

PRELIMINARY NOTE TO THE INTER-AMERICAN COURT OF HUMAN RIGHTS
regarding
***Amicus Curiae* Submission on the**
Request for an Advisory Opinion on the Climate Emergency and Human Rights

The following submission is 43 pages in length excluding signatures.
The **footnotes account for more than half** of this length and include links to ensure the Court can easily access **all** the source materials.

Additionally, there are approximately 200 pages of **Annexes** to ensure the Court can easily access to the **key** source materials.

In consideration of the environment, for **printing purposes**,
the **submission** and **Annex A** contain all the key information. The **Annexes** only should only be printed as needed.

If the Court would like copies of any of the source materials relied upon in this submission or further information regarding the qualifications of many of the cited scientific experts, this be provided upon request. In-person testimony by experts can also arranged.

In the
INTER-AMERICAN COURT OF HUMAN RIGHTS
Request for an Advisory Opinion on the Climate Emergency and Human Rights
Submitted by the Republic of Colombia and the Republic of Chile

***Amicus Curiae* Submission**

11 December 2023

Presented by:



Our Children's Trust
Oregon, United States



University Network for Human
Rights
Connecticut, United States



Centro Mexicano para la
Defensa del Medio
Ambiente, A.C.
Baja California, Mexico

WITH THE SUPPORT OF

Youth, Youth Organizations, and Supporters

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Section IV, V and VI and Annex C on child health and climate change are submitted with the support of the 18 pediatric associations representing over 1 million medical professionals in over 120 countries across the globe

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Indigenous Healers, our Relatives in the Web of Life, our Youth Partners, our Children,
and all Future Generations

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On behalf of the presenters

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**Request for an Advisory Opinion
on the Climate Emergency and Human Rights
Submitted by the Republic of Colombia and the Republic of Chile**

Amicus Curiae Submission

“The choices and actions implemented in this decade will have impacts now and for
thousands of years (high confidence).”

— *Intergovernmental Panel on Climate Change, 2023*¹

“Like youth who have come before us in the civil rights movement and other social
justice movements, it is often the young among us that shine the light on systems
of injustice.”²

— Aji Piper, Youth Plaintiff, *Juliana v. U.S.*

I. Introduction

1. On January 9, 2023, the Republic of Colombia and the Republic of Chile (“Petitioners”) submitted a Request for an Advisory Opinion on the Climate Emergency and Human Rights (“Request”) to the Inter-American Court of Human Rights (“Inter-American Court” or “Court”).
2. In their Request, Petitioners asked the Court to clarify the scope of States’ obligations to respond to the climate emergency in accordance with international human rights law, in light of the emergency’s effects on human life, survival, and the development of present and future generations.
3. **Twenty-one young people and youth-led organizations** are the lead supporters of the *Amicus* submission. They are supported by **18 pediatric associations** representing over one million medical professionals from more than 120 countries across the globe. This *Amicus* is presented to the Court by Our Children’s Trust, the University Network for Human Rights, and Centro Mexicano para la Defensa del Medio Ambiente A.C.— human rights organizations with expertise in access to justice for youth who are harmed by the climate emergency and/or the Inter-American system of human rights.
4. The **purpose** of this submission is to highlight the special obligations States should carry out pursuant (i) to their duties set forth in the American Convention on Human Rights (“American Convention” or “Convention”) to effectively protect fundamental

¹ IPCC, 2023: *Summary for policymakers*. In: Climate change 2023: Synthesis report, at 24 (2023) https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf.

² Statement of Aji Piper, Youth Plaintiff, *Juliana v. U.S.*, Hearing, *Generation Climate: Young leaders urge climate action now* before the U.S. House of Representatives, Select Committee on the Climate Crisis, 1-76 at 14 (Apr. 4, 2019) <https://www.govinfo.gov/content/pkg/CHRG-116hhrg36812/pdf/CHRG-116hhrg36812.pdf>.

rights in the context of climate change with a focus on children's rights; and (ii) the **most protective and emerging jurisprudence** together with the **best available scientific and medical evidence**.

5. The importance of the **dual analysis of law and science** cannot be overstated. Courts have borne witness to many moments in legal history when questionable scientific evidence has contaminated legal processes and seriously harmed the innocent. As this submission **will make clear**, judicial guidance grounded in the non-science-based climate targets would harm billions,³ prevent the full and free exercise of Convention rights, and nullify the timeless principle that for every wrong there is an effective remedy. Simply put, in the context of the climate emergency, **law and science the inseparable bookends** of climate rights, obligations, redress, and justice.
6. In examining the law and science, this submission seeks to assist the Court in answering a **subset** of Petitioners' questions, namely:

Question IV(A)(1): What is the scope of the duty of States to **prevent** climate phenomena generated by global warming, including extreme events and slow onset events, in accordance with Inter-American treaty obligations in light of the Paris Agreement and the scientific consensus that encourages not to increase global temperature beyond 1.5°C?

Question IV(A)(2): What measures should States take to **minimize** the impact of the damages caused by the climate emergency, in light of the obligations established in the American Convention? In this regard, what differentiated measures should be taken with respect to populations in situations of vulnerability or intersectional considerations?

Question IV(A)(2)(2.A): What considerations should a State take to **implement** its obligation to (i) regulate; (ii) monitor and oversee; [...] and (v) mitigate activities within its jurisdiction that aggravate or may aggravate the climate emergency?

Question IV(A)(2)(2.B): What **principles** should inspire mitigation, adaptation and response actions to the losses and damages generated by the climate emergency [...]?

Question IV(C)(1): What is the **nature and scope** of a State Party's obligation to **adopt timely and effective measures** in the face of a climate emergency to

³ UNICEF, *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, 1-26 at 9 (2021) ("Almost every child on earth (>99 per cent) is exposed to at least 1 [...] major climate and environmental hazards, shocks and stresses. 2.2 billion children are exposed to at least 2 of these overlapping climate and environmental hazards, shocks and stresses. 1.7 billion children are exposed to at least 3 of these overlapping climate and environmental hazards, shocks and stresses.") see also 2, 4, 8, 11,12, <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>.

ensure the protection of children's rights derived from its obligations under Articles 1, 4, 5, 11 and 19 of the American Convention?

Question IV(C)(2): What is the **nature and extent** of a State Party's obligation to **provide children with meaningful and effective means to freely and fully express their views**, including the opportunity to initiate, or otherwise participate in, any judicial or administrative proceedings concerning the prevention of climate change that constitutes a threat to their lives?

7. While this submission focuses solely on mitigation—not adaptation or loss and damage—guidance on these areas is crucial to the well-being and survival of millions across the Americas. This submission, however, focuses solely on mitigation because there is a limit to the level of climate imbalance humanity can adapt to or damages it can compensate for.⁴ Beyond that limit, no technological innovation and level of financial support will allow humanity—especially the global south—to adapt.⁵ By analogy, adaptation without mitigation⁶ is akin to mopping up an overflowing sink before turning off the tap. The speed at which States turn off the fossil-fuel tap will establish the extent of adaptation measures needed, loss, and damage to people's lives, livelihoods, and rights.
8. To assist the Court,

Part II first addresses question **IV(A)(2)(2.B)** explaining that the core **principle** that should inspire mitigation is the use of best available science. It then addresses questions **IV(A)(1)** explaining the **scope** of States' duties **to prevent** climate change considering the Convention, the best available science, and the Paris Agreement.

⁴ IPCC, 2023: *Summary for policymakers*. In: Climate change 2023: Synthesis report, at 19 paras. B.4.2, B.4.3 (2023) ("With additional global warming, limits to adaptation and losses and damages, strongly concentrated among vulnerable populations, will become increasingly difficult to avoid [...].") https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf.

⁵ Future Earth, et al., *10 new insights in climate science*, 1-46 at 13-14 (2022) ("[A]s the planet continues to warm, we will be increasingly confronted with intolerable impacts of climate change to which people and ecosystems are not able to adapt. In other words, there are limits to adaptation" and "Limits to adaptation are being breached already in different places across the world. Climate adaptation will become increasingly difficult as we approach 1.5°C [...].") <https://10insightsclimate.science/wp-content/uploads/2023/02/10NICS-2022-Report-digital.pdf>; Federal Constitutional Court, *Neubauer et al. v. Germany*, Case Nos. 1 BvR 2656/18, 1 BvR 78/20, 1nBvR 96/20, and 1 BvR 288/20, Order, para. 157 (Mar. 24, 2021) ("[A]daptation measures on their own would not be enough to sufficiently contain the risks posed to life and health over the long term [...]. The legislator must therefore protect life and health by, in particular, taking action to stop climate change [with] laws that limit greenhouse gas emissions.") (official English translation) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2021/20210324_11817_order-1.pdf; and Supreme Court of the Netherlands, *Urgenda Foundation v. State of the Netherlands*, No. 19/00135, Judgement, para 7.5.2 (Dec. 20, 2019) ("[A]lthough it is correct that the consequences of climate change can be mitigated by taking adaptation measures, it has not been demonstrated or made plausible that the potentially disastrous consequences of excessive global warming can be adequately prevented by such measures.") https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2020/20200113_2015-HAZA-C0900456689_judgment.pdf.

⁶ *Amici* recognize that that some—but certainly not all—adaptation measures also mitigate climate change.

Part III speaks to questions **IV(A)(2)** and **(2.A)** setting forth the **measures** States must take to **minimize** the impact of the climate emergency and **implement** its obligation to **mitigate** the crisis.

Parts IV, V and VI address question **IV(C)(1)** setting out precisely why States must adopt **timely and effective measures to protect children's rights** as well as the second half question **IV(A)(2)** asking about measures that should be taken with respect to **populations in situations of vulnerability or intersectional considerations**.

Part VII concludes this submission by addressing question **IV(C)(2)** and giving concrete options for States to **provide children with meaningful participation** in legal processes.

Importantly, for the Court's convenience, **Annex A** provides a compiled list of the key findings and critical special obligations States should carry out pursuant to their duties set forth in the American Convention on Human Rights to effectively protect fundamental rights in the context of climate change with a focus on children's rights.

II. The Convention's Requirement to Use the "Best Available Science" Obligates States to Observe the 350 ppm Limit, Not the 1.5°C Target (Questions IV(A)(1) and (2)(2.B))

9. This Court has determined that the obligation to **prevent** environmental degradation must be undertaken in accordance with "**scientific or technological knowledge**".⁷ Further, States have the obligation to **mitigate** damage and **reverse** climate change relying upon the "**best available scientific data and technology**".⁸ Additionally, all relevant international treaties—the UN Framework Convention on Climate Change ("UNFCCC"),⁹ Paris Agreement,¹⁰ and Glasgow Climate Pact¹¹—reinforce that the **best available science** must be used to determine States' obligations to address the climate crisis. Other judicial systems have also emphasized this, underscoring that

⁷ I/A Court H.R., The Environment and Human Rights, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 142.

⁸ I/A Court H.R., The Environment and Human Rights, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 172; see Section II and III of this submission, (In the context of climate change mitigation requires States to first end the use of fossil fuels for energy and industry by no later than 2050 as this will stop adding to the harms and to second stabilize the climate system by reducing the level of atmospheric CO₂ to 350 ppm by no later than 2100 as this will then begin to reverse the climate harms and restore Earth's energy balance.)

⁹ United Nations Framework Convention on Climate Change, Art. 4 §(2)(d) (May 9, 1992).

¹⁰ Paris Agreement, Preamble and Art. 4 §1 (Dec. 12, 2015).

¹¹ Glasgow Climate Pact, I §1 (Nov. 13, 2021).

“[t]his is not about opinion or ideology, but about scientific evidence.”¹² This obligation **ensures** that legally binding findings and remedies are just, practical, and effective.¹³

10. As a preliminary matter, in judicial proceedings where climate is at issue, **the non-science based** Paris temperature targets¹⁴ of “[h]olding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels”¹⁵ **have too often been improperly presented to courts as the best scientific evidence and the de facto legal standard** for compliance with international legal principles, obligations, and human rights.¹⁶ This scientifically unsupported—yet common—approach reoccurs in the Request for an Advisory Opinion.

¹² Supreme Federal Court, *PSB et al. v. Brazil*, ADPF 708, Concurring Opinion at 2 (Jul. 1, 2022) (unofficial translation) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2022/20220701_ADPF-708_decision-3.pdf; see e.g. Supreme Court of the State of Hawai'i, *In the Matter of Hawai'i Electric Light Company, Inc.*, SCOT-22-0000418, Concurrence at p. 10 (The Court based its findings on scientific consensus rather than political consensus). (Mar. 13, 2023) https://climatecasechart.com/wp-content/uploads/case-documents/2023/20230313_docket-SCOT-22-0000418_opinion-2.pdf; and ECHR, *Sutherland v. United Kingdom*, No. 25186/94, Decision, paras 59-60 (Jul. 1, 1997) (The Commission found in favor of the Applicant reasoning, in part, that the government's political consensus was contradicted by the weight of scientific evidence.) [https://hudoc.echr.coe.int/eng#{%22itemid%22:\[%22001-45912%22\]}](https://hudoc.echr.coe.int/eng#{%22itemid%22:[%22001-45912%22]});

¹³ See Alexa Koenig et al., *Climate candor: Ridding climate case of questionable science*, Open Global Rights, Center for Human Rights and Global Justice and the Future of Rights Program at New York University School of Law (Dec. 5, 2023) <https://www.openglobalrights.org/climate-candor-ridding-climate-cases-questionable-science/> (last accessed Dec. 6, 2023).

¹⁴ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, Earth's Future, 11:1-14 at 1 (2023) (The UN's Paris Agreement goal of keeping global warming between 1.5 and 2°C is dangerously obsolete and needs to be replaced by a commitment to restore Earth's climate.) <https://doi.org/10.1029/2023EF003639>.

¹⁵ Paris Agreement, Art. 2 §1(a) (Dec. 12, 2015).

¹⁶ See e.g. ECHR, *KlimaSeniorinnen v. Switzerland*, No. 53600/20, Observations on the facts, admissibility, and the merits (Dec. 2, 2022) (In 2016, over 2,000 older women asserted that Switzerland failed to take sufficient climate action exposing them to climate-induced heatwaves. To remedy the resulting violations, Applicants asked the court to order Switzerland to meet the 1.5°C Paris target. In 2016, the Earth's average surface temperature was ~1.07°C above pre-industrial levels. The Applicants erred in asking the Court to sanction a target that is *higher* than the temperature at the time the violations occurred.), see e.g. p. II para. 3, pp. 10-13 §2 at 1.10 paras. 33-36, and p. 69 §3 para. (3)(2)(a-d), https://en.klimaseniorinnen.ch/wp-content/uploads/2022/12/221202_53600_20_Observations_GC_KlimaSeniorinnen_and_others_v_Switzerland.pdf; *Duarte Agostinho and Others v. Portugal and 32 Others*, No. 39371/20, Observations of the Applicants on Admissibility and the Merits (Feb. 9, 2022) (Assertions similar to those in *KlimaSeniorinnen* were made by child applicants from Portugal against 33 States. Applicants also presented the 1.5°C target as the remedy on 559 pages of their 868-page submission even though the average global temperature was *lower* at the time the violations occurred.) see e.g. paras. 2, 5(a)(i), 5(e), and 5(f) (accessible via <https://youth4climatejustice.org/case-documents/>, last accessed Dec. 6, 2023); and ITLOS, *Request for an Advisory Opinion on Climate Change and International Law*, Case No. 31, Written statement of the commission of small island states on climate change (Jun. 16, 2023) (The Commission of Small Island States (COSIS) underscores “up-to-date scientific data is a critical yardstick against which States’ environmental due diligence obligations must be measured” and highlights the “devastating effects” Small Island States will suffer even if global warming remains under 1.5°C. Yet, the COSIS concludes that a 1.5°C target would be an acceptable legal standard.) see e.g. para 3 and 122 https://www.itlos.org/fileadmin/itlos/documents/cases/31/written_statements/2/C31-WS-2-4-COSIS.pdf,

11. The Request asks, "What is the scope of the duty of States to prevent climate phenomena generated by global warming [...] in accordance with obligations pursuant to [...] the scientific consensus that encourages not to increase global temperature beyond 1.5°C?"¹⁷ The Request **supposes that 1.5°C derives from a scientific consensus. Regrettably, it does not.**¹⁸ Accordingly, the threshold question should be modified: **What is the scope of the duty of States to prevent human rights violations caused by anthropogenic climate change in light of best available scientific evidence?**
12. Considering this Court's authority to interpret other treaties concerning the protection of human rights in the American states,¹⁹ and its authority to structure guidance in a manner best suited to the interests of justice and the purposes of this opinion,²⁰ this Court's forthcoming Advisory Opinion should **not** treat the 1.5°C Paris target as if it were compatible with best available science and States' human rights obligations, for three reasons: (i) the 1.5°C target is a product of political negotiation, not science;²¹ (ii) the best available science finds that 1.5°C of warming will cause human rights violations on a staggering scale;²² particularly for the global south and small island developing states;²³ and (iii) a science-based target for the **primary pollutant** causing

see also ITLOS, Case No. 31, *Amicus Curiae* Submission, Our Children's Trust and Oxfam International (Jun. 16, 2023) https://www.itlos.org/fileadmin/itlos/documents/cases/31/written_statements/4/C31-WS-4-8-Our_Children_s_Trust_Oxfam.pdf).

¹⁷ I/A Court H.R., Request for an Advisory Opinion submitted by Chile and Colombia on the Climate Emergency and Human Rights, January 9, 2023, IV(A)(1).

¹⁸ See Section II(B) and Annex B.

¹⁹ American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 64(1); and I/A Court H.R., Juridical Condition and Rights of Undocumented Migrants, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 53, (This Court "has established some guidelines on the interpretation of international norms *other than* the American Convention. Principally, it has considered that Art. 64(1) of the Convention, when referring to the authority of the Court to provide an opinion on "other treaties concerning the protection of human rights in the American States," is broad and non-restrictive."), see also paras 48 and 54.

²⁰ See e.g. I/A Court H.R., Juridical Condition and Rights of Undocumented Migrants, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 67.

²¹ Andrea Rodgers et al., *The injustice of 1.5°C–2°C: The need for a scientifically based standard of fundamental rights protection in constitutional climate change cases*, Va. Env't L. J., 40:102-151 (2022) http://www.velj.org/uploads/1/2/7/0/12706894/40.2_va_envt_lj_rodgers_sancken_marlow_102_151.pdf (Annex H); and Béatrice Cointe et al., *A history of the 1.5°C target*, WIREs Clim. Change, e824:1-11 (2023) <https://doi.org/10.1002/wcc.824>.

²² IPCC, *Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C*, (2019) https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_LR.pdf; IPCC, 2023: *Summary for Policymakers*. In: Climate change 2023: Synthesis report (2023) https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf; and IPCC, 2023: *Longer Report*, In: Climate change 2023: Synthesis report (2023) https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf.

²³ See e.g. Michalis I. Voutsoukas et al., *Small island developing states under threat by rising seas even in a 1.5°C warming world*, Nat. Sustain., 1-13 at 3 (2023) <https://doi.org/10.1038/s41893-023-01230-5> (Small island developing states already suffer high losses and damage from extreme events. For instance, in 2019, tropical cyclone Dorian resulted in over US \$3 billion in damages and losses linked to flooding only in the

climate change—**CO₂**—exists and requires that States urgently reduce the level of atmospheric CO₂ from the current concentration of ~420 parts per million (“ppm”)²⁴ to 350 ppm as quickly as possible this century.²⁵ Moreover, **emerging jurisprudence** supports the conclusion that this Court should obligate States to adopt and implement climate action to achieve the **350 ppm limit, and not the 1.5°C Paris target**, as protective of human rights.²⁶

A. Defining “best available science”

13. The Court would be well within its mandate to provide of the definition of “best available science”.²⁷ On occasion, this Court has decided to start its Advisory Opinions by drawing up a glossary to define the conceptual scope of words used within.²⁸ Because this Court, along with others, has yet to define “best available science,” an important initial step would be to do so. Such a definition should be distilled from best practices in scientific research and principles already established in law.²⁹ Pursuant to these principles, the “best available science” is:

Bahamas, with 30,000 people impacted, 67 fatalities, and 282 missing. Losses and damages will increase as the world approaches 1.5°C); Adele M. Dixon et al., *Future loss of local-scale thermal refugia in coral reef ecosystems*, PLoS Climate, 1(2):1-20 at 4 (2022) (From 1986-2019, ~84% of areas within coral reefs served as a refuge for coral protecting coral from rising sea temperatures. At 1.5°C the area of refuge drops drastically to 0.2%) <https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000004>; and Matthew W. Jones et al., *Global and regional trends and drivers of fire under climate change*, Rev. Geophys., 60(e2020RG000726):1-76 at 12 (2022) (At current levels of warming (1990-2019 average), South America has experienced the second highest increase in length of the fire season and has experienced the greatest increase in conditions conducive to fire ignition and spread anywhere in the globe. This is expected to worsen relative to the 1990-2019 average by 21% for fire season length and 55.6% for extreme fire weather under the 1.5°C scenario). <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2020RG000726>.

²⁴ National Oceanic and Atmospheric Administration,

https://gml.noaa.gov/webdata/ccgg/trends/co2/co2_annmean_mlo.txt (last accessed Dec. 6, 2023).

²⁵ See the critical studies in Annex D.

²⁶ See Section II(D) below citing the Supreme Court of the State of Hawai'i, *In the Matter of Hawai'i Electric Light Company, Inc.*, SCOT-22-0000418, Concurrence at pp. 9-11 (Mar. 13, 2023)

https://climatecasechart.com/wp-content/uploads/case-documents/2023/20230313_docket-SCOT-22-0000418_opinion-2.pdf; and Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact at paras. 67-92 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

²⁷ See e.g. I/A Court H.R., Juridical Condition and Rights of Undocumented Migrants, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 67 (“The Court is empowered to structure its rulings as it considers best suited to the interests of justice and the purposes of an advisory opinion.”); and I/A Court H.R., *I.V. v. Bolivia*. Judgment of November 30, 2016. Series C No. 329, paras. 147, 166, 176-189 (defining, interpreting the scope of, and articulating three elements of informed consent; then determining the parameters necessary to analyze whether a State’s action is in violation of international human rights standards).

²⁸ I/A Court H.R., Juridical Condition and Rights of Undocumented Migrants, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 67.

²⁹ See e.g., 33 U.S.C. § 1321(a)(27); and U.S. Supreme Court, *Daubert et al. v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 at 579, 592-595 (Jun. 28, 1993) (The five non-exclusive factors judges should consider when determining whether evidence is based on scientifically valid reasoning and been properly applied are: (i) whether the technique or theory can be or has been tested; (ii) whether it has been subjected to peer review and publication; (iii) the known or potential error rate; (iv) the existence and maintenance of standards controlling its operation; and (v) whether it has attracted wide acceptance within a relevant scientific community.) <https://supreme.justia.com/cases/federal/us/509/579/>.

- a. the most **up-to-date** science that;
- b. is based on internationally recognized scientific **practices, methodologies, and standards**, where such standards exist;
- c. maximizes the **quality and objectivity** of information used, including statistics and assumptions;
- d. **publicly releases** the data used to reach its conclusions, and publishes its results through the **peer-review** process;
- e. clearly **communicates risks and uncertainties** in the scientific bases for its conclusions; and
- f. reflects a **consensus** (where consensus exists) or at least rests on multiple peer-reviewed studies from different research groups.

If this Court's forthcoming Advisory Opinion were to define best available science, such a definition would not only provide concrete guidance to State Parties, it would also guide courts around the world as they grapple with rights-based climate questions.

14. Despite the Paris Agreement's call to use the "best available science,"³⁰ even its lower target of 1.5°C target **does not meet** the criteria listed above.³¹ Most crucially, the outdated 1.5°C target does not even derive from science. Rather, "[b]y design, the Paris Agreement target began as a heuristic intended to guide policy decisions addressing climate change. A review of the history leading up to the Paris Agreement reveals the target was based on intergovernmental compromise, not science."³² The history of how power dynamics between governments and the fossil fuel industry and the global north and global south—not science—drove States to 1.5°C is beyond the scope of this submission; however, it is available in Annex H.³³

³⁰ Paris Agreement, Preamble and Art. 4 §1 (Dec. 12, 2015).

³¹ IPCC, *Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C*, (2019) (In 2018, the IPCC estimated that global warming had already reached between ~0.8° C and 1.2°C of warming and that this level of warming was already violating human rights.). Volumes of studies come to this same conclusion, see Annexes B, C and D. Notably, the Paris Agreement temperature targets were supported by the fossil fuel majors, including Exxon Mobil, who stated as of 2021: "We commend President Biden's decision to rejoin the Paris Agreement, a framework that ExxonMobil has supported since its adoption in 2015." <https://corporate.exxonmobil.com/news/viewpoints/commitment-paris-agreement> (last accessed Dec. 6, 2023).

³² Andrea Rodgers et al., *The injustice of 1.5°C–2°C: The need for a scientifically based standard of fundamental rights protection in constitutional climate change cases*, Va. Env't L. J., 40:102-151 at 104 (2022) http://www.velj.org/uploads/1/2/7/0/12706894/40.2_va_envt_lj_rodgers_sancken_marlow_102_151.pdf (Annex H); see also, Justin Gillis, *Paris climate talks avoid scientists' idea of 'carbon budget'*, New York Times (Nov. 28, 2015) ("Yet the negotiators gathering in Paris will not be discussing any plan that comes close to meeting their own stated goal of limiting the increase of global temperatures to a reasonably safe level. They have pointedly declined to take up a recommendation from scientists [...] because "Politically, it would be very difficult.") <https://bit.ly/3EV6E4n> (last accessed Dec. 6, 2023).

³³ Andrea Rodgers et al., *The injustice of 1.5°C–2°C: The need for a scientifically based standard of fundamental rights protection in constitutional climate change cases*, Va. Env't L. J., 40:102-151 (2022) http://www.velj.org/uploads/1/2/7/0/12706894/40.2_va_envt_lj_rodgers_sancken_marlow_102_151.pdf

15. Further, because the Paris Agreement's 1.5°C target does not derive from the best available science—and is in fact dangerous for human rights—the target is not only incompatible with the American Convention, **1.5°C violates the UNFCCC and the Paris Agreement.**³⁴ The ultimate objective of the UNFCCC and any related legal instruments—such as the Paris Agreement—is to achieve “**stabilization of greenhouse gas concentrations** in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”³⁵ The 1.5°C target undermines this objective as well as a number of other commitments
16. In light of established commitments to use best available science to address dangerous climate change, the forthcoming Advisory Opinion should completely **avoid reinforcing the misconception** that the political target of 1.5°C is the best available science.

B. The best available science concludes that 1.5°C does not protect human rights

17. Another imperative reason the Court should **not** embrace the 1.5°C target as a meaningful benchmark for protecting human rights is because **scientific consensus finds that 1.5°C of warming is unsafe** for humanity and will result in widespread and serious human rights violations.³⁶

(Annex H); Expert Report of James E. Hansen, Ph.D., *Juliana v. United States*, 339 F. Supp. 3d 1062, No. 6:15-cv-01517-TC (D. Or. Jun. 28, 2018), ECF No. 274-1 at 24 https://climatecasechart.com/wp-content/uploads/case-documents/2018/20180628_docket-615-cv-1517_exhibit-7.pdf (“This 450 ppm CO₂ target [~2.0°C] avoided the need to face the task of confronting the powerful fossil fuel industry in the near term.”); Béatrice Cointe et al., *A history of the 1.5°C target*, WIREs Clim. Change, e824:1-11 (2023) (Referring to 1.5°C as “originated with a political impetus”, a “politically driven target”; “politically approved”; with its origin “clearly on the diplomatic side”; with an “overtly political history”; and “the result of intense and difficult negotiations”) <https://doi.org/10.1002/wcc.824>; and Juan Auz et al., *The neocolonial violence of 1.5°C*, Open Global Rights, Center for Human Rights and Global Justice and the Future of Rights Program at New York University School of Law (Oct. 6, 2023) <https://www.openglobalrights.org/neocolonial-violence-1-5C-threshold/>; See also Piero Morseletto et al., *Governing by targets: Reductio ad unum and evolution of the two-degree climate target*, Int'l Env't Agreements: Pol., L. & Econ., 17:655 at 660 (2017) <https://link.springer.com/article/10.1007/s10784-016-9336-7>.

³⁴ Pursuant to the UNFCCC and Paris Agreement, States are committed to ensure equity; support persons in vulnerable situations especially children; safeguard food security; eradicate poverty; protect the integrity of ecosystems and biodiversity; and avert and minimize loss and damage associated with climate change. 1.5°C of heating prevents States from realizing each of these commitments. See Annex E for further explanation and citations.

³⁵ United Nations Framework Convention on Climate Change, Art. 2 (May 9, 1992) (Noting that the switch from using the concentration of atmospheric CO₂ as a measurement as adopted by the UNFCCC to temperature, as adopted by the Paris Agreement to evaluate how well the world is doing to address the climate emergency does not align with best available science. The indeterminacy of global average temperature rise is one of the reasons temperatures make a poor metric for evaluating the extent of global warming. Measurements of atmospheric CO₂ are much more precise.)

³⁶ IPCC, *Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C*, (2019) https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_LR.pdf; IPCC, 2023: *Summary for Policymakers*. In: Climate change 2023: Synthesis report (2023)

18. In 2008—seven years before the Paris Agreement—scientists raised the alarm that the then-existing warming of 0.9°C-1.0°C³⁷ “is already too high.”³⁸ Scientists subsequently warned that planetary heating of 1.5°C will have disastrous consequences for human society.³⁹ In 2018, the IPCC⁴⁰ **explicitly confirmed** the earlier warnings:

Warming of **1.5°C is not considered “safe”** [...] and poses significant risks to natural and human systems as compared to the current warming of 1°C [...]. The impacts of 1.5°C of warming would disproportionately affect disadvantaged and vulnerable populations through **food insecurity, higher food prices, income losses, lost livelihood opportunities, adverse health impacts and population displacements** [...]. Some of the **worst impacts** on sustainable development are expected to be felt among [...] **children** [...].⁴¹

19. Since 2018, the IPCC has only **reiterated** its conclusions:

Risks and projected adverse impacts and related losses and damages from climate change will **escalate with every increment of global warming** [...]. They are higher for global warming of 1.5°C than at present [...].⁴²

https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf; and IPCC, 2023: *Longer Report*, In: Climate change 2023: Synthesis report (2023)
https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf; See also, Annexes B and C.

³⁷ The 2008 estimated increase of 0.9°C-1.0°C of mean average global temperature increase above preindustrial levels is relative to the 1881-1910 average and based on the following data sets: NASA's Goddard Institute for Space Studies (0.9°C), NOAA Global Surface Temperature Dataset (0.9°C), Berkeley Earth (1.0°C), and the Hadley Centre (1.0°C). Datasets available at: <https://data.giss.nasa.gov/gistemp/>, <https://www.noaa.gov/access/metadatas/landing-page/bin/iso?id=gov.noaa.ncdc:C01585>, <https://berkeleyearth.org/data/>, and <https://www.metoffice.gov.uk/hadobs/hadcrut5/>.

³⁸ James Hansen et al., *Target atmospheric CO₂: Where should humanity aim?*, Open Atmospheric Sci. J., 2:217-231 at 228 (2008); and also 218 (“[T]he present global mean CO₂, 385 ppm, is already in the dangerous zone.”) <https://openatmosphericsciencejournal.com/contents/volumes/V2/TOASCJ-2-217/TOASCJ-2-217.pdf>.

³⁹ See Annex B for examples of the dangers of allowing the average mean annual temperature to rise to and remain at 1.5°C.

⁴⁰ The IPCC is a partnership between scientists and policymakers set up to provide international climate *negotiators* with “regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options.” As a quasi-political body of volunteer scientists set up to inform the UNFCCC, the IPCC provides guidance that is policy-relevant, but not policy-prescriptive. In keeping with its role, the IPCC has neither endorsed nor recommended 2°C or 1.5°C as a target in any of its reports since it began publishing reports in 1990. <https://www.ipcc.ch/> (Dec. 6, 2023).

⁴¹ IPCC *Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C*, at 44 (2019) (emphasis added)

https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_LR.pdf.

⁴² IPCC, 2023: *Summary for policymakers*, In: Climate change 2023: Synthesis report, para. B.2.2, see also paras. B.1, B.1.3, Figure SPM.2, B.2, Figure SPM.4, C.1.1, and Figure SPM.6 (2023) (emphasis added) https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf (emphasis added).

