difficulties' that they 'usually' present.[28] This practice is accepted as long as the domestic fact-finding has been conducted in accordance with established standards. Indeed, the ECtHR would be overburdened if it were to perform fact-finding *ab initio* in every case, especially when the case involves facts of a technical nature. However, the ECtHR's reluctance to reopen facts which have been 'established' at the domestic level may lead to unfair outcomes, particularly as it is suggested that the practice tends to advantage the respondent State rather than the applicant.[29] The ECtHR's role as a fact finder becomes crucial, and therefore the focus of critical attention, in cases where there are justified doubts about domestic fact-finding.[30]

Environmental cases typically involve claims that the respondent State's conduct has caused or risks causing environmental deterioration, which in turn has had or risks having an adverse impact on the human rights of individual applicant(s) under Articles 2 (right to life), 6 (right to a fair trial), 8 (right to respect for private and family life) and 13 (right to an effective remedy) of the ECHR[31] and Article 1 (protection of property) of Protocol No 1 to the ECHR.[32] This article focuses on environmental cases where Articles 2 or 8 are implicated. It is worth noting that in its environmental case law, the Court

[26] ECHR (n 18) art 35.

[27] P Leach, C Paraskeva and G Uzelac, 'Human Rights Fact-Finding. The European Court of Human Rights at a Crossroads' (2010) 28(1) NQHR 41, 42.

[28] *Pavlov and Others v Russia* App No 31612/09 (ECtHR, 11 October 2022) para 62; see also, *Ledyayeva and Others v Russia* App Nos 53157/99, 53247/99, 53695/00 and 56850/00 (ECtHR, 26 October 2006) para 90; *Cordella and Others v Italy* App Nos 54414/13 and 54264/15 (ECtHR, 24 January 2019) para 160. The Court has suggested in these cases that such 'evidentiary difficulties' include quantifying the effects of a particular source of pollution, parsing the influence of other factors (like age or occupation of the applicant) on the applicant's health or well-being, and appreciating alleged deteriorations in 'quality of life' (due to the latter's subjectivity).

[29] See MB Dembour, 'The Evidentiary System of the European Court of Human Rights in Critical Perspective' (2023) 4 EurConvHumRtsLRev 363, 367–8.

[30] As well as in the exceptional cases where there is no prior domestic fact-finding and the requirement for the applicant to exhaust of domestic remedies is waived by the Court. See ibid 363–4.

[31] It has also been suggested that art 3 (prohibition on torture) could be implicated in environmental cases, see C Heri, 'Climate Change before the European Court of Human Rights: Capturing Risk, Ill-Treatment and Vulnerability' (2022) 33(3) EJIL 925.

[32] See examples cited in N Kobylarz, 'The European Court of Human Rights, an Underrated Forum for Environmental Litigation' in HT Anker and BE Olsen (eds), *Sustainable Management of Natural Resources: Legal Instruments and Approaches* (Intersentia 2018) 102–4.

has more frequently analysed Article 8 on the merits than Article 2. It has also found more violations of Article 8 than of Article 2.[33] This prompted Judge Serghides in *Pavlov and Others v Russia* to recognize that Article 8 'also necessitates and entails the implicit sub-right to a healthy environment which is indispensable for the exercise and enjoyment of the right to respect for one's private life'.[34] In contrast to Article 8, the applicability of Article 2 entails a high threshold of severity of the injury: the case must involve a risk of death.[35] Environmental cases where a violation of Article 2 was found have involved risks to life arising from the permitting of inherently hazardous activities[36] or in the management of natural disaster risks.[37] However, to a great extent, the Court has applied the same principles as those set out in Article 2 when examining cases involving environmental issues under Article 8.[38]

Environmental cases under Article 2 and Article 8 involve questions of law which necessitate the establishment of scientific facts. This is a process which may (depending on the circumstances of the case) be very different from traditional fact-finding.[39] D'Aspremont and Mbengue classify the questions which arise in international adjudication into three general types: (i) the establishment of the fact at the origin of the wrongful act, the availability of exception or the establishment of circumstances precluding wrongfulness; (ii) the establishment of the damage actually suffered by the victim; and (iii) the establishment of the causality between the wrongfulness and the damage.[40]As will be explained below, it is the applicant who bears the burden of proof with respect to most (but not all) of these questions. Moreover, the standards of proof applicable to the facts relating to each question are different, with the Court exercising flexibility in making certain assessments in order to treat the applicants fairly. However, such flexibility is not applied to all questions in respect of which the applicant bears the burden of proof, and thus it is important to bear in mind the distinct nature of the various determinations.

[33] H Keller, C Heri and R Piskóty, 'Something Ventured, Nothing Gained? Remedies Before the ECtHR and their Potential for Climate Change Cases' (2022) 22 HRLRev 1, 10–11; S Theil, *Towards the Environmental Minimum: Environmental Protection through Human Rights* (CUP 2021) 131.

[34] Concurring Opinion of Judge Serghides in *Pavlov and Others v Russia* (n 28) para 11.

[35] *Brincat and Others v Malta* App Nos 60908/11, 62110/11, 62129/11, 62312/11 and 62338/11 (ECtHR, 24 July 2014) para 82; *Kolyadenko and Others v Russia* App Nos 17423/05, 20534/05, 20678/05, 23263/05, 24283/05 and 35673/05 (ECtHR, 28 February 2012) para 151.

[36] eg *Öneryıldız v Turkey* App No 48939/99 (ECtHR, 30 November 2004).

[37] eg *Budayeva and Others v Russia* App Nos 15339/02, 21166/02, 20058/02, 11673/02 and 15343/02 (ECtHR, 20 March 2008).

[38] *Verein KlimaSeniorinnen Schweiz and Others* (n 13) para 538.

[39] Fact-finding in the 'traditional' sense is a process that seeks to uncover certainties or truths, whereas scientific fact-finding can also involve the uncovering of 'non-facts' or 'uncertainties'. This requires the Court to pay keen attention to methods of science and the limitations inherent to them. See J d'Aspremont and MM Mbengue, 'Strategies of Engagement with Scientific Fact-Finding in International Adjudication' (2014) 5(2) JIDS 240, 246.

[40] ibid 249–50.

III. BURDEN AND STANDARD OF PROOF IN ENVIRONMENTAL CASES

A. The Applicant's Burden

The applicant must provide proof of facts which demonstrate that there has been a *prima facie* breach of the Convention and that the applicant qualifies as a 'victim' for the purposes of admissibility.[41] While it has not been declared explicitly in the Court's jurisprudence, the applicant bears the burden of proving their allegations in relation to the merits of the case.[42] These include the applicability and breach of ECHR provisions as well as the causal link between such breach and the harm suffered by the applicant and quantifying such harm for the purpose of just satisfaction.[43]

In environmental cases, proof of each of these contentions may require the applicant to bring forth scientific evidence. This may include natural science evidence looking at interactions between different environmental components,[44] risk assessments demonstrating the nature and level of risks the applicant faces,[45] evidence concerning the State's risk assessment and management techniques,[46] evidence concerning standard practices and technological interventions,[47] and medical evidence connecting adverse impacts on the applicant's or the general population's life, health or well-being.[48] In practice, evidence which is relevant for assessing the applicant's victim status is usually also relevant in assessing their claims as to the applicability of the ECHR provisions.[49]

[41] M O'Boyle, 'Proof: European Court of Human Rights (ECtHR)' in HR Fabri and R Wolfrum (eds), *Max Planck Encyclopedia of International Procedural Law* (OUP 2019) para 28; the same is true in relation to facts alleged by the applicant demonstrating the necessity of an interim measures order, since the Court would not indicate measures if the case were *prima facie* inadmissible. On this, see E Reiter, *Preventing Irreparable Harm: Provisional Measures in International Human Rights Adjudication* (Intersentia 2010) 789.