20. Even more recent research to affirm the litany of problems with 1.5°C states:

[T]here is agreement that **1.5°C** or more of warming **entails enormous danger for human society** and the broader Earth system [...]. We now know that continued use of fossil fuels associated with 1.5–2°C scenarios would result in **hundreds of millions of pollution deaths** and likely **trigger multiple tipping elements** in the Earth system. [...] If sustained through the end of the century or longer, this level of warming would very likely result in **immense damage to human society** [...].⁴³

The research concludes:

The UN's Paris Agreement goal of keeping global warming between 1.5 and 2°C is **dangerously obsolete** and needs to be replaced by a commitment to **restore Earth's climate**.⁴⁴

21. Consequently, not only is the **1.5°C** Paris target irreconcilable with States' obligation to use the best available science, it is **incompatible with States' obligation to protect human rights**.⁴⁵ 1.5°C burdens numerous Convention rights and principles with unrivaled severity and scale,⁴⁶ including the rights to life; physical, mental, and moral integrity; private life; health; water; food; housing; participation in cultural life; property; not be forcibly displaced;⁴⁷ non-discrimination;⁴⁸ a healthy environment;⁴⁹ and the rights as a child.⁵⁰ By analogy, climate policies built upon a foundation of 1.5°C

⁴³ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, Earth's Future, 11:1-14 at 1-2 (2023) <https://doi.org/10.1029/2023EF003639> (emphasis added).

⁴⁴ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, Earth's Future, 11:1-14 at 1 (2023) <https://doi.org/10.1029/2023EF003639> (emphasis added) (Further emphasizing that, "Despite convincing evidence that 1.5°C of warming would cause immense disruption to Earth systems, especially human civilization, many policy makers and researchers continue to treat this target as acceptable [...].")

⁴⁵ Andrea Rodgers et al., *The Injustice of 1.5°C–2°C: The need for a scientifically based standard of fundamental rights protection in constitutional climate change cases*, Va. Env't L. J., 40:102-151 at 109-10 (2022) ("IPCC reports have summarized a significant body of science projecting that warming of 1.5°C of 2°C would be catastrophic [...].")

http://www.velj.org/uploads/1/2/7/0/12706894/40.2_va_envt_lj_rodgers_sancken_marlow_102_151.pdf (Annex H); and Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, Earth's Future, 11:1-14 at 1-2 (2023) <https://doi.org/10.1029/2023EF003639>; and See Annexes B and C.

⁴⁶ See Annexes B and C.

⁴⁷ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17, November 15, 2017, Series A, No. 23, paras. 47, 64, 66; I/A Court H.R., *Case of Kawas Fernández v. Honduras*, Merits, Reparations and Costs. Judgment of April 3, 2009. Series C No. 196, para. 148.

⁴⁸ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17, November 15, 2017, Series A, No. 23, paras. 60, 67, 68.

⁴⁹ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17, November 15, 2017, Series A No. 23.

⁵⁰ See, e.g., I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 67; I/A Court H.R., *Case of the Massacres of El Mozote and surrounding areas v. El Salvador*, Merits, Reparations and Costs. Judgment of October 25, 2012, Series C No. 252, para. 150

are akin to a house of cards built on a powder keg: dangerously unstable and constantly on the brink of an explosive and fiery collapse. Therefore, this Court should **take care that the forthcoming Advisory Opinion does not imply that a 1.5°C target is compatible with States' obligations to protect human rights.**

C. The best available science finds that to protect human rights, the level of atmospheric CO₂—the primary climate pollutant—must be limited to 350 ppm

22. Instead of the 1.5°C target, the best available science finds that to stabilize the climate system and protect fundamental rights, States must reduce the **annual mean concentration of atmospheric CO₂** from the current level of ~420 parts per million (ppm)⁵¹ (a level currently resulting in ~1.1°C to 1.3°C of temperature rise above pre-industrial levels)⁵² to 350 ppm or lower. **This ceiling is known as the 350 ppm limit.**
23. The 350 ppm limit was first identified by two separate working groups of scientists over five years prior to the Paris negotiations in 2008 and 2009. These teams found that “[I]f humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted [...] **CO₂ will need to be reduced from its current 385 ppm to at most 350 ppm, but likely less than that.**”⁵³

(stating that “[c]ases in which children are victims of human rights violations, are especially serious”); I/A Court H.R., Case of the “*Juvenile Reeducation Institute*” v. *Paraguay*, *Preliminary Objections*, Merits, Reparations and Costs. Judgment of September 2, 2004, Series C No. 112, para. 147 (affirming that “[c]hildren ... have the same rights as all human beings ... and also special rights derived from their condition, and these are accompanied by specific duties of the family, society, and the State”).

⁵¹ “Annual mean concentration of atmospheric CO₂” is the amount of carbon dioxide in the atmosphere. It is measured in parts per million (ppm). Ppm is the number of CO₂ molecules per million molecules of the air that sits 8-12 kilometres above the Earth’s surface. Just as one percent means one out of a hundred, one ppm means one out of a million. While each ppm denotes a very small numerical value, the geologically unprecedented large and rapid change in ppm of CO₂ in our atmosphere over the last century are devastating for the planet and human rights, such that *every ppm matters*. See <https://climate.nasa.gov/vital-signs/carbon-dioxide/> (last accessed Dec. 6, 2023). The 2022 annual mean concentration of atmospheric CO₂ was ~419 ppm. The 2023 level is expected to be ~420 or greater. The 2023 average will be available in January 2024 and can be accessed through the National Oceanic and Atmospheric Administration at https://gml.noaa.gov/webdata/ccgg/trends/co2/co2_annmean_mlo.txt.

⁵² The indeterminacy of global average temperature rise is one of the reasons temperatures make a poor metric for evaluating the extent of global warming. For purposes of this submission, *Amici* will use ~1.1°C–1.3°C of average global temperature rise above pre-industrial levels as the current level of rise. *Amici* note that ongoing temperature analysis by NASA determines that Earth has warmed “by at least 1.1° Celsius (1.9° Fahrenheit) since 1880[,]” whereas a separate study by Berkeley Earth states that the Earth has warmed by 1.3°C. The IPCC indicates a “likely range of total human caused global surface temperature increase” of 0.8°C to 1.3°C. Such discrepancies make it difficult to determine whether and when global temperature targets may have been breached and are one of the reasons why measurements of atmospheric CO₂ are much more precise.

⁵³ James Hansen et al., *Target atmospheric CO₂: Where should humanity aim?*, Open Atmospheric Sci. J., 2:217-231 at 228 (2008); and also 218 (“[T]he present global mean CO₂, 385 ppm, is already in the dangerous zone.”) <https://openatmosphericssciencejournal.com/contents/volumes/V2/TOASCIJ-2-217/TOASCIJ-2-217.pdf>; and Johan Rockström et al., *A safe operating space for humanity*, Nature 461:472-475 at 473 (2009) (“[H]uman changes to atmospheric CO₂ concentrations should not exceed 350 parts per million by volume [...] above pre-industrial levels.”) <https://www.nature.com/articles/461472a>.

24. Since 2008-2009, scientists have continued to identify 350 ppm as the Earth's uppermost atmospheric boundary. A curated bibliography of the key scientific studies from 2008 to present can be found in Annex D. Combined, these studies detail: (i) the evidence behind the establishment of this limit; and (ii) the dangers associated with having surpassed this boundary.
25. The 350 ppm limit is important because **climate change is a response to an energy imbalance** in the climate system and the concentration of atmospheric **CO₂ is the primary cause of "Earth's energy imbalance"**.⁵⁴ Simply put, certain molecules in our atmosphere enable the heat energy that comes in from the Sun to be radiated back into space. In contrast, CO₂ and other greenhouse gas molecules radiate heat in all directions including back towards Earth's surface, so instead of leaving the atmosphere, the heat energy remains trapped and supercharges the imbalance and results climate change.⁵⁵ By analogy, Earth's energy balance can be thought of like cooking rice—if the right amount of heat is allowed to leave the pot, the rice cooks perfectly. If too much heat is trapped inside, the pot boils over. Right now, Earth is boiling over. For instance, **between 2005 and 2019, Earth's energy imbalance doubled**,⁵⁶ exposing communities throughout the Americas to deadly extreme events including severe heat and prolonged heatwaves, melting ice and snow, rising sea level, floods, droughts, fires, and more powerful storms and hurricanes.⁵⁷
26. Lowering atmospheric CO₂ to 350 ppm by 2100 (with further reductions thereafter) is not only fundamental to rebalancing the climate system on which the continued existence and quality of life depends,⁵⁸ curtailing climate-disasters, and solving the climate emergency,⁵⁹ it also gives humanity the best—and perhaps only—chance of

⁵⁴ Karina von Schuckmann et al., *Heat stored in the Earth system: Where does the energy go?*, Earth Syst. Sci. Data, 12:2013-2041 at 2029 (2020) ("Stabilization of climate, the goal of the universally agreed UNFCCC [...] and the Paris Agreement [...], requires that EEI [Earth's Energy Imbalance] be reduced to approximately zero to achieve Earth's system quasi-equilibrium. [...] The amount of CO₂ in the atmosphere would need to be reduced from 410 to 353 ppm [...] bringing Earth back towards energy balance [...].") <https://doi.org/10.5194/essd-12-2013-2020>.

⁵⁵ National Oceanic and Atmospheric Administration, *Climate change: Atmospheric Carbon Dioxide*, <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>; UCAR Center for Climate Education, *The greenhouse effect*, <https://scied.ucar.edu/learning-zone/how-climate-works/greenhouse-effect>; and State of the Planet, *How exactly does Carbon Dioxide cause global warming*, <https://news.climate.columbia.edu/2021/02/25/carbon-dioxide-cause-global-warming/> (last accessed Dec. 6, 2023).

⁵⁶ Norman G. Loeb et al., *Satellite and ocean data reveal marked increase in Earth's heating rate*, Geophys. Res. Lett., 48:1-8 (2021) <https://doi.org/10.1029/2021GL093047>.

⁵⁷ See Annexes B and C.

⁵⁸ Karina von Schuckmann et al., *Heat stored in the Earth system: Where does the energy go?*, Earth Syst. Sci. Data, 12:2013-2041 at 2029 (2020) ("The amount of CO₂ in the atmosphere would need to be reduced from 410 to 353 ppm [...] bringing Earth back towards energy balance [...].") <https://doi.org/10.5194/essd-12-2013-2020>.

⁵⁹ Norman G. Loeb et al., *Satellite and ocean data reveal marked increase in Earth's heating rate*, Geophys. Res. Lett., 48:1-8 at 7 (2021) (Earth Energy Imbalance "is such a fundamental property of the climate system, the implications of an increasing [Earth Energy Imbalance] trend are far reaching." <https://doi.org/10.1029/2021GL093047>; and Karina von Schuckmann et al., *Heat stored in the Earth system:*

avoiding irreversible harms and **protecting the fundamental rights** that depend upon climate stability.

27. Ironically, Earth crossed above the 350 ppm limit in 1988, the year the United Nations established the IPCC.⁶⁰ Today—at ~70 ppm over the limit⁶¹—Earth has been immersed in an overshoot scenario for 35 years. Research concludes that “[i]f the present overshoot of this target CO₂ is not brief, there is a possibility of seeding irreversible catastrophic effects.”⁶² The irreversible catastrophic effects that scientists are most concerned about are **climate tipping points**,⁶³ also known as points of no return.⁶⁴ If one tipping point is crossed, it increases the likelihood of triggering other tipping points, causing an unstoppable cascade of impacts.⁶⁵ This would further reinforce global warming, result in runaway effects that cannot be controlled, and may make large areas of our planet uninhabitable for humanity.⁶⁶
28. Finally, it is important to note that the 350 ppm limit is not controversial. Scientists continue to identify 350 ppm as the maximum “safe” limit for climate pollution⁶⁷ and **no scientific body or journal—including the IPCC—has published any scientific evidence** indicating that concentrations *above* 350 ppm are safe.

Where does the energy go?, Earth Syst. Sci. Data, 12:2013-2041 at 2029 (2020) (Recognizing that Art. 14 of the Paris Agreement requires that the global stocktake be based on best available science and underscoring Earth Energy Imbalance is “the most critical number defining the prospects for continued global warming and climate change [...]” The authors “[C]all for an implementation of [Earth Energy Imbalance] into the global stocktake.”) <https://doi.org/10.5194/essd-12-2013-2020>.

⁶⁰ *Trends in atmospheric Carbon Dioxide*, NOAA Earth System Research Lab., https://gml.noaa.gov/webdata/ccgg/trends/co2/co2_annmean_mlo.txt (last accessed Dec. 6, 2023).

⁶¹ *Trends in atmospheric Carbon Dioxide*, NOAA Earth System Research Lab., https://gml.noaa.gov/webdata/ccgg/trends/co2/co2_annmean_mlo.txt (last accessed Dec. 6, 2023).

⁶² James Hansen, *Target atmospheric CO₂: Where should humanity aim?*, Open Atmospheric Sci. J., 2:217-230 at 217 (2008) (emphasis added) <https://openatmosphericssciencejournal.com/contents/volumes/V2/TOASCJ-2-217/TOASCJ-2-217.pdf>; and Johan Rockström et al., *A safe operating space for humanity*, Nature 461:472-475 at 473 (2009) (“Transgressing these boundaries will increase the risk of irreversible climate change [...]”) <https://www.nature.com/articles/461472a>.

⁶³ David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, Sci. 377:1-10 at 1, 10 (2022) (“[E]ven the Paris Agreement goal of limiting warming to well below 2°C and preferably 1.5°C is not safe as 1.5°C and above risks crossing multiple tipping points. Crossing these [climate tipping points] can generate positive feedbacks that increase the likelihood of crossing other [climate tipping points].” Further, “The Earth may have left a safe climate state beyond 1°C global warming.”) <https://doi.org/10.1126/science.abn7950>.

⁶⁴ See Alexandria Herr et al., *The 7 climate tipping points that could change the world forever*, Grist (Dec. 3, 2019), <https://grist.org/climate-tipping-points-amazon-greenland-boreal-forest/> (last accessed Dec. 6, 2023).

⁶⁵ David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, Sci. 377:1-10 at 1, 7 (2022) <https://doi.org/10.1126/science.abn7950>.

⁶⁶ See Will Steffen et al., *Trajectories of the Earth system in the Anthropocene*, PNAS, 115:8252-8259 at 8256 (2018) <https://www.pnas.org/doi/epdf/10.1073/pnas.1810141115>; and see generally David Wallace-Wells, *The uninhabitable Earth: Life after warming* (2019), <https://www.crisrieder.org/thejourney/wp-content/uploads/2019/05/The-Uninhabitable-Earth-David-Wallace-Wells.pdf>

⁶⁷ See Annex D.

D. Emerging jurisprudence

29. **Courts are already turning away from the 1.5°C target** and identifying the 350 ppm limit and Earth's energy imbalance as the benchmark that is protective of human rights. These decisions could be powerfully reinforced in this Advisory Opinion.
30. Recognizing that “[w]ith each year, the impacts of climate change amplify and the chances to mitigate dwindle,”⁶⁸ the U.S. State of Hawai'i's Supreme Court unanimously found that the fundamental right to a clean and healthful environment “encompasses the right to a life sustaining climate system [...]”⁶⁹ and that “[y]esterday's good enough has become today's unacceptable.”⁷⁰ Further, in light of the best available science, the Concurrence underscored that “[at the] current level of atmospheric carbon concentrations, humanity faces an imminent global emergency”.⁷¹ It then set forth the State's corresponding obligation:

Governments cannot use the 1.5°C Paris Agreement target as a mechanism to delay reducing emissions until that threshold has been met. [...] **The target for emission reductions must instead be based on the level of atmospheric CO₂** that ensures a life-sustaining climate system. [...] **Current scientific consensus**, as opposed to political consensus in the Paris Agreement regarding an acceptable increase in global average temperature, **suggests that mitigation strategies must be consistent with** achieving global atmospheric CO₂ concentrations below **350 parts per million** (“ppm”) by 2100. [...] Limiting atmospheric CO₂ levels to below 350 ppm is essential to [...] “restore a viable climate system on which the life, liberty, and property” of all people depend.⁷²

31. A decision issued by the U.S. State of Montana's District Court was even more sweeping. The Court held that State laws prohibiting the analysis of greenhouse gas emissions, including CO₂, violated the youth plaintiffs' constitutional rights to equal

⁶⁸ Supreme Court of the State of Hawai'i, *In the Matter of Hawai'i Electric Light Company, Inc.*, SCOT-22-0000418, Opinion, 1-20 at 19 (Mar. 13, 2023) (emphasis added) <https://s3.documentcloud.org/documents/23706794/6368709716.pdf>.

⁶⁹ Supreme Court of the State of Hawai'i, *In the Matter of Hawai'i Electric Light Company, Inc.*, SCOT-22-0000418, Opinion, 1-20 at 16, 18 (Mar. 13, 2023) (Also finding that the right to a clean and healthful environment is “is not just affirmative; it is constantly evolving.”) <https://s3.documentcloud.org/documents/23706794/6368709716.pdf>.

⁷⁰ Supreme Court of the State of Hawai'i, *In the Matter of Hawai'i Electric Light Company, Inc.*, SCOT-22-0000418, Opinion, 1-20 at 19 (Mar. 13, 2023) <https://s3.documentcloud.org/documents/23706794/6368709716.pdf>.

⁷¹ Supreme Court of the State of Hawai'i, *In the Matter of Hawai'i Electric Light Company, Inc.*, SCOT-22-0000418, Concurrence at 11 (Mar. 13, 2023) (emphasis added) <https://www.courthousenews.com/wp-content/uploads/2023/03/re-hu-honua-opinion-affirmed-wilson.pdf>.

⁷² Supreme Court of the State of Hawai'i, *In the Matter of Hawai'i Electric Light Company, Inc.*, SCOT-22-0000418, Concurrence at 9-11 (Mar. 13, 2023) (emphasis added) <https://www.courthousenews.com/wp-content/uploads/2023/03/re-hu-honua-opinion-affirmed-wilson.pdf>.

protection, dignity, liberty, health and safety, all predicated on the right to a clean and healthful environment.⁷³ The court's key findings and conclusions included:

- a. "The **Earth's energy imbalance [...] is what climate scientists describe as the most critical metric** for determining the amount of global heating and climate change we have already experienced and will experience as long as the Earth's energy imbalance exists."⁷⁴
- b. "The **scientific consensus** is that **CO₂ from fossil fuel pollution is the primary driver** of Earth's energy imbalance. [...] Due to the buildup of CO₂ from about 280 ppm to 419 ppm in the past 140 years [...], more solar energy is now retained on Earth and less energy is released back to space."⁷⁵
- c. "The Earth's energy **imbalance is currently significant**."⁷⁶
- d. "**As long as there is an energy imbalance, the Earth will continue to heat**, ice will continue to melt, and weather patterns will become more extreme."⁷⁷
- e. "**If more GHGs [greenhouse gases] are added** to the atmosphere and more incoming energy received from the sun is trapped as thermal energy, the **Earth's climate system will continue to heat up**."⁷⁸
- f. "**Until atmospheric GHG [greenhouse gas] concentrations are reduced**, extreme weather events and other climactic events such as droughts and heatwaves will occur more frequently and in greater magnitude, and [youth] **Plaintiffs will be unable to live clean and healthy lives [...]**."⁷⁹
- g. "[Youth] Plaintiffs have proven that as **children and youth, they are disproportionately harmed** by fossil fuel pollution and climate impacts."⁸⁰

⁷³ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 92, Section III, paras 30(b); and also Order at p. 102, paras. 6, 7 and 11 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁷⁴ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact at p. 22, para. 82 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁷⁵ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact at p. 23, para. 86 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁷⁶ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact at p. 22, para. 83 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁷⁷ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact at p. 23, para. 85 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁷⁸ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact at p. 23, para. 85 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁷⁹ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact at p. 24, para. 89 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁸⁰ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 87, para. 8; and see also Findings of Fact at p. 28, para. 104 ("Children are uniquely vulnerable to the consequences of climate change, which harms their physical and psychological health and safety, interferes with family and cultural foundations and integrity, and causes economic deprivations.")(Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

- h. **“Every additional ton of GHG [greenhouse gas] emissions exacerbates [youth] Plaintiffs’ injuries and risks locking in irreversible climate injuries.”**⁸¹
- i. **“[Youth] Plaintiff’s injuries will grow increasing severe and irreversible without science-based actions to address climate change.”**⁸²

E. State obligations to protect human rights in the context of climate change

32. Considering the above, together with the well-established principle that scientific knowledge advances over time,⁸³ it is impossible to overstate how vital it is that this Court adopt an **appropriate science-and human rights-based target** for expressing States’ Convention obligations in the context of the climate emergency. Accordingly, in the context of climate change, the Court should obligate States to:

- a. **Use the best science available** to protect Convention rights, meaning: (i) the most up-to-date science that; (ii) is based on internationally recognized scientific practices, methodologies, and standards, where such standards exist; (iii) maximizes the quality and objectivity of information used, including statistics and assumptions; (iv) publicly releases the data used to reach its conclusions, and publishes its results through the peer-review process; (v) clearly communicates risks and uncertainties in the scientific bases for its conclusions; and (vi) reflects a consensus (where consensus exists) or at least rests on multiple peer-reviewed studies from different research groups.
- b. **Recognize**, in law and in the adoption and implementation of actions to address the climate emergency, **that the 2015 temperature targets set forth in Article 2 §(1)(a) of the Paris Agreement are irreconcilably contrary to** the best available science, the Convention, this Court’s jurisprudence, other international instruments, the UNFCCC, and the Paris Agreement.
- c. **Update their commitments** under the Paris Agreement **to reflect the most up-to-date and best available science** and protect Convention rights by adopting the 350 ppm limit as the highest atmospheric concentration of CO₂ that is consistent with States’ Convention obligations—namely, their obligations to prevent further degradation of the climate system, minimize climate damages, restore climate stability, and protect Convention rights.
- d. **Conform their conduct to the necessity of allowing atmospheric CO₂ concentration to fall below 350 ppm as soon as possible** and no later than

⁸¹ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 87, para. 6 (Aug. 14, 2023); see also Findings of Fact at p. 24, para. 92 (“Every ton of fossil fuel emissions contributes to global warming and impacts to the climate and thus increases the exposure of Youth Plaintiffs to harms now and additional harms in the future.”) bit.ly/HeldFindingsConclusionsOrder.

⁸² Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 87, para. 7 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

⁸³ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para.142.

2100 to avoid further violations of Convention rights and the breach of irreversible climate tipping points, by making “deep, rapid, and sustained reductions in greenhouse gas emissions”⁸⁴ with unrivaled urgency (discussed further in section III).

III. States' Obligation to Use “All the Means at Their Disposal” Requires Them to Phase Out Fossil Fuels by 2035, but no later than 2050 (Questions IV(A)(2) and (2.A))

33. There is universal agreement that a healthy environment and stable climate system are essential for the free and full enjoyment of human rights, especially children's rights.⁸⁵ This Court has firmly established this **“undeniable relationship”** between protecting the environment and Convention rights.⁸⁶ This Court further recognizes the adverse impacts of climate change “on the real enjoyment of human rights”.⁸⁷ National Courts

⁸⁴ IPCC, 2023: *Summary for policymakers*, In: Climate change 2023: Synthesis report, pp. 1-34 at p. 28 para C.3 (“Rapid and far-reaching transitions across all sectors and systems are necessary to achieve deep and sustained emissions reductions and secure a livable and sustainable future for all.”); see also. B.1, B.3, B.3.1, B.6, B.6.1, B.6.2, Figure SPM.5, B.7.3, C.2, C.2.1, and C.2.4. https://bit.ly/IPCC_ar6.

⁸⁵ See e.g. United Nations Children's Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, 1-26 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>; and UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change* (Aug. 22, 2023).

⁸⁶ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, paras. 47, 54, 64 (para. 54 citing an Independent Expert for the Human Rights Council “all human rights are vulnerable to environmental degradation, in that the full enjoyment of all human rights depends on a supportive environment.”); Case of the *Mayagna Community (Sumo) Awas Tingni*. Judgment of August 31, 2001. Series C No. 79, paras. 144, 149; Case of the *Yakye Axa Indigenous Community v. Paraguay*. Merits, Reparations and Costs. Judgment of June 17, 2005. Series C No. 125, paras. 131, 137, 141; Case of the *Sawhoyamaya Indigenous Community*. Merits, Reparations and Costs. Judgment of March 29, 2006, Series C No. 146 paras. 118, 121, 131; and Case of the *Saramaka People v. Suriname*. Preliminary Objections, Merits, Reparations, and Costs. Judgment of November 28, 2007. Series C No. 172, paras. 121, 122, 123, 126, 128, 146.

⁸⁷ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017, Series A No. 23, paras. 47, 49, 54 (para. 54 “climate change has a wide range of implications for the effective enjoyment of human rights, including the rights to life, health, food, water, housing and self-determination”); and I/A Court H.R., Case of *Kawas Fernández v. Honduras*, Merits, Reparations and Costs. Judgment of April 3, 2009. Series C No. 196, para. 148.

around the world concur with these findings,⁸⁸ as does science.⁸⁹

34. Recognizing that damage to the environment—and the climate system—may affect all human rights,⁹⁰ including children's rights,⁹¹ the Court has affirmed that **“States are bound to use all means at their disposal to avoid activities under their jurisdiction causing significant harm to the environment.”**⁹²

35. This Court has further found that States' duties go beyond prevention: **States also have a positive duty** to mitigate significant damage that has occurred, including the obligation to **“clean up and restore” the environment.**⁹³ The Protocol of San

⁸⁸ See e.g. Federal Supreme Court, *PBS et al. v. Brazil*, ADPF708, Decision, para. 7 (Jul. 1, 2022) (“All these changes could jeopardize man's survival on Earth.” Originally “O conjunto de tais alterações pode colocar em risco a sobrevivência do homem na Terra.”) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2022/20220701_ADPF-708_decision-2.pdf; Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 87, para. 7 (Aug. 14, 2023) (“[Youth] Plaintiffs' injuries will grow increasingly severe and irreversible without science-based actions to address climate change.”) bit.ly/HeldFindingsConclusionsOrder; Supreme Court of the Netherlands, *Stichting Urgenda v. The State of the Netherlands*, No. 19/00135, Judgement at 5.7.9 (Dec. 20, 2019) (“Climate change threatens human rights [...]”) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2020/20200113_2015-HAZA-C0900456689_judgment.pdf; and High Court of Lahore, *Leghari v. Federation of Pakistan*, W.P. No. 25501/2015, para. 6 (Sep. 4, 2015) (“Climate change is the defining challenge of our time and has led to dramatic alterations of our planet's climate system [...]. On a legal and constitutional plane this is a clarion call for the protection of fundamental rights[...].”) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2015/20150404_2015-W.P.-No.-25501201_decision.pdf.

⁸⁹ See Annexes B, C, and D.

⁹⁰ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A 23, para. 64.

⁹¹ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 67; UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change* (Aug. 22, 2023) (Finding that climate change is an “urgent and systemic threat to children's rights globally” and describing the harms climate change presents to children's right to non-discrimination; life; survival; development; to be heard; to enjoy freedom of expression, association, and peaceful assembly; to access to information; to be free from all forms of violence; to the highest attainable standard of health; to social security and an adequate standard of living; to education; to belong to Indigenous and minority groups; to rest, play, leisure and recreation; and the right to clean, healthy and sustainable environment.).

⁹² I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 142 (emphasis added); see also para. 180 (“States must act with due caution to prevent possible damage. [...] Therefore, even in the absence of scientific certainty, they must take ‘effective’ measures to prevent severe or irreversible damage.”).

⁹³ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 172 (emphasis added); See e.g., I/A Court H.R., *Juridical Condition and Rights of Undocumented Migrants*, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 81 and para. 1 of the final Opinion (States “should take affirmative action, avoid taking measures that restrict or infringe a fundamental right, and eliminate measures and practices that restrict or violate a fundamental right.”); and Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 96, paras. 43-45 (Aug. 14, 2023) (Concluding that Montana's language regarding the right to a clean and healthy environment is “forward looking and preventative” and “clearly indicate that Montanans have a right not only to reactive measures after a constitutionally-proscribed environmental harm has occurred, but to be free of its occurrence in the first place” and that the right to a clean and healthy environment requires “enhancement and is “complemented by an affirmative duty upon governments to take active steps to realize this right.”) bit.ly/HeldFindingsConclusionsOrder.

Salvador reinforces the duty to mitigate damage **obligating States to protect, preserve, and improve an environment** that has already been degraded.⁹⁴

36. The Inter-American Commission of Human Rights ("Commission") likewise recognizes that "climate change is one of the greatest threats to the full enjoyment and exercise of human rights of present and future generations."⁹⁵ In turn, the Commission has called on States to reduce their emissions to ensure a safe climate that enables the exercise of rights⁹⁶ and "adopt and implement policies aimed at **reducing greenhouse gas emissions** that reflect the **greatest possible ambition** [...]."⁹⁷

37. This Court has yet to define what "**all means at their disposal**" and the "**greatest possible ambition**" entail in the context of climate change. It would be regionally critical and globally valuable for the Court to define these obligations in its forthcoming Advisory Opinion. It would also be straightforward to do so because:

- a. the necessary "**ambition**" needed to stabilize and restore the climate system **has already been identified** by scientists (see section II(C) setting out the need for the 350 ppm limit); and
- b. the "**means**" are **available** to States, **technically feasible**, and **economically beneficial** as discussed next.

Providing guidance on "all means" and "greatest possible ambition" would also clarify States' commitments pursuant to the Paris Agreement.⁹⁸

38. As a preliminary matter, **States' obligation** to use "all means" to reflect "the greatest possible ambition" to mitigate, protect, preserve, and improve the climate system **has already been triggered**. As established in section II(C), the world has already overshoot the safe level of CO₂ resulting in significant damage to the climate system.⁹⁹

⁹⁴ Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights ("Protocol of San Salvador") November 16, 1999, Art. 11.

⁹⁵ I/A Comm'n H.R., Resolution No. 3/2021 Climate Emergency: Scope of Inter-American Human Rights Obligations of December 31, 2021, Section B, Considerations.

⁹⁶ I/A Comm'n H.R., Resolution No. 3/2021 Climate Emergency: Scope of Inter-American Human Rights Obligations of December 31, 2021, para. 11 ("States have an obligation to cooperate in good faith in order to prevent pollution of the planet, which entails reducing their emissions to ensure a safe climate that enables the exercise of rights.").

⁹⁷ I/A Comm'n H.R., Resolution No. 3/2021 *Climate emergency: Scope of Inter-American Human Rights obligations* of December 31, 2021, para. 1 (emphasis added).

⁹⁸ Paris Agreement, Art. 4(3) (Dec. 12, 2015) (committing States to achieve the "highest possible ambition"); see also States' obligations pursuant to the Paris Agreement set forth in Annex E.

⁹⁹ Annex B, see e.g. Katherine Richardson et al., *Earth beyond six of nine planetary boundaries*, Sci. Adv. 9:1-16 at 10 (2023) ("[A]nthropogenic activities brought both climate and land system change outside their safe operating space around 1988.") <https://www.science.org/doi/epdf/10.1126/sciadv.adh2458>; David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, Sci. 377:1-10 at 8 (2022) ("The Earth may have left a safe climate state beyond 1°C global warming.") <https://doi.org/10.1126/science.abn7950>; and James Hansen et al., *Target atmospheric CO₂: Where should*

39. Since the world has reached the fateful point in the climate emergency where **every additional tonne of CO₂ emitted amplifies risks, increases harms, and violates human rights,¹⁰⁰ deep, rapid, and sustained reductions in greenhouse gas emissions are crucial.¹⁰¹**
40. To rapidly make the necessary cuts, States must prioritize two principle means:¹⁰²
- a. **Phasing out** the emission of economy-wide CO₂ and other greenhouse gas; and
 - b. **Maximizing the removal** of already-existing carbon pollution from the atmosphere.
41. It is a well-recognized principle that Member States must do everything in their power—even modify their laws, if necessary—to conform their conduct to their obligations under international human rights instruments.¹⁰³ Here, the means required to restore the climate system are not only within the State's power; they are also feasible and beneficial. To demonstrate, this submission focuses on States' obligation to phase out CO₂ emissions by transitioning away from fossil-fuel-based energy systems.
42. Hundreds of scientific studies find that **CO₂-emitting fossil fuels are not needed to power human energy systems.¹⁰⁴** A recent study sums up the findings and

humanity aim?, Open Atmospheric Sci. J., 2:217-231 at 218 (2008) (“[T]he present global mean CO₂, 385 ppm, is already in the dangerous zone.”)

<https://openatmosphericsciencejournal.com/contents/volumes/V2/TOASCIJ-2-217/TOASCIJ-2-217.pdf>.

¹⁰⁰ IPCC, *Summary for policymakers*, In: Climate change 2021: The physical science basis at 15:B.2.2 (2021) (“With every additional increment of global warming, changes in extremes continue to become larger [...]. There will be an increasing occurrence of some extreme events unprecedented in the observational record with additional global warming”)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf; and

IPCC, *Summary for policymakers*. In: Climate change 2023: Synthesis report, pp. 1-34, see e.g. p. 12, B.1 (“Every increment of global warming will intensify multiple and concurrent hazards (*high confidence*)”); see also B.1.3, Figure SPM.2, B.2, B.2.2, Figure SPM.4, C.1.1, and Figure SPM.6, https://bit.ly/IPCC_ar6.