[42] 'Burden of proving' here is being used in the same sense as 'burden of persuasion'; see JH Gerards and HCK Senden, 'The Structure of Fundamental Rights and the European Court of Human Rights' (2009) 7 ICON 619, 642–3; MB Dembour, 'Beyond Reasonable Doubt at its Worst – But Also at its Potential Best: Dissecting *Ireland v the United Kingdom*'s No-Torture Finding' (2023) 4 EurConvHumRtsLRev 375, 390.

[43] ECHR (n 18) art 41.

[44] See, eg, the original application form in *Duarte Agostinho and Others v Portugal*, Communicated Case App No 39371/20 (ECtHR, 13 November 2020) paras 14–20 <https://youth4climatejustice.org/wp-content/uploads/2020/12/Application-form-annex.pdf>; additional submission attached to original application form in *Verein Klimaseniorinnen Schweiz and Others v Switzerland*, Communicated Case App No 53600/20 (ECtHR, 17 March 2021) <https://klimaseniorinnen.ch/wp-content/uploads/2020/11/201126_Application_ECtHR_KlimaSeniorinnen_extract_anonymised-2.pdf>.

[45] *Hardy and Maile v UK* App No 31965/07 (ECtHR, 14 February 2012) paras 125–127.

[46] *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* (n 13) para 323.

[47] *Pavlov and Others v Russia* (n 28) paras 24–25.

[48] *López Ostra v Spain* App No 16798/90 (ECtHR, 9 December 1994) para 19; *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* (n 13) paras 532–534.

[49] In *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* ibid, para 459, the Court noted: '[G]iven the close link between victim status and the applicability of the relevant Convention provisions, whether the applicants have victim status in the present case will be

The standard of proof (ie how convincing the evidence needs to be for the applicant's burden of proof to be discharged) applied by the ECtHR is 'proof beyond a reasonable doubt'.[50] While seemingly stringent, the Court has indicated that this evidentiary standard must be understood as an autonomous one.[51] The strictness of this standard as it is usually applied in criminal prosecutions cannot be transposed to litigation before the ECtHR. The applicant cannot be expected to be in the same position as a prosecutor who has the benefit of findings from a formal investigative process which usually precedes the proceedings before the appropriate court. The difficulty posed by the stringency of this evidentiary standard can be tempered on the basis of principles attached to its application.[52] One such principle is that 'proof beyond reasonable doubt' can follow from the coexistence of *sufficiently* strong, clear and concordant inferences or similar unrebutted presumptions of fact.[53] The level of persuasion necessary for reaching a conclusion on such proof is also variable, and is intrinsically linked to the specificity of the facts, the nature of the allegation made and the ECHR right at stake.[54] This approach is exemplified in *Fadeyeva v Russia*,[55] a case where the applicant was aggrieved by air pollution. In this case, the applicant's medical record could not prove that air pollution levels at her residence were a causal factor for her specific health condition. However, the applicants' arguments were backed by expert evidence confirming the risks of increased adverse health conditions of persons residing near the polluting steel mill,[56] and findings that the pollution levels clearly exceeded the safe concentrations of toxic elements defined in Russian environmental legislation.[57] As Shelton explains, the Court found that:

> exceeding these limits produced a presumption of unsafe conditions potentially harmful to health and well-being. This presumption, together with the evidence submitted, led the court to conclude that the applicant's health deteriorated as a result of her prolonged exposure to the industrial emissions from the steel plant.[58]

The Court's approach in *Fadayeva* addresses an earlier critique of its jurisprudence on risk management: that the burden of proof on applicants was 'diabolical' since there was no accommodation of the unequal position of applicants compared to respondent States in terms of access to knowledge

examined together with the Court's assessment of the applicability of Articles 2 and 8 of the Convention' (citations omitted).

[50] *Fadeyeva v Russia* App No 55723/00 (ECtHR, 9 June 2005) para 79.

[51] See *Nachova v Bulgaria* (n 23) para 147; *Aghdgomelashvili and Japaridze v Georgia* App No 7224/11 (ECtHR, 8 October 2020) para 43, where the Court noted that 'it has never been its purpose to borrow the approach of the national legal systems that use [the] standard [of proof beyond reasonable doubt]'.

[52] Dembour (n 42) 393.

[53] This was espoused first in *Ireland v the United Kingdom* App No 5310/71 (ECtHR, 18 January 1978) para 161; and has been reiterated in several cases, including the environmental case *Fadeyeva v Russia* (n 50) para 79.

[54] *N.D. and N.T. v Spain* App Nos 8675/15 and 8697/15 (ECtHR, 13 February 2020) para 85.

[55] *Fadeyeva v Russia* (n 50).

[56] ibid, para 46.

[57] ibid, para 73.

[58] Shelton (n 6) 112.

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about adverse effects on health at the various stages of risk regulation by the State.[59] Instead of the applicant having to provide direct evidence for causation, the fact of a causal link between pollution and adverse effects to health could be presumed based on proof of exposure, along with certain pieces of evidence of a general nature (eg as to level of pollution in the relevant areas, and epidemiological evidence speaking to the link between the pollution and types of harms akin to those alleged to have been suffered by the applicant). Another way in which this asymmetry could pose a challenge for the applicant is when the State does not properly document environmental harms.[60] This problem has been addressed by the Court through its elaboration of the obligation on States to provide information to relevant populations about risks, derived from Articles 2 and 8 of the ECHR.[61]

Evidentiary difficulties experienced by applicants in environmental cases have a relationship with States' procedural obligations with respect to the environment under the Aarhus Convention concerning the collection and dissemination of environmental information.[62] Proper performance of these obligations may provide applicants with evidence to support their causality arguments.[63] More significantly, a failure to perform these procedural obligations, coupled with the materialization of environmental harm and the consequent interference with rights, would lead to the finding of a violation. In cases where the respondent State has acted in compliance with these obligations, the applicants would be able to rely on this information to prove causality in relation to interference with their rights, and the severity of the interference.

However, the flexibility shown by the Court in the face of the asymmetry in the parties' ability to adduce evidence stops short when it comes to proof of the cause of the applicants' injuries for the purpose of compensation or 'just satisfaction' which the Court has the power to award under Article 41 of the EHCR.[64] The Court has been inconsistent regarding the significance of applicants' exposure to unsafe levels of environmental pollution when awarding non-pecuniary damages.[65] Applicants who claim to have suffered

[59] L Seminara, 'Risk Regulation and the European Convention on Human Rights' (2017) 7(4) EJRR 733, 749.

[60] Theil (n 33) 166–7.

[61] *Guerra and Others v Italy* App No 14967/89 (ECtHR, 19 February 1998) para 60; *Taşkin and Others v Turkey* App No 46117/99 (ECtHR, 10 November 2004) para 119; *Giacomelli v Italy* App No 59909/00 (ECtHR, 2 November 2006) para 83; and *Tătar v Romania* App No 67021/01 (ECtHR, 27 January 2009) para 113.

[62] Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (adopted 25 June 1998, entered into force 30 October 2001) 2161 UNTS 447 (Aarhus Convention) art 5.

[63] Kobylarz (n 32) 112; C Hilson, 'Risk and the European Court of Human Rights: Towards a New Approach' (2009) 11 CYELS 353, 372.

[64] Keller, Heri and Piskóty (n 33) 21–2.

[65] For example, see *Cordella and Others v Italy* (n 28) paras 184–187 where the Court noted that the finding of a violation against the respondent State constituted sufficient reparation for non-pecuniary harm suffered by the applicant. There was no reasoning offered by the Court as to why compensation was denied to the applicants even though they were regarded as victims of breaches of

from exposure to environmental pollution have lost out on compensation awards despite having been successful in proving that the respondent State violated their rights.[66] This is presumably because of the very nature of scientific evidence which can be adduced in relation to such causality. While science is a highly authoritative method of understanding the factual realities of natural processes, the knowledge produced as a result of the scientific method is burdened with uncertainty.[67] This 'scientific uncertainty' runs deeper than a lack of precise knowledge at the relevant time[68] or contradictory expert opinions,[69] stemming from the framing of evidence in terms of 'probabilities' as opposed to absolute certainties. Thus far, the Court has only referred to 'probabilistic reasoning' in one case, *Tătar v Romania*.[70] It justified this approach by noting the problem of the plurality of potential causes, suggesting that in the absence of evidence on the issue, 'probabilistic reasoning' could be used where there was '*sufficient* and convincing statistical evidence' in situations of scientific uncertainty.[71] In the particular case, the Court found that a study by a local hospital documenting the increase in the number of respiratory tract diseases was not sufficient to establish a probabilistic causal link.[72] The *Tătar* judgment does not give any guidance on what statistical evidence would meet the threshold of sufficiency and demonstrate a causal link by way of probabilistic reasoning.

When it comes to evidence brought forth in support of compensation claims, the evaluation of its sufficiency occurs within a 'black box', which is to say that the Court processes the evidence in a clandestine manner, preventing the interested parties from knowing how it evaluates their claims. A standard of

substantive obligations. The *Cordella* case was decided after *Fadeyeva v Russia* (n 50) para 138, *Dubetska and Others v Ukraine* App No 30499/03 (ECtHR, 10 February 2011) para 165, and *Ledyayeva and Others v Russia* (n 28) para 113, where the Court awarded non-pecuniary damages based on the applicants' prolonged exposure to environmental pollution. The Court's lack of reasons for denying the applicants' claim for just satisfaction in *Cordella* is conspicuous, given that, as in the earlier cases, it concluded that the applicants were exposed to severe environmental pollution for a prolonged duration (para 173), and in those cases it held that the fact of exposure to high levels of pollution had sufficed to prove causation of harm.

[66] *Tătar v Romania* (n 61) paras 131–132; *Cordella and Others v Italy* ibid, para 187.

[67] K Sulyok, 'Science, Epistemology and Legitimacy in Environmental Disputes – The Epistemically Legitimate Judicial Argumentative Space' (2024) 37(1) LJIL 139, 143.

[68] For example, in *Vilnes and Others v Norway* App Nos 52806/09 and 22703/10 (ECtHR, 5 December 2013), the Court refused to award pecuniary damages due to the prevailing perceptions and lack of precise knowledge at the material time about the possible long-term effects.

[69] Sulyok (n 67) 143.

[70] *Tătar v Romania* (n 61) para 105.

[71] idem, unofficial translation of the original French (emphasis added): 'En l'absence d'éléments de preuve à cet égard, la Cour pourrait éventuellement se livrer à un raisonnement probabiliste, les pathologies modernes se caractérisant par la pluralité de leurs causes. Cela serait possible dans le cas d'une incertitude scientifique accompagnée d'éléments statistiques suffisants et convaincants.'

[72] ibid, para 106: 'The document produced by a hospital in Baia Mare attesting to a certain increase in the number of respiratory illnesses is not sufficient on its own to establish a causal probability. The Court therefore finds that the applicants have not succeeded in proving the existence of a sufficiently established causal link between exposure to certain doses of sodium cyanide and the worsening of asthma' (unofficial translation).

proof, by its very nature, cannot be defined so precisely that applicants can always know exactly which evidence they must present to cross the persuasive threshold. Guidance as to the requisite adequacy of evidence can only be gleaned from how the Court engages with evidence produced by the applicants in each individual case. Thus, a problem arises when the Court does not publicly engage with evidence that is of a scientific nature. For example, in some judgments the Court refers to the applicants' (lack of) proximity to the source of pollution as a decisive factor in determining the presence or absence of a causal link between pollution and the claimed effects on the applicants' health and well-being, rather than addressing the adequacy of the level of exposure.[73] This suggests that the submitted scientific evidence relating to duration of exposure and the relative impact on the applicant's health was assessed in the background (within internal deliberations), whilst the easily measured and evidenced geographical proximity of the source of pollution was publicly noted (in the judgment) as a proxy. As will be explained below,[74] the 'black box' problem is also encountered when the Court assesses scientific or technical evidence adduced by the respondent State when it seeks to justify the impugned conduct.

B. The Respondent's Burden

Once the applicant has demonstrated that there is a *prima facie* case of infringement of their right, the respondent State must seek to discharge its burden of proving to the Court that justificatory circumstances were present, by adducing evidence supporting the assertion.[75] This relates only to Article 8 cases, as Article 2 contains an absolute right which cannot be derogated from. Article 8, on the other hand, provides in its second paragraph that interference with the right may be justified if it is:

> in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.[76]

The respondent State must demonstrate that its conduct struck a fair balance between the competing interests involved.[77] However, the nature of the obligation that is at the heart of Article 2 environmental cases is similar to that in Article 8 environmental cases, ie the obligation is one of conduct

[73] Sulyok (n 67) 154. [74] See Section V. [75] Gerards and Senden (n 42) 643.
[76] ECHR (n 18) art 8(2).
[77] As was held in *López Ostra v Spain* (n 48) at para 51: 'In both contexts [of alleged violations of either negative or positive obligations] regard must be had to the fair balance that has to be struck between the competing interests of the individual and of the community as a whole, and in any case the State enjoys a certain margin of appreciation. Furthermore, even in relation to the positive obligations flowing from the first paragraph of Article 8 (art. 8-1), in striking the required balance the aims mentioned in the second paragraph (art. 8-2) may be of a certain relevance.'

rather than result. The respondent State need only demonstrate that it acted with due diligence, or, to be more specific, that it had 'put in place a legislative and administrative framework *designed* to provide effective deterrence against threats to the right to life'[78] and applied that framework 'effectively in practice'.[79] Thus the Court's assessment of the respondent's compliance with obligations under Article 2 appears similar to the assessment performed in Article 8 environmental cases, despite the absence of a justification clause attached to the former provision. The reason that the Court gives for this is that the relevant State conduct occurs within 'difficult social and technical spheres' where the respondent State enjoys a 'wide margin of appreciation'.[80]

Respondent States often submit scientific evidence to the Court when seeking to discharge their burden of proof in relation to the justifiability of the impugned conduct,[81] but they may also do so to refute the applicants' initial assertions. A State may adduce contrary scientific evidence to assert that its conduct posed/poses no risk of serious harm to the applicant[82] or (where the harms have materialized) that it could not have foreseen risks arising from its conduct at the given time.[83] As noted above, the Court has stated that in establishing the facts of the case, it will rely 'mainly, although not exclusively' on the findings of the national courts and other competent national authorities.[84] In situations where these findings are '*obviously* inconsistent or contradict each other', the Court will 'assess the evidence in its *entirety*'.[85] These propositions suggest that the Court takes a deferential attitude towards the substantive veracity of the findings of the national courts and authorities of the respondent State. The following section will critically analyse this deferential approach.