¹⁰¹ IPCC, 2023: *Summary for policymakers*. In: Climate change 2023: Synthesis report, pp. 1-34 at C.3 (“Rapid and far-reaching transitions across all sectors and systems are necessary to achieve deep and sustained emissions reductions and secure a livable and sustainable future for all.”); see also. B.1, B.3, B.3.1, B.6, B.6.1, B.6.2, Figure SPM.5, B.7.3, C.2, C.2.1, and C.2.4. https://bit.ly/IPCC_ar6.

¹⁰² James Hansen, et al., *Young people's burden: Requirement of negative CO₂ emissions*, Earth Sys. Dyn., 8: 577-616 at 595 (2017) (Because “the world has already overshoot appropriate targets for GHG amount, [...] we thus infer an urgent need for (1) rapid phasedown of fossil fuel emissions, (2) actions that drawdown atmospheric CO₂ [...]”; and also at 593 (There is “no persuasive scientific reason to a priori reject as implausible a rapid phasedown of fossil fuel emissions.”) <https://esd.copernicus.org/articles/8/577/2017/>.

¹⁰³ United Nations Human Rights Committee, *General comment no. 31: The nature of the general legal obligation imposed on States Parties to the [International] Covenant [on Civil and Political Rights]* (2004), para. 6–7. <https://digitallibrary.un.org/record/533996?ln=en>.

¹⁰⁴ IPCC, 2023: *Summary for policymakers*. In: Climate change 2023: Synthesis report, pp. 1-34 at A.4.2 (“[M]itigation options [...] are technically viable, are becoming increasingly cost effective and are generally supported by the public.”) https://bit.ly/IPCC_ar6; and Christian Breyer et al., On the history and future of 100% renewable energy systems research, IEEE Access, 10:78176-78218 at 78176, 78202 (2022) (“The main

opportunities: “The plummeting cost of renewable technologies has reshaped global energy, creating an opportunity for faster defossilization than previously thought possible.[...] Renewables are now the cheapest form of electricity available in human history.”¹⁰⁵ Countries and regions as diverse as Uruguay, Vietnam, Denmark, and South Dakota have already transitioned to high levels of renewables, demonstrating proof of concept.¹⁰⁶

43. While the switch cannot flip overnight, all Member States can rapidly transition from a predominantly fossil fuel-based energy systems to renewable-based systems while advancing sustainable development goals.¹⁰⁷ **Leading energy scientists developed roadmaps for 145 countries showing how this is possible.**¹⁰⁸ The roadmaps provide States with pathways to rapidly transition energy infrastructure in all sectors (electricity, transportation, buildings, industry, agriculture/forestry/fishing, and the military) to 100% clean, renewable energy (wind, water, and solar) by as early as 2035, but by no later than 2050, with an 80% transition by 2030.¹⁰⁹ Once States¹¹⁰ subject to

conclusion of most of these studies is that 100% renewables is feasible worldwide at low cost.”)
<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9837910>.

¹⁰⁵ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, *Earth's Future*, 11:1-14 at 5 (2023) (“Energy storage has progressed even faster [...]”) <https://doi.org/10.1029/2023EF003639>.

¹⁰⁶ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, *Earth's Future*, 11:1-14 at 5 (2023) <https://doi.org/10.1029/2023EF003639>.

¹⁰⁷ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, *Earth's Future*, 11:1-14 at 5 (2023) (“Renewable energy can now supply grid-stable energy for every sector of the economy year-round on every continent [...]”) <https://doi.org/10.1029/2023EF003639>; and United Nations Department of Economic and Social Affairs, *The 17 Goals* (The feasibility of 100% renewables allows countries to meet Sustainable Development Goal 7, “Ensure access to affordable, reliable, sustainable, and modern energy for all”, Goal 13 “Take urgent action to combat climate change and its impacts”, and supports progress towards the other 15 goals) <https://sdgs.un.org/goals> (last accessed on Dec. 6, 2023).

¹⁰⁸ Mark Z. Jacobson et al., *Low-cost solutions to global warming, air pollution, and energy insecurity for 145 countries*, *Energy Environ. Sci.*, 15:3343–3359 (2022) <https://web.stanford.edu/group/efmh/jacobson/Articles/I/145Country/22-145Countries.pdf>.

¹⁰⁹ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Trial Transcript, Testimony of Mark Z. Jacobson, p. 1057 (Jun 16, 2023) (noting that the roadmaps set forth only one of many scenarios to reach 100% renewables providing States with a starting point to tailor their climate actions) (available upon request).

¹¹⁰ The totals reflect the combined roadmaps of Argentina, Bolivia, Brazil, Chile, Columbia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, and Uruguay. Barbados, Dominica, and Granada are not included in this compilation because the roadmaps for these countries do not yet exist. Roadmaps are also available for Canada, Cuba, Trinidad-Tobago, the United States, and Venezuela in *Annex F*. *Amici* recognize that this Court will not “restrict its ruling to those States that have ratified the American Convention”, fully agreed that to do so would “restrict the purpose of the advisory proceeding”, and understand that any decisions the Court takes “in this Advisory Opinion applies to the OAS Member States that have signed either the OAS Charter, the American Declaration, or the Universal Declaration, or have ratified the International Covenant on Civil and Political Rights, regardless of whether or not they have ratified the American Convention or any of its optional protocols.” See I/A Court H.R., *Juridical Condition and Rights of Undocumented Migrants*, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, paras. 58, 59, and 60. However, *Amici* included the States that have ratified (and not denounced) the Convention in the compiled “Totals” to: (i)

the jurisdiction of this Court convert from fossil fuels to 100% renewables pursuant to the roadmaps available via in Annex F, together they will:

- a. **eliminate** approximately 3.7 billion metric tons of CO₂ per year;
- b. **save** approximately \$2.7 trillion US dollars **per year** in social costs;¹¹¹
- c. **save** over \$591 billion US dollars **per year** in annual energy costs;
- d. **add** net 1.29 million long-term, full-time jobs to the economy;
- e. **prevent** approximately 200,000 deaths related to air pollution **each year**; and
- f. **reduce** the amount of energy required to power the States by 56.7% because renewables are more energy efficient.

44. The transition to renewables will also substantially reduce the risks associated with energy security,¹¹² and the greatest benefits gained will be in the communities currently suffering the worst environmental injustice.¹¹³

45. This Court **will not be the first** judicial body to examine the feasibility of obligating States to transition from a fossil-fueled based energy system to 100% renewables. In *Held et al. v. State of Montana*, “feasibility” was a factual question resolved by the Court.¹¹⁴ For context, Montana is emissions intensive economy and “linchpin” of the fossil fuel economy in North America with emissions that rival nations.¹¹⁵ For example, the annual emissions of Montana’s ~1 million people is approximately equivalent to the annual emissions of Argentina’s population of 47 million.¹¹⁶ Consequently, the feasibility to transition off fossil was a factual issue at trial. Assessing cross-examined expert testimony,¹¹⁷ the District Court first established that, historically, **States have**

ensure a conservative approach to assessing the benefits of transitions from fossil-fuel based energy systems to renewables; and (ii) because of roadmap availability for the OAS Member States that have not ratified the American Convention.

¹¹¹ The social savings are estimated by assessing a number of economic costs (e.g. health, loss of life, labor productivity, loss of property, and environmental costs) that are saved with every ton of CO₂ that is not emitted.

¹¹² Mark Z. Jacobson et al., *Low-cost solutions to global warming, air pollution, and energy insecurity for 145 countries*. Energy Environ. Sci., 15:3343–3359 (2022).
<https://web.stanford.edu/group/efmh/jacobson/Articles/II/145Country/22-145Countries.pdf>.

¹¹³ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*. Earth’s Future, 11:1-14 at 6 (2023) <https://doi.org/10.1029/2023EF003639>.

¹¹⁴ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Trial Transcript, pp. 1017-1018, 1059 (Jun 16, 2023) (available upon request).

¹¹⁵ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Trial Transcript, Testimony of Peter Erickson, pp. 931-932 (Jun 16, 2023) (available upon request).

¹¹⁶ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Trial Transcript, Testimony of Peter Erickson, pp. 931-932 (Jun 16, 2023) (available upon request).

¹¹⁷ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Trial Transcript, Testimony of Mark Z. Jacobson, pp. 1017-1138 (Jun. 16, 2023) (available upon request).

chosen to develop widespread fossil fuel infrastructure and dependency.¹¹⁸ This was—and remains—a choice for all States.¹¹⁹ Second, the Court found that “It is technically and economically feasible for [the State of] Montana to replace 80% of existing fossil fuel energy by 2030 and 100% by no later than 2050 but as early as 2035.”¹²⁰ The District Court concluded, “clean renewable energy it technically feasible and economically beneficial in Montana.”¹²¹

46. In light of the availability and benefits of transitioning to renewables, the “continued creation of fossil fuel infrastructure is both deeply irresponsible and morally unacceptable [...]”¹²² This, combined with the scale of the issue, ensures **it is neither unjust nor premature for this Court to obligate States to end CO₂ emissions from fossil fuels.**¹²³ In light of the responsibility to use **all means at their disposal** to achieve **the greatest possible ambition** the Court should obligate States to:

- a. **Eliminate** at least 80% of all **CO₂ emissions** by 2030 and 100% by 2035 but no later than 2050.

¹¹⁸ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact, p. 84, para. 282 (Aug. 14, 2023) (“The current barriers to implementing renewable energy systems are not technical or economic, but social and political. Such barriers primarily result from government policies that slow down and inhibit the transition to renewables, and laws that allow utilization of fossil fuel development and preclude a faster transition to a clean, renewable energy system.”) bit.ly/HeldFindingsConclusionsOrder.

¹¹⁹ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Expert Report of Mark Z. Jacobson, Ph.D., at 9 (Sep. 30, 2022) ([C]urrent barriers to implementing the WWS roadmaps are neither technical nor economic. They are social and political. Such barriers are primarily a result of government policies that continue to promote fossil fuel development and keep fossil energy locked in.”)(available upon request); United Nations Climate Change, *History of the Convention* (State Parties have known since well before the 1992 Earth Summit in Rio de Janeiro when the UNFCCC was opened for signature that to avert a climate crisis, time was of the essence. Rather than take appropriate measures then, States delayed for decades allowing the crisis to escalate into the full-blown emergency that it is today.) <https://unfccc.int/process/the-convention/history-of-the-convention> (last accessed Dec. 6, 2023); James G. Speth, *They Knew: The US federal government's role in causing the climate crisis*, MIT Press, at 3 (2022) (By 1981 it was already very clear that the U.S. federal government “knew that the continued burning of high levels of fossil fuels would lead to climate danger; and [...] knew of pathways recommended by experts within government and others to transition away from fossil fuels, including through [...] solar and other renewables. Notwithstanding this, [the U.S. government] continued [...] to the present to plan for, support, invest in, permit, and otherwise foster a national fossil-fuel-based energy system.”); and e.g. Justin Rowlatt, *COP18: UAE planned to use climate talks to make oil deals*, BBC (Nov. 26, 2023) <https://www.bbc.com/news/science-environment-67508331> (last accessed Dec. 6, 2023).

¹²⁰ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Findings of Fact, p. 81, paras. 271-272, see also pp. 80-84, paras. 269-283 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

¹²¹ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law, p. 101, para. 65 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

¹²² Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*. *Earth's Future*, 11:1-14 at 5 (2023) <https://doi.org/10.1029/2023EF003639>.

¹²³ Helen Keller et al., *Something ventured, nothing gained? Remedies before the ECtHR and their potential for climate change cases*, *Human Rights Law Review*, 22:1 at 19 (2022) (Discussing why it is precisely the scale of the emergency that creates the need for this Court to order emissions-reduction measures.) <https://www.zora.uzh.ch/id/eprint/228785/1/ngab030.pdf>.

- b. **Prohibit** the renewal of permits or new, intensified, or expanded instances of fossil fuel extraction or fossil fuel infrastructure (defined broadly).
- c. **Audit** all anthropogenic CO₂ emissions from human activities in State-controlled territory, calculated in good faith according to best practices, without relying on carbon offsets.¹²⁴
- d. **Identify** the State's laws, regulations, policies, and practices that contribute to, encourage, facilitate, or tolerate continuing CO₂ emissions and modify as necessary in light of phasing out CO₂ emissions. This process of identification should encompass:
 - i. Acts and omissions;
 - ii. All scales of government activity, including local government and state-owned enterprises; and
 - iii. All spheres of government activity, including government purchasing practices, land-use policies, subsidies, investigation and enforcement practices, public education, and the diplomatic sphere.
- e. **Adopt** a comprehensive overarching climate mitigation plan containing policies, practices, measures, and mechanisms to eliminate CO₂ emissions, with ambitious benchmarks and deadlines culminating in (a) above.¹²⁵

**IV. Climate Change Discriminates Against Children Obligating States to Ground Their Climate Actions in the “Best Available Science”, Pursue “All Means at Their Disposal”, and Achieve the “Greatest Possible Ambition”
(Question IV(C)(1) and IV(A)(2))**

47. This Court has already established that children are in a situation of special

¹²⁴ See e.g. Nikki Lakhani, *Revealed: Top carbon offset projects may not cut planet-heating emissions*, The Guardian (Sep. 19, 2023) (“The vast majority of the environmental projects most frequently used to offset greenhouse gas emissions appear to have fundamental failings [... that] exaggerate climate benefits and underestimate potential harms.”) <https://www.theguardian.com/environment/2023/sep/19/do-carbon-credit-reduce-emissions-greenhouse-gases> (last accessed Dec. 6, 2023); Thales A.P. West et al., *Action needed to make carbon offsets from forest conservation work for climate change mitigation*, Science, 381:1-5 at 4 (2023) (In a study examining 26 carbon offset sites in 6 countries the findings “corroborate prior studies that questioned the additionality, and thus environmental integrity, of carbon-offset interventions.”) <https://www.science.org/doi/10.1126/science.ade3535> (restricted access, available upon request); and Jared Stapp et al., *Little evidence of management change in California’s forest offset program*, Commun. Earth Environ., 4(331):1-10 at 1 (2023) (“Carbon offsets are widely promoted as a strategy to lower the cost of emission reductions, but recent findings suggest that offsets may not causally reduce emissions by the amount claimed.”) <https://doi.org/10.1038/s43247-023-00984-2>.

¹²⁵ I/A Court H.R., Juridical Condition and Rights of Undocumented Migrants, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, paras. 64, 67 (“[T]he Court recalls the board scope of its advisory function” and is “empowered to structure its rulings as it considers best suited to the interests of justice and the purpose of an advisory opinion. [...] [T]he Court takes into account the basic issues that underlie the questions posed [...] to reach general conclusions that can, in turn, be extended to specific points mentioned in the request itself [...].”).

vulnerability to environmental damage.¹²⁶ Based on the differentiated impact children face in this context, this Court should extend its existing jurisprudence by making an explicit declaration that climate change discriminates against children.

48. Such a declaration would be a logical extension of this Court's jurisprudence for three legal reasons. First, the Commission has declared that children have a **particularly high risk of harm** from the climate crisis¹²⁷ and extensive medical research echoes this finding.¹²⁸ Second, children are entitled to extra protection under Article 19, in addition to the protection they are entitled to under the rest of the Convention.¹²⁹ Such protection requires all decisions concerning them to be made in light of the **best interests of the child**.¹³⁰ Third, "[b]ased on the principle of **intergenerational equity** which necessitates that all children [...] have the right to [...] live on a planet equal to or in better conditions than their ancestors."¹³¹ In the context of climate change, this means restoring atmospheric CO₂ to ~280-350 ppm: the pre-industrial level to which humanity is adapted.¹³²

49. Such a declaration is justified factually because children are harmed by climate change to a more intense degree than adults.¹³³ For example, due to physiological

¹²⁶ I/A Court H.R., The Environment and Human Rights, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 67 ("Various human rights bodies have recognized that [...] children [...] are groups that are especially vulnerable to environmental damage [...]").

¹²⁷ I/A Comm'n H.R., Resolution No. 3/2021 *Climate emergency: Scope of Inter-American Human Rights obligations*, at 6 (Dec. 31, 2021).

¹²⁸ See Annex C.

¹²⁹ I/A Court H.R., Case of the *Massacres of El Mozote and surrounding areas v. El Salvador*. Merits, Reparations and Costs. Judgment of October 25, 2012. Series C No. 252, para. 150.

¹³⁰ I/A Court H.R., Differentiated approaches with respect to certain groups of persons in detention, Advisory Opinion OC-29/22 of May 30, 2022. Series A No. 29, para. 172 ("The Court has already emphasized that, in protecting the rights of children and in adopting measures to achieve that protection, the following four guiding principles of the Convention on the Rights of the Child should transversally inspire, and be implemented throughout, the entire system of comprehensive protection: the principle of non-discrimination; the principle of the best interests of the child; the principle of respect for the right to life, survival and development, and the principle of respect for the opinion of children in all procedures affecting them in a manner that ensures their participation."); and UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change*, paras. 16-19 (Aug. 22, 2023) ("[T]he best interests of the child shall be a primary consideration in the adoption and implementation of environmental decisions, including laws, regulations, policies, standards, guidelines, plans, strategies, budgets, international agreements and the provision of development assistance.").

¹³¹ I/A Comm'n H.R., Resolution No. 3/2021 *Climate emergency: Scope of Inter-American Human Rights obligations*, para. 21 (Dec. 31, 2021); See also, UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change*, para. 11 (Aug. 22, 2023).

¹³² James Hansen et al., *Target atmospheric CO₂: Where should humanity aim?*, Open Atmospheric Sci. J., 2:217-231 (2008) <https://openatmosphericsciencejournal.com/contents/volumes/V2/TOASCJ-2-217/TOASCJ-2-217.pdf>,

¹³³ See e.g. Samantha Ahdoot et al., *Global climate change and children's health*, Pediatrics, 136:e1468-1484 at e1468-1469 (2015) <https://doi.org/10.1542/peds.2015-3233>. ("Children are a uniquely vulnerable group that suffers disproportionately from these effects."); Perry E. Sheffield et al., *Global climate change and children's health: Threats and strategies for prevention*, Environ. Health Perspect., 119(3):291-298 at

differences between children and adults,¹³⁴ children die from exposure to extreme heat at 1.5 to 2 times the rate of adults.¹³⁵ Children are also vulnerable to certain **types** of climate-induced harm that do not apply to adults. For example, maternal exposure to heat during pregnancy greatly increases the newborn's risk of dying or having a disability.¹³⁶ Children are also **dependent on caregivers** for their safety. They are less likely than adults to be able to find their way to safety or access food and safe drinking water alone—and if separated from caregivers, they are vulnerable to starvation, the elements, abuse, and trafficking.¹³⁷ Finally, children have more years left to live than adults do and will therefore be exposed to **worse climate effects over a larger portion** of their lives.¹³⁸ (See Annex C for more on the disproportionate impact climate change has on children's rights.)

50. For these reasons, States' continued emission of the primary climate pollutant—CO₂—discriminates against children.

51. It is legally irrelevant whether States *themselves* consider their CO₂ emissions to be discriminatory. This Court has said that if various options are available to a State to achieve an objective, the one that “least restricts the right protected must be

296 (2011) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3059989/pdf/ehp-119-291.pdf> (“Effects on children and on other vulnerable populations are already—and are projected to continue to be—disproportionately heavy.”); Zulfiqar Ahmed Bhutta et al., *Climate change and global child health: What Can paediatricians do?* Arch. Dis. Child., 104(5):417-418 at 417 (2019) <https://adc.bmj.com/content/archdischild/104/5/417.full.pdf>. (Children pay a disproportionate price for climate change [...]); and Annex C.

¹³⁴ See e.g. Zhiwei Xu et al., *Climate change and children's health—A call for research on what works to protect children*, Int. J. Environ. Res. Public Health, 9:3298-3316 at 3299 (2012) (“Climate change poses a significant threat to children's health because children have unique metabolism, behavior, physiology and development characteristics.”) <https://doi.org/10.3390/ijerph9093298>; Samantha Ahdoot et al., *Global climate change and children's health*, Pediatrics 136(5):e1468-1484 at e1470 (2015) (Children's “immature physiology and metabolism; incomplete development; higher exposure to air, food, and water per unit body weight; unique behavior patterns; and dependence on caregivers place children at much higher risk of climate-related health burdens than adults.”) <https://doi.org/10.1542/peds.2015-3233>; and Frederica Perera et al., *Climate Change, Fossil-Fuel Pollution, and Children's Health*, New Eng. J. Med., 386:2303-2314 at 2304, Figure 2 (2022) (“The fetus, infant, and child are uniquely vulnerable to climate-related environmental impacts and air pollution owing to a host of biologic and behavioral factors.”) <https://www.nejm.org/doi/full/10.1056/NEJMra2117706>.

¹³⁵ Joshua Graff Zivin et al., *Temperature extremes, health, and human capital*, Future Child., 26(1):31-50 at 35 (2016) (Each additional 1°C rise in ambient temperature over 27°C to 29°C increases adult mortality by 2%-3%, and child mortality by approximately 1.5%-6%.) <https://files.eric.ed.gov/fulltext/EJ1101427.pdf>.

¹³⁶ See e.g. Matthew F. Chersich et al., *Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: Systematic review and meta-analysis*, BMJ, 371; 1-13 (2020) <https://doi.org/10.1136/bmj.m3811>; and Tamás Hajdu et al., *Climate change and the mortality of the unborn*, J. Environ. Econ. Manag., 118:1-12 (2023) <https://doi.org/10.1016/j.jeem.2022.102771>.

¹³⁷ See e.g. Samantha Ahdoot et al., *Global climate change and children's health*, Pediatrics 136(5):e1468-e1484 at e1470 (2015) <https://doi.org/10.1542/peds.2015-3233>; and Kristie L. Ebi, *Climate Change and Children*, Pediatr. Clin. North Am., 54(2):213-226 at 213, 218 (2007) <https://doi.org/10.1016/j.pcl.2007.01.004> (restricted access, available upon request).

¹³⁸ See e.g. Perry E. Sheffield et al., *Global climate change and children's health: Threats and strategies for prevention*, Environ. Health Perspect., 119(3):291-298 at 292 (2011) <https://doi.org/10.1289/ehp.1002233>; and Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, Clin. Psychol. Sci., 10(4):767-785 at 769-775, Figures 1 and 2 (2022) <https://doi.org/10.1177/21677026211040787>.

selected.”¹³⁹ The European Court of Human Rights (“European Court”) holds that a State’s systemic failure to appreciate the seriousness and extent of a problem that has a discriminatory effect *itself* breaches the right to equal protection, even if the failure is not intentional.¹⁴⁰

52. In the European Court, “once an applicant has shown that there has been a difference in treatment it is then for the respondent Government to show that that difference in treatment could be justified [...].”¹⁴¹ Applied here, because every additional tonne of CO₂ emissions harms children **disproportionately** as compared to adults (as shown in sections IV, V and VI and Annex C), States have an obligation to either stop emitting, or to prove that their emissions are justified notwithstanding the harm. Because the harms to child health are extraordinarily severe, it is extremely unlikely any State can overcome this standard of proof.

53. In sum, because climate change discriminates against children, this Court should declare that States have a special obligation to prevent children’s rights from being infringed by climate change. States’ obligations under the Convention require them to:

- a. **Cease the emission of all anthropogenic CO₂ to the extent necessary to protect children** from harm, which is the extent specified in section II(C) and III above, namely, limiting the concentration of atmospheric CO₂ to 350 ppm or less by 2100 at the latest, which is achievable by reducing fossil fuel emissions by 80% by 2035 and 100% by 2050 at the latest.
- b. Give the **best interests of the child** a primary consideration in all matters concerning climate change.¹⁴²
- c. Demonstrate—via each State’s thorough and serious action to **rapidly cut emissions**—the State’s high responsiveness toward children’s complaints about their mistreatment at the hands of continuing emissions.

¹³⁹ I/A Court H.R., Compulsory Membership in an Association Prescribed by Law for the Practice of Journalism. Advisory Opinion OC-5/85, November 13, 1985, Series A No. 5, para. 46; see section III above and Annex F for options available to States to transition off fossil fuels.

¹⁴⁰ ECHR, Case of *Eremia v. The Republic of Moldova*, No. 3564/11. Judgement of Aug. 8, 2013, paras 85, 89, see also ECHR, Case of *Munteanu v. The Republic of Moldova*, No. 34168/11. Judgement of Aug. 26, 2020, paras. 78-83 .

¹⁴¹ ECHR, Case of *Volodina v. Russia*, No. 41261/17. Judgement of Nov. 4, 2019, para. 111.

¹⁴² I/A Court H.R., Differentiated approaches with respect to certain groups of persons in detention, Advisory Opinion OC-29/22 of May 30, 2022. Series A No. 29, para. 172; Convention of the Rights of the Child, Art. 3(1) (Sep. 2, 1990); and UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children’s rights and the environment, with a special focus on climate change*, paras. 16-19 (Aug. 22, 2023).

- d. Treat children who belong to groups in situations of risk with an **intersectional approach**,¹⁴³ because “the climate crisis magnifies existing inequities[.]”¹⁴⁴

V. Anthropogenic Climate Change Violates Children's Right to Physical Integrity (Question IV(C)(1) and IV(A)(2))

54. In cases “involving human health” this Court has said that “the lack of access to conditions that ensure a dignified life may also constitute a violation of the right to personal integrity[.]”¹⁴⁵ The right to physical integrity is “impacted” by violations of the right to a healthy environment because “[e]nvironmental degradation may cause irreparable harm to human beings.”¹⁴⁶
55. Based on section IV and Annex C, it is clear that climate change disproportionately affects children's rights such as the right to physical integrity, health, and life **constituting a violation of the Convention**.¹⁴⁷
56. For example, anthropogenic climate change increases the risk and intensity of fires.¹⁴⁸ Smoke from wildfires already causes two premature deaths per 100,000 people per year across South America, rising to four premature deaths per 100,000 people throughout Indigenous territories.¹⁴⁹ Additionally, since adolescent and young adult

¹⁴³ I/A Court H.R., Differentiated approaches with respect to certain groups of persons in detention, Advisory Opinion OC-29/22 of May 30, 2022. Series A No. 29, para. 69 (“[A]s has been stated by the Court in other cases, States should pay special attention to those cases in which there is an intersection of multiple factors of vulnerability and risk of discrimination associated with a of particular conditions and identity traits.”).

¹⁴⁴ See e.g. Emmanuelle Arpin et al., *Climate change and child health inequality: A review of reviews*, Int. J. Environ. Res. Public Health, 18(10896):1-17 at 11-13, Table 4 (2018) <https://doi.org/10.3390/ijerph182010896>.

¹⁴⁵ I/A Court H.R., The Environment and Human Rights, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 114.

¹⁴⁶ I/A Court H.R., The Environment and Human Rights, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 59.

¹⁴⁷ American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Arts. 4 and 5(1); and I/A Court H.R., Differentiated approaches with respect to certain groups of persons in detention, Advisory Opinion OC-29/22 of May 30, 2022. Series A No. 29, para. 101.

¹⁴⁸ IPCC, *Chapter 12: Central and South America* In: Climate change 2022: Impacts, Adaptation and Vulnerability, Working Group II, Sixth Assessment Report, pp. 1689–1816, see e.g. 1691 and 1705 (2022) (“On average, people in the region were more exposed to high fire danger between 1 and 26 additional days depending on the sub-region for the years 2017–2020 compared to 2001–2004 (high confidence).” And, “Forest fires pose a major threat to public health in the region because they relate to an increase in hospital admissions due to respiratory problems, mainly among children and the elderly (Figure 12.5).”); [doi:10.1017/9781009325844.014](https://doi.org/10.1017/9781009325844.014); Matthew W. Jones et al., *Global and regional trends and drivers of fire under climate change*, Rev. Geophys., 60(e2020RG000726):1-76 (2022) (South America has experienced the greatest increase in “fire weather”—defined as conditions conducive to fire ignition and spread—anywhere in the globe.) <https://doi.org/10.1029/2020RG000726>; and Clair Barnes et al., *Climate change more than doubled the likelihood of extreme fire weather conditions in Eastern Canada*, World Weather Attribution, 1-26 at 2, 19 (For example, climate change increased the intensity of Canada's 2023 wildfires by 20%.) <https://spiral.imperial.ac.uk/bitstream/10044/1/105981/17/scientific%20report%20-%20Canada%20wildfires.pdf>; see also Annex C.

¹⁴⁹ Eimy Bonilla et al., *Health impacts of smoke exposure in South America: Increased risk for populations in the Amazonian Indigenous territories*, Environ. Res. Health, 1(2):1-10 at 1 (2023) <https://doi.org/10.1088/2752-5309/acb22b>.

lung function is predictive of respiratory health later in life, wildfire exposure also creates numerous short- and long-term health impacts for children including increased acute respiratory problems, exacerbation-of-asthma events, growth effects, increased cancer risk, and poorer cardiovascular health among others.¹⁵⁰ A growing body of literature also suggest the exposures may have neuropsychological effects in children, including associations with ADHD, autism, school performance, and memory.¹⁵¹

57. Rising heat is also especially dangerous to health. To illustrate, anthropogenic greenhouse gas emissions made the record-breaking 2022 heatwaves in South America **60 times** more likely.¹⁵² **At current levels** of global warming, heat-related deaths in Ecuador have increased nearly **15-fold** since 2000¹⁵³ and anthropogenic climate change now causes **more than 60%** of all heat-related deaths in Colombia, Ecuador, Peru, Brazil, Costa Rica, and Guatemala.¹⁵⁴ Heat-related kidney failure is now the **second leading cause of death** in Nicaragua and El Salvador,¹⁵⁵ especially among children and young people involved in agricultural work.¹⁵⁶ In the decade spanning 2012 and 2021, South American children younger than one-year old were affected, on average, by 2.35 million more person-days of heatwave exposure each year.¹⁵⁷ As noted in section IV and Annex C, due to physiological differences between children

¹⁵⁰ Radhika Dhingra et al., *Wildfire smoke expo exposure and early childhood respiratory health: A study of prescription claims data*, *Enviro. Health*, 22(48):1-13 at 2 (2023) <https://doi.org/10.1186/s12940-023-00998-5>; and Stephanie M. Holm et al., *Health effects of wildfire smoke in children and public health tools: A narrative*, *J. Expo. Sci. Environ. Epidemiol.*, 31:1-20 at 3 (2021) <https://doi.org/10.1038/s41370-020-00267-4>.

¹⁵¹ Stephanie M. Holm et al., *Health effects of wildfire smoke in children and public health tools: A narrative*, *J. Expo. Sci. Environ. Epidemiol.*, 31:1-20 at 3 (2021) <https://doi.org/10.1038/s41370-020-00267-4>.

¹⁵² Juan Antonio Rivera et al., *2022 early-summer heatwave in southern South America: 60 times more likely due to climate change*, *Clim. Chang.*, 176(102):1-23 at 1, 18 (2023) <https://doi.org/10.1007/s10584-023-03576-3> (restricted access, available upon request).

¹⁵³ Stella M. Hartinger et al., *The 2022 South America report of The Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, *Lancet Reg. Health - Am.*, 20(100470):1-35 at 8 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

¹⁵⁴ Ana M. Vicedo-Cabrera et al., *The burden of heat-related mortality attributable to recent human-induced climate change*, *Nat. Clim. Chang.*, 11:492-509 at 497 (2021) (restricted access, available on request).

¹⁵⁵ Cecilia Sorensen et al., *A new era of climate medicine: Addressing heat-triggered renal disease*, *N. Engl. J. Med.*, 381(8):693-696 at 693 (2019) <https://www.nejm.org/doi/full/10.1056/NEJMp1907859>.

¹⁵⁶ Pedro Ordúñez et al., *Chronic kidney disease mortality trends in selected Central America countries, 1997-2013: Clues to an epidemic of chronic interstitial nephritis of agricultural communities*, *J. Epidemiol. Community Health* 72(4):280-286 at 280 (2018) <http://dx.doi.org/10.1136/jech-2017-210023> ("[T]he main health facility of southeastern El Salvador, San Miguel Hospital, is filled with young patients requiring access to dialysis.") (restricted access, available upon request); see also Eleni Geladari et al., *Failing kidneys in a failing planet: CKD of unknown origin*, *Rev. Environ. Health*, 38(1):125-135 at 125, 127 (2023) <https://doi.org/10.1515/reveh-2021-0109> (restricted access available upon request); and Cecilia Sorensen et al., *A new era of climate medicine: Addressing heat-triggered renal disease*, *N. Engl. J. Med.*, 381(8):693-696 (2019) <https://www.nejm.org/doi/full/10.1056/NEJMp1907859>.