IV. JUDICIAL DEFERENCE TO NATIONAL DETERMINATIONS

In environmental cases, there are several types of findings of national courts and other competent authorities: determinations as to the existence or foreseeability of a significant risk to life, health or well-being of individuals or groups

[78] *Öneryıldız v Turkey* (n 36) para 89 (emphasis added).

[79] *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* (n 13) para 538(b).

[80] *Öneryıldız v Turkey* (n 36) para 107. In para 107 the Court explicitly refers to the margin of appreciation doctrine, notwithstanding that the doctrine is typically referenced in relation to arts 8–11. The reference to paras 100 and 101 of the case of *Hatton and Others v the United Kingdom* App No 36022/97 (ECtHR, 8 July 2003) confirms that the legal norms elaborated by the Court in art 8 cases involving risk management and environmental pollution are relevant for art 2 cases involving a similar subject matter. However, the margin of appreciation doctrine in this context seems to be applied in line with its 'structural' rather than 'substantive' concept. See G Letsas, 'Two Concepts of the Margin of Appreciation' (2006) 26(4) OJLS 705, for a critical analysis of 'margin of appreciation' and the two understandings in which the Court applies the doctrine.

[81] C Burke and A Molitorisová, '(Not) Proving the Public Good: Scientific Evidence and the Margin of Appreciation' (2019) 18 LPICT 240, 242.

[82] *L.C.B. v The United Kingdom* App No 23413/94 (ECtHR, 9 June 1998) para 32.

[83] *Kolyadenko and Others v Russia* (n 35) para 145.

[84] *Ledyayeva and Others v Russia* (n 28) para 90.

[85] ibid, para 90 (emphasis added).

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('risk-foreseeability determinations'); determinations as to the acceptability of an allocation of burdens arising from such risks across the population, ie striking a 'fair balance' of different competing interests ('fair-balance determinations'); and determinations as to the choice of measures for alleviating such risk or reducing the weight of the burdens placed upon certain individuals or populations ('determinations as to response measures').

It is not just the information (including scientific evidence) relied upon in making these determinations, but the determinations themselves which become part of the evidentiary basis for the purposes of adjudication. Each type of determination is related to the others. For example, a determination as to how the burdens arising from the risk in question will be shared across the population must be informed by how probable and how serious the risk is;[86] and the kinds of measures that the State may take to soften (potential) impacts on an individual or a group will depend how it has decided to balance the competing interests at stake. While each of these determinations ought to be based on the scientific knowledge that is available at the time,[87] they all contain subjective elements—thus requiring the Court to contend with them while allowing the authorities responsible for making such determinations some margin of appreciation. In relation to fair-balance determinations, the following quote from the judgment in *Fadayeva* clarifies the Court's approach:

> It remains open to the Court to conclude that there has been a *manifest error of appreciation* by the national authorities in striking a fair balance between the competing interests of different private actors in this sphere. However, the complexity of the issues involved with regard to environmental protection renders the Court's role primarily a subsidiary one. The Court must first examine whether the decision-making process was fair and such as to afford due respect to the interests safeguarded to the individual by Article 8 … and *only in exceptional circumstances may it go beyond this line* and revise the material conclusions of the domestic authorities.[88]

In relation to determinations as to response measures, the Court has consistently held that '[i]n cases involving environmental issues, the State must be allowed a

[86] *Hardy and Maile v UK* (n 45) para 220: 'A governmental decision-making process concerning complex issues of environmental and economic policy must in the first place involve appropriate investigations and studies so that the effects of activities that might damage the environment and infringe individuals' rights may be predicted and evaluated in advance and a fair balance may accordingly be struck between the various conflicting interests at stake.'

[87] This includes not only information from 'best available' external sources, for example the Intergovernmental Panel on Climate Change's assessment reports on climate change in climate cases (*Verein KlimaSeniorinnen Schweiz and Others v Switzerland* (n 13) paras 550, 552), but also knowledge that it is reasonable for the State to have obtained pursuant to its compliance with its positive obligation to be reasonably vigilant and assess risks. See V Stoyanova, *Positive Obligations under the European Convention on Human Rights: Within and Beyond Boundaries* (OUP 2023) 26–9, 211–13.

[88] *Fadeyeva v Russia* (n 50) para 105 (emphasis added).

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wide margin of appreciation and be left a choice between *different ways and means of meeting its obligations*'.[89]

Risk-foreseeability determinations are very different from the other two types of determinations identified above, since the scientific evidence on the basis of which such determinations are made often stands primarily on 'country non-specific grounds'.[90] To explain by way of example, the evidence that certain chemicals which create air pollution increase risks of respiratory illnesses for children is likely to be equally true for children in Luxembourg as it would be for children in Poland. Establishing that the national authority 'knew or *ought to have known*' that the activities in question in a case posed significant risks for the applicants is crucial for commencing the inquiry into its responsibility for violations of rights.[91] In the authors' view, authoritative findings by independent scientific institutions should play an important role when the Court is confronted with risk-foreseeability determinations by respondent States,[92] unless it is apparent that such determinations necessarily depend on country-specific factors. Thus, it is appropriate to exercise caution in reviewing determinations made by national authorities—nuancing their type rather than painting them all with a broad brushstroke of 'wide margin of appreciation' simply because they relate to the area of environmental protection or urban planning.

In the absence of domestic fact-finding suggesting that the State knew about the existence of significant risks, the Court has placed heavy reliance on scientific evidence concerning the existence, nature and significance of risks from sources like the United Nations Environmental Programme (UNEP) and the World Health Organization (WHO).[93] Furthermore, the Court has shown that it is capable of using scientific outputs of independent sources as a way to validate the risk-foreseeability determinations of national authorities on which the respondent State based their conduct.[94] Could it not, conversely, also use external evidentiary sources as a way to scrutinize State conduct? It is conceivable that in the process of arriving at risk-foreseeability determinations, risks evidenced by sound science are downplayed in light of economic considerations.[95] Rather than showing deference to national authorities' risk-foreseeability determinations, it is arguable that the Court should be willing, in appropriate cases, to engage in an exercise that verifies their scientific basis.

[89] *Dubetska and Others v Ukraine* (n 65) para 141 (emphasis added).
[90] Expression borrowed from Burke and Molitorisová (n 81) 248.
[91] *Brincat and Others v Malta* (n 35) paras 105–106 (emphasis added).
[92] Here, it is worth noting that there may be cases where there is no evidence on the issue of whether the respondent State even considered making a risk-foreseeability determination before allowing certain activities. In such cases, the conduct could be presumptively regarded as the State having made a 'risk-foreseeability' determination that there were no significant risks from the activities in question.
[93] eg in *Tătar v Romania* (n 61) paras 9, 25, 31, 32, 66, 91, 104.
[94] As was the case in *Fägerskiöld v Sweden* App No 37664/04 (ECtHR, 26 February 2008).
[95] Shelton (n 6) 112.

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Another aspect worth examining is the Court's approach regarding fair-balance determinations and the State's choice of response measures, where the difference of views between the applicant and respondent pertains to interpretations of the evidence, as occurred in *Hatton and Others v the United Kingdom*.[96] The applicants challenged the United Kingdom's (UK) handling of noise pollution from night flights at Heathrow airport. The UK's solution—the '1993 Scheme'—limited aircraft movements during the 'night' (defined as the period between 23.00 and 07.00) and imposed stricter limitations on this airport within the 'night quota period' between 23.30 and 06.00. Aircraft were rated for noisiness, with units defined as quota counts (QCs): 0.5 QCs for the quietest aircraft and 16 QCs for the noisiest.[97] During the night period, aircraft rated 8–16 QCs were not allowed to take off, and aircraft rated at 16 QCs were not allowed to land.[98] The scheme did not track the types of aircraft operating during the night quota period, but rather, airports were allotted a noise quota which they could not exceed. The system was designed to encourage airports to lower the frequency of movements of aircraft with higher QCs and increase the frequency of aircraft with lower QCs.[99]

The parties disagreed about whether the 1993 regime actually led to a deterioration of the noise climate at night in light of new findings made in 1998.[100] These findings were contained in a periodic review of the scheme, and suggested that 'the noise climate around Heathrow *may have improved* during the night quota period, but *probably deteriorated* over the full night period'.[101] The deterioration was attributed to the increase in traffic between 06.00 and 07.00, ie, outside the night quota period.[102] Whether or not it could be concluded that the applicants' sleep quality was detrimentally affected depended on an interpretation of the evidence, ie whether the improvement in noise climate between 23.30 and 06.00 was more salient than the overall deterioration between 23.00 and 07.00. In response to the disagreement, the Court laconically held that it was 'not able to make any firm findings on this point'.[103]

The Court dismissed the disagreement between the parties as to the implications of the new evidence on impacts of the 1993 Scheme on the noise climate as irrelevant to the analysis under Article 8 of the ECHR. Without resolving the disputed issue, the Court proceeded to conclude that that there was 'no indication that the authorities' decision to introduce a regime based on the quota count system was as such incompatible with Article 8'.[104] Had the Court made a finding on the disagreement in favour of the applicants, it would have heightened the burden on the UK government to prove that the balance it struck between competing interests was based on

[96] *Hatton and Others v the United Kingdom* (n 80). [97] ibid, para 44.
[98] ibid, para 45. [99] ibid, para 44. [100] ibid, para 124. [101] ibid. [102] ibid, para 61.
[103] ibid, para 124. [104] ibid.

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due consideration of the latest information on noise climate deterioration. Resolving the disagreement appears to have been crucial in order to conclude upon the non-arbitrariness of the noise quota system, considering that residents near Heathrow regarded their sleep quality between 06.00 to 07.00 to be just as important to their health as their sleep quality between 23.30 and 06.00.[105] Even assuming that this lapse by the Court did not affect the final finding that there was no violation of Article 8 by the UK, the legitimacy of the judgment would have been enhanced had the Court employed its investigative powers to resolve the disagreement between the parties instead of holding that it was 'unable' to take a side.

V. SCIENCE-BASED REASONING: WHERE LEGITIMACY HANGS IN THE BALANCE

When the national authorities have made findings of fact that fail to capture the reality of the applicants' situation or the respondents' conduct, the Court becomes responsible for conducting its own assessment of the risks that the applicants had been subjected to and the adequacy of the respondent State's actions to protect them from those risks. This can be seen in the judgment in *Pavlov and Others v Russia*.[106] The ECtHR found that the domestic court had limited itself to merely establishing that the relevant authorities had taken some measures to address the pollution, 'without addressing a central issue in the proceedings of whether those measures were in fact effective and capable of remedying the adverse consequences of industrial pollution for the applicants'.[107] The judgment continued:

> The Court reiterates that it is mindful of its subsidiary role in deciding what is necessary for achieving one of the aims mentioned in Article 8 § 2 of the Convention …, however in the present case … it appears that it cannot benefit from a prior assessment by the national courts of the balancing of the competing interests at stake and *therefore will proceed to such an assessment on its own*, taking account of the information available to the domestic court at the material time and all subsequent developments.[108]

The conclusion reached by the Court was that while the respondent acted with due diligence to address the environmental pollution from 2014 onwards, the same could not be said with respect to the period between 1999 and 2014. The assessment which preceded the Court's conclusion on the insufficiency of the measures taken by the authorities[109] was based on scientific evidence and inferences of a sociological nature. The scientific evidence consisted of findings in the environmental reports prepared by the State authority that

[105] It is worth highlighting that earlier in the judgment, the Court noted: 'Each of the applicants has described the way in which he or she was affected by the changes brought about by the 1993 Scheme at the relevant time and the Court sees no reason to doubt the sincerity of their submissions in this respect' (citation omitted); ibid, para 118. [106] *Pavlov and Others v Russia* (n 28).
[107] ibid, para 85. [108] ibid, para 86 (emphasis added). [109] ibid, para 87.

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there were high levels of air and water pollution in the area, which were attributable in large part to local industrial polluters and the use of 'outdated' technology.[110] The latter finding is perhaps more interesting. The Court pointed to documentation on penalties imposed on polluting industries on the one hand, and the lack of improvement in the environmental conditions in the area on the other. It also argued that the quantum of the penalties was 'rather small' relative to the level of pollution in the area,[111] and more severe sanctions like suspensions of operations and closures were not routinely imposed.[112] Taken together, the Court arrived at the inference that the penalties were insufficient to produce the desired result (of requiring the polluters to take remedial measures).[113]

From the text of the judgment, it is unclear where the Court's 'own assessment' of the evidence began and ended, given that the relevant parts of the judgment only made references to the evaluations made by the State authority in its own environmental reports. In regard to the finding that the State conduct before 2014 was insufficient for the purposes of protecting the applicants' right under Article 8, the Court only cited evidence concerning the period before 2008 rather than 2014. The majority's failure to explain the insufficiency of measures taken by the respondent before 2014 was met with criticism by Judge Lobov, who argued in his dissenting opinion that the Court '[turned] an obligation of means into an obligation of result'.[114]

Whilst *Pavlov* is a relatively exceptional environmental judgment given its high level of scrutiny in the assessment of regulatory responses to pollution, it is also symptomatic of the Court's difficulty with providing cogent science-based reasoning on the insufficiency or inadequacy of State responses to environmental problems. There are also other examples of this which are worth highlighting. In *Di Sarno and Others v Italy*,[115] the Court held, based on the environmental pollution in the municipality of Somma Vesuviana between the end of 2007 and May 2008, that:

> [I]n spite of the margin of appreciation left to the respondent state, *there is no denying that the protracted inability* of the Italian authorities to ensure the proper functioning of the waste collection, treatment and disposal service adversely affected the applicants' right to respect for their homes and their private life, in violation of Article 8 of the Convention in its substantive aspect.[116]

[110] ibid, para 24.