¹⁵⁷ Stella M. Hartinger et al., *The 2022 South America report of The Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, *Lancet Reg. Health - Am.*, 20(100470):1-35 at 8 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

and adults, children are orders of magnitude more vulnerable to dying from heat than adults are.¹⁵⁸

58. Climate change also inflicts **severe physical harm on newborns**. As noted earlier, maternal exposure to heat during pregnancy greatly increases the newborn's risk of dying or being born with a lifelong disability.¹⁵⁹ This Court has held that "among the positive measures to be adopted by the States are those which are necessary to prevent all types of disabilities which may be prevented [...]."¹⁶⁰
59. Climate change adversely impacts access to **services that are crucial for maintaining physical health**. For example, severe weather cuts off access to medical care by washing out roads, damaging medical facilities, and forcing facilities to close due to lack of water,¹⁶¹ power,¹⁶² and communications networks. When water infrastructure is damaged by floods, storms, or fires children are exposed to diseases such as cholera, typhoid, acute respiratory infections, measles, and more.¹⁶³
60. Likewise, this Court, has recognized that "**displacements** caused by environmental deterioration **frequently unleash violent conflicts** between the displaced population and the population settled on the territory to which it is displaced. **Some of these conflicts are massive and thus extremely grave.**"¹⁶⁴ Moreover, children displaced by climate change are **especially vulnerable to abuse**: "children and youths are the groups most severely affected by the displacement. [D]isplacement, in turn, causes a security crisis, because the groups of internally displaced persons [including children] become a new focus or resource for recruitment by paramilitary groups themselves, by

¹⁵⁸ Joshua Graff Zivin et al., *Temperature extremes, health, and human capital*, *Future Child.*, 26(1):31-50 at 35 (2016) <https://files.eric.ed.gov/fulltext/EJ1101427.pdf>; Sarah Chapman et al., *Past and projected climate change impacts on heat-related child mortality in Africa*, *Environ. Res. Lett.*, 17(7):1-11 at 2 (2022) <https://doi.org/10.1088/1748-9326/ac7ac5>; and Jean Calleja-Agius et al., *The effect of global warming on mortality*, *Early Hum. Dev.*, 155(105222):1-5 at 2 (2021) <https://doi.org/10.1016/j.earlhumdev.2020.105222>.

¹⁵⁹ Matthew F. Chersich et al., *Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: Systematic review and meta-analysis*, *BMJ*, 371;1-13 (2020) <https://doi.org/10.1136/bmj.m3811>; Tamás Hajdu et al., *Climate change and the mortality of the unborn*, *J. Environ. Econ. Manag.*, 118(102771):1-12 (2023) <https://doi.org/10.1016/j.jeem.2022.102771>; and Jenna Kanner et al., *Ambient temperature and stillbirth: Risks associated with chronic extreme temperature and acute temperature change*, *Environ. Res.*, 189(109958):1-8 (2020) <https://doi.org/10.1016/j.envres.2020.109958> (restricted access, available upon request).

¹⁶⁰ I/A Court H.R., *Case of Ximenes Lopes v. Brazil*. Merits, Reparations and Costs. Judgment of July 4, 2006. Series C No. 149, para. 104.

¹⁶¹ Carolyn Kousky, *Impacts of natural disasters on children*, *Future Child.*, 26(1):73-92 at 73 (2016) <https://files.eric.ed.gov/fulltext/EJ1101425.pdf>.

¹⁶² Chaamala Klinger et al., *Power outages, extreme events and health: A systematic review of the literature from 2011-2012*, *PLoS Curr.*, 2(6) (2014) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3879211/>.

¹⁶³ UNICEF, *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, 1-26 at 33 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>; and Perry E. Sheffield et al., *Global climate change and children's health: Threats and strategies for prevention*, *Environ. Health Perspect.*, 119(3):291-298 (2011) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3059989/pdf/ehp-119-291.pdf>.

¹⁶⁴ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 66.

drug traffickers, and by the guerrilla forces.”¹⁶⁵ For example, in 2020, Hurricanes Eta and Iota displaced thousands of people in Central America into shelters, where children, especially girls, were reportedly exposed to sexual abuse.¹⁶⁶

61. In sum, climate change impinges seriously upon individuals' physical integrity. These infringements burden children particularly severely.
62. This seriousness is underscored by the sheer magnitude of climate change's impacts on child physical integrity. To give a sense of scale, **90% of children** under this Court's jurisdiction—over **170 million children**¹⁶⁷—are already exposed to **at least two** climate shocks¹⁶⁸ such as heatwaves and flooding. Children's exposure will continue to rise in parallel with the continued rise of CO₂ emissions, such that by 2050, **nearly all children** will be exposed to frequent heatwaves.¹⁶⁹ This impinges on physical integrity because heat is especially harmful to child physical health¹⁷⁰ (See section IV and Annex C).
63. For these reasons, climate change constitutes, *per se*, a violation of the right to physical integrity for those who are exposed, and especially for children.
64. Because every tonne of CO₂ emissions incrementally worsens climate change, every tonne violates children's right to physical integrity. States therefore have an obligation to:
- a. **Stop all human-caused CO₂ at the utmost speed**, as specified above.

¹⁶⁵ I/A Court H.R., Case of the “Mapiripán Massacre” v. Colombia. Merits, Reparations and Costs. Judgment of September 15, 2005. Series C No. 134, para. 96.59.

¹⁶⁶ United Nations Honduras, *Honduras: Tormentas tropicales Eta e Iota, informe de situación No. 05* (Dec. 2, 2020) <https://honduras.un.org/sites/default/files/2020-12/SitRep%205%20Tormentas%20Eta%20e%20Iota%20HN%202020.pdf> (Measures needed to be taken to prevent sexual abuse and violence in the shelters); UNFPA, *Contar con datos que salvan vidas ayuda a UNFPA en la respuesta ante el Huracán Eta y Iota* (April 5, 2021) <https://lac.unfpa.org/es/news/contar-con-datos-que-salvan-vidas-ayuda-unfpa-en-la-respuesta-ante-el-hurac%C3%A1n-eta-y-iota> (Data visualization helped the Honduran government and international organizations address children's vulnerability to sexual violence in the shelters); Boris Miranda, *Los abusos sexuales a los que están expuestas miles de niñas y adolescentes en albergues de Centroamérica por los huracanes Iota y Eta*, BBC News (Dec. 23, 2020) <https://www.bbc.com/mundo/noticias-america-latina-55431077> (last accessed Dec. 6, 2023).

¹⁶⁷ UNICEF, *UNICEF data warehouse: Population under age 18*, https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=DM&ver=1.0&dq=.DM_POP_U18...&startPeriod=2020&endPeriod=2023 (last accessed Dec. 6, 2023).

¹⁶⁸ UNICEF, *9 out of 10 children in Latin America and the Caribbean are exposed to at least two climate and environmental shocks* (Aug. 20, 2021) <https://www.unicef.org/lac/en/press-releases/children-latin-america-and-caribbean-are-exposed-climate-climate-environmental-shocks> (last accessed Dec. 6, 2023).

¹⁶⁹ UNICEF, *The coldest year of the rest of their lives: Protecting children from the escalating impacts of heatwaves*, 1-52 at 6 (Oct. 25, 2022) <https://www.unicef.org/media/129506/file/UNICEF-coldest-year-heatwaves-and-children-EN.pdf>.

¹⁷⁰ World Health Organization, *Heatwaves*, https://www.who.int/health-topics/heatwaves#tab=tab_1 (last accessed Dec. 6, 2023).

- b. **Prevent**¹⁷¹ the further deterioration of the climate system, **protect and preserve** the atmosphere, and **improve and restore** the level of atmospheric CO₂ to a level that is safe for humanity,¹⁷² in line with children's right to a clean and healthy environment, as specified in sections II(C) and III above.

65. Additionally, while the focus of this submission is on mitigating climate change rather than adaptation, adaptive measures will need to be taken because even if CO₂ emissions were reduced to zero tomorrow, it will be decades until Earth's significant energy imbalance is rectified and the climate stabilized. Accordingly, it is **also urgent for States to invest in the following preparedness measures** relevant to child physical health:

- a. develop resilient healthcare infrastructure that minimizes healthcare's carbon footprint;
- b. build supply-chain resilience to withstand climate shocks;
- c. implement early warning systems and emergency preparedness including coordination with emergency service agencies;
- d. conduct surveillance of the health impacts of climate change, including infectious-disease surveillance and analysis, vaccination, and vector control;
- e. implement continuing education and training for healthcare workers to prepare them to meet the growing challenges to child health amidst the crisis; and
- f. research the effectiveness of the mitigation and adaptation efforts put in place.¹⁷³

VI. Anthropogenic Climate Change Violates Children's Right to Mental Integrity (Question IV(C)(1) and IV(A)(2))

66. The continued emissions of CO₂ from fossil fuels violates children's right to mental integrity.¹⁷⁴ Based on the impact climate has on children's mental health, this Court

¹⁷¹ I/A Court H.R., The Environment and Human Rights, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, paras. 140-142.

¹⁷² Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights ("Protocol of San Salvador") November 16, 1999, Art.11.

¹⁷³ Harvard T.H. Chan School of Public Health, *2019 Lancet countdown on health and climate change: Policy brief for the U.S.* (Nov. 13, 2019) <https://www.hsph.harvard.edu/c-change/news/2019-lancet-countdown/> (last accessed Dec. 6, 2023); Anthony J. McMichael, *Globalization, climate change, and human health*, N. Engl. J. Med., 368:1335-1343, Table 3 (2013) <https://doi.org/10.1056/NEJMr1109341>.

¹⁷⁴ Annex C; American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 5(1); I/A Court H.R., Case of *Contreras et al. v. El Salvador*. Merits, Reparations and Costs. Judgment of August 31, 2011. Series C No. 232, para. 85 (Circumstances capable of violating a child's right to mental integrity include "feelings of loss, abandonment, intense fear, uncertainty, anguish, and pain, all of which could vary or intensify depending on age and the specific circumstances"); and I/A Court H.R., Case of *Gudiel Álvarez et al. ("Diario Militar") v. Guatemala*. Merits, Reparations and Costs. Judgment of November

should **extend its existing jurisprudence by making an explicit declaration that the continued emission of CO₂ violates a child's right to mental integrity.** This extension of the law is logical for three reasons.

67. First, as children are exposed to multiple climate stressors during childhood, the effects **accumulate and compound**. “[T]he cumulative stress brought on by slower onset but chronic climate related changes like severe drought or sea-level rise led to more serious mental health problems including depression and suicidality.”¹⁷⁵ As noted in section IV above and Annex C, the climate emergency's inherent intergenerational inequity also exposes children to worse climate effects over a larger portion of their lives.

68. Second, growing up with an **awareness of the gravity and urgency** of climate change also negatively impacts young people's mental health.¹⁷⁶ A global survey of 10,000 children found that, regarding climate change,

A large proportion of children and young people around the world report emotional distress and a wide range of painful, complex emotions (sad, afraid, angry, powerless, helpless, guilty, ashamed, despair, hurt, grief, and depressed). Similarly, large numbers report experiencing some functional impact and have pessimistic beliefs about the future (people have failed to care for the planet; the future is frightening; humanity is doomed; they won't have access to the same opportunities their parents had; things they value will be destroyed; security is threatened; and they are hesitant to have children).¹⁷⁷

69. For example, 2022 UNICEF poll found that two-thirds of young people in Latin America and the Caribbean considered moving to another city or country because of climate change.¹⁷⁸ Forty percent of young people globally said climate change made them reconsider their desire to have children.¹⁷⁹ As noted by UNICEF, “[t]he impacts of climate change [...] extend to our very sense of hope.”¹⁸⁰

20, 2012. Series C No. 253, para. 287 (“liv[ing] in an environment of suffering and uncertainty” can cause a violation of the right to mental integrity); and I/A Court H.R., Case of the “Mapiripán Massacre” v. Colombia. Merits, Reparations and Costs. Judgment of September 15, 2005. Series C No. 134, para. 96.59 (displacement from their home can have “grave psychological repercussions”).

¹⁷⁵ Susie E. L. Burke et al., *The psychological effects of climate change on children*, Curr. Psychiatry Rep., 20(35):1-8 at 3 (2018) <https://doi.org/10.1007/s11920-018-0896-9> (restricted access).

¹⁷⁶ Susie E. L. Burke et al., *The psychological effects of climate change on children*, Curr. Psychiatry Rep., 20(35):1-8 at 2-3 (2018) <https://doi.org/10.1007/s11920-018-0896-9> (restricted access).

¹⁷⁷ Caroline Hickman et al., *Climate anxiety in children & young people and their beliefs about government responses to climate change: A global survey*, Lancet, 5(12):e863-e873 at e870 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3).

¹⁷⁸ United Nations, *Young people reconsidering parenthood due to climate change, UNICEF poll reveals* (2022) <https://news.un.org/en/story/2022/11/1130377> (last accessed Dec. 6, 2023).

¹⁷⁹ United Nations, *Young people reconsidering parenthood due to climate change, UNICEF poll reveals* (2022) <https://news.un.org/en/story/2022/11/1130377> (last accessed Dec. 6, 2023).

¹⁸⁰ United Nations, *Young people reconsidering parenthood due to climate change, UNICEF poll reveals* (2022) <https://news.un.org/en/story/2022/11/1130377> (last accessed Dec. 6, 2023).

70. Third, growing up with knowledge of how government contributes to the crisis also negatively impacts young people's mental health.¹⁸¹ Children's distress is exacerbated by a **sense of betrayal** that States continue to act in ways that contribute to climate change, and lack ambition in addressing it.¹⁸²
71. Additionally, exposure to a severe stressor during childhood or adolescence has a **stronger and more lasting impact on mental health** than if it had occurred during adulthood.¹⁸³
72. For these reasons, the continued emission of CO₂ and the resulting change to the climate system causing climate-related disasters violates children's right to mental integrity.
73. Therefore, under the Convention, States should be obligated to:
- a. Reduce the level of atmospheric CO₂ to 350 ppm as described above.
 - b. Develop and implement child-centered mental health services nationwide.
 - c. Communicate publicly to children—through avenues children are likely to notice—what the State is doing to quickly phase out CO₂ emissions.

VII. Child-Complainants in Climate Cases are Entitled to an “Ipso Facto” Standard for Harm, Causality, Redress, and Notice (Question IV(C)(2))

74. In its Advisory Opinion, this Court should find that the Convention requires States' courts to make special considerations when a child or group of children bring a climate case. Namely, if certain conditions are met, they must find that the **harm, causation, and redress elements of standing, together with the notice requirement are ipso facto met** by virtue of certain well-established facts. Further, this Court should reinforce the role of national judiciaries and best available science in providing **prompt and effective redress** when fundamental rights are violated. Such an opinion would be robustly supported by the Convention,¹⁸⁴ this Court's jurisprudence, by international human rights instruments, international human rights bodies, emerging jurisprudence, and by the unique nature of certain well-established facts in climate cases.

¹⁸¹ Caroline Hickman et al., *Climate anxiety in children & young people and their beliefs about government and responses to climate change: A global survey*, Lancet, 5(12):e863-e873 at e870 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3).

¹⁸² Caroline Hickman et al., *Climate anxiety in children & young people and their beliefs about government and responses to climate change: A global survey*, Lancet, 5(12):e863-e873 at e863, e864, e870-e871 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3).

¹⁸³ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, Clin. Psychol. Sci., 10(4):767-785 at 772-775 (2022), <https://doi.org/10.1177/21677026211040787>.

¹⁸⁴ American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 25.

75. This Court has established that:

[T]he absence of an effective remedy to violations of the rights recognized by the Convention is itself a violation of the Convention[.] [...] [F]or such a remedy to exist, it is not sufficient that it be provided for by the Constitution or by law [...], but rather it must be truly effective in establishing whether there has been a violation of human rights and in providing redress.¹⁸⁵

76. The Commission has made similar statements especially for complainants in situations of vulnerability, which certainly includes children.¹⁸⁶ In its statements the Commission has underscored that States have “a **positive duty** to organize their institutional apparatus so that all individuals can access those remedies [...] and] are **required to remove** any regulatory, social, or economic **obstacles** that prevent or hinder the possibility of access to justice.”¹⁸⁷

77. Further, the Escazú Agreement—an instrument that a vast majority of Member States have ratified—also obligates States to provide “effective access to judicial and administrative proceedings, including redress and remedy” *specifically* with respect to environmental issues.¹⁸⁸

78. Finally, the UN Committee on the Rights of the Child has called for States to **make it easier for children to bring climate cases and be heard in proceeding affecting them**¹⁸⁹ by “adjusting the rules of **standing**,”¹⁹⁰ “shifting the onerous burden of proof from child plaintiffs to establish **causation**,”¹⁹¹ and **making “[m]echanisms [...] available** for claims of imminent or foreseeable harms and past or current violations of children’s rights.”¹⁹²

¹⁸⁵ I/A Court H.R., Case of the “Street Children” (*Villagrán Morales et al.*) v. *Guatemala*. Judgment of November 19, 1999. Series C No. 63, para. 235, citing I/A Court H.R., Case of *Cesti Hurtado*. Judgment of September 29, 1999. Series C No. 56, para. 121; I/A Court H.R. Case of *Castillo Petruzzi et al.* Judgment of May 30, 1999. Series C No. 52, para. 185; I/A Court H.R., Judicial Guarantees in States of Emergency, Advisory Opinion OC-9/87 of October 6, 1987. Series A No. 9, para. 24.

¹⁸⁶ See e.g., IACHR, *Access to Justice as a Guarantee of Economic, Social, and Cultural Rights. A Review of the Standards Adopted by the Inter-American System of Human Rights* (2007); and IACHR Special Rapporteurship on the Rights of Women, *Access to Justice for Women Victims of Violence in the Americas* (2007).

¹⁸⁷ IACHR, *Access to Justice as a Guarantee of Economic, Social, and Cultural Rights. A Review of the Standards Adopted by the Inter-American System of Human Rights* (2007) para. 1 <https://www.refworld.org/docid/477e3d062.html>.

¹⁸⁸ Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (Escazú Agreement), Preamble, Arts. 1, 8 (Sep. 27, 2018) reaffirming Rio Declaration on Environment and Development, Principle 10 (Aug. 12, 1992).

¹⁸⁹ UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children’s rights & the environment, with a special focus on climate change* (Aug. 22, 2023) para. 86.

¹⁹⁰ UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children’s rights & the environment, with a special focus on climate change* (Aug. 22, 2023) para. 83.

¹⁹¹ UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children’s rights & the environment, with a special focus on climate change* (Aug. 22, 2023) para. 87.

¹⁹² UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children’s rights & the environment, with a special focus on climate change* (Aug. 22, 2023) para. 84-85.

79. Nevertheless, when it comes to **climate cases brought by children**, States do not uniformly protect children's access to justice. "Despite children having been at the vanguard of [...] climate change cases and their recognition under the [UN] Convention [on the Rights of the Child] as rights holders, children [...] encounter barriers to attaining legal standing in many States, thereby limiting their means of asserting their rights" by bringing climate cases.¹⁹³ In fact, some Member States take overt and extraordinary measures to block children from accessing justice.¹⁹⁴

A. Harm: A child complainant bringing a climate-change case should *ipso facto* meet the harm element of standing

80. Some jurisdictions require that, to have standing, a complainant must prove **particularized harm**.¹⁹⁵ Requiring a showing of particularized harm is inappropriate in the context of climate cases brought by children because it is **well-established** that all children alive today were born into a climate system that is already broken and all of today's children are harmed disproportionately by this damaged system as compared to adults.

81. For example, in a case brought against Belgium and two regional governments for government's failure to adequately reduce greenhouse gas emissions, Belgium's Appeals Court found that "The potential impact of global warming on the lives and private and family lives of **every individual on the planet has been sufficiently demonstrated**."¹⁹⁶ The Appeals Court then concluded that the "extent of the consequences of global warming and the scale of the risks it entails" mean that it can be considered, "with **sufficient judicial certainty**," that each person involved with the case had interest to meet the requirements of standing.¹⁹⁷

¹⁹³ UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children's rights & the environment, with a special focus on climate change* (Aug. 22, 2023) para. 82.

¹⁹⁴ See e.g. Stephen I. Vladeck, *The Solicitor General and the Shadow Docket*, Harvard Law Rev., 133:123-163 at 144 (2019) ("[A] major category in which the [U.S.] government has repeatedly sought emergency or extraordinary relief from the [U.S. Supreme] Court has been discovery disputes—in which the Solicitor General has invoked the specter of district courts abusing their authority in structuring discovery in litigation against the executive branch as a justification for unusual intervention from the Court. [...] Perhaps the most striking example of this phenomenon has come in the *Juliana [v. U.S.]* litigation—a lawsuit filed in 2015 by a group of plaintiffs, including minor children, arguing that the government's failure to take adequate measures to arrest the impact of climate change violates the [...] Fifth Amendment.) <https://harvardlawreview.org/print/vol-133/the-solicitor-general-and-the-shadow-docket/>.

¹⁹⁵ See e.g. "To have standing [...] a plaintiff must have (1) a concrete and particularized injury [...]" U.S. 9th Circuit Court of Appeals, *Juliana et al. v. United States*, No. 18-36082, Opinion, p. 18 (Jan. 17, 2020) (emphasis added) <https://cdn.ca9.uscourts.gov/datastore/opinions/2020/01/17/18-36082.pdf>.

¹⁹⁶ 2^eme Chamber Cour d'Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, para. 131 (Nov. 30, 2023) (machine translated version, officially translated version not available at the time of submission but will be forthcoming) (emphasis added) https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf.

¹⁹⁷ 2^eme Chamber Cour d'Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, para. 133 (Nov. 30, 2023) (machine translated version, officially translated version not available at the time of submission but will be forthcoming) (emphasis added) [https://prismic-](https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf)

82. Moreover, **all children suffer personal and disproportional harm from climate change because they are children** (see section IV and Annex C). It would be unnecessarily duplicative and obstructive, in climate cases, to require children to show additional particularized harm.
83. Therefore, a child complainant bringing a climate-change case should ***ipso facto* meet the harm element of standing** if they can show that the harm or risk that they complain of is a ***type of harm that is made more likely and/or exacerbated by climate change***. A child complainant can demonstrate this by citing relevant findings by the IPCC, in peer-reviewed attributional studies, and/or States' own research and reports.

B. Cause: A child complainant bringing a climate-change case should *ipso facto* meet the cause element of standing

84. With respect to the element of **causation**, in climate cases child complainants are often required to prove every link in the causal chain stretching from the State's conduct to the harm or risk complained of.¹⁹⁸ In climate cases, placing this burden on child plaintiffs is inappropriate and unnecessary because the **causal link**—from **each** tonne of CO₂ emissions to climate harms to children—has been **firmly established by science**¹⁹⁹ and **by courts**.²⁰⁰
85. For example, based on predominately undisputed cross-examined testimony from multiple experts and extensive documentary evidence, the trial court in *Held v. Montana* found that every link in the **causal chain was established between each additional tonne of carbon emitted and the types of harms** that tend to be

[io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf](https://s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf).

¹⁹⁸ See e.g. U.S. 9th Circuit Court of Appeals, *Juliana et al. v. United States*, No. 18-36082, Opinion, pp. 18-20 (Jan. 17, 2020) (To have standing a plaintiff's injury must be "caused by the challenged conduct" and that "[c]ausation can be established 'even if there are multiple links in the chain.'" Based on the established evidentiary in this case, the Court found that "the [youth] Plaintiffs' alleged injuries are caused by carbon emissions from fossil fuel production, extraction and transportation.") <https://cdn.ca9.uscourts.gov/datastore/opinions/2020/01/17/18-36082.pdf>.

¹⁹⁹ See e.g. IPCC, *Summary for policymakers*, In: Climate change 2021: The physical science basis at 15:B.2.2 (2021) ("With every additional increment of global warming, changes in extremes continue to become larger [...]. There will be an increasing occurrence of some extreme events unprecedented in the observational record with additional global warming") https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf; and IPCC, *Summary for policymakers*. In: Climate change 2023: Synthesis report, pp. 1-34, see e.g. p. 12, B.1 ("Every increment of global warming will intensify multiple and concurrent hazards (*high confidence*)"); see also B.1.3, Figure SPM.2, B.2, B.2.2, Figure SPM.4, C.1.1, and Figure SPM.6, https://bit.ly/IPCC_ar6.

²⁰⁰ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 87, para. 6 (Aug. 14, 2023) ("Every additional ton of GHG [greenhouse gas] emissions exacerbates [youth] Plaintiffs' injuries and risks locking in irreversible climate injuries.") and also Findings of Fact at p. 24, para. 92 ("Every ton of fossil fuel emissions contributes to global warming and impacts to the climate and thus increases the exposure of Youth Plaintiffs to harms now and additional harms in the future.") bit.ly/HeldFindingsConclusionsOrder.

exacerbated by climate change.²⁰¹ This causal chain operates identically in every situation involving climate change where a State is continuing to promote a fossil-fuel based energy system rather than striving to transition to 100% renewables by 2050 at the latest.²⁰² In any case where a State is continuing to invest in—rather than shut down—fossil-based infrastructure, it is unnecessarily duplicative and obstructive for courts to require children to prove the same causal chain again and again, in each climate case.

86. Therefore, State courts hearing climate-change cases have an obligation to determine that child complainants have ***ipso facto* satisfied the causation element** if, in addition to showing that the type of harm alleged is made more likely by climate change, complainants also show that a government is continuing to invest in fossil-based infrastructure and/or will not meet the proposed obligation to eliminate economy-wide CO₂ emissions 2050 at the latest.²⁰³ This could be satisfied by identifying relevant findings by the IPCC, in peer-reviewed attributional studies, and in States' own documentation showing that it is planning for, subsidizing, permitting, investing in, and/or otherwise fostering a fossil-fuel-based energy system rather than urgently phasing this system out.

C. Notice: A child complainant bringing a climate-change case should *ipso facto* meet notice requirements if the challenged conduct occurred after 1992—at the latest

87. With respect to **notice**, some courts require children to show that a **State was on notice** that the complained-of climate harms would result. In the context of climate change there is a **long and vast history of State knowledge**.²⁰⁴ Scientists and world

²⁰¹ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, see para. 31(a-i) above (Aug. 14, 2023) (Connecting the evidence the Court found that; (i) CO₂ from fossil fuel pollution is the primary driver of Earth's energy imbalance; (ii) this imbalance is currently significant; (iii) as long as there is an energy imbalance there will be more extremes; (iv) the more CO₂ added to the atmosphere the more the planet will heat; (v) until CO₂ is reduced youth will be unable to live clean and healthy lives; and therefore (vi) every additional tonne emitted matters as it injures young people and risks locking in irreversible climate injuries that will grow increasing severe without science-based action to address climate change.) bit.ly/HeldFindingsConclusionsOrder.

²⁰² See e.g. Sam Meadows, *Vaca Muerta was the future': Argentina goes all in on fracking*, Guardian (Oct. 18, 2023); Oliver Milman et al., *Biden approves controversial Willow oil drilling project in Alaska*, Guardian (Mar. 13, 2023) <https://www.theguardian.com/us-news/2023/mar/13/alaska-willow-project-approved-oil-gas-biden> (last accessed Dec. 6, 2023); Justin Rowlatt, *UAE planned to use COP28 climate talks to make oil deals*, BBC (Nov. 26, 2023) (last accessed Dec. 6, 2023).

²⁰³ See Margaretha Wewerinke-Singh, *Remedies for human rights violations caused by climate change*, Climate Law, 9:224-243 at 232 (2019) (A probabilistic approach to causality is appropriate in climate cases.) <http://bit.ly/Wewerinke-Singh>.

²⁰⁴ See e.g. UCAR Center for Science Education, *History of Climate Scientific Research*, <https://scied.ucar.edu/learning-zone/how-climate-works/history-climate-science-research> (last accessed Dec. 6, 2023); International Criminal Court, *Request to open investigations and request for reparations regarding the crimes against humanity of climate change*, submitted pursuant to Art. 15 of the Rome Statute (2022) (Providing evidence that BP Senior Executives have amassed in-house and external scientific research since at least the 1950s establishing the severe harmful impacts of climate change.)

leaders have known **since at least 1903** that burning fossil fuels causes global warming.²⁰⁵ **At the very latest**, all UN-member States were definitely on notice that continuing to emit CO₂ would cause dangerous global warming in **1988** when the UN established the IPCC to prepare a comprehensive review and recommendations with respect to the state of knowledge of the science of climate change as well as the social and economic impact of climate change.²⁰⁶ The **Earth Summit** in Rio de Janeiro followed in **1992** establishing the UN Framework Convention on Climate Change where States recognized that “change in the Earth’s climate and its adverse effects are a common concern of humankind”.²⁰⁷ Further, almost every year since 1995 negotiators have gathered annually for the Conference of the Parties (“COP”)²⁰⁸ to find solutions to the climate crisis. During the COPs, State Parties **repetitively** and **explicitly** documented warnings such as:

[C]limate change represents an urgent and potentially irreversible threat to human societies, future generations and the planet, that continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system and that limiting climate change will require substantial and sustained reductions of greenhouse gas emissions[.]²⁰⁹

<https://climatecasechart.com/non-us-case/nz-students-for-climate-solutions-and-uk-youth-climate-coalition-v-board-of-bp/>; and James G. Speth, *They Knew: The US federal government’s role in causing the climate crisis*, MIT Press, at 3 (2022) (By 1981 it was already very clear that the U.S. federal government “knew that the continued burning of high levels of fossil fuels would lead to climate danger; and [...] knew of pathways recommended by experts within government and others to transition away from fossil fuels, including through [...] solar and other renewables. Notwithstanding this, [the U.S. government] continued [...] to the present to plan for, support, invest in, permit, and otherwise foster a national fossil-fuel-based energy system.”)(book can be provided upon request).

²⁰⁵ Steven Running, Ph.D., *Replacing the 1.5°C target with what science demands: The 350 ppm limit*, Open Global Rights (Sep. 28, 2023), <https://www.openglobalrights.org/science-demands-350-ppm-limit/> (last accessed Dec. 6, 2023) (In 1903, the Nobel Prize in Chemistry was awarded to Svante Arrhenius’s discovery that continued emissions from burning fossil fuels would dangerously warm the planet.); Ian Sample, *The father of climate change*, *Guardian* (Jun. 30, 2005) last accessed Dec. 6, 2023); and Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Trial Transcript, Testimony of Steven Running, Ph.D., p. 108 (Jun. 12, 2023)(available upon request).

²⁰⁶ IPCC, *History of the IPCC*, <https://www.ipcc.ch/about/history/> (last accessed Dec. 6, 2023).

²⁰⁷ United Nations Framework Convention on Climate Change, Preamble (May 9, 1992); see also, United Nations Climate Change, *History of the Convention* (documenting that State Parties have known since well before the 1992 Earth Summit in Rio de Janeiro when the UNFCCC was opened for signature that to avert a climate crisis, time was of the essence.) <https://unfccc.int/process/the-convention/history-of-the-convention> (last accessed Dec. 6, 2023).

²⁰⁷ United Nations Framework Convention on Climate Change, Preamble (May 9, 1992).

²⁰⁸ UN Climate Change, *Conference of the Parties (COP)*, <https://unfccc.int/process/bodies/supreme-bodies/conference-of-the-parties-cop> (last accessed Dec. 6, 2023).

²⁰⁹ UN Framework Convention of Climate Change, *Report of the Conference of the Parties on its nineteenth session, held in Warsaw from 11 to 23 November 2013*, FCCC/CP/2013/10/Add.1 (Jan. 31, 2014)

<https://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf>; cited by 2^{ème} Chamber Cour d’Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, para. 34 (Nov. 30, 2023)

https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf.

88. Emerging jurisprudence supports the fact that governments have known about the dangers of fossil fuels for decades. For example, Belgium's Court of Appeals noted that "Since at least 1988, it has been accepted that climate change is a '*common concern of mankind*' that will '*require timely action to address* [...]" and as such, is relevant to "verify[ing] when the respondent parties knew or should have known that they had to act".²¹⁰ **Because** States made clear admissions of knowledge at **each** of these historical events which are documented at great length in the public record, it is unnecessarily duplicative and obstructive to require children to prove **notice** anew in each successive climate case.

89. Therefore, States' courts hearing climate-change cases have an obligation to determine that child complainants have ***ipso facto* satisfied the element of notice** if the challenged conduct occurred **after 1992**—at the latest—when the UNFCCC was established.

D. Redress: A child complainant bringing a climate-change case should *ipso facto* meet the redress element of standing

90. For some Member States, **redress** is the final element of standing requiring that **children** show that the court has authority to provide an effective judicial remedy.²¹¹ States should eliminate this procedural barrier in climate cases brought by children for two reasons. First, it is **well established** that States' courts have the **power** to grant effective recourse.²¹² Second, the **core role** of judiciaries is to determine whether challenged conduct violates fundamental rights obligations.²¹³ This power and mandate **extend to** violations of Convention rights resulting from States' conduct in the context of **climate change**.

91. The most recent court to underscore the **power** of the judiciary to decide **States' climate obligations** is the Belgium Appeals Court. The Appeals Court found that the judiciary has "**the power both to prevent and to remedy** any unlawful infringement

²¹⁰ 2ème Chambre Cour d'Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, paras. 165-166 (Nov. 30, 2023) (The Court then went into a detailed analysis of State knowledge with respect to the emissions reductions that needed to be put into place when) https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf; see also, U.S. 9th Circuit Court of Appeals, *Juliana et al. v. United States*, No. 18-36082, Opinion, p. 15 (Jan. 17, 2020) ("The record also conclusively establishes that the federal government has long understood the risks of fossil fuel use and increasing carbon dioxide emission.") <https://cdn.ca9.uscourts.gov/datastore/opinions/2020/01/17/18-36082.pdf>.

²¹¹ See e.g. U.S. 9th Circuit Court of Appeals, *Juliana et al. v. United States*, No. 18-36082, Opinion, p. 18 (Jan. 17, 2020) (To have standing a plaintiff must show their injury is "likely redressable by a favorable judicial decision.") <https://cdn.ca9.uscourts.gov/datastore/opinions/2020/01/17/18-36082.pdf>.

²¹² See e.g. American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 63.

²¹³ See e.g. American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 63.

of subjective rights by authorities in the exercise of their discretionary power.”²¹⁴ A recent ruling on the **role** of the judiciary in climate cases invoking fundamental rights came down from the U.S. District Court of Oregon. It ruled, “The judicial **role** in cases like this is to apply constitutional law, declare rights, and declare the government’s responsibility. No other branch of government can perform this function because the ‘judicial power’ is exclusively in the hands of [...] courts.”²¹⁵

92. Despite clear recognition among Member States that effective redress is a **bedrock** legal principle and **foundational** doctrine of democracy,²¹⁶ which courts have the **power** and **mandate** to provide, a minority of courts have **incorrectly** cited redressability to **deny** children’s access to justice. For example, in a case brought by 21 young people challenging the U.S. government’s climate actions, the U.S. Ninth Circuit Court of Appeals recognized that although “[a] substantial evidentiary record documents that the federal government has long promoted fossil fuel use despite **knowing** that it can **cause** catastrophic climate change, and that failure to change existing policy may hasten an **environmental apocalypse** [...] and] that other branches [of government] may have abdicated their responsibility to remediate the problem,” this case presented redressability barriers.²¹⁷
93. This Advisory should **dispel any remnants of the legal fiction** that courts do not have the power and mandate to address State conduct in the context of the climate emergency. Specially, States’ courts hearing climate-change cases should be obligated to determine that child complainants have **ipso facto satisfied the redressability element** of standing in all cases where children allege that State action

²¹⁴ 2^eme Chamber Cour d’Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, para. 113 (Nov. 30, 2023) (emphasis added) https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf.

²¹⁵ United States District Court for the District of Oregon, *Juliana et al., v. United States*, Civ. No. 6:15-cv-01517-AA, Opinion and Order, p. 18 (Jun. 1, 2023) (emphasis added) (Also finding, “It is a foundational doctrine that when government conduct catastrophically harms [...] citizens, the judiciary is constitutionally required to perform its independent role and determining whether the challenged conduct [...] is unconstitutional.”) https://climatecasechart.com/wp-content/uploads/case-documents/2023/20230601_docket-615-cv-01517_opinion-and-order-2.pdf.

²¹⁶ I/A Court H.R., Differentiated approaches with respect to certain groups of persons in detention, Advisory Opinion OC-29/22 of May 30, 2022. Series A No. 29 para. 53. (The right to an effective judicial remedy constitutes “one of the basic pillars not only of the American Convention, but also of the rule of law itself in a democratic society.”); see also United States District Court for the District of Oregon, *Juliana et al., v. United States*, Civ. No. 6:15-cv-01517-AA, Opinion and Order, p. 18 (Jun. 1, 2023) (“It is a foundational doctrine that when government conduct catastrophically harms [...] citizens, the judiciary is constitutionally required to perform its independent role and determining whether the challenged conduct [...] is unconstitutional.”) https://climatecasechart.com/wp-content/uploads/case-documents/2023/20230601_docket-615-cv-01517_opinion-and-order-2.pdf.

²¹⁷ U.S. 9th Circuit Court of Appeals, *Juliana et al. v. United States*, No. 18-36082, Opinion at pp. 11, 32 (Jan. 17, 2020) (emphasis added) <https://cdn.ca9.uscourts.gov/datastore/opinions/2020/01/17/18-36082.pdf> (Noting the case is now back on the path to trial, see United States District Court for the District of Oregon, *Juliana et al., v. United States*, Civ. No. 6:15-cv-01517-AA, Opinion and Order, p. 18 (Jun. 1, 2023) https://climatecasechart.com/wp-content/uploads/case-documents/2023/20230601_docket-615-cv-01517_opinion-and-order-2.pdf).

and/or inaction is violating international human rights obligations derived from the American Convention and other Inter-American treaties.

94. Finally, this Advisory Opinion should **underscore** that in the context of the climate emergency, the unbending laws of physics and chemistry **require** that **effective legal redress** be grounded in the **best available science**. In the words of the court in *Held v. Montana*, children's injuries will "grow increasing severe and irreversible **without science-based actions** to address climate change"²¹⁸

VIII. Conclusion

95. Today, climate is the prism through which all humanity will pass. As this Court originates a robust body of legal guidance at the intersection of human rights and climate change, the words of Brazil Supreme Court Justice, Edson Fachin, are particularly helpful to underscore the importance of this opinion,

The climate question is the question of our time. It is the question that casts destiny upon us and the answers we formulate will decide the future of humanity—or if there will be any future at all. There is no other agenda, no other problem, no other question. The climate emergency is the antechamber to all others.²¹⁹

As the Court deliberates, *Amici* respectfully submit—based on the law and science included in this submission—that the only practical and effective path States can take to comply with their international human rights obligations derived from the American Convention and other Inter-American treaties is to adhere to the **laws of this Court and the enduring laws of physics and chemistry**. Only then will we have a chance at safeguarding human rights.

IX. Signatures

Youth, Youth Organizations, and Supporters

Bodhi K

Bodhi K., Youth, Washington, United States



Cade Terada, Youth, Alaska, United States

²¹⁸ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 87, para. 7 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

²¹⁹ Supreme Federal Court, *PSB et al. v. Brazil*, ADPF 708, Concurring Opinion at 3 (Jul. 1, 2022) (unofficial translation) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2022/20220701_ADPF-708_decision-3.pdf.



Cadence R.H., Youth, Virginia, United States



Cedar B.B., Youth, Virginia, United States



Claudia Sachs, Youth, Virginia, United States



Delaney Reynolds, Youth, Florida, U.S.



Eva L., Youth, Montana, U.S.



Georgianna Fischer, Youth, Montana, U.S.



Grace Gibson-Snyder, Youth, Montana, U.S.



Kalālapaikuānalū Winter, Youth, Hawai'i, United States



Kawahine'ilikea N., Youth, Hawai'i, U.S.



Lauren Wright, Youth, Saskatchewan, Canada



Layla Hasanzadah, Youth, Virginia, U.S.



Levi D., Youth, Florida, U.S.



Maryn O., Youth, Virginia, U.S.



Mica K., Youth, Montana, U.S.



Rikki Held, Youth, Montana, U.S.



Tia Hatton, Youth, Arizona, U.S.



Sadie V., Youth, Alberta, Canada



Sáj S., Youth, Saskatchewan, Canada



Zoe G.W., Youth, British Columbia, Canada



Leah Qusba, Executive Director, Action for the Climate Emergency, United States



Sue Brown, Director of Advocacy and Staff Attorney, Justice for Girls, Canada



Annabel Webb, Founding Director, Just Planet, Canada



David Schwartz, Supporter, Oregon, United States



Tanya M. Naehu, Supporter, Hawai'i, U.S.

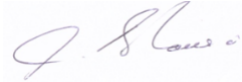
Medical organizations and professionals supporting section IV, V, VI and Annex C



María Lucía Mesa Rubio, Presidenta, Sociedad Colombiana de Pediatría Regional Bogotá



Dr. Jorge Fabres B., Presidente, Sociedad Chilena de Pediatría



Carlos Gilberto Alonso Rivera, M.D., Presidente, Asociación Latinoamericana de Pediatría



Dra. María del Carmen Calle Dávila, Secretaria Ejecutiva, Organismo Andino de Salud Convenio Hipólito Unanue



Jeffery Goldhagen, M.D., M.P.H., President, International Society for Social Pediatrics and Child Health



Naveen Thacker, M.D. President, International Pediatric Association



Dr. Helen Brotherton, MBChB, FRCPCH, DTM, Ph.D., Consultant, Paediatrician/Neonatologists and Convenor, International Child Health Group



Dr. Dipesalema Joel, MBBChBAO, B Med Sc (NUI), MRCPI, President, Union of National African Paediatric Societies and Associations



Chalilwe Chungu, President, Zambia Paediatric Association



Massimo Pettoello-Mantovani, M.D., Ph.D., European Paediatric Association



Dr. Laura Reali, President and Dr. Christine Magendie, Vice President, European Confederation of Primary Care Pediatricians



Carmen Vidal Palacios, Presidenta, Sociedad Española de Pediatría Social



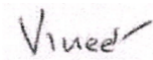
Dr. Andreas Werner, Président, L'Association Française de Pédiatrie Ambulatoire



Dr. Paolo Becherucci, Presidente, Società Italiana delle Cure Primarie Pediatriche



Olga Tzetzzi, President, Association of Private Practice Paediatricians of Northern Greece



Dr. Vineet Saxena, Honorable Secretary General, Indian Academy of Pediatrics



Prof. Jackie Stewart, Executive Director, Students' Health and Welfare Centres Organisation



Dr. Nathaniel Uchtmann, Co-Founder and Executive Director NS Nightingale Wakigera,
Co-Founder and Executive Director and President, Africa Community of Planetary
Partners for Health and Environment



Dr. I. Leslie Rubin, Founder and President, Break the Cycle of Health Disparities, Inc.



Prof. Hajime Takeuchi, Board Member Japanese Society of Social Medicine, signing as
an individual medical professional

Annex A

The climate question is the question of our time. It is the question that casts destiny upon us and the answers we formulate will decide the future of humanity—or if there will be any future at all. There is no other agenda, no other problem, no other question. The climate emergency is the antechamber to all others.¹

— Justice Edson Fachin, Brazil Supreme Court Justice

Summary: Key Findings and Main Special Obligations

For the Court's convenience, this Annex provides a **compiled** list of the key findings and main special obligations—related to a subset of the questions presented—that States should carry out pursuant to their duties set forth in the American Convention on Human Rights ("Convention") to effectively protect fundamental rights in the context of climate change with a focus on children's rights.

Key Findings

The following findings are grounded in established and emerging **jurisprudence** together with the **best available scientific and medical evidence**. The importance of the **dual analysis of law and science** cannot be overstated. Courts have borne witness to many moments in legal history when questionable scientific evidence has contaminated legal processes and seriously harmed the innocent. As this submission **made clear**, judicial guidance grounded in the non-science-based climate targets would harm billions,² prevent the full and free exercise of Convention rights, and nullify the timeless principle that for every wrong there is an effective remedy. Simply put, in the context of the climate emergency, **law and science the inseparable bookends** of climate rights, obligations, redress, and justice.

Amici submit that the law and science found within this submission provide the Court with a strong evidential basis to consider the following findings in interpreting the rights and States' obligations established in the American Convention:

- A.1. The rights contemplated in the Convention **encompass the right to a stable and life-sustaining climate system**, particularly the rights to life; personal integrity; private life; health; water; food; housing; participation in cultural life; property; not be forcibly displaced; a healthy environment; and the rights of the child; together with the principle of non-discrimination.^{3, 4}
- A.2. **"Best available science"** must be used to determine States' obligations to address the climate crisis.⁵
- A.3. Best available science has yet to be **defined** by any court and is: (i) the most **up-to-date** science that; (ii) is based on internationally recognized scientific **practices, methodologies**, and **standards**, where such standards exist; (iii) maximizes the

quality and **objectivity** of information used, including statistics and assumptions; (iv) **publicly releases** the data used to reach its conclusions, and publishes its results through the **peer-review** process; (v) clearly **communicates risks** and **uncertainties** in the scientific bases for its conclusions; and (vi) reflects a **consensus** (where consensus exists) or at least rests on multiple peer-reviewed studies from different research groups.⁶

- A.4. The temperature targets of 1.5°C to 2.0°C set forth in Article 2 §(1)(a) of the Paris Agreement are **political targets** and incompatible with best available science.⁷
- A.5. **Scientific consensus** finds that the more restrictive target of 1.5°C of heating is unsafe for humanity and will result in **widespread and serious human rights violations**.⁸ 2.0°C is even more dangerous for humanity.
- A.6. Because 1.5°C of heating will result in widespread rights violations,⁹ this target is **incompatible** with States': (i) existing human right obligations derived from the Convention, other Inter-American treaties, and international human rights law;¹⁰ and (ii) commitments pursuant to the United Nations Framework Convention of Climate Change ("UNFCCC") and the Paris Agreement.¹¹
- A.7. To protect human rights, **best available science requires** that States urgently reduce the level of atmospheric CO₂ from the current concentration of ~420 parts per million ("ppm")¹² to **350 ppm or less** as quickly as possible this century ("350 ppm limit").¹³
- A.8. The **positive duties** to: (i) avoid activities causing significant harm to the climate system by using "**all means at their disposal**";¹⁴ (ii) **protect, preserve, and improve** the climate system that has already been degraded;¹⁵ and (iii) reduce greenhouse gas emissions to reflect the "**greatest possible ambition**",¹⁶ **require** that the level of atmospheric CO₂—the primary climate pollutant—be reduced from the current level of ~420 parts per million ("ppm") **to 350 ppm or less** by 2100.¹⁷
- A.9. Compliance with the **positive duties** set forth above requires **deep, rapid, and sustained reductions in greenhouse gas emissions** which means **phasing out fossil fuels** by 2035 but no later than 2050.¹⁸
- A.10. **Pathways exist**¹⁹ for States to meet the above **positive duties** by rapidly transitioning energy infrastructure in all sectors to 100% clean, renewable energy (wind, water, and solar) by as early as 2035, but by no later than 2050, with an 80% transition by 2030.²⁰
- A.11. Children are in a situation of **special vulnerability** and are at **particularly high risk** of harm from climate change.²¹
- A.12. The disproportionate harms already being inflicted on children stemming from the current dangerous level of atmospheric CO₂ (~420 ppm) and resulting climate

change **discriminates against children**²² invoking special legal obligations to prevent their rights from being infringed by climate change.

- A.13. Climate change violates children's right to **physical and mental integrity**.^{23, 24}
- A.14. **Every tonne** of CO₂ emissions incrementally worsens climate change.²⁵ Consequentially, the continued emission of CO₂ discriminates against children and constitutes a violation of children's right to physical and mental integrity.²⁶
- A.15. If certain conditions are met, a child complainant bringing a climate-change case should ***ipso facto*** meet the **harm**,²⁷ **cause**,²⁸ and **redress**²⁹ **elements of standing** by virtue of certain well-established facts.
- A.16. States' have known or should have known that burning fossil fuels causes global warming since 1903 and, **at the very latest**, were **definitely** on notice that continuing to emit CO₂ would cause dangerous global warming in **1988** but likely much earlier.³⁰
- A.17. Courts have the **power** and **mandate**³¹ to address States' conduct and provide **effective remedies** in the context of the climate emergency.
- A.18. **The right to effective and just redress** can only be achieved if judicial remedies are grounded in best available science.³²

Critical Legal Obligations

The special obligations States must carry out to effectively comply with their international human rights obligations derived from the **American Convention and other Inter-American treaties** stemming from the above findings are:

- A.19. **Use the best science available** as defined above and requiring that the level of atmospheric CO₂ be reduced from the current level of ~420 parts per million ("ppm") **to 350 ppm or less** by 2100 to effectively protect the human rights contemplated by the American Convention.
- A.20. **Recognize**, in law and in the adoption and implementation of actions to address the climate emergency, that the **2015 temperature targets set forth in Article 2(1)(a) of the Paris Agreement are irreconcilably contrary to** the best available science, the rights contemplated in the Convention, this Court's jurisprudence, other international human rights obligations, and States' commitments made pursuant to the UNFCCC and the Paris Agreement and, in turn, must be aligned with science.
- A.21. **Update their commitments** under the Paris Agreement and national laws **to reflect the most up-to-date and best available science** and protect Convention rights by adopting the 350 ppm limit as the highest atmospheric concentration of CO₂ that is consistent with States' obligations—namely, their obligations to prevent

further degradation of the climate system, minimize climate damages, restore climate stability, and protect Convention rights.

- A.22. **Conform their conduct to the necessity of allowing atmospheric CO₂ concentration to fall below 350 ppm as soon as possible** and no later than 2100 to avoid further violations of Convention rights and the breach of irreversible climate tipping points, by making “**deep, rapid, and sustained reductions in greenhouse gas emissions**” with unrivaled urgency.
- A.23. In light of the positive duties to avoid activities causing significant harm to the climate system by using “**all means at their disposal**”, **protect, preserve, and improve** the climate system that has already been degraded, and reduce greenhouse gas emissions to reflect the “**greatest possible ambition**”, States must:
- a. **Eliminate** at least 80% of all **CO₂ emissions** by 2030 and 100% by 2035 but no later than 2050.
 - b. **Prohibit** the renewal of permits or new, intensified, or expanded instances of fossil fuel extraction or fossil fuel infrastructure (defined broadly).
 - c. **Audit** all anthropogenic CO₂ emissions from human activities in State-controlled territory, calculated in good faith according to best practices, without relying on carbon offsets.³³
 - d. **Identify** the State's laws, regulations, policies, and practices that contribute to, encourage, facilitate, or tolerate continuing CO₂ emissions and modify as necessary in light of phasing out CO₂ emissions. This process of identification should encompass:
 - i. Acts and omissions;
 - ii. All scales of government activity, including local government and state-owned enterprises; and
 - iii. All spheres of government activity, including government purchasing practices, land-use policies, subsidies, investigation and enforcement practices, public education, and the diplomatic sphere.
 - e. **Adopt** a comprehensive overarching climate mitigation plan containing policies, practices, measures, and mechanisms to eliminate CO₂ emissions and reach the 350 limit, with ambitious benchmarks and deadlines culminating in (a) above.³⁴

- A.24. To prevent discrimination against children, and comply with the special obligation to prevent their rights from being infringed by climate change States must:
- a. **Cease the emission of all anthropogenic CO₂ to the extent necessary to protect children** from harm, namely, limiting the concentration of atmospheric CO₂ to 350 ppm or less by 2100 at the latest, which is achievable by reducing fossil fuel emissions by 80% by 2035 and 100% by 2050 at the latest.
 - b. Give the **best interests of the child** a primary consideration in all matters concerning climate change.³⁵
 - c. Demonstrate—via each State's thorough and serious action to **rapidly cut emissions**—the State's high responsiveness toward children's complaints about their mistreatment at the hands of continuing emissions.
 - d. Treat children who belong to groups in situations of risk with an **intersectional approach**.³⁶
- A.25. Because every tonne of CO₂ emissions incrementally worsens climate change, every tonne of CO₂ emitted violates children's right to physical and mental integrity. States therefore have an obligation to:
- a. **Stop all human-caused CO₂ at the utmost speed**, as specified above.
 - b. **Prevent** the further deterioration of the climate system, **protect and preserve** the atmosphere, and **improve and restore** the level of atmospheric CO₂ to a level that is safe for humanity, in line with children's right to a clean and healthy environment.
- A.26. It is **also urgent for States to be obligated to invest in the following preparedness measures** relevant to child physical and mental health³⁷ by:
- a. developing resilient healthcare infrastructure that minimizes healthcare's carbon footprint;
 - b. building supply-chain resilience to withstand climate shocks;
 - c. implementing early warning systems and emergency preparedness including coordination with emergency service agencies;
 - d. conducting surveillance of the health impacts of climate change, including infectious-disease surveillance and analysis, vaccination, and vector control;
 - e. implementing continuing education and training for healthcare workers to prepare them to meet the growing challenges to child health amidst the crisis; and

- f. researching the effectiveness of the mitigation and adaptation efforts put in place.
 - g. develop and implement child-centered mental health services nationwide.
 - h. communicating publicly to children—through avenues children are likely to notice—what the State is doing to quickly phase out CO₂ emissions.
- A.27. To ensure access to justice States' Courts should grant ***ipso facto* standing** to child complainants in climate cases that invoke rights contemplated in the Convention, other Inter-American treaties, and international human rights law by virtue of certain well-established facts.
- A.28. To ensure the **right to redress is effective, just, and practical** in climate cases asserting violations of fundamental human rights, States' court must ground their judicial decisions and remedies in best available science.

¹ Supreme Federal Court, *PSB et al. v. Brazil*, ADPF 708, Concurring Opinion at 3 (Jul. 1, 2022) (unofficial translation) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2022/20220701_ADPF-708_decision-3.pdf.

² UNICEF, *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, 1-26 at 9 (2021) ("Almost every child on earth (>99 per cent) is exposed to at least 1 [...] major climate and environmental hazards, shocks and stresses. 2.2 billion children are exposed to at least 2 of these overlapping climate and environmental hazards, shocks and stresses. 1.7 billion children are exposed to at least 3 of these overlapping climate and environmental hazards, shocks and stresses.") *see also* 2, 4, 8, 11, 12, <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>.

³ *See e.g.* I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, paras. 47, 49, 54, 64 (para. 54 "all human rights are vulnerable to environmental degradation, in that the full enjoyment of all human rights depends on a supportive environment" and "climate change has a wide range of implications for the effective enjoyment of human rights, including the rights to life, health, food, water, housing and self-determination"; *Case of the Mayagna Community (Sumo) Awas Tingni*. Judgment of August 31, 2001. Series C No. 79, paras. 144, 149; *Case of the Yakye Axa Indigenous Community v. Paraguay*. Merits, Reparations and Costs. Judgment of June 17, 2005. Series C No. 125, paras. 131, 137, 141; *Case of the Sawhoyamaya Indigenous Community*. Merits, Reparations and Costs. Judgment of March 29, 2006, Series C No. 146 paras. 118, 121, 131; *Case of the Saramaka People v. Suriname*. Preliminary Objections, Merits, Reparations, and Costs. Judgment of November 28, 2007. Series C No. 172, paras. 121, 122, 123, 126, 128, 146; and I/A Court H.R., *Case of Kawas Fernández v. Honduras*, Merits, Reparations and Costs. Judgment of April 3, 2009. Series C No. 196, para. 148.

⁴ *See e.g.* Federal Supreme Court, *PBS et al. v. Brazil*, ADPF708, Decision, para. 7 (Jul. 1, 2022) ("All these changes could jeopardize man's survival on Earth.") https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2022/20220701_ADPF-708_decision-2.pdf; Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Conclusions of Law at p. 87, para. 7 (Aug. 14, 2023) ("[Youth] Plaintiffs' injuries will grow increasingly severe and irreversible without science-based actions to address climate change.") bit.ly/HeldFindingsConclusionsOrder; Supreme Court of the Netherlands, *Stichting Urgenda v. The State of the Netherlands*, No. 19/00135, Judgment at 5.7.9 (Dec. 20, 2019) ("Climate change threatens human rights [...]") https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2020/20200113_2015-HAZA-C0900456689_judgment.pdf; and High Court of Lahore, *Leghari v.*

Federation of Pakistan, W.P. No. 25501/2015, para. 6 (Sep. 4, 2015) ("Climate change is the defining challenge of our time and has led to dramatic alterations of our planet's climate system [...]. On a legal and constitutional plane this is a clarion call for the protection of fundamental rights[...]").
https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2015/20150404_2015-W.P.-No.-25501201_decision.pdf.

⁵ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, paras. 142, 172; United Nations Framework Convention on Climate Change, Art. 4 §(2)(d) (May 9, 1992); Paris Agreement, Preamble and Art. 4 §1 (Dec. 12, 2015); and Glasgow Climate Pact, I §1 (Nov. 13, 2021).

⁶ See e.g., 33 U.S.C. § 1321(a)(27); and U.S. Supreme Court, *Daubert et al. v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 at 579, 592-595 (Jun. 28, 1993) (The five non-exclusive factors judges should consider when determining whether evidence is based on scientifically valid reasoning and been properly applied are: (i) whether the technique or theory can be or has been tested; (ii) whether it has been subjected to peer review and publication; (iii) the known or potential error rate; (iv) the existence and maintenance of standards controlling its operation; and (v) whether it has attracted wide acceptance within a relevant scientific community.) <https://supreme.justia.com/cases/federal/us/509/579/>.

⁷ See e.g. Andrea Rodgers et al., *The injustice of 1.5°C–2°C: The need for a scientifically based standard of fundamental rights protection in constitutional climate change cases*, Va. Env't L. J., 40:102-151 at 104 (2022) ("By design, the Paris Agreement target began as a heuristic intended to guide policy decisions addressing climate change. A review of the history leading up to the Paris Agreement reveals the target was based on intergovernmental compromise, not science.")
http://www.velj.org/uploads/1/2/7/0/12706894/40.2_va_envt_lj_rodgers_sancken_marlow_102_151.pdf (Annex H); Expert Report of James E. Hansen, Ph.D., *Juliana v. United States*, 339 F. Supp. 3d 1062, No. 6:15-cv-01517-TC (D. Or. Jun. 28, 2018), ECF No. 274-1 at 24 https://climatecasechart.com/wp-content/uploads/case-documents/2018/20180628_docket-615-cv-1517_exhibit-7.pdf ("This 450 ppm CO₂ target [~2.0°C] avoided the need to face the task of confronting the powerful fossil fuel industry in the near term."); Béatrice Cointe et al., *A history of the 1.5°C target*, WIREs Clim. Change, e824:1-11 (2023) (Referring to 1.5°C as "originated with a political impetus"; a "politically driven target"; "politically approved"; with its origin "clearly on the diplomatic side"; with an "overtly political history"; and "the result of intense and difficult negotiations") <https://doi.org/10.1002/wcc.824>; see also Juan Auz et al., *The neocolonial violence of 1.5°C*, Open Global Rights, Center for Human Rights and Global Justice and the Future of Rights Program at New York University School of Law (Oct. 6, 2023) ("global climate negotiations embody neocolonialism because the Global North introduced insidious temperature targets, enabling silent yet significant devastation in the Global South at and below the 1.5°C threshold")
<https://www.openglobalrights.org/neocolonial-violence-1-5C-threshold/>; Justin Gillis, *Paris climate talks avoid scientists' idea of 'carbon budget'*, New York Times (Nov. 28, 2015) ("Yet the negotiators gathering in Paris will not be discussing any plan that comes close to meeting their own stated goal of limiting the increase of global temperatures to a reasonably safe level. They have pointedly declined to take up a recommendation from scientists [...] because "Politically, it would be very difficult.") <https://bit.ly/3EV6E4n> (last accessed Dec. 6, 2023); and Piero Morseletto et al., *Governing by targets: Reductio ad unum and evolution of the two-degree climate target*, Int'l Env't Agreements: Pol., L. & Econ., 17:655 at 660 (2017) <https://link.springer.com/article/10.1007/s10784-016-9336-7>.

⁸ See e.g. IPCC, *Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C*, at 44 (2019) ("Warming of 1.5°C is not considered 'safe' [...] and poses significant risks to natural and human systems as compared to the current warming of 1°C [...]. The impacts of 1.5°C of warming would disproportionately affect disadvantaged and vulnerable populations through food insecurity, higher food prices, income losses, lost livelihood opportunities, adverse health impacts and population displacements [...]. Some of the worst impacts on sustainable development are expected to be felt among [...] children [...]").

https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_LR.pdf; IPCC, 2023: *Summary for Policymakers*. In: Climate change 2023: Synthesis report (2023)
https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf; IPCC, 2023: *Longer Report*, In: Climate change 2023: Synthesis report (2023)
https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf; Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, *Earth's Future*, 11:1-14 at 1 (2023) ("The UN's Paris Agreement goal of keeping global warming between 1.5 and 2°C is dangerously obsolete and needs to be replaced by a commitment to restore Earth's climate. We now know that continued use of fossil fuels associated with 1.5–2°C scenarios would result in hundreds of millions of pollution deaths [...]. [T]here is agreement that 1.5°C or more of warming entails enormous danger for human society and the broader Earth system [...]. [...] If sustained through the end of the century or longer, this level of warming would very likely result in immense damage to human society [...])
<https://doi.org/10.1029/2023EF003639>; United Nations Children's Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, 1-26 (2021)
<https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>; Marina Romanello et al., *The 2023 report of the Lancet Countdown on health and climate change: The imperative for a health-centered response in a world facing irreversible harms*, *Lancet*, (2023) ("climate change is increasingly impacting the health and survival of people worldwide, and projections show these risks could worsen steeply with further inaction.") [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(23\)01859-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(23)01859-7/fulltext); and Annexes B and C.

⁹ See citations above.

¹⁰ See e.g. I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, paras. 47, 49, 54, 64 (para. 54 "all human rights are vulnerable to environmental degradation, in that the full enjoyment of all human rights depends on a supportive environment" and "climate change has a wide range of implications for the effective enjoyment of human rights, including the rights to life, health, food, water, housing and self-determination").

¹¹ Pursuant to the UNFCCC and Paris Agreement, States are committed to use best available science; ensure equity; support persons in vulnerable situations especially children; safeguard food security; eradicate poverty; protect the integrity of ecosystems and biodiversity; and avert and minimize loss and damage associated with climate change. 1.5°C of heating prevents States from realizing each of these commitments. See Annex E for further explanation and citations; and with respect to the Court's authority to provide guidance on the duties of States to prevent climate phenomena "in light of the Paris Agreement" per Question IV(A)(1) see American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 64(1); I/A Court H.R., *Juridical Condition and Rights of Undocumented Migrants*, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 53, (This Court "has established some guidelines on the interpretation of international norms *other than* the American Convention. Principally, it has considered that Art. 64(1) of the Convention, when referring to the authority of the Court to provide an opinion on "other treaties concerning the protection of human rights in the American States," is broad and non-restrictive."), see also paras 48 and 54.

¹² National Oceanic and Atmospheric Administration, https://gml.noaa.gov/webdata/ccgg/trends/co2/co2_annmean_mlo.txt (last accessed Dec. 6, 2023).

¹³ See e.g. the studies in Annex D which includes: James Hansen et al., *Target atmospheric CO₂: Where should humanity aim?*, *Open Atmospheric Sci. J.*, 2:217-231 at 228 (2008); and also 218 ("[T]he present global mean CO₂, 385 ppm, is already in the dangerous zone.") <https://openatmosphericsciencejournal.com/contents/volumes/V2/TOASCI-2-217/TOASCI-2-217.pdf>; and Johan Rockström et al., *A safe operating space for humanity*, *Nature* 461:472-475 at 473 (2009) ("[H]uman changes to atmospheric CO₂ concentrations should not exceed 350 parts per million by volume [...] above

pre-industrial levels.”) <https://www.nature.com/articles/461472a>. It is important to note that the 350 ppm limit is not controversial. Scientists continue to identify 350 ppm as the maximum “safe” limit for climate pollution and no scientific body or journal—including the IPCC—has published any scientific evidence indicating that concentrations *above* 350 ppm are safe.

¹⁴ I/A Court H.R., The Environment and Human Rights, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 142 (emphasis added); see also para. 180 (“States must act with due caution to prevent possible damage. [...] Therefore, even in the absence of scientific certainty, they must take ‘effective’ measures to prevent severe or irreversible damage.”).

¹⁵ Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights (“Protocol of San Salvador”) November 16, 1999, Art. 11.

¹⁶ I/A Comm’n H.R., Resolution No. 3/2021 *Climate emergency: Scope of Inter-American Human Rights obligations* of December 31, 2021, para. 1.

¹⁷ See e.g. the studies in Annex D which includes: James Hansen et al., *Target atmospheric CO₂: Where should humanity aim?*, Open Atmospheric Sci. J., 2:217-231 at 228 (2008); and also 218 (“[T]he present global mean CO₂, 385 ppm, is already in the dangerous zone.”) <https://openatmosphericsciencejournal.com/contents/volumes/V2/TOASCJ-2-217/TOASCJ-2-217.pdf>; and Johan Rockström et al., *A safe operating space for humanity*, Nature 461:472-475 at 473 (2009) (“[H]uman changes to atmospheric CO₂ concentrations should not exceed 350 parts per million by volume [...] above pre-industrial levels.”) <https://www.nature.com/articles/461472a>. It is important to note that the 350 ppm limit is not controversial. Scientists continue to identify 350 ppm as the maximum “safe” limit for climate pollution and no scientific body or journal—including the IPCC—has published any scientific evidence indicating that concentrations *above* 350 ppm are safe.

¹⁸ IPCC, 2023: *Summary for policymakers*. In: Climate change 2023: Synthesis report, pp. 1-34 at C.3 (“Rapid and far-reaching transitions across all sectors and systems are necessary to achieve deep and sustained emissions reductions and secure a livable and sustainable future for all.”); see also. B.1, B.3, B.3.1, B.6, B.6.1, B.6.2, Figure SPM.5, B.7.3, C.2, C.2.1, and C.2.4. https://bit.ly/IPCC_ar6; and James Hansen, et al., *Young people’s burden: Requirement of negative CO₂ emissions*, Earth Sys. Dyn., 8: 577-616 at 595 (2017) (Because “the world has already overshoot appropriate targets for GHG amount, [...] we thus infer an urgent need for (1) rapid phasedown of fossil fuel emissions, (2) actions that drawdown atmospheric CO₂ [...]”; and also at 593 (There is “no persuasive scientific reason to a priori reject as implausible a rapid phasedown of fossil fuel emissions.”) <https://esd.copernicus.org/articles/8/577/2017/>. This submission focuses solely on the phasedown of atmospheric CO₂—rather than the removal of already-existing carbon pollution from the atmosphere. However, guidance on drawdown is crucial as well and should be addressed in this Advisory Opinion.