[111] The Court provided no explanation of this assessment. It instead referenced para 11 of the judgment, in which it noted the fact that in total, fines of €9,600 for 171 violations of air pollution regulations and €130 for 25 violations regarding water pollution regulations had been imposed by the national authority between 1998 and 2008. Para 11 also mentions the finding by a district court that on average €1.8 million is allocated every year from the regional budget for the implementation of regional environmental protection programmes; ibid, paras 11, 87.

[112] ibid, para 87.

[113] ibid.

[114] Dissenting opinion of Judge Lobov in *Pavlov and Others v Russia* (n 28) para 18.

[115] *Di Sarno and Others v Italy* App No 30765/08 (ECtHR, 10 January 2012).

[116] ibid, para 112 (emphasis added).

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This judgment also showed no evidence of the Court attempting to scrutinize the domestic legal and administrative framework, or the specific measures taken thereunder, to expose the State's ineffectual mitigation of the 'waste crisis'.

A similar approach can be seen in the Court's *KlimaSeniorinnen* judgment. Here, the Court regarded Switzerland's failure to meet its greenhouse gas emissions reduction target of 20 per cent (compared to the level in 1990) by 2020[117] as one of the dispositive reasons[118] for its conclusion that Switzerland breached its obligation under Article 8 to adopt and 'effectively apply' regulations and measures for the mitigation of climate change.[119] The judgment does not reflect on Switzerland's argument that it had taken several measures prior to 2020 which it believed 'should have enabled' it to meet the 2020 target.[120] There was no explanation as to why these measures were not in line with due diligence.

Judgments such as these give the impression that the Court regards the persistence of unabated environmental pollution over long periods as a proxy for a lack of diligence in the respondent's response to the problem. The use of a proxy-based approach to reasoning as opposed to elaboration on cause and effect (between the respondent's identifiable acts or omissions and corresponding positive or negative impacts on the environment, or lack thereof) has several drawbacks.[121] This article does not intend to reappraise the conclusions reached by the Court in environmental cases, but, rather, seeks to expose this lacuna in the Court's reasoning ability. In order to ensure that their judgments enjoy epistemic legitimacy, courts have to reflect in their decisions on scientific evidence and the conclusions that have been drawn from it,[122] rather than concealing the assessment of such evidence within the 'black box' or, indeed, failing to engage with it at all. Given the nature of the obligation at the heart of these cases, the use of scientific rationality as the epistemic underpinning of their reasoning would be the correct approach.

VI. LEGITIMACY THROUGH EPISTEMIC RESPONSIBILITY

International courts and tribunals may take a range of approaches when dealing with scientific evidence, which d'Aspremont and Mbengue have classified into

[117] *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* (n 13) para 559.

[118] The other being the existence of 'critical lacunae' in the adoption of climate legislation, such as: (a) the legislation's failure to reflect the more ambitious emissions reduction target (25–40 per cent by 2020) (para 558); (b) leaving emissions in the medium and long term unregulated through the use of targets (paras 561, 562); (c) leaving concrete measures to meet targets undetermined (paras 566, 567); and (d) failing to attempt a quantification of Switzerland's carbon budget (paras 570, 572); ibid.

[119] ibid, para 572.

[120] ibid, paras 86, 87.

[121] See K Sulyok, 'Managing Uncertain Causation in Toxic Exposure Cases: Lessons for the European Court of Human Rights from U.S. Toxic Tort Litigation' (2017) 18 VtJEnvtlL 519, 548–9, who argues that such a use of proxies in avoidance of complex causal inquiries and evidentiary assessments renders the Court's decision-making unpredictable and incurs risks of decisions in environmental cases 'being over- or under-inclusive'.

[122] Sulyok (n 12) 160–3.

four schools: the 'nihilist' school;[123] the 'protectionist' school;[124] the 'adversarial' school;[125] and the 'outsourcing school'.[126] Thus far, this article has avoided pigeonholing the ECtHR into a particular school in relation to scientific evidence. Unlike the International Court of Justice (ICJ) or the Dispute Settlement Body of the World Trade Organization (WTO-DSB), the Court typically hears cases brought by individuals against a State, after having had recourse to domestic remedies. This has led the Court to adopt a peculiar modified adversarial approach.[127]

This approach comes with certain disadvantages for applicants considering their asymmetrical position in comparison to the respondent State with regard to their ability to produce relevant evidence. The Court's method of accommodating this asymmetry and ensuring fairness in its procedure has been to increase the flexibility of the evidentiary rules relating to the applicant. The Court can thus conclude that the applicant's claims have been proven beyond reasonable doubt despite the absence of direct evidence on the basis of the coexistence of sufficiently strong, clear and concordant inferences or of similar unrebutted presumptions of fact. The process that the Court will use to arrive at an evaluation of 'sufficiency' in this regard is unknown to the parties to the case and to observers. Clearly, the Court needs to consider scientific facts given that the material that applicants typically submit to the Court, aside from evidence which has been generated through the respondent States' compliance with procedural obligations and domestic court proceedings, is largely comprised of abstract scientific material. Concerning the respondent's burden of proof, the Court has shown 'epistemic deference' towards certain determinations made by national authorities which are or ought to have been based on non-country specific scientific evidence,[128] and it is argued above that it would be reasonable to review such determinations by having recourse to independent sources of evidence, for instance, from international bodies like the WHO and UNEP.

[123] Which rests on the idea that questions involving scientific fact-finding are simply non-justiciable. D'Aspremont and Mbengue (n 39) 251.

[124] Which recognizes international tribunals as triers of scientific facts, but (rather arbitrarily) does not engage with scientific argumentation. Such tribunals '[stifle] scientific issues by hiding behind legal reasoning and using legal rationality to shield itself from scientific controversies'. ibid 252.

[125] Under which the court regards the parties as the masters of the evidence and considers itself as having a passive role. D'Aspremont and Mbengue note that 'such an adversarial attitude has not gained ground in international adjudicative practice'. ibid 256–7.

[126] International adjudicative bodies which fall under this school make use of scientific knowledge by 'calling upon experts to produce scientific findings geared towards the establishment of the facts necessary to solve the dispute'. This school is based on the idea that judges must exercise 'epistemic deference' to scientific experts since they lack the expertise to deal with the scientific questions at stake. ibid 257–62.

[127] However, with a tendency of epistemic deference towards scientific findings and technical evaluations made by the respondent State.

[128] See Section IV.

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A common thread that runs through the analysis presented in this article is that the Court's current approach towards the assessment of scientific evidence is not ideal, and there are concerns regarding what it makes of certain evidence and how it translates its assessment of such evidence into cogent reasoning in its judgments. Explaining failures on the part of State authorities to act in a diligent manner may, especially in environmental cases, require well-articulated reflections on scientific evidence. It would thus be a clear advantage for the Court to step into the 'outsourcing' school of approaching scientific evidence and rely on its power to consult independent scientific experts, which could help to elucidate the science and enable the Court to engage directly with it in reaching a decision, and openly describe their assessment of the evidence in the judgment.

VII. OPERATIONALIZING THE COURT'S POWER UNDER RULE A1

The Court has the inherent power to seek assistance in carrying out its tasks by hearing experts. This power is codified in Rule A1 of the Annex to the Rules of the Court concerning investigations. The provision is agnostic as to the specific tasks for which expert assistance may be used. The authors suggest that assistance with scientific fact-finding would be the optimal use for this power by the Court. For instance, where there is disagreement between the parties on matters of science the Court could be apprised by experts of the methodology underlying the collection of information and its evaluation by the authorities of the respondent State, and advised on the relevant scientific concepts which must be understood in order to interpret the content of environment-related obligations properly. The ambiguity created by the recent *KlimaSeniorinnen* judgment's discussion of 'net neutrality'[129] is a stark reminder of why it is important that the Court understands and elaborates upon the meaning of popular climate science concepts when referencing them.[130] More broadly, however, the exercise of this power may have a more subtle yet significant function, assisting the Court to produce judgments with enhanced epistemic legitimacy.

Typically, Rule A1 has been invoked by the Court in cases where there is a paucity of evidence or lack of clarity in the factual matrix of a case as

[129] *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* (n 13) para 548.

[130] C Hilson and O Geden, 'Climate or Carbon Neutrality? Which One Must States Aim for under Article 8 ECHR?' (*EJIL:Talk!*, 29 April 2024) <https://www.ejiltalk.org/climate-or-carbon-neutrality-which-one-must-states-aim-for-under-article-8-echr/>; cf Switzerland's implementation plan submitted ahead of the December 2024 meeting of the CoE Committee of Ministers. The document argues that Switzerland's mitigation measures are in compliance with the judgment, in part, in light of the net zero greenhouse gas emissions target, but contains no information on its plans to achieve net zero carbon dioxide emissions; Swiss Federal Office of Justice, 'Communication de la Suisse concernant l'affaire Verein KlimaSeniorinnen Schweiz et autres c. Suisse (requête n° 53600/20)' (CoE, 8 October 2024) 10 <https://rm.coe.int/0900001680b1ddd9>.

constructed based on the parties' submissions, including the evidence that they have adduced. The power has been used more frequently to conduct fact-finding missions and witness-hearings than to commission or hold consultations with scientific or technical experts.[131] As to the discretionary nature of this power, Judge Gyulumyan argued in her dissenting opinion in *Chiragov v Russia* that:

> [w]here the facts cannot be established on the basis of the parties' written submissions, the right of the Court to initiate a fact-finding mission turns into a legal obligation to do so in order to be in line with its obligations under the Convention.[132]

While this refers to 'fact-finding missions', the argument can be extended to expert consultations as well.[133] In line with this view, it would be inconsistent with the ECHR for the Court to adopt a nihilist or purely adversarial approach[134] when confronted with difficulties understanding or resolving contestations between parties concerning scientific evidence. Admittedly, not all situations where it might be advantageous to consult scientific experts can be characterized as ones where the Court is obligated to seek such assistance. However, the legitimacy-enhancing function of expert consultations in the Court's adjudication of environmental cases serves as a strong argument in favour of utilizing this power.

The authors are aware that actively harnessing the potential of the Rule A1 power may be controversial.[135] One may question what makes an independent expert 'independent', and an 'expert'. Questions such as this have been major stumbling blocks, for instance, in the debate about the safety of nuclear power, with experts disagreeing with each other and claiming that others' views are based on politics rather than science.[136] Moreover, experience in other international tribunals demonstrates the considerable difficulty a court faces in selecting its own independent experts.[137] However, these concerns should

[131] Leach, Paraskeva and Uzelac (n 27) 42–3.

[132] Dissenting opinion of Judge Gyulumyan in *Chiragov v Russia* App No 13216/05 (ECtHR, 16 June 2015) paras 43, 45.

[133] The Court's sensitivity to an obligation to establish the facts by resorting to its power to consult experts can be evidenced by the case of *W.A. and Others v Italy* App No 18787/17 (ECtHR, 16 November 2023). This was an expulsion case where Italy claimed that the applicants could not have been expelled from Italy since they had never been in Italy. The Court appointed an expert in facial comparison to ascertain whether the photographic identification (of expelled Sudanese nationals) provided by the Italian government corresponded to photographic and video evidence adduced by the applicants.

[134] See Section VI.

[135] As Flett writes from his experience with judicial institutions which liberally seek assistance from experts, 'in the real world, experts are mercurial, in the sense that it is often very difficult or even impossible to contain them within the conceptual box that we might thus define for them'. In light of this reality, however, the authors echo his advice to adjudicators that they 'should retain full control of the agenda-setting function in the court room when it comes to experts, so that they remain harnessed to fulfilling the court's objectives, rather than the interests of specific litigants'; J Flett, 'When is an Expert not an Expert?' (2018) 9 JIDS 352, 360.

[136] D Bodansky, 'The Legitimacy of International Governance: A Coming Challenge for International Environmental Law?' (1999) 93 AJIL 596, 620.

[137] Foster (n 6) 171.

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invite further discussion on refining the process of identifying independent experts and delimiting their role under the Rule A1 procedure, rather than avoiding recourse to expert assistance. For example, valuable insights may be gained from the experience of the WTO-DSB into how to ensure procedural legitimacy in the appointment of scientific experts.[138] This discourse is important for the ECtHR, given the unavoidability of involving experts in legal issues before the Court,[139] and the prevalence of evidence from party-appointed experts and evidence generated at the local level by national authorities of the respondent State. The selection of appropriate institutions or individual experts fit for the purpose of assisting the Court will vary with each case, but, as a minimum, standards of procedural fairness under Article 6 of the ECHR should inform the Court's exercise of the Rule A1 power.[140]

An important pragmatic consideration in the exercise of the Rule A1 power by the Court is that of costs. The CoE would have to bear the cost of paying experts consulted by the Court *proprio motu*.[141] It has been noted that financial considerations have motivated the Court to replace fact-finding missions with strategies like reversals in burden of proof and reliance on other readily available evidence from international organizations.[142] As this article has demonstrated, such adjustments to evidentiary rules may only amount to a half-measure in the face of the problems posed by complex scientific evidence in environmental cases. It is difficult to determine whether the financial costs of appointing scientific experts are comparable to commissioning a fact-finding mission and would create similar difficulties. Not all who are familiar with the workings of the Court share the concern that frequent reliance on the Rule A1 power to consult experts would be too expensive to justify.[143] In any event, a cost–benefit assessment of commissioning independent scientific experts to assist the Court may reveal that the investment is worth it in terms of the increase in legitimacy. It is not

[138] ibid, 172.

[139] ibid, 182.