¹⁹ Hundreds of scientific studies find that CO₂-emitting fossil fuels are not needed to power human energy systems. See e.g. IPCC, 2023: *Summary for policymakers*. In: Climate change 2023: Synthesis report, pp. 1-34 at A.4.2 (“[M]itigation options [...] are technically viable, are becoming increasingly cost effective and are generally supported by the public.”) https://bit.ly/IPCC_ar6; and Christian Breyer et al., On the history and future of 100% renewable energy systems research, IEEE Access, 10:78176-78218 at 78176, 78202 (2022) (“The main conclusion of most of these studies is that 100% renewables is feasible worldwide at low cost.”) <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9837910>; Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*. Earth’s Future, 11:1-14 at 5 (2023) (“The plummeting cost of renewable technologies has reshaped global energy, creating an opportunity for faster defossilization than previously thought possible.[...] Renewables are now the cheapest form of electricity available in human history.”) <https://doi.org/10.1029/2023EF003639>.

²⁰ See Annex F *Synopsis and links: Roadmaps to transition States to 100% clean, renewable energy to curtail global warming, air pollution, and risks to energy security*; and Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307, Trial Transcript, Testimony of Mark Z. Jacobson, p. 1057 (Jun 16, 2023) (noting that the roadmaps set forth only one of many scenarios to reach 100% renewables providing States with a starting point to tailor their climate actions) (available upon request).

²¹ I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017, Series A No. 23, para. 67 (“Various human rights bodies have recognized that [...] children [...] are groups that are especially vulnerable to environmental damage [...]”); I/A Comm’n H.R., Resolution No. 3/2021 *Climate emergency: Scope of Inter-American Human Rights obligations*, at 6 (Dec. 31, 2021) (recognizing that the risks of climate change are “particularly high” for children”); see e.g. United Nations Children’s Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children’s climate risk index*, 1-26 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>; also noting that thousands of scientific and medical studies conclude that children are at high risk due to climate change, see e.g. Annex C: *Scientific findings on the effects of climate change on child health*; Samantha Ahdoot et al., *Global climate change and children’s health*, *Pediatrics* 136:e1468-e1484 at e1468-1469 (2015) (“Children are a uniquely vulnerable group that suffers disproportionately from these effects”) <https://publications.aap.org/pediatrics/article/136/5/e1468/33813/Global-Climate-Change-and-Children-s-Health>; Perry E. Sheffield et al., *Global climate change and children’s health: Threats and strategies for prevention*, *Environ. Health Perspect.*, 119:291-298 (2011) (“According to WHO estimates using the DALY [disability-adjusted life year] metric, > 88% of the existing burden of disease due to climate change occurs in children < 5 years of age in both developed and developing countries.” “Effects on children and on other vulnerable populations are already—and are projected to continue to be—disproportionately heavy.”) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3059989/pdf/ehp-119-291.pdf>; Zulfiqar Ahmed Bhutta et al., *Climate change and global child health: What can paediatricians do?*, *Arch. Dis. Child.*, 104(5):417-418 at 417 (May 2019) (“Children pay a disproportionate price for climate change [...]”). <https://adc.bmj.com/content/archdischild/104/5/417.full.pdf>;

²² See citations above.

²³ Extensive medical research echoes this finding. See e.g. Annex C: *Scientific findings on the effects of climate change on child health*; Ruth A. Etzel et al., *Pediatric societies’ declaration on responding to the impact of climate change on children*, *J. Clim. Chang. Health*, 4(10038):1-4 (2021) <https://doi.org/10.1016/j.joclim.2021.100038:1-4> (also available in Annex I); United Nations Children’s Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children’s climate risk index*, 1-26 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>; Frederica Perera et al., *Climate Change, Fossil-Fuel Pollution, and Children’s Health*, *New Eng. J. Med.*, 386:2303- 2314, <https://www.nejm.org/doi/full/10.1056/NEJMra2117706>; Caroline Hickman et al., *Climate anxiety in children & young people and their beliefs about government responses to climate change: A global survey*, *Lancet*, 5(12):e863-e873 at e870 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3); Susie E. L. Burke et al., *The psychological effects of climate change on children*, *Curr. Psychiatry Rep.*, 20(35):1-8 (2018) <https://doi.org/10.1007/s11920-018-0896-9> (restricted access, available upon request).

²⁴ No court has yet to earnestly consider the human rights implications of climate change on children’s mental health. Consequently, the Court’s guidance in this area would be pioneering. It would also be a logical extension of established jurisprudence, see I/A Court H.R., *Case of Contreras et al. v. El Salvador*. Merits, Reparations and Costs. Judgment of August 31, 2011. Series C No. 232, para. 85 (Circumstances capable of violating a child’s right to mental integrity include “feelings of loss, abandonment, intense fear, uncertainty, anguish, and pain, all of which could vary or intensify depending on age and the specific circumstances”); and I/A Court H.R., *Case of Gudiel Álvarez et al. (“Diario Militar”) v. Guatemala*. Merits, Reparations and Costs. Judgment of November 20, 2012. Series C No. 253, para. 287 (“liv[ing] in an environment of suffering and uncertainty” can cause a violation of the right to mental integrity); and I/A Court

H.R., Case of the “Mapiripán Massacre” v. Colombia. Merits, Reparations and Costs. Judgment of September 15, 2005. Series C No. 134, para. 96.59 (displacement from their home can have “grave psychological repercussions”).

²⁵ IPCC, *Summary for policymakers*, In: Climate change 2021: The physical science basis at 15:B.2.2 (2021) (“With every additional increment of global warming, changes in extremes continue to become larger [...]. There will be an increasing occurrence of some extreme events unprecedented in the observational record with additional global warming”) https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf; and IPCC, *Summary for policymakers*. In: Climate change 2023: Synthesis report, pp. 1-34, see e.g. p. 12, B.1 (“Every increment of global warming will intensify multiple and concurrent hazards (*high confidence*)”); see also B.1.3, Figure SPM.2, B.2, B.2.2, Figure SPM.4, C.1.1, and Figure SPM.6, https://bit.ly/IPCC_ar6.

²⁶ Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307 (Aug. 14, 2023), see Findings of Fact at p. 24, para. 92 (“Every ton of fossil fuel emissions contributes to global warming and impacts to the climate and thus increases the exposure of Youth Plaintiffs to harms now and additional harms in the future.”); Conclusions of Law at p. 87, para. 6 (“Every additional ton of GHG [greenhouse gas] emissions exacerbates [youth] Plaintiffs’ injuries and risks locking in irreversible climate injuries.”); and Conclusions of Law at p. 87, para. 7 (“[Youth] Plaintiff’s injuries will grow increasing severe and irreversible without science-based actions to address climate change.”)²⁶ bit.ly/HeldFindingsConclusionsOrder.

²⁷ See e.g. 2ème Chamber Cour d’Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, para. 131, 133 (Nov. 30, 2023) (“In a case brought against Belgium and two regional governments for government’s failure to adequately reduce greenhouse gas emissions, Belgium’s Appeals Court found that “The potential impact of global warming on the lives and private and family lives of every individual on the planet has been sufficiently demonstrated.”²⁷ The Appeals Court then concluded that the “extent of the consequences of global warming and the scale of the risks it entails” mean that it can be considered, “with sufficient judicial certainty,” that each person involved with the case had interest to meet the requirements of standing (machine translated version, officially translated version not available at the time of submission but will be forthcoming) https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf.

²⁸ This causal chain operates identically in every case involving climate change where a State is continuing to promote a fossil-fuel based energy system rather than striving to transition to 100% renewables by 2050 at the latest so there is no need for children to prove it again and again. See e.g. para. 31 subsections (a-i) of this *Amicus Curiae* demonstrating how the District Court of Montana connected the predominately undisputed cross-examined testimony from multiple experts and extensive documentary evidence finding that every link in the causal chain was established between each additional tonne of carbon emitted and the types of harms that tend to be exacerbated by climate change. The District Court specifically found: (i) CO₂ from fossil fuel pollution is the primary driver of Earth’s energy imbalance; (ii) this imbalance is currently significant; (iii) as long as there is an energy imbalance there will be more extremes; (iv) the more CO₂ added to the atmosphere the more the planet will heat; (v) until CO₂ is reduced youth will be unable to live clean and healthy lives; and therefore (vi) every additional tonne emitted matters as it injures young people and risks locking in irreversible climate injuries that will grow increasing severe without science-based action to address climate change. Montana First Judicial District Court, *Held et al. v. State of Montana*, CDV-2020-307 (Aug. 14, 2023) bit.ly/HeldFindingsConclusionsOrder.

²⁹ See e.g. American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 63; 2ème Chamber Cour d’Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, para. 113 (Nov. 30, 2023) (The judiciary has “the power both to prevent and to remedy any

unlawful infringement of subjective rights by authorities in the exercise of their discretionary power [...].") https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf; and United States District Court for the District of Oregon, *Juliana et al., v. United States*, Civ. No. 6:15-cv-01517-AA, Opinion and Order, p. 18 (Jun. 1, 2023) (Finding, "It is a foundational doctrine that when government conduct catastrophically harms [...] citizens, the judiciary is constitutionally required to perform its independent role and determining whether the challenged conduct [...] is unconstitutional." and "The judicial role in [climate] cases like this is to apply constitutional law, declare rights, and declare the government's responsibility. No other branch of government can perform this function because the 'judicial power' is exclusively in the hands of [...] courts https://climatecasechart.com/wp-content/uploads/case-documents/2023/20230601_docket-615-cv-01517_opinion-and-order-2.pdf."

³⁰ United Nations Framework Convention on Climate Change (May 9, 1992); see e.g. 2ème Chamber Cour d'Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, paras. 165-166 (Nov. 30, 2023) (Finding that "Since at least 1988, it has been accepted that climate change is a 'common concern of mankind' that will 'require timely action to address [...]' and as such, is relevant to "verify[ing] when the respondent parties knew or should have known that they had to act". The Court then went into a detailed analysis of State knowledge with respect to the emissions reductions that needed to be put into place when) https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf; see also, U.S. 9th Circuit Court of Appeals, *Juliana et al. v. United States*, No. 18-36082, Opinion, p. 15 (Jan. 17, 2020) ("The record also conclusively establishes that the federal government has long understood the risks of fossil fuel use and increasing carbon dioxide emission.") <https://cdn.ca9.uscourts.gov/datastore/opinions/2020/01/17/18-36082.pdf>.

³¹ See e.g. American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 63; 2ème Chamber Cour d'Appel Bruxelles, *VZW Klimaatzaak v. Kingdom of Belgium et al.*, Arrêt, 2022/AR/891, para. 113 (Nov. 30, 2023) (The judiciary has "the power both to prevent and to remedy any unlawful infringement of subjective rights by authorities in the exercise of their discretionary power [...].") https://prismic-io.s3.amazonaws.com/affaireclimat/4460824d-989f-4c3e-ad14-6dc1e4c9a1d3_SP52019923113012320+en.pdf; and United States District Court for the District of Oregon, *Juliana et al., v. United States*, Civ. No. 6:15-cv-01517-AA, Opinion and Order, p. 18 (Jun. 1, 2023) (Finding, "It is a foundational doctrine that when government conduct catastrophically harms [...] citizens, the judiciary is constitutionally required to perform its independent role and determining whether the challenged conduct [...] is unconstitutional." and "The judicial role in [climate] cases like this is to apply constitutional law, declare rights, and declare the government's responsibility. No other branch of government can perform this function because the 'judicial power' is exclusively in the hands of [...] courts https://climatecasechart.com/wp-content/uploads/case-documents/2023/20230601_docket-615-cv-01517_opinion-and-order-2.pdf."

³² I/A Court H.R., Case of the "Street Children" (*Villagrán Morales et al.*) v. Guatemala. Judgment of November 19, 1999. Series C No. 63, para. 235 ("[T]he absence of an effective remedy to violations of the rights recognized by the Convention is itself a violation of the Convention[...] [...] [F]or such a remedy to exist, it is not sufficient that it be provided for by the Constitution or by law [...], but rather it must be truly effective in establishing whether there has been a violation of human rights and in providing redress.") citing I/A Court H.R., Case of *Cesti Hurtado*. Judgment of September 29, 1999. Series C No. 56, para. 121; I/A Court H.R. Case of *Castillo Petruzzi et al.* Judgment of May 30, 1999. Series C No. 52, para. 185; I/A Court H.R., Judicial Guarantees in States of Emergency, Advisory Opinion OC-9/87 of October 6, 1987. Series A No. 9, para. 24; IACHR, *Access to Justice as a Guarantee of Economic, Social, and Cultural Rights. A Review of the Standards Adopted by the Inter-American System of Human Rights* (2007) para. 1 ("States have "a positive duty to organize their institutional apparatus so that all individuals can access those remedies [...] and] are required

to remove any regulatory, social, or economic obstacles that prevent or hinder the possibility of access to justice.”) <https://www.refworld.org/docid/477e3d062.html>.

³³ See e.g. Nikki Lakhani, *Revealed: Top carbon offset projects may not cut planet-heating emissions*, The Guardian (Sep. 19, 2023) (“The vast majority of the environmental projects most frequently used to offset greenhouse gas emissions appear to have fundamental failings [... that] exaggerate climate benefits and underestimate potential harms.”) <https://www.theguardian.com/environment/2023/sep/19/do-carbon-credit-reduce-emissions-greenhouse-gases> (last accessed Dec. 6, 2023); Thales A.P. West et al., *Action needed to make carbon offsets from forest conservation work for climate change mitigation*, Science, 381:1-5 at 4 (2023) (In a study examining 26 carbon offset sites in 6 countries the findings “corroborate prior studies that questioned the additionality, and thus environmental integrity, of carbon-offset interventions.”) <https://www.science.org/doi/10.1126/science.ade3535> (restricted access, available upon request); and Jared Stapp et al., *Little evidence of management change in California’s forest offset program*, Commun. Earth Environ., 4(331):1-10 at 1 (2023) (“Carbon offsets are widely promoted as a strategy to lower the cost of emission reductions, but recent findings suggest that offsets may not causally reduce emissions by the amount claimed.”) <https://doi.org/10.1038/s43247-023-00984-2>.

³⁴ I/A Court H.R., *Juridical Condition and Rights of Undocumented Migrants*, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, paras. 64, 67 (“[T]he Court recalls the board scope of its advisory function” and is “empowered to structure its rulings as it considers best suited to the interests of justice and the purpose of an advisory opinion. [...] [T]he Court takes into account the basic issues that underlie the questions posed [...] to reach general conclusions that can, in turn, be extended to specific points mentioned in the request itself [...].”)

³⁵ I/A Court H.R., *Differentiated approaches with respect to certain groups of persons in detention*, Advisory Opinion OC-29/22 of May 30, 2022. Series A No. 29, para. 172; Convention of the Rights of the Child, Art. 3(1) (Sep. 2, 1990); and UN Committee on the Rights of the Child, *General comment No. 26 (2023) on children’s rights and the environment, with a special focus on climate change*, paras. 16-19 (Aug. 22, 2023).

³⁶ I/A Court H.R., *Differentiated approaches with respect to certain groups of persons in detention*, Advisory Opinion OC-29/22 of May 30, 2022. Series A No. 29, para. 69 (“[A]s has been stated by the Court in other cases, States should pay special attention to those cases in which there is an intersection of multiple factors of vulnerability and risk of discrimination associated with a of particular conditions and identity traits.”).

³⁷ Harvard T.H. Chan School of Public Health, *2019 Lancet countdown on health and climate change: Policy brief for the U.S.* (Nov. 13, 2019) <https://www.hsph.harvard.edu/c-change/news/2019-lancet-countdown/> (last accessed Dec. 6, 2023); Anthony J. McMichael, *Globalization, climate change, and human health*, N. Engl. J. Med., 368:1335-1343, Table 3 (2013) <https://doi.org/10.1056/NEJMr1109341>.

Annex B Supporting facts and evidence: Climate science

Introduction

- B.1. In 2023, the IPCC **reiterated** that “[h]uman-caused climate change is **already** affecting many weather and climate extremes in every region across the globe. This has led to **widespread** adverse impacts and related **losses and damages** to nature and people (*high confidence*). Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected (*high confidence*).”¹
- B.2. The purpose of this Annex is to highlight **three critical scientific findings** and provides corroborating examples that demonstrate that people across the Americas—especially children—are being harmed at today's level of heating and, as Earth's temperature rises, so too will the toll on human rights across continents. The critical findings are:
- a. Climate-related environmental harms resulting in serious violations of Convention rights are already occurring at the current level of heating, which is ~1.1°C-1.3°C above pre-industrial levels.
 - b. Climate-related environmental harms will only increase as the Earth heats to the Paris Agreement temperature targets of 1.5°C and 2°C exacerbating the violation of Convention rights.
 - c. Remaining at the currently-too-high temperatures and reaching and/or exceeding 1.5°C could trigger multiple climate tipping points further endangering human rights.

The handful of examples provided here—together with countless others—underscore the scientific consensus that **current** global warming of ~1.1°C-1.3°C above pre-industrial levels is already resulting in harm to natural systems and, in turn, significant human rights violations. Further heating will be even more devastating for humanity. For evidence of how climate change is harming child health, see **Annex C**.

¹ IPCC, 2023: *Summary for Policymakers*. In: Climate change 2023: Synthesis report, at para. A.2 (2023) (“Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Human-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts and related losses and damages to nature and people (*high confidence*). Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected (*high confidence*)”).
https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf.

Critical finding #1:
Climate-related environmental harms resulting in serious violations of Convention rights are already occurring at the current level of heating: ~1.1°C-1.3°C above pre-industrial levels

- B.3. At a current temperature rise of ~1.1° to 1.3°C of warming over pre-industrial levels, **droughts** have besieged large geographic areas of Latin America. For example:
- a. Since 2008, Chile and Argentina have experienced the longest drought in the historical record and possibly the driest period in over 1,000 years, with anthropogenic-caused warming being responsible for up to half of the total precipitation reduction.²
 - b. In northern Chile on the Altiplano, average precipitation for the last 17 years is the lowest it has been in 389 years.³
 - c. From 2000-2021, southwestern North America experienced the driest 22-year period in at least 1,200 years, with over 40% of the drought due to human-caused climate change.⁴
 - d. Colombia and Brazil have some of the highest **occurrences** of “flash”⁵ droughts—or rapid onset droughts—in the world. Chile has the **fastest increase** of such droughts in the world. Anthropogenic climate change caused nearly half of these flash droughts.⁶
 - e. Nearly half of Colombia's cropland faces at least a 50% probability of extreme drought, which is the highest in the world among top agriculture-producing countries.⁷

² Benjamin I. Cook et al., *Megadroughts in the Common Era and the Anthropocene*, Nat. Rev. Earth Environ., 3:741-757 at 6, Figure 2 (2022) <https://doi.org/10.1038/s43017-022-00329-1> (restricted access, available upon request).

³ Mariano S. Morales et al., *Drought increase since the mid-20th century in the northern South American Altiplano revealed by a 389-year precipitation record*, Climate Past, 19(2):457-476 at 464 (2023) <https://doi.org/10.5194/cp-19-457-2023>.

⁴ A. Park Williams et al., *Rapid Intensification of the emerging southwestern North American megadrought in 2020-2021*, Nat. Clim. Chang., 12:1-14 at 3 (2022) (noting that this research looks at changes from 800 CE which is the last 1200 years) <https://doi.org/10.1038/s41558-022-01290-z> (restricted access, available upon request).

⁵ Xing Yuan et al., *A global transition to flash droughts under climate change*, Science, 380:187-191 at 187 (2023) (Conventional droughts evolve slowly while a flash drought is a rapid-onset drought that can develop into severe droughts within less than a one month) <https://www.science.org/doi/10.1126/science.abn6301> (restricted access, available upon request).

⁶ Xing Yuan et al., *A global transition to flash droughts under climate change*, Science, 380:187-191 at 190, Figure 3 (2023) <https://www.science.org/doi/10.1126/science.abn6301> (restricted access, available upon request).

⁷ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 6, Figure 3 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

- f. Chile's hydroelectric resources are the most exposed to drought anywhere in the world due to current global warming.⁸
 - g. The Amazon faces a 30% chance of extreme drought each year in today's climate⁹ while the record breaking 2015/2016 drought in the Amazon was made 2.7 to 4.7 times more likely by anthropogenic climate change.¹⁰ During the two major droughts in 2005 and 2010, the Amazon temporarily turned into a carbon source—rather than a carbon sink—due to tree mortality.¹¹ Since the early 2000s, the increasing dry-season length and drought frequency have resulted in a loss of resilience for more than three-quarters of the Amazon rainforest, risking dieback and creating profound implications for biodiversity, carbon storage and climate change at a global scale.¹²
 - h. Every tiny fraction of a degree matters with respect to drought. In today's warmer world, 1.7 billion people (25% of 2020 global population) already face a 25% likelihood of extreme drought every year.¹³ As the Earth heats from 1.0°C to 1.5°C, an additional 562 million will be exposed.¹⁴ At 3.0°C of warming, 4.7 billion—more than half of the 2020 global population—will live in areas with at least 25% likelihood of annual extreme drought.¹⁵
- B.4. At the current level of warming, South America has experienced the world's second highest increase in length of the **fire season**, second only to Europe, and has experienced the greatest increase in conditions conducive to fire ignition and spread — known as "**fire weather**" — anywhere in the globe.¹⁶ For example:

⁸ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 8, Figure 5 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

⁹ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 5, Figure 2 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

¹⁰ G. G. Ribeiro Neto et al., *Attributing the 2015/2016 Amazon Basin drought to anthropogenic influence*, Clim. Resilience Sustain., 1(e25):1-10 (2021) (noting that the precise confidence range is 2.7 to 4.7 times and as a broad conclusion the authors, on page 8, find "the occurrence likelihood of the 2015/2016 drought event has been increased by almost four times due to anthropogenic influence") <https://doi.org/10.1002/cli2.25>.

¹¹ Chris A. Boulton et al., *Pronounced Loss of Amazon rainforest resilience since the early 2000s*, Nat. Clim. Chang., 12:271-278 at 271 (2022) <https://doi.org/10.1038/s41558-022-01287-8>.

¹² Chris A. Boulton et al., *Pronounced Loss of Amazon rainforest resilience since the early 2000s*, Nat. Clim. Chang., 12:271-278 at 271, 277 (2022) <https://doi.org/10.1038/s41558-022-01287-8>; see also David M. Lapola et al., *The Drivers and Impacts of Amazon Forest Degradation*, Science, 379(eabp8622):1-11 (2023) <https://www.science.org/doi/10.1126/science.abp8622> (restricted access, available upon request).

¹³ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 4 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

¹⁴ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 4 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

¹⁵ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 4 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

¹⁶ Matthew W. Jones et al., *Global and regional trends and drivers of fire under climate change*, Revs. Geophys., 60(e2020RG000726):1-76 at 12, Table 1 (2022) (change calculated over 40 years from 1979-2019) <https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020RG000726>.

- a. South of the equator, the **fire season length has increased**¹⁷ by 30 days (a 62.4% increase) since 1979. North of the equator, South America's fire season length increased by 10 days (a 38.25% increase)—and in the southern Amazon, it increased by 39 days (94.37%). For comparison, fire season length in the boreal and temperate zones of North America increased by 4 days (30.45%) and 20 days (45.17%), respectively, while Central America's fire season lengthened by 39 days (48.9%).
- b. South of the equator, extreme **fire weather frequency** increased¹⁸ by 26 days per year (118.7%) since 1979, and the Amazon's extreme fire weather increased by 37 days (162.6%). In North America, the level of increase observed in Pacific USA forests was more than 37 days per year (166%).
- c. Canada's 2023 fire season illustrates the repercussions of longer fire seasons and more severe fire weather.¹⁹ Over the course of a fire season that **started early** and **ended late**, blazes burned an estimated 18.4 million hectares from the country's western province of British Columbia all the way to Quebec in the east. In total, hundreds of fires each exceeded 10,000 hectares (39 square miles), large enough to be considered "megafires."²⁰ And in total, flames burned an area roughly the size of Uruguay. For comparison, on average just 2.5 million hectares burn in Canada each year.
- d. The climate change-induced wildfires in Quebec exposed 86 million people in the USA to fine particulate air pollution at levels higher than USA federal health standards, which scientists at the USA's National Oceanic and Atmospheric Administration characterized as a "stunning impact".²¹

¹⁷ All the findings in this subpoint are in: Matthew W. Jones et al., *Global and regional trends and drivers of fire under climate change*, *Revs. Geophys.*, 60(e2020RG000726):1-76 at 12-14, Table 1 and Figure 1 (2022) (change calculated over 41 years from 1979-2019)

<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020RG000726>.

¹⁸ All the findings in this subpoint are in: Matthew W. Jones et al., *Global and regional trends and drivers of fire under climate change*, *Revs. Geophys.*, 60(e2020RG000726):1-76 at 12-14, Table 1 and Figure 1 (2022) (change calculated over 41 years from 1979-2019)

<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020RG000726>.

¹⁹ All the findings in this subpoint are in: NASA's Earth Observatory, *Tracking Canada's Extreme 2023 Fire Season*, <https://earthobservatory.nasa.gov/images/151985/tracking-canadas-extreme-2023-fire-season> (last accessed Dec. 6, 2023).

²⁰ Grant D. Lindley, et al., *What do you mean, 'megafire'?*, *Glob. Ecol. Biogeogr.*, 32:1906-1922 at 1907 (2022) (A "megafire" is an emerging concept commonly used to describe fires that are extreme in terms of size, behaviour, and/or impacts, but the meaning is yet to be precisely defined)
<https://doi.org/10.1111/geb.13499>.

²¹ NOAA National Environmental Satellite, Data, and Information Service, *NOAA Satellites Tracked Historic Levels of Harmful Smoke, Impacting Millions in the Eastern U.S.* (Jun. 20, 2023), <https://www.nesdis.noaa.gov/news/noaa-satellites-tracked-historic-levels-of-harmful-smoke-impacting-millions-the-eastern-us> (last accessed Dec. 6, 2023).

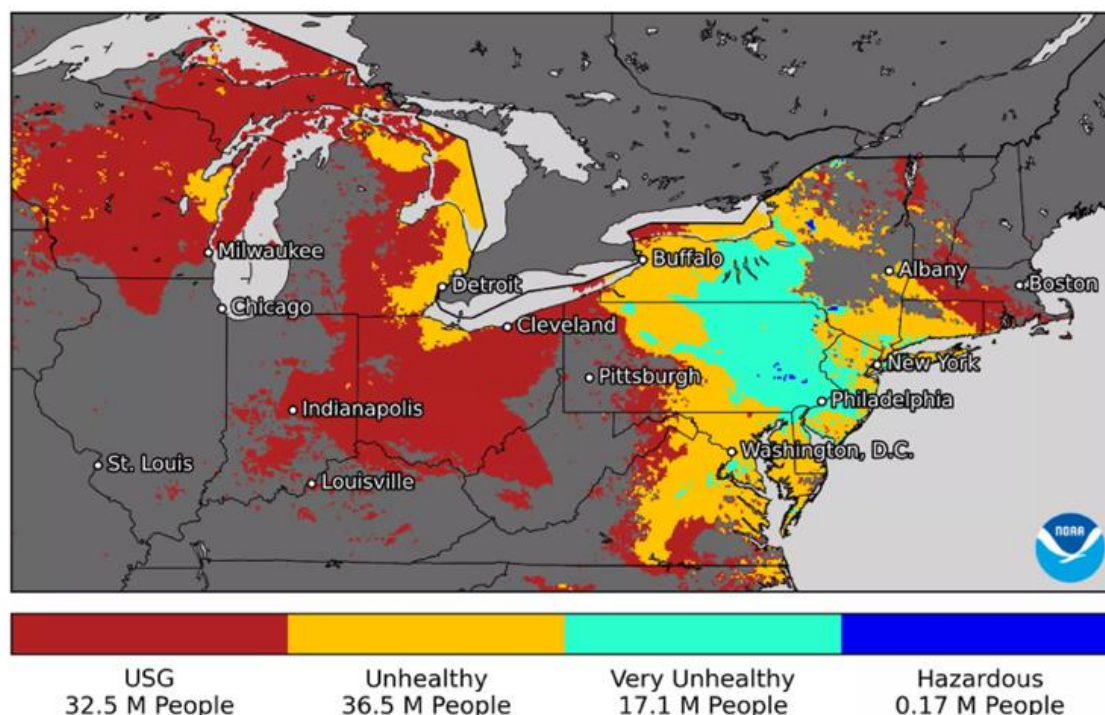


Figure. 1. USA human exposure to harmful particulate pollution (PM_{2.5}) from June 3-10, 2023. Regions in Canada were not part of the analysis.²²

B.5. The Earth has yet to reach 1.5°C of heating over pre-industrial levels and **temperatures** are already exposing unprecedented millions to extreme heat and heatwaves. For example:

- a. The latter half of the 20th century was the warmest 51-year period anywhere in the Americas in at least the last 2,000 years.²³ While the full data for 2023 is not yet in, the World Meteorological Organization announced at COP28 that “[t]his year is ‘virtually certain’ to be the hottest year in recorded history.”²⁴ The current level of heating is already causing severe climate impacts including death and damages.
- b. At the current level of global heating, southern Colombia has sub-yearly severe heat events where residents experience high incidence of heat

²² NOAA National Environmental Satellite, Data, and Information Service, *NOAA Satellites Tracked Historic Levels of Harmful Smoke, Impacting Millions in the Eastern U.S.* (Jun. 20, 2023), <https://www.nesdis.noaa.gov/news/noaa-satellites-tracked-historic-levels-of-harmful-smoke-impacting-millions-the-eastern-us> (last accessed Dec. 6, 2023).

²³ Raphael Neukom et al., *No evidence for globally coherent warm and cold periods over the preindustrial Common Era*, *Nature*, 571:550-554 at 550, 552, Figure 3 (2019) <https://doi.org/10.1038/s41586-019-1401-2> (restricted access, available upon request).

²⁴ Delger Erdenesanaa et al., *This year is ‘virtually certain’ to be hottest in human history, researchers say*, *New York Times* (Nov. 30, 2023) (noting that a final finding on this will be available in early January 2024) <https://www.nytimes.com/2023/11/30/climate/2023-hottest-year-cop28.html> (last accessed Dec. 6, 2023).

cramps, heat exhaustion, and heat stroke, with a multi-decadal occurrence of dangerous heat (high chance of heat stroke) along the equator in western Brazil.²⁵

- c. This heat also leads to death. From 2000 to 2019, 56,759 excess deaths from heat (95% probability range 29,551-93,707) occurred in across the Americas each year with approximately 36,695 (range 20,064-59,526) of those excess deaths being in Latin America and the Caribbean and another 20,064 (range 8,703-35,204) deaths in North America.²⁶ Anthropogenic climate change caused more than 60% of heat-related deaths from 1991 to 2018 in Colombia, Ecuador, Peru, Brazil, Costa Rica, and Guatemala; more than 40% of heat-related deaths in Chile, Paraguay, Panama, Puerto Rico, Mexico, and Canada; and at least 20% of heat related deaths in Argentina, Uruguay, and the USA.²⁷

B.6. Warming across the 21st century **accelerated glacier retreat** throughout the Americas. This acceleration continues in response to increasing heating today.

- a. Some of the most extreme glacier thinning in the world is found in southern Chile, southern Alaska, and the southern Canadian Arctic.²⁸ In one case, glaciers in Los Alerces National Park, Argentina, a UNESCO World Heritage Site, lost 45.6% of their mass since 2000, which is the second fastest rate of loss for any glaciated World Heritage Site on Earth.²⁹
- b. Farther south, the northern and southern Patagonian icefields in Chile and Argentina lost about 3.6 cubic kilometres of ice **per year** from 1976 to 2000, and the rate of loss **accelerated** to around 19.1 cubic kilometres of ice per year from 2000 to 2020.³⁰ In total, in the last 20 years, these ice fields lost

²⁵ Nicolas Freychet et al., *Robust increase in population exposure to heat stress with increasing global warming*, Environ. Res. Lett., 17(064049):1-10 at 2-3, 5, Figure 1 (2022) <https://doi.org/10.1088/1748-9326/ac71b9>.

²⁶ Qi Zhao et al., *Global, regional, and national burden of mortality associated with non-optimal ambient temperatures from 2000 to 2019: A three-stage modelling study*, Lancet Planet Health, 5:e415-e425 at e418, Table 1 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00081-4](https://doi.org/10.1016/S2542-5196(21)00081-4).

²⁷ A. M. Vicedo-Cabrera et al., *The burden of heat-related mortality attributable to recent human-induced climate change*, Nat. Clim. Chang., 11:492-500 at 497 (2021) <https://doi.org/10.1038/s41558-021-01058-x> (restricted access, available upon request).