[140] The parties to the case must be able to comment effectively on expert inputs, which are 'likely to have a preponderant influence' on the Court's fact-finding. See *Mantovanelli v France* App No 21497/93 (ECtHR, 18 March 1997) para 36. On the legitimacy of use by the ICJ and International Tribunal on the Law of the Sea of 'unseen' experts, ie the practice of consulting experts without the knowledge of the parties to the case, see G Goss, 'Unseen Actors as Unseen Experts' in F Baetens (ed), *Legitimacy of Unseen Actors in International Adjudication* (CUP 2019) 347–70.

[141] With respect to summons to appear before the Court, if the expert was summoned by the Court on behalf of or at the request of the Contracting party, the costs would have to be borne by the Contracting party. However, in other cases where experts are summoned, the Court is required to decide whether the costs are to be borne by the CoE or awarded against the applicant or third party at whose request or on whose behalf the expert appears; CoE (n 17) Annex to the Rules (concerning investigations) Rule A5(6); L Zwaak, 'The Procedure before the European Court of Human Rights' in P van Djik et al (eds), *Theory and Practice of the European Convention of Human Rights* (4th edn, Intersentia 2006) 220.

[142] C Heri, 'Evidence: European Court of Human Rights (ECtHR)' in Fabri and Wolfrum (n 41) para 68.

[143] See the presentation of interview responses of judges and lawyers at the Court in Leach, Paraskeva and Uzelac (n 27) 51.

possible to demonstrate empirically whether such gains in the normative legitimacy of the ECtHR would translate into social legitimacy,[144] but there are scholars who suggest that they would.[145]

A final point worth mentioning is the role played by *amici curiae* in relation to scientific fact-finding.[146] International rights-based litigation has witnessed a rise in interventions by non-governmental organizations (NGOs) and research organizations by means of *amicus* briefs (and oral presentations) meant to facilitate the work of international judges.[147] This is exemplified by the *KlimaSeniorinnen* case, where the Court granted leave to intervene to the highest number of third parties in a case to date.[148] While it is not evident from the *KlimaSeniorinnen* judgment that any of these interventions were relied upon or consequential for the Court's findings, some *amicus curiae* interventions have meaningfully directed the Court's attention to legal arguments and factual information not introduced to it by the parties to the case.[149] However, opinions of *amici curiae* cannot be equated with those of experts.[150] While experts are required to be non-partisan, the same cannot necessarily be said of

[144] The assessment of social legitimacy is an empirically grounded exercise which observes the actual behaviour of relevant actors vis-à-vis the institution or captures their normative expectations and how they assess whether their expectations are met. Normative standards of legitimacy, on the other hand, focus on aspects like legality, procedural propriety, internal and systemic coherence of the institution's outputs and so on. See B Çalı, A Koch and N Bruch, 'The Legitimacy of Human Rights Courts: A Grounded Interpretivist Analysis of the European Court of Human Rights' (2013) 35(4) HumRtsQ 955.

[145] See, eg, Çalı, Koch and Bruch's view on the relationship between social and normative legitimacy: that 'normative standards of legitimacy are relevant for the social-scientific analysis of legitimacy to the extent that these standards are socially embedded or appropriated'; ibid 960.

[146] The provisions governing intervention by *amicus curiae* before the ECtHR are art 36(2) of the ECHR (n 18) and Rule 44 of the CoE's (n 17) Rules of the Court. *Amicus curiae* interventions fall under the category of 'third-party interventions' before the Court, and can be defined as interventions by entities whose 'interest in intervening normally lies in the opportunity to provide submissions which may assist the Court, and thus to further the "interest[s] of the proper administration of justice"'. See in detail N Bürli, *Third-Party Interventions Before the European Court of Human Rights* (Intersentia 2018). See ECtHR, 'Practice Directions: Third-party Intervention under Article 36 § 2 of the Convention or under Article 3, Second Sentence, of Protocol No. 16' (13 March 2023) para 10 <https://www.echr.coe.int/documents/d/echr/pd_third_party_intervention_eng-pdf>.

[147] L Van den Eynde, 'An Empirical Look at the Amicus Curiae Practice of Human Rights NGOs before the European Court of Human Rights' (2013) 31(3) NQHR 271, 279–80; F Novak, 'Amicus Curiae: Inter-American Court of Human Rights (IACtHR)' in Fabri and Wolfrum (n 41) paras 18–21, 41–42; D Shelton, 'The Participation of Nongovernmental Organizations in International Judicial Proceedings' (1994) 88(4) AJIL 611; A Mohamed, 'Individual and NGO Participation in Human Rights Litigation before the African Court of Human and Peoples' Rights: Lessons from the European and Inter-American Courts of Human Rights' (1999) 43 JAfrL 201, 204–211.

[148] Leave to make written interventions was granted to 11 non-governmental entities and 8 State parties to the ECHR. Owing to the 'exceptional' nature of the case, two interveners, the European Network of National Human Rights Institutions and the Government of Ireland, were granted leave to take part in the oral hearings pursuant to Rule 44(3)(a) of the CoE's (n 17) Rules of the Court; *Verein KlimaSeniorinnen Schweiz and Others v Switzerland* (n 13) paras 6–7.

[149] See examples cited in fns 128 and 37 on pp 361 and 443, respectively, in A Wiik, *Amicus Curiae before International Courts and Tribunals* (Nomos 2018).

[150] Novak (n 147) para 38.

amici curiae, although they are required to be as independent and impartial as possible, and cannot express direct support for either party.[151] Although *amici curiae* can add value to the fact-finding process, the robust selection procedure for experts lends significant probative value to their input.[152]

VIII. CONCLUSION

This article has highlighted several different issues which can be described as symptoms of the deeper problem that the ECtHR has when it is confronted with scientific evidence, namely, its inability to understand, engage with and evaluate such evidence properly. These include problems in the Court's reasoning ability when it tries to account for the asymmetry in the applicant and respondent's respective abilities to adduce relevant scientific evidence, its questionable deference to determinations by national authorities in the respondent State, and its apparent inability to elaborate elements of due diligence and/or the shortcomings in the respondent's conduct based on analyses of evidence.

The article suggests that the ECtHR should seek to engage more robustly with scientific evidence, particularly in environmental cases which involve technical questions of science at almost every stage of proceedings, in order to avoid further damage to its perceived legitimacy. One way in which the ECtHR could do this would be to make liberal use of its power to seek assistance from independent scientific experts. The Court has been described as an underrated forum for environmental litigation,[153] and, criticism notwithstanding, its environmental jurisprudence will continue to grow as new cases are brought before it. Now more than ever, it must be explored not whether, but how the Court can improve its handling of scientific evidence in environmental cases, and the potential solution suggested in this article of operationalizing its power under Rule A1 to seek assistance from independent scientific experts warrants serious consideration by the Court.

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[151] Wiik (n 149) 130. However, see ECtHR (n 146) para 2, which notes: 'The role of third parties invited or granted leave to intervene under Article 36 § 2 of the Convention is to put before the Court, *as impartially and objectively as possible*, legal or factual points capable of assisting it in resolving the matters in dispute before it on a more enlightened basis. In consequence, third parties are not entitled to express support directly for one or the other party, make requests as regards the procedures before the Court, seek a remedy from the Court, participate in friendly-settlement negotiations between the parties, or seek the relinquishment or referral of a case to the Grand Chamber' (emphasis added). [152] Foster (n 15) 452. [153] Kobylarz (n 32).