²⁸ Romain Hugonnet et al., *Accelerated global glacier mass loss in the early twenty-first century*, Nature 592:726-731 at 729, Figure 3 (2021) <https://doi.org/10.1038/s41586-021-03436-z> (restricted access, available upon request).

²⁹ UNESCO et al., *World Heritage Glaciers: Sentinels of Climate Change*, United Nations Educational, Paris, UNESCO, 1-34 at 21, Table 3 (2022) <https://unesdoc.unesco.org/ark:/48223/pf0000383551>.

³⁰ Morgan McDonnell et al., *Quantifying geodetic mass balance of the northern and southern Patagonian icefields since 1976*, Front. Earth Sci., 10(813574):1-19 at 8 and Table 3 (2022) <https://doi.org/10.3389/feart.2022.813574> (*Amici* are happy to provide the Court with the calculations behind how these numbers were reached).

roughly 382 cubic kilometres of ice.³¹ To give a sense of the scale, 382 cubic kilometres is equal to approximately 137,429 La Danta pyramids at El Mirador, Guatemala or 85,843 Great Pyramids of Cholula, Mexico.³²

- c. Glaciers in the Peruvian Andes, the primary source of water for thousands of people, are also rapidly retreating, having already lost 54% to 64% of their area since the 1970s.³³ Current retreat of the Peruvian Quelccaya ice cap is unprecedented in more than 3,000 years.³⁴ In Colombia, glaciers of the Cocuy-Güican Mountains had lost about two thirds of their 1955 area and about half of the 1994 area by 2019,³⁵ with the nearby Conejeras Glacier in Los Nevados National Park on the brink of disappearance.³⁶ Venezuela has now lost all of its glaciers.³⁷
- i. Glacier melt provides valuable water to surrounding communities. With climate change projected to cause the demise of many glaciers from the Canadian Arctic to the southern Andes, glacial retreat and glacier loss will increase streamflow variability and reduce water resource predictability for numerous dependent communities.³⁸

³¹ Morgan McDonnell et al., *Quantifying geodetic mass balance of the northern and southern Patagonian icefields since 1976*, *Front. Earth Sci.*, 10(813574):1-19 (2022) <https://doi.org/10.3389/feart.2022.813574> (*Amici* are happy to provide the Court with the calculations behind how this number was reached).

³² La Danta, El Mirador pyramids in Guatemala are approximately 0.0009 km³. The Great Pyramids of Cholula in Mexico are approximately 0.00445 km³, see Wikipedia, *El Mirador*, https://en.wikipedia.org/wiki/El_Mirador#:~:text=The%20La%20Danta%20temple%20measures,largest%20pyramids%20in%20the%20world; and DOGO News, Mexico is Home to the world's Largest Pyramid, https://www.dogonews.com/2023/2/21/mexico-is-home-to-the-worlds-largest-pyramid (Feb. 21, 2023) (last accessed on Dec. 6, 2023).

³³ Liam S. Taylor et al., *Multi-decadal glacier area and mass balance change in the southern Peruvian Andes*, *Front. Earth Sci.*, 10(863933):1-14 at 1, 2, 5 (2022) <https://doi.org/10.3389/feart.2022.863933>.

³⁴ Anthony C. Vickers et al., *Similar Holocene glaciation histories in tropical South America and Africa*, *Geology*, 49(2):140-144 at 143, Figure 3G (2021) <https://doi.org/10.1130/G48059.1>.

³⁵ Juan Ignacio López-Moreno et al., *Recent evolution of glaciers in the Cocuy-Güican Mountains (Colombian Andes) and the hydrological implications*, *Land Degrad. Dev.*, 33:2606-2618 at 2611, Figure 4C (2022) <https://doi.org/10.1002/ldr.4336>.

³⁶ Juan Ignacio López-Moreno et al., *Recent evolution of glaciers in the Cocuy-Güican Mountains (Colombian Andes) and the hydrological implications*, *Land Degrad. Dev.*, 33:2606-2618 at 2612-2613 (2022) <https://doi.org/10.1002/ldr.4336>.

³⁷ Maximillian Van Wyk de Vries et al., *Glacier thickness and ice volume of the northern Andes*, *Sci. Data*, 9(342):1-16 at 1 (2022) <https://doi.org/10.1038/s41597-022-01446-8>; see also Nerio Ramírez et al., *The end of the eternal snows: Integrative mapping of 100 years of glacier retreat in the Venezuelan Andes*, *Arct. Antarct. Alp. Res.*, 52(1):563-581 (2020) <https://doi.org/10.1080/15230430.2020.1822728>.

³⁸ David R. Rounce et al., *Global glacier change in the 21st century: Every increase in temperature matters*, *Science*, 379(6627):1-6 at 1, 3, Figure 3 (2023) <https://www.science.org/doi/10.1126/science.abo1324> (restricted access, available upon request); see e.g. Liam S. Taylor et al., *Multi-decadal glacier area and mass balance change in the southern Peruvian Andes*, *Front. Earth Sci.*, 10(863933):1-14 (2022) <https://doi.org/10.3389/feart.2022.863933>; and Juan Ignacio López-Moreno et al., *Recent evolution of glaciers in the Cocuy-Güican Mountains (Colombian Andes) and the hydrological implications*, *Land Degrad. Dev.*, 33:2606-2618 (2022) <https://doi.org/10.1002/ldr.4336>; and see generally UN Environment Programme, *Shrinking glaciers upend lives across South America*, <https://www.unep.org/news-and-stories/story/shrinking-glaciers-upend-lives-across-south-america> (last accessed Dec. 6, 2023).

- B.7. Finally, the Greenland ice sheet has consistently lost mass since 2000 while the Antarctic ice sheets have lost mass in most years since 2005.³⁹ Cumulative CO₂ emissions to date have already committed the planet to meters of sea-level rise in the coming millennia.⁴⁰ Such committed meters of sea-level rise would, in Colombia, drown large portions of the Parque Nacional Natural Los Katíos along the Atrato River and the cities of Cartagena and Barranquilla. Elsewhere in South America, Buenos Aires, Rio de Janeiro, and much of the coastlines of Venezuela, Guyana, Suriname, French Guiana, and northern Brazil would experience significant flooding and land loss. So too would the Caribbean coastlines of Nicaragua, Honduras, Guatemala, Belize, Mexico, and the USA as well as the southeast USA's Atlantic coast.

Critical finding #2

Climate-related environmental harms will only increase as the Earth heats to the Paris Agreement temperature targets of 1.5°C and 2°C, exacerbating the violation of Convention rights

- B.8. Scientific consensus—including findings by the IPCC and myriad peer-reviewed publications—concludes that 1.5°C of warming is not only unsafe for humanity,⁴¹ it is “not enough to protect us from sea level rise, ecosystem collapse, and hundreds of millions of [avoidable] human deaths from fossil fuel pollution.”⁴² Supporting this **scientific consensus that is critical for human rights**, the IPCC's Sixth Assessment Report⁴³ details what UN Secretary General António Guterres called “an atlas of human suffering.”⁴⁴
- B.9. In general,⁴⁵ for Latin America, **global heating of 1.5°C** will expose up to 51.5 million **more** people **per year** to heat stress, up to 93 million more people per year

³⁹ Inès N. Otsaka et al., *Mass balance of the Greenland and Antarctic ice sheets from 1992 to 2020*, Earth Sys. Sci. Data, 15(4):1597-1616 (2023) <https://doi.org/10.5194/essd-15-1597-2023>.

⁴⁰ Peter U. Clark et al., *Sea-level commitment as a gauge for climate policy*, Nat. Clim. Chang., 8:648-659 at 654, Figure 1a (2018) <https://doi.org/10.1038/s41558-018-0226-6> (restricted access, available upon request); Ute Kloenne et al., *Only halving emissions by 2030 can minimize risks of crossing cryosphere thresholds*, Nature Clim. Chang., 13:9-11 at 10, Figure 1 (2023) <https://doi.org/10.1038/s41558-022-01566-4> (restricted access, available upon request); and IPCC, *Technical Summary*, In: Climate Change (2021): The Physical Science Basis, at 77, Box TS.4 (2021) https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_TS.pdf.

⁴¹ IPCC *Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C*, at 44 (2019) (“Warming of 1.5°C is not considered “safe” [...] and poses significant risks to natural and human systems as compared to the current warming of 1°C [...].”) https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_LR.pdf.

⁴² Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, Earth's Future, 11:1-14 at 1 (2023) <https://doi.org/10.1029/2023EF003639>.

⁴³ IPCC *Climate change 2022: Impacts, adaptation and vulnerability*, In: Sixth Assessment Report, <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>.

⁴⁴ United Nations, António Guterres (UN Secretary-General) to the Press Conference Launch of IPCC Report (Feb. 28, 2022), <https://media.un.org/en/asset/k1x/k1xcijxjhp> (last accessed Dec. 6, 2023).

⁴⁵ All the findings in this paragraph are from In: Rachel Warren et al., *Quantifying risks avoided by limiting global warming to 1.5 or 2 °C above pre-industrial levels*, Clim. Chang., 172(39):1-16, Supplemental Materials (2022) <https://doi.org/10.1007/s10584-021-03277-9>.

to drought, up to 500,000 more people per year to 100-year river flooding, and up to 43.7 million more people per year to water stress with up to 4.6% greater loss in crop yield. Sea-level rise will inundate up to 15,400 km² of coastline, exposing up to 2.6 million more people per year to flooding, while up to 8.2 million more people per year will experience dengue fever. Total damages will be up to 0.8% of gross domestic product annually.

- B.10. For comparison, in the USA, drought will impact up to 54.1 million more people per year, with up to 91.8 million more people per year experiencing water stress. Crop yields will fall by 5.8%, and up to 400,000 more people per year will be impacted by 100-year river floods. Coastal flooding will drown up to 13,700 km² of coastline, with up to 2.7 million more people per year experiencing coastal flooding. Total damages will reach 1.1% of gross domestic product of the USA.
- B.11. Thousands of additional specific research findings are available. Here are a few.
- B.12. At 1.5°C of global warming, **drought** duration, frequency, peak intensity, and severity will increase in large parts of South America, all of Central America and southern North America, with the greatest increases focused in Chile, northern Colombia, and into Central America.⁴⁶ Specifically, the annual probability of severe drought in Brazil increases from today's level of 6% to 21% at 1.5°C and 28% at 2.0°C.⁴⁷ In parts of Chile and Colombia, the probability increases to a greater than 90%,⁴⁸ and in the Amazon, the probability increases from ~30% to nearly 50%.⁴⁹ This rising drought risk will threaten water security, and consequently, human health.
- B.13. Longer, more frequent, and more severe **droughts** will also threaten **food security** and States' capacity to generate **electricity**,
- a. At 1.5°C, 75% of Colombia's **cropland** will have a 50% annual probability of extreme drought, the highest of any top producing country.⁵⁰ 50% of Mexico's cropland and 25% of Brazil's cropland will also have a 50% risk of drought

⁴⁶ Hossein Tabari et al., *Trivariate analysis of changes in drought characteristics in the CMIP6 multimodel ensemble at global warming levels of 1.5°, 2°, and 3°C*, J. Clim., 35:5823-5837 at 5827-5830 (2022) <https://doi.org/10.1175/JCLI-D-21-0993.1>; and Srinidhi Jha et al., *Partitioning the uncertainties in compound hot and dry precipitation, soil moisture, and runoff extremes projections in CMIP6*, Earths' Future 11(e2022EF003315):1-15 at 8-12 (2023) <https://doi.org/10.1029/2022EF003315>.

⁴⁷ Jeff Price et al., *Quantification of meteorological drought risks between 1.5 °C and 4 °C of global warming in 6 countries*, Clim. Chang., 174(12):1-16 at 7, Table 2 (2022) <https://doi.org/10.1007/s10584-022-03359-2>.

⁴⁸ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 4, Figure 1 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

⁴⁹ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 5, Figure 2 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

⁵⁰ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 6, Figure 3 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

every year at 1.5°C.⁵¹

- b. More than 25% of Brazil's and 10% of Venezuela's, Colombia's, and Peru's **hydroelectric generation** capacity will be at risk of drought at 1.5°C of global warming, while **half** of Chile's hydroelectric capacity will be at risk—the highest risk in the world.⁵²

- B.14. **Fire season** will become even longer at 1.5°C,⁵³ with a 21% longer season south of the equator and a 22% longer season in South America north of the equator. The fire season lengths in Central America and in temperate and boreal North America will increase by 12%, 9%, and 18%, respectively. Fire season length in the Amazon rainforest increases another 52% at 1.5°C, which is **the largest increase anywhere in the world**. Under a 1.5°C scenario, the frequency of **extreme fire weather** also increases in South America by another 29.6% north of the equator and 55.6% south of the equator, with the Amazon experiencing a 51.3% increase. The smoke from those increased fires will harm respiratory health and cause premature deaths, among other health issues, on a large scale.⁵⁴
- B.15. **Extreme heat** will further impact humans at 1.5°C, especially children.⁵⁵ Southwest Colombia and northwest Brazil will experience dangerously **severe heatwaves** nearly every year, while large swaths of Colombia and Brazil will experience dangerous heat events **more than once per year**. Decadal dangerous heat events will develop in Argentina.⁵⁶ Southern Brazil may also experience deadly heat events at 1.5°C of global warming.⁵⁷ The number of dangerous heat days in Colombia and Brazil will increase to 100-250 days per year at 1.5°C, which is the largest increase anywhere in the Americas, and rivals the largest anywhere in the world.⁵⁸ In terms of the impacts to children at 1.5°C of global warming, a person

⁵¹ Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 6, Figure 3 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

⁵² Isabelle Runde et al., *Human and natural resource exposure to extreme drought at 1.0°C-4. °C warming levels*, Environ. Res. Lett., 17(064005):1-12 at 7, Figure 4, and 8, Figure 5 (2022) <https://doi.org/10.1088/1748-9326/ac681a>.

⁵³ All the findings in this paragraph are in: Matthew W. Jones et al., *Global and regional trends and drivers of fire under climate change*, Revs. Geophys., 60(e2020RG000726):1-76 at 41, Table 7, 42, Table 8 (2022) <https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020RG000726>.

⁵⁴ See e.g. Eimy X. Bonilla et al., *Health impacts of smoke exposure in South America: Increased risk for populations in the Amazonian Indigenous territories*, Environ. Res. Health, 1(021007):1-10 (2023) <https://doi.org/10.1088/2752-5309/acb22b>.

⁵⁵ See Annex C.

⁵⁶ Nicolas Freychet et al., *Robust increase in population exposure to heat stress with increasing global warming*, Environ. Res. Lett., 17(064049):1-10 at 5, Figure 1 (2022) <https://doi.org/10.1088/1748-9326/ac71b9>.

⁵⁷ Nicolas Freychet et al., *Robust increase in population exposure to heat stress with increasing global warming*, Environ. Res. Lett., 17(064049):1-10 at 5, Figure 1(2022) <https://doi.org/10.1088/1748-9326/ac71b9>.

⁵⁸ Lucas R. Vargas Zeppetello et al., *Probabilistic projections of increased heat stress driven by climate change*, Commun. Earth Environ. 3(183):1-7 at 4, Figure 3 (2022) <https://www.nature.com/articles/s43247-022-00524-4>.

born in 2020 will have a lifetime exposure to heatwaves that is three to six times greater than a person born in 1960.⁵⁹

- B.16. Globally, mountain glaciers and perennial ice masses are a critical water resource for nearly two billion people.⁶⁰ Allowing the planet to warm to 1.5°C will severely harm this invaluable resource because 1.5°C is projected to cause **half of the world's individual glaciers to disappear entirely**, including many glaciers in Chile, Argentina, Peru, Bolivia, Colombia, and Mexico.⁶¹ Up to 60% and 80% of the glacier volume in the southern Andes and in low-latitude South America, respectively, that existed in 2015 will be lost at 1.5°C.⁶²
- B.17. Global warming to 1.5°C will also result in a 100% loss of thermal refugia for coral reefs during marine heatwaves in the Caribbean and along the Pacific coastline from Baja California to Colombia, Ecuador, and Peru. Brazil's corals will lose 86.5% of their thermal refugia.⁶³ Widespread die-off of tropical corals will occur,⁶⁴ and in general, the IPCC found that "[c]oral reefs are projected to decline by a further 70–90% at 1.5°C of global warming (*high confidence*)."⁶⁵ Reefs provide outsized benefits to people so their loss can devastate communities. Worldwide, reefs support at least 25% of marine species and underpin the safety, coastal protection, wellbeing, food and economic security of hundreds of millions of people.⁶⁶ The value of goods and services provided by coral reefs is estimated at US \$2.7 trillion per year, including US\$36 billion in coral reef tourism.⁶⁷

⁵⁹ Wim Thiery et al., *Intergenerational inequities in exposure to climate extremes*, *Science*, 374(6564):158-160 at 159 (2021) https://texmex.mit.edu/pub/emanuel/PAPERS/Thiery_etal_2021_Science.pdf.

⁶⁰ David R. Rounce et al., *Global glacier change in the 21st century: Every increase in temperature matters*, *Science*, 379(6627):1-6 at 1 (2023) <https://www.science.org/doi/10.1126/science.abo1324> (restricted access, available upon request).

⁶¹ David R. Rounce et al., *Global glacier change in the 21st century: Every increase in temperature matters*, *Science*, 379(6627):1-6 at 2, Figure 1F and Figure S 11 in the Supplemental Materials (2023) <https://www.science.org/doi/10.1126/science.abo1324> (restricted access, available upon request).

⁶² David R. Rounce et al., *Global glacier change in the 21st century: Every increase in temperature matters*, *Science*, 379(6627):1-6 at 4, Figure 4 (2023) <https://www.science.org/doi/10.1126/science.abo1324> (restricted access, available upon request).

⁶³ Adele M. Dixon et al., *Future loss of local-scale thermal refugia in coral reef ecosystems*, *PLoS Clim.*, 1(2)(e0000004):1-20 at 4, Figure 2 (2022) <https://doi.org/10.1371/journal.pclm.0000004>.

⁶⁴ David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, *Science*, 377(1171):1-10 at 7-6 (2022) <https://doi.org/10.1126/science.abn7950>.

⁶⁵ IPCC, *Synthesis Report*. In: *Climate change 2023*, 1-115 at 71 para. 3.1.2 (2023) https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf.

⁶⁶ David Souter et al. (eds.), *Status of coral reefs of the world: 2020*, Global Coral Reef Monitoring Network, International Coral Reef Initiative, Australian Government, and Australian Institute of Marine Science, 1-200 at 16 (2021) <https://doi.org/10.59387/WOTJ9184>.

⁶⁷ David Souter et al. (eds.), *Status of coral reefs of the world: 2020*, Global Coral Reef Monitoring Network, International Coral Reef Initiative, Australian Government, and Australian Institute of Marine Science, 1-200 at 16 (2021) <https://doi.org/10.59387/WOTJ9184>.

- B.18. Similarly, warming to 1.5°C will increase committed global mean **sea-level rise by an additional 2 to 5 meters** due to further icesheet and glacier melt as well as ocean thermal expansion.⁶⁸
- B.19. At 2.0°C of warming, the impacts and injuries will be **significantly** worse on almost every metric.⁶⁹ In a seminal paper published in 2008 by Dr. James Hansen, the former director of the NASA Goddard Institute for Space Studies,⁷⁰ together with nine co-authors, concluded the Earth is **“already in the danger zone” at 385 ppm**.⁷¹ In 2018, Dr. Hansen testified that the political targets of **“2°C and 450 ppm were extremely dangerous[,]”**⁷² explaining that “[s]uch warming would lock in eventual loss of coastal cities, including more than half of the world’s large cities. In addition, the tropics in all seasons and subtropics in summer would become uncomfortably hot [...] likely causing large scale emigration from those regions. Economic and social effects of such displacements would challenge the ability of governments to maintain order.”⁷³ He concluded that it is,

[E]ssential to commence serious and sustained action to return atmospheric CO₂ to < 350 ppm without further delay; essential, that is, to preserve coastal cities from rising seas and floods [...] and superstorms, and otherwise to restore a viable climate system on which the life, liberty, and property prospects [...] of young citizens of America, and future generations so thoroughly depend.⁷⁴

⁶⁸ Peter U. Clark et al., *Sea-level commitment as a gauge for climate policy*, Nat. Clim. Chang., 8:648-659 at 654, Figure 1 (2018) <https://doi.org/10.1038/s41558-018-0226-6> (restricted access, available upon request); Ute Kloenne et al., *Only halving emissions by 2030 can minimize risks of crossing cryosphere thresholds*, Nature Clim. Chang., 13:9-11 at 10, Figure 1 (2023) <https://doi.org/10.1038/s41558-022-01566-4> (restricted access, available upon request)

⁶⁹ If the Court would like more information on the ecological and human impacts of 2.0°C of warming, we would be happy to provide it upon request.

⁷⁰ Dr. James Hansen worked at NASA for 46 years and served as the Director of NASA’s Goddard Institute for Space Studies (GISS) for 32 years. Currently, he serves as Director of the Program on Climate Science, Awareness and Solutions at Columbia University’s Earth Institute.
<https://people.climate.columbia.edu/users/profile/james-e-hansen> - :~:text=James Hansen, formerly Director of,space science program of Dr..

⁷¹ James Hansen et al., *Target atmospheric CO₂: Where should humanity aim?*, Open Atmospheric Sci. J., 2:217-231 at 218, 226, 228 (2008)
<https://openatmosphericsciencejournal.com/contents/volumes/V2/TOASCJ-2-217/TOASCJ-2-217.pdf>.

⁷² Expert Report of James E. Hansen, Ph.D., *Juliana v. United States*, 339 F. Supp. 3d 1062, No. 6:15-cv-01517-TC (D. Or. Jun. 28, 2018), ECF No. 274-1 at 23; and also 4 (“[T]he political guardrail of 2°C of warming (corresponding approximately to an atmospheric CO₂ concentration of ~450 ppm) is highly dangerous, and that an initial target of < 350 ppm CO₂ is justified by the relevant science.”)
https://climatecasechart.com/wp-content/uploads/case-documents/2018/20180628_docket-615-cv-1517_exhibit-7.pdf.

⁷³ Expert Report of James E. Hansen, Ph.D., *Juliana v. United States*, 339 F. Supp. 3d 1062, No. 6:15-cv-01517-TC (D. Or. Jun. 28, 2018), ECF No. 274-1 at 23 https://climatecasechart.com/wp-content/uploads/case-documents/2018/20180628_docket-615-cv-1517_exhibit-7.pdf.

⁷⁴ Expert Report of James E. Hansen, Ph.D., *Juliana v. United States*, 339 F. Supp. 3d 1062, No. 6:15-cv-01517-TC (D. Or. Jun. 28, 2018), ECF No. 274-1 at 4-5 https://climatecasechart.com/wp-content/uploads/case-documents/2018/20180628_docket-615-cv-1517_exhibit-7.pdf.

Critical finding #3

Remaining at today's currently-too-high temperatures and reaching or exceeding 1.5°C could trigger multiple climate tipping points further endangering human rights

- B.20. Climate tipping points—also known as points of no return—are **critical thresholds that, if crossed**, would lead to **large and likely irreversible changes in a component of the Earth's climate system that contributes significantly to the well-being of humanity**.⁷⁵ Tipping points do not stand alone. If one tipping point is crossed, it increases the likelihood of precipitating other tipping points, too—risking a **“tipping cascade”** of impacts that may further reinforce global warming and result in runaway heating that cannot be controlled.⁷⁶ The best available science finds that heating of up to 1.5°C or beyond **for any length of time** could drive our planet across several of these climate tipping points and possibly cause a tipping cascade.⁷⁷
- B.21. With the atmosphere already at a current warming of at least 1.1°C, IPCC assessments indicate that the risk of exceeding tipping-point thresholds is **already “moderate”**, and **could be “high” with warming above 1.5 °C**.⁷⁸ This means that “limiting warming in line with the Paris Agreement *might* still suffice to avoid passing multiple thresholds.”⁷⁹ In other words, adopting 1.5°C as a legal standard to protect human rights is akin to **betting this protection on a coin flip**.
- B.22. In September 2022, researchers updated a comprehensive reassessment of climate tipping points to focusing on tipping points breached at three levels of global warming: current levels, 1.5°C, and above 1.5°C.⁸⁰ The investigators identified the approximate temperature threshold at which 16 core tipping points that are triggerable by global warming will become irreversible and result in significant ecological and human impacts. **At 1.5°C of global warming, four of**

⁷⁵ David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, *Science*, 377(1171):1-10 (2022) <https://doi.org/10.1126/science.abn7950>.

⁷⁶ Nico Wunderling et al., *Global warming overshoots increase risks of climate tipping cascades in a network model*, *Nat. Clim. Chang.*, 13:75-82 (2023) <https://doi.org/10.1038/s41558-022-01545-9> (restricted access, available upon request).

⁷⁷ See e.g. David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, *Science*, 377(1171):1-10 at 1, 5 (2022) <https://doi.org/10.1126/science.abn7950>; Nico Wunderling et al., *Global warming overshoots increase risks of climate tipping cascades in a network model*, *Nat. Clim. Chang.*, 13:75-82 at 76 (2023) <https://doi.org/10.1038/s41558-022-01545-9> (restricted access, available upon request); see also Ute Kloenne et al., *Only halving emissions by 2030 can minimize risks of crossing cryosphere thresholds*, *Nature Clim. Chang.*, 13:9 (2023) <https://doi.org/10.1038/s41558-022-01566-4> (restricted access, available upon request).

⁷⁸ Ute Kloenne et al., *Only halving emissions by 2030 can minimize risks of crossing cryosphere thresholds*, *Nature Clim. Chang.*, 13:9 at 1 (2023) <https://doi.org/10.1038/s41558-022-01566-4> (restricted access, available upon request).

⁷⁹ Ute Kloenne et al., *Only halving emissions by 2030 can minimize risks of crossing cryosphere thresholds*, *Nature Clim. Chang.*, 13:9 at 1 (2023) <https://doi.org/10.1038/s41558-022-01566-4> (restricted access, available upon request).

⁸⁰ All the findings in this paragraph are in: David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, *Science*, 377(1171):1-10, see especially 3, Table 1 (2022) <https://doi.org/10.1126/science.abn7950>.

these sixteen large-scale, irreversible, and destabilizing “tipping points” in the global climate system are “likely” to be crossed, including (i) the collapse of the Greenland ice sheet; (ii) the collapse of West Antarctic ice sheet; (iii) the abrupt thaw of boreal permafrost; and (iv) the die off of 70-90% of tropical and subtropical coral reefs. Furthermore, at ~1.6°C of global warming, abrupt loss of sea ice over the Barents Sea north of Scandinavia is expected. As global warming and the Earth's energy imbalance increase, it is more likely than not that additional tipping points will be crossed. Due to this increased risk of triggering irreversible and devastating tipping points at higher levels of warming, the comprehensive reassessment concludes that **“[t]he Earth may have left a safe climate state beyond 1°C global warming.”**⁸¹

- B.23. One key tipping point of concern for Latin America is the Amazon rainforest,⁸² which is currently positioned to rapidly transition to a non-forested landscape due to climate change and human industrial and agricultural activities.⁸³ In terms of a tipping cascade, the Amazon is intimately linked via long-distance climactic connections to the Tibetan Plateau.⁸⁴ Tibetan Plateau snow cover has been losing stability since 2008, portending similar instability in the Amazon via cascading tipping dynamics.
- B.24. Another tipping element is the “AMOC”, the Atlantic meridional overturning circulation. This element could have a tipping threshold as low as 1.4°C of global warming⁸⁵ and would impact snow cover in the Andes.⁸⁶ **If global warming proceeds on its current path** towards exceeding 2.0°C and nearing 3.0°C,⁸⁷ then potential slowing of the AMOC would trap heat in the southern hemisphere and drive low-to-no snow austral winters in the Andes about 20 years earlier at one third of the local warming level than in the North American cordillera.⁸⁸

⁸¹ David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, *Science*, 377(1171):1-10 at 8 (2022) <https://doi.org/10.1126/science.abn7950>.

⁸² David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, *Science*, 377(1171):1-10 at 6 (2022) <https://doi.org/10.1126/science.abn7950>.

⁸³ James S. Albert et al., *Human impacts outpace natural processes in the Amazon*, *Science*, 379(6630):1-9 (2023) <https://doi.org/10.1126/science.abo5003> (restricted access, available upon request).

⁸⁴ Teng Liu et al., *Teleconnections among tipping elements in the Earth system*, *Nat. Clim. Change.*, 13:67-74 at 67 (2023) <https://doi.org/10.1038/s41558-022-01558-4>.

⁸⁵ David I. Armstrong McKay et al., *Exceeding 1.5°C global warming could trigger multiple climate tipping points*, *Science*, 377(1171):1-10 at 3, Table 1 (2022) <https://doi.org/10.1126/science.abn7950>.

⁸⁶ Alan M. Rhoades et al., *Asymmetric emergence of low-to-no snow in the midlatitudes of the American Cordillera*, *Nat. Clim. Chang.*, 12:1151-1159 at 1156 (2022) <https://doi.org/10.1038/s41558-022-01518-y>.

⁸⁷ UN Environment Programme, *Emissions Gap Report 2023*, 1-15 at 10 (2023) (“A continuation of the level of climate change mitigation efforts implied by current policies is estimated to limit global warming to 3°C [...]”) https://wedocs.unep.org/bitstream/handle/20.500.11822/43923/EGR2023_ESEN.pdf?sequence=10.

⁸⁸ Alan M. Rhoades et al., *Asymmetric Emergence of Low-to-No Snow in the Midlatitudes of the American Cordillera*, *Nat. Clim. Chang.*, 12:1151-1159 at 1156 (2022) <https://doi.org/10.1038/s41558-022-01518-y>.

- B.25. On this *current* global warming pathway,⁸⁹ ocean acidification will also increase and reduce coral reef carbonate production by 149%⁹⁰ on top of the near-complete loss of thermal refugia from heatwaves that would occur at 1.5°C. The Arctic Ocean will become ice free in most September months, and long-term committed sea-level rise would increase 4 to 10 metres⁹¹ or even exceed 10 metres⁹² as the likelihood of Greenland and Antarctic ice-sheet destabilization increases. Fifty to 70% of Andean and Alaskan glacier volume will disappear while western North American glaciers will lose 95-100% of their volume.⁹³ In fact, at 2.0°C of global warming, which the globe currently is not on track to achieve, marine animal biomass will decrease by 5% or more⁹⁴ while beluga whales, bowhead whales, and narwhals will lose at least 25% of their summer Arctic habitat, including nearly all of their habitat around the Canadian Arctic Archipelago.⁹⁵ Also at 2.0°C of global warming, ocean warming alone would rival all current anthropogenic stressors (e.g., disturbance, disease, aquaculture, pollution, fishing, energy production, etc.) for **marine extinction**.⁹⁶ If global greenhouse gas emissions continue to increase through the 21st century, then 40-60% of marine species are at risk of extinction, wiping out the marine biodiversity that has evolved over the last 50 million years—which would rival the five great mass extinctions of the last 500 million years.⁹⁷

Conclusion

- B.26. The above scientific findings are only a glimpse of the devastation and dangers of allowing global heating to reach and remain at 1.5°C. As demonstrated by the examples above and those in Annex C, climate-related disasters are like landmines. Both indiscriminately kill innocent civilians, cause injuries that can last a lifetime,

⁸⁹ UN Environment Programme, *Emissions Gap Report 2023*, 1-15 at 10 (2023) https://wedocs.unep.org/bitstream/handle/20.500.11822/43923/EGR2023_ESEN.pdf?sequence=10.

⁹⁰ Christopher E. Cornwall et al., *Global declines in coral reef calcium carbonate production under ocean acidification and warming*, PNAS, 18(21)(e2015265118):1-10 at 1 (2021) <https://doi.org/10.1073/pnas.2015265118>.

⁹¹ Ute Kloenne et al., *Only halving emissions by 2030 can minimize risks of crossing cryosphere thresholds*, Nature Clim. Chang., 13:9 at 9 (2023) <https://doi.org/10.1038/s41558-022-01566-4> (restricted access, available upon request).

⁹² Peter U. Clark et al., *Sea-level commitment as a gauge for climate policy*, Nat. Clim. Chang., 8:648-659 at 654, Figure 1b (2018) <https://doi.org/10.1038/s41558-018-0226-6> (restricted access, available upon request).

⁹³ David R. Rounce et al., *Global glacier change in the 21st century: Every increase in temperature matters*, Science, 379(6627):1-6 at 4, Figure 4 (2023) <https://www.science.org/doi/10.1126/science.abo1324> (restricted access, available upon request).

⁹⁴ Derek P. Tittensor et al., *Next-generation ensemble projections reveal higher climate risks for marine ecosystems*, Nat. Clim. Chang., 11: 973-981 at 977, Figure 3 (2021) <https://doi.org/10.1038/s41558-021-01173-9>.

⁹⁵ Philippine Chambault et al., *Future seasonal changes in habitat for Arctic whales during predicted ocean warming*, Sci. Adv., 8(eabn2422):1-9 at 3, Figure 2 (2022) <https://www.science.org/doi/epdf/10.1126/sciadv.abn2422>.

⁹⁶ Justin L. Penn et al., *Avoiding Ocean mass extinction from climate warming*, Science, 376:524-526 at 525, Figure 1 (2022) <https://www.science.org/doi/10.1126/science.abe9039>.

⁹⁷ Justin L. Penn et al., *Avoiding Ocean mass extinction from climate warming*, Science, 376:524-526 at 524-525, Figure 1 (2022) <https://www.science.org/doi/10.1126/science.abe9039>.

make community lands and homes unsafe or unliveable, exacerbate food and water insecurity, and more. In the climate context, atmospheric CO₂ below 350 ppm is analogous to a safe field that has been cleared of mines. 2023's atmospheric carbon concentration that is expected to be higher than 420 ppm⁹⁸, and its attendant current heating of ~1.1°C-1.3°C above pre-industrial levels, is analogous to climate minefields scattered across the globe, harming millions. Global heating of 1.5°C (approximately 420 ppm)⁹⁹ is analogous to even denser minefields and would cause harm to many more millions of people. A rise to 2.0°C (approximately 470 ppm) and higher is akin to carpeting the globe with climate devastation.¹⁰⁰ The only way to protect human rights is to clear the "mines" by reducing atmospheric CO₂ to 350 ppm or less as quickly as possible.¹⁰¹ Just as the process of clearing a field of mines to restore the protection of fundamental rights is **methodical, time-intensive, and extremely intentional**, so too must be States' effort to reverse the climate crisis and restore the stability of the climate system. Inadequate ambitions and half measures will leave billions of humans—and most especially future generations—to live in constant fear of indiscriminate harm.

⁹⁸ The 2022 annual mean concentration of atmospheric CO₂ was ~419 ppm. The 2023 level is expected to be greater than 420. The 2023 average will be available in January 2024 and can be accessed through the National Oceanic and Atmospheric Administration at https://gml.noaa.gov/webdata/ccgg/trends/co2/co2_annmean_mlo.txt.

⁹⁹ It is impossible to directly relate an atmospheric CO₂ level to a given temperature level of global warming due to the uncertainty in Earth's climate sensitivity to atmospheric CO₂ (i.e., we have already emitted enough CO₂ to reach the Paris target once the climate system adjusts to these emissions). With the current likely range in Earth climate sensitivity of 2.5°C-4.0°C to a doubling of atmospheric CO₂ from the IPCC's Working Group 1 AR6 Report, the best estimates are as follows: a rise to 1.5°C will likely result from approximately 420 ppm of atmospheric CO₂ with a best estimate range being 385 to 450 ppm; and a rise of 2.0°C will likely result from approximately 470 ppm of atmospheric CO₂ with the a best estimate range being 420 to 505 ppm.

¹⁰⁰ See note directly above.

¹⁰¹ See the nine studies summarized in *Annex D*.

Annex C: Scientific findings on the effects of climate change on child health

Introduction

- C.1. We stand in the midst of a climate emergency whose magnitude and urgency require an appropriately immense and urgent response.¹
- C.2. The climate emergency is already exacting a brutal toll² on individuals and communities throughout the Americas, from the Arctic to Patagonia. Not a single State Party to the American Convention on Human Rights has been spared.
- C.3. Insofar as States continue to allow the emergency to intensify, the harms to child health will intensify, too. Unless States act forcefully now, our children and theirs will inherit an inherently unstable world that lacks the necessary ecological and social stability to support even the most basic levels of health and wellbeing.³
- C.4. The signatories to this Annex are associations of pediatricians who are well-placed to attest that young patient regularly present with the described harms in exam rooms, emergency clinics, and hospitals all around the world. In this Annex, the signatories offer the Court a curated synopsis of the vast body of scientific evidence examining the impact of human-induced climate change on child health.
- C.5. The science summarized in this Annex demonstrates that **each individual disaster** that is caused or intensified by climate change—every heatwave, cyclone, drought, and flood—**on its own, tremendously harms children and child health**. The fact that *ongoing* CO₂ emissions are continuing to make such disasters *even more powerful and frequent* going forward, is unacceptable.
- C.6. For example, in 2020, Hurricane Eta ravaged vast areas of Central America.⁴ Within days Eta was followed by Hurricane Iota. It was **the first time in meteorological history** that “two storms made landfall so close in time and place at Category 4

¹ Raisa Uddin et al., *A global child health perspective on climate change, migration and human rights*, Curr. Probl. Pediatr. Adolesc. Health Care, 51(6):1-8 at 1 (2021) <https://doi.org/10.1016/j.cppeds.2021.101029>.

² See e.g. Annex B; IPCC, *Chapter 12: Central and South America* In: Climate Change 2022: Impacts, Adaptation and Vulnerability, Working Group II, Sixth Assessment Report, pp. 1689–1816 (2022) https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter12.pdf; and World Meteorological Organization, *State of the Climate in Latin America and the Caribbean 2022*, WMO-No. 1322 (2023) <https://library.wmo.int/idurl/4/66252>.

³ Frederica Perera, *Pollution from fossil-fuel combustion is the leading environmental threat to global pediatric health and equity: Solutions exist*, Int. J. Environ. Res. Public Health, 15(1):1-17 at 2 (2018) <https://doi.org/10.3390/ijerph15010016>.

⁴ ReliefWeb, *Central America: Hurricanes Eta & Iota - Operations update no. 5 (MDR43007)*, <https://reliefweb.int/report/guatemala/central-america-hurricanes-eta-iota-operations-update-no-5-mdr43007> (last accessed Dec. 6, 2023).

intensity.”⁵ **Climate change drove both hurricanes** to intensify unusually quickly.⁶ The winds, floods, and torrential rains **affected 3.5 million children**⁷ by destroying their homes and classrooms, contaminating their water supply with diseases, and inflicting untold psychological stress.⁸ At least 42 children were killed.⁹ Others were orphaned. Thousands were displaced into shelters, where children, especially girls, were exposed to sexual abuse.¹⁰



⁵ James M. Shultz et al., *Convergence of climate-driven hurricanes and COVID-19: The impact of 2020 hurricanes Eta and Iota on Nicaragua*, J. Clim. Change Health, 3(100019):1-5 at 2 (2021) <https://doi.org/10.1016/j.joclim.2021.100019>.

⁶ James M. Shultz et al., *Convergence of climate-driven hurricanes and COVID-19: The impact of 2020 hurricanes Eta and Iota on Nicaragua*, J. Clim. Change Health, 3(100019):1-5 at 2 (2021) <https://doi.org/10.1016/j.joclim.2021.100019>.

⁷ United Nations Children's Fund (UNICEF), *The impact of hurricanes Eta and Iota*, <https://www.unicef.org/lac/en/stories/impact-of-hurricanes-eta-and-iota> (last accessed Dec. 6, 2023).

⁸ United Nations Children's Fund (UNICEF), *The impact of hurricanes Eta and Iota*, <https://www.unicef.org/lac/en/stories/impact-of-hurricanes-eta-and-iota> (last accessed Dec. 6, 2023).

⁹ BBC News, *Huracanes Eta e Iota: la crisis humanitaria que dejaron en Centroamérica las tormentas (agravada por la pandemia)* (22-30 children killed in a landslide in Guatemala) <https://www.bbc.com/mundo/noticias-america-latina-55479861> (last accessed Dec. 6, 2023); Diario las Américas, *Siguen lluvias por Eta en Centroamérica; van 13 muertos* (7 children killed by Eta in various locations in Guatemala and Honduras) <https://www.diariolasamericas.com/siguen-lluvias-eta-centroamerica-van-13-muertos-n4209948> (last accessed Dec. 6, 2023); Diario las Américas, *Huracán Iota deja al menos 38 muertos en Centroamérica* (at least 7 children killed by Iota in Nicaragua) <https://www.diariolasamericas.com/america-latina/huracan-iota-deja-al-menos-38-muertos-centroamerica-n4210786> (last accessed Dec. 6, 2023); Gustavo Palencia et al., *Tormenta Iota se disipa sobre El Salvador, deja inundaciones y más de 20 muertos*, Reuters (3 children killed by Iota in Honduras) <https://www.reuters.com/article/clima-iota-idLTAKBN27Y2CF> (last accessed Dec. 6, 2023); Los Angeles Times, *Tres niños mueren a causa de Eta en Panamá, aún se desconoce la cantidad general de desaparecidos* (3 children killed by Iota in Panama) <https://www.latimes.com/espanol/internacional/articulo/2020-11-06/tres-ninos-mueren-a-causa-de-eta-en-panama-aun-se-desconoce-la-cantidad-general-de-desaparecidos> (last accessed Dec. 6, 2023).

¹⁰ United Nations Honduras, *Honduras: Tormentas tropicales Eta e Iota, informe de situación No. 05* (Measures needed to be taken to prevent sexual abuse and violence in the shelters) <https://honduras.un.org/sites/default/files/2020-12/SitRep%205%20Tormentas%20Eta%20e%20Iota%20HN%202020.pdf> (last accessed Dec. 6, 2023); UNFPA, *Contar con datos que salvan vidas ayuda a UNFPA en la respuesta ante el Huracán Eta y Iota*, (Data visualization helped the Honduran government and international organizations address children's vulnerability to sexual violence in the shelters) <https://lac.unfpa.org/es/news/contar-con-datos-que-salvan-vidas-ayuda-unfpa-en-la-respuesta-ante-el-huracan%20Eta-y-Iota> (last accessed Dec. 6, 2023); BBC News, Boris Miranda, *Los abusos sexuales a los que están expuestas miles de niñas y adolescentes en albergues de Centroamérica por los huracanes Iota y Eta*, <https://www.bbc.com/mundo/noticias-america-latina-55431077> (last accessed Dec. 6, 2023).

- C.7. Hurricanes Eta and Iota combined to form a **single climate disaster**. **Cumulatively**, the increasingly frequent and severe impacts of climate change are harming children and child health **on a staggering scale**.

Key finding #1:

All children are in a situation of extreme vulnerability to the harms caused by climate change *because they are children*

- C.8. The World Health Organization estimates that 88% or greater of the existing global burden of disease attributable to climate change occurs in children younger than 5 years old in both industrialized and developing countries¹¹ and these “[e]ffects on children [...] are already—and are projected to continue to be—disproportionately heavy.”¹²
- C.9. Climate change disproportionately burdens child health¹³ for four primary reasons.
- C.10. First, **children have distinct physiology**.¹⁴ Children are not small adults. All their major vital organs are still developing.¹⁵ Consequently, when children are exposed to

¹¹ Samantha Ahdoot et al., *Global climate change and children's health*, *Pediatrics*, 136(5):e1468-1484 at e1470 (2015) <https://doi.org/10.1542/peds.2015-3233>; and Perry E. Sheffield et al., *Global climate change and children's health: Threats and strategies for prevention*, *Environ. Health Perspect.*, 119:291-298 at 292, 296 (2011) <https://doi.org/10.1289/ehp.1002233>.

¹² Perry E. Sheffield et al., *Global climate change and children's health: Threats and strategies for prevention*, *Environ. Health Perspect.*, 119:291-298 at 296 (2011) <https://doi.org/10.1289/ehp.1002233>.

¹³ See e.g. Samantha Ahdoot et al., *Global climate change and children's health*, *Pediatrics*, 136(5):e1468-1484 at e1468-1469 (2015) (“Children are a uniquely vulnerable group that suffers disproportionately from these effects”) <https://doi.org/10.1542/peds.2015-3233>; and Susie E.L. Burke et al., *The psychological effects of climate change on children*, *Curr. Psychiatry Rep.*, 20(35):1-8 at 1 (2018) (“Children represent a uniquely vulnerable group but have received less research focus than adults.”) <https://doi.org/10.1007/s11920-018-0896-9> (restricted access, available upon request).

¹⁴ See e.g. Laura Anderko, et al., *Climate changes reproductive and children's health: A review of risks, exposures, and impacts*, *Pediatr. Res.*, 87:414-419 (2020) <https://doi.org/10.1038/s41390-019-0654-7>; Samantha Ahdoot et al., *Global climate change and children's health*, *Pediatrics*, 136(5):e1468-e1484 at e1470 (2015) <https://doi.org/10.1542/peds.2015-3233>; and Expert Report of Lori G. Byron, MD, MS and Robert G. Byron, MD, MPH, *Held et al. v. The State of Montana et al.*, Montana First Judicial District Court, Case No. CDV-2020-307 at 4 (May 16, 2022) (available upon request).

¹⁵ Frederica Perera et al., *Climate change, fossil-fuel pollution, and children's health*, *N. Engl. J. Med.*, 386:2303-2314 at 2304-2305 (2022) (“The fetus, infant, and child are uniquely vulnerable to climate-related environmental impacts and air pollution owing to a host of biologic and behavioral factors.”) <https://www.nejm.org/doi/pdf/10.1056/NEJMra2117706?articleTools=true>; Samantha Ahdoot et al., *Global climate change and children's health*, *Pediatrics*, 136(5):e1468-e1484 at e1470 (2015) (Children’s “immature physiology and metabolism; incomplete development; higher exposure to air, food, and water per unit body weight; unique behavior patterns; and dependence on caregivers place children at much higher risk of climate-related health burdens than adults”) <https://doi.org/10.1542/peds.2015-3233>; U.S. Environmental Protection Agency, *Climate change and children's health and well-being in the United States*, pp. 1-108 at 36-37 (2023) (addressing a child’s respiratory system and brain development) https://www.epa.gov/system/files/documents/2023-04/CLiME_Final%20Report.pdf; Zhiwei Xu et al., *Climate change and children's health: A call for research on what works to protect children*, *Int. J. Environ. Res. Public Health*, 9:3298-3316 at 3299 (2012) (“Climate change poses a significant threat to children’s health because

climate-induced heat, smoke, pollution, diseases, and stress, their bodies respond to these stimuli differently than adults' bodies would. All told, the key physiological differences between children and adults that make children more vulnerable to the effects of climate change are:

- a. Children have lower cardiac output than adults,¹⁶ a less-developed thermo-regulatory system, a greater body surface-area-to-mass ratio, and produce more heat during exercise.¹⁷ As a result, children's bodies produce or absorb more heat but are less able to dissipate it, making children more vulnerable to heat illness.¹⁸
- b. Children breathe faster with higher minute ventilation, which enables more polluted air to enter the lungs per unit of body weight.¹⁹ This makes children particularly vulnerable to the effects of air pollution, including pollution from burning fossil fuels²⁰ and indoor air contaminated by mold spores after floods.
- c. Because children's lungs continue to grow and develop into young adulthood,²¹ their respiratory systems are especially susceptible to environmental damage.
- d. A child's immune system develops gradually during childhood.²² For that reason, children are more vulnerable than adults to dying from numerous diseases including diarrheal illnesses, one of the biggest killers of children globally.²³

children have unique metabolism, behavior, physiology and development characteristics.") <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3499869/pdf/ijerph-09-03298.pdf>; and Maureen Andrew et al., *Maturation of the hemostatic system during childhood*, *Blood*, 80(8):1998–2005 at 1998, 2003 (1992) ("[T]he coagulation system in children is distinctly different from that in adults, and this difference must be considered physiologic.") <https://doi.org/10.1182/blood.V80.8.1998.1998>.

¹⁶ Giovanni de Simone et al., *Stroke volume and cardiac output in normotensive children and adults*, *Circulation*, 95(7):1837–1843 (1997) <https://doi.org/10.1161/01.CIR.95.7.1837>.

¹⁷ Caroline J. Smith, *Pediatric thermoregulation: Considerations in the face of global climate change*, *Nutrients*, 11(9):1-24 at 2–4, 6–7 (2019) <https://doi.org/10.3390/nu11092010>; see also Miklós Székely et al., *Chapter 23: Thermoregulation and age*, *Handbook of clinical neurology*, 156:377-395 at 377, 379, 381, 384 (2018) <https://doi.org/10.1016/B978-0-444-63912-7.00023-0> (restricted access, available upon request).

¹⁸ Caroline J. Smith, *Pediatric thermoregulation: Considerations in the face of global climate change*, *Nutrients*, 11(9):1-24 at 2–4, 6–7 (2019) <https://doi.org/10.3390/nu11092010>.

¹⁹ Samantha Ahdoot et al., *Global climate change and children's health*, *Pediatrics*, 136(5):e1468-e1484 at e1470, e1472 (2015) <https://doi.org/10.1542/peds.2015-3233>.

²⁰ Samantha Ahdoot et al., *Global climate change and children's health*, *Pediatrics*, 136(5):e1468-e1484 at e1472 (2015) <https://doi.org/10.1542/peds.2015-3233>.

²¹ American Lung Association, *Lung capacity and aging*, <https://www.lung.org/lung-health-diseases/how-lungs-work/lung-capacity-and-aging> (last accessed Dec 6, 2023).

²² A. Katharina Simon et al., *Evolution of the immune system in humans from infancy to old age*, *Proc. Royal Soc. B*, 282:1-9 at 1–4 (2015) <https://doi.org/10.1098/rspb.2014.3085>.

²³ See e.g. Pin Wang et al., *Associations between long-term drought and diarrhea among children under five in low-and middle-income countries*, *Nature Comms.*, 13(3661):1-10 at 2 (2022) ("The World Health Organization estimated that in 2050, climate change could be responsible for approximately 32,954 additional diarrheal deaths worldwide among children aged 0–15 year. [...] In addition to causing mortality, diarrhea in children can also have lasting adverse effects such as impaired growth and cognitive development and increased susceptibility to chronic diseases.") <https://doi.org/10.1038/s41467-022-31291->

- e. Children have higher metabolic demands, requiring more calories and water per unit of body weight.²⁴ This makes child health especially vulnerable to malnourishment due to disruptions in food systems.
- f. Children's central nervous systems do not reach full maturation until their twenties,²⁵ which makes children more susceptible to damage from neurotoxins, and also dependent on adults to provide for their basic needs.

C.11. Second, **children are in a formative window of psychosocial development.**²⁶ As illustrated in Figure C.1, exposure to severe stressors during childhood has a

stronger and longer-term impact on a person's mental health going forward, than if the exposure had occurred during adulthood.²⁷ Thus, **preventing exposure to severe stressors**—including those by brought on by climate change—is key to child mental health.

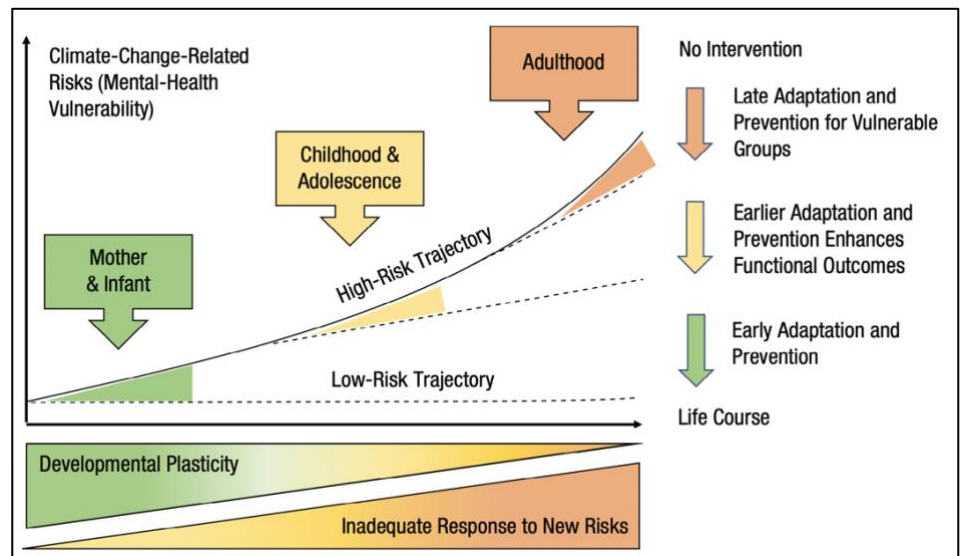


Figure C.1. Childhood is a formative—or plastic—period for psychosocial development. This mental plasticity decreases with age. Exposure to severe climate stressors during childhood sets children on a trajectory for greater vulnerability to mental illness as adults. By contrast, preventing climate harms in the first place puts children on a trajectory for lower risk of mental illness as adults.²⁸

Z; Carolyn Kousky, *Impacts of natural disasters on children*, *Future Child.*, 26(1):73-92 at 73, 79-80 (2016) <https://files.eric.ed.gov/fulltext/EJ1101425.pdf>; and World Health Organization (WHO), *Diarrheal disease*, <https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease> (last accessed Dec. 6, 2023).

²⁴ Laura Watson et al., *Centile reference chart for resting metabolic rate through the life course*, 108:545-549 at 547 (2023) <https://adc.bmj.com/content/108/7/545>.

²⁵ Mariam Arain et al., *Maturation of the adolescent brain*, *Neuropsychiatr. Dis. Treat.*, 9:449-461 at 459 (2013) ("The development and maturation of the prefrontal cortex occurs primarily during adolescence and is fully accomplished at the age of 25 years.") <https://doi.org/10.2147/NDT.S39776>.

²⁶ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, *Clin. Psychol. Sci.*, 10(4):767-785 at 768 (2022) ("[C]hildhood is a period of extremely high developmental vulnerability when most psychiatric disorders are first established [...].") <https://doi.org/10.1177/21677026211040787>.

²⁷ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, *Clin. Psychol. Sci.*, 10(4):767-785 at 769-775 (2022) <https://doi.org/10.1177/21677026211040787>.

²⁸ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, *Clin. Psychol. Sci.*, 10(4):767-785 at 769 (2022) <https://doi.org/10.1177/21677026211040787>.

- C.12. Third, **newborn health is uniquely vulnerable to permanent harm**. When mothers are exposed to heatwaves during pregnancy, it increases the risk that the newborn will be born preterm,²⁹ with a lifelong disability,³⁰ or stillborn.³¹ Maternal exposure to air pollution from fossil fuel development and combustion during pregnancy also harms newborn health, causing the newborn a range of permanent health impacts ranging from asthma to death.³²
- C.13. Fourth, **children have more years of life ahead of them** than adults do. Today's children will be exposed to a greater number (and greater severity) of adverse climate effects over the course of their lives than today's adults will.³³ Those effects will therefore adversely affect the entirety of children's lives, unlike today's adults who largely had childhoods free from climate-induced harms.
- C.14. For these reasons, children's exposure to adverse climate events makes them more susceptible than any other group to lifelong health effects arising from greenhouse gas pollution — pollution they had no part in creating.³⁴

²⁹ See e.g. Matthew Francis Chersich et al., *Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: Systematic review and meta-analysis*, *BMJ*, 371(m3811):1-13 (2020) (Review of 47 studies found that “preterm births were more common at higher than lower temperatures.”) <https://doi.org/10.1136/bmj.m3811>; and Lara Cushing et al., *Extreme heat and its association with social disparities in the risk of spontaneous preterm birth*, *Paediatr. and Perinat. Epidemiol.*, 36:13–22 at 20 (2021) <https://onlinelibrary.wiley.com/doi/epdf/10.1111/ppe.12834>.

³⁰ See e.g. Christopher P. Howson et al., *Born too soon: Preterm birth matters*, *Reprod. Health*, 10(Supp. 1):1-9 at 1 (2013) <http://www.reproductive-health-journal.com/content/10/S1/S1>.

³¹ See e.g. Matthew Francis Chersich et al., *Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: Systematic review and meta-analysis*, *BMJ*, 371(m3811):1-13 (2020) (Review of eight studies on stillbirths “all showed associations between temperature and stillbirth, with stillbirths increasing 1.05-fold (1.01 to 1.08) per 1°C rise in temperature.”) <https://doi.org/10.1136/bmj.m3811>; Jenner Kanner et al., *Ambient temperature and stillbirth: Risks associated with chronic extreme temperature and acute temperature change*, *Environ. Res.*, 189(109958):1-8 (2020) <https://doi.org/10.1016/j.envres.2020.109958> (restricted access, available upon request); and L.B. Strand et al., *Maternal exposure to ambient temperature and the risks of preterm birth and stillbirth in Brisbane, Australia*, *Am. J. Epidemiol.*, 175(2):99–107 (2012) <https://doi.org/10.1093/aje/kwr404>.

³² Insa Korten et al., *Air pollution during pregnancy and lung development in the child*, *Paediatr. Respir. Rev.*, 21:38-46 (2017) <https://doi.org/10.1016/j.prrv.2016.08.008> (restricted access, available upon request).

³³ See e.g. Emmanuelle Arpin et al., *Climate change and child health inequality: A review of reviews*, *Int. J. Environ. Res. Public Health*, 18(10896):1-17 at 12 (2018) <https://doi.org/10.3390/ijerph182010896>.

³⁴ See e.g. Helen Clark et al., *A future for the world's children? A WHO-UNICEF-Lancet commission*, *Lancet*, 395(10224):605-658 at 609 (2020) (Children are [...] the most vulnerable to the lifelong environmental effects caused by climate change arising from anthropogenic greenhouse gas emissions, and from industry linked pollution of the air, water, and land.”) [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(19\)32540-1/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32540-1/fulltext); Emmanuelle Arpin et al., *Climate change and child health inequality: A review of reviews*, *Int. J. Environ. Res. Public Health*, 18(10896):1-17 at 12 (2018) <https://doi.org/10.3390/ijerph182010896>; and Anthony J. McMichael, *Climate change and children: Health risks of abatement inaction, health gains from action*, *Children*, 1:99-106 (2014) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4928726/pdf/children-01-00099.pdf>.

C.15. While all children are at risk, certain populations of children are *especially at risk*. The most at-risk of all are children with chronic or pre-existing medical conditions, disabilities, and those who are socially and economically disadvantaged.³⁵

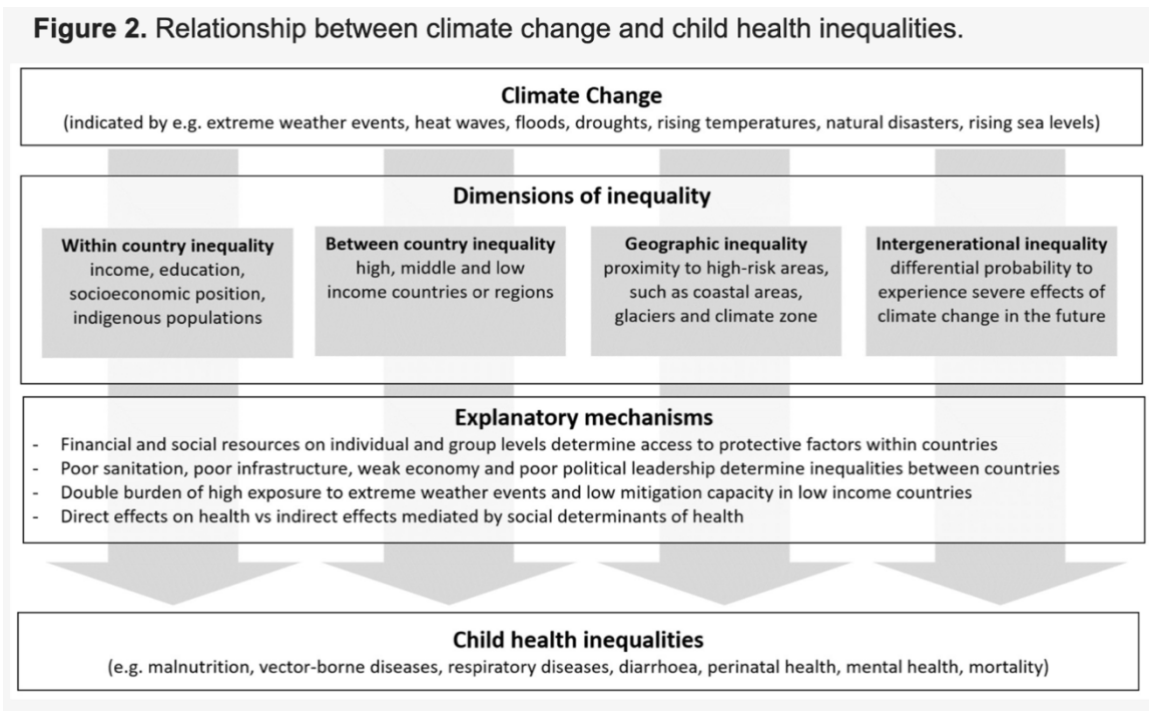


Figure C.2. Relationship between climate change and a number of child health inequalities.³⁶

C.16. Among the State Parties to the Convention, approximately 18 million children have a disability, and over 68 million children live in conditions of social and economic disadvantage.³⁷ The climate emergency exposes children in **intersectional**

³⁵ See e.g. Cadeyrn J. Gaskin et al., *Factors associated with the climate change vulnerability and the adaptive capacity of people with disability: A systematic review*, Weather Clim. Soc., 9(4):801-814 at 801 (2017) (“[P]eople with disability are especially at risk of the direct and indirect effects of climate change.”) <https://doi.org/10.1175/WCAS-D-16-0126.1>; Emmanuelle Arpin et al., *Climate change and child health inequality: A review of reviews*, Int. J. Environ. Res. Public Health, 18(10896):1-17 at 11 (2018) (“[C]limate change acts as an amplifier of existing inequities with the result that the world’s poorest and socially-disadvantaged children will bear the greatest burden of climate change-related ill-health.”) <https://doi.org/10.3390/ijerph182010896>; Federica Perera et al., *Climate change, fossil-fuel pollution, and children’s health*, N. Engl. J. Med., 386:2303-2314 at 2303 (2022) <https://www.nejm.org/doi/pdf/10.1056/NEJMra2117706?articleTools=true>; and State of Colorado, *In the Matter of Changes to the Rules and Regulations of the Oil and Gas Conservation Commission*, Docket No. 200600155, *Expert Testimony of Susan E. Pacheco, M.D., Department of Pediatrics, University of Texas Health Science Center*, p. 2 para 5 (Oct. 16, 2020) (available upon request).

³⁶ Emmanuelle Arpin et al., *Climate change and child health inequality: A review of reviews*, Int. J. Environ. Res. Public Health, 18(10896):1-17 at 13 (2018) <https://doi.org/10.3390/ijerph182010896>.

³⁷ United Nations Children’s Fund (UNICEF), *UNICEF data warehouse: Population under age 18*, (Total child population of all Convention party states) https://data.unicef.org/resources/data_explorer/unicef_f/?ag=UNICEF&df=GLOBAL_DATAFLOW&ver=1.0&dq=DM_POP_U18.&startPeriod=2020&endPeriod=2023 (last accessed Dec. 6, 2023); United Nations

situations to multiple layers of risk: it especially burdens them because they are children, and also because of their other situation(s) of risk.³⁸

Key finding #2:

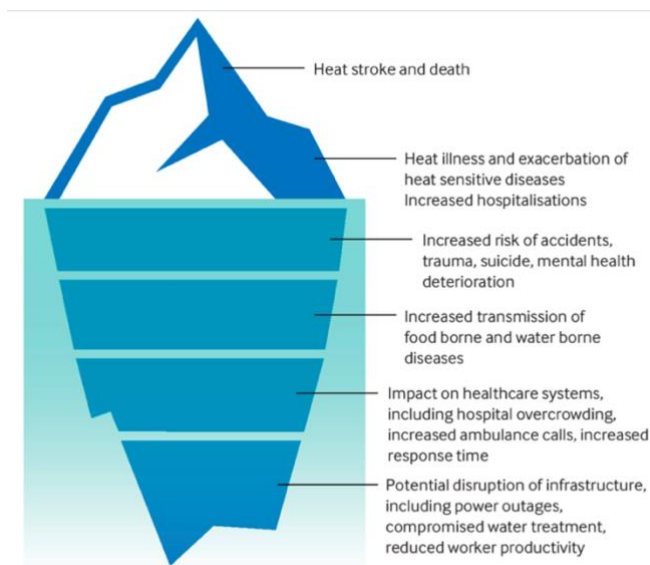
Climate change exposes child health to harms that are multiple, overlapping, complex, long-term, and compound over time

C.17. While some climate effects are highly visible, such as an immediate death or bodily injury, many are not (see Figure C.3). Climate change's less-visible effects take place within the body, the mind, on a microscopic scale (in the air, soil, or water), and in the infrastructure and social institutions that children depend on for health and survival.

Children's Fund (UNICEF), *Seen, counted, included: Using data to shed light on the well-being of children with disabilities*, pp. 1-175 at 18, 21, and 166 (2021) (Percentages of children in each country with a disability) https://data.unicef.org/wp-content/uploads/2022/12/Disabilities-Report_11_30.pdf; United Nations Children's Fund (UNICEF), *Every child has a fair start in life* (Number of children in poverty in Latin America and the Caribbean) <https://www.unicef.org/lac/en/every-child-has-fair-start-life> (last accessed Dec. 6, 2023); United Nations Children's Fund (UNICEF), *Pobreza monetaria y privaciones no monetarias en Argentina*, pp. 1-50 at 6 (2023) (Approximately 6.8 million children in Argentina live in poverty) <https://www.unicef.org/argentina/informes/pobreza-monetaria-y-privaciones-no-monetarias-en-ni%C3%B1as-y-adolescentes-en-argentina>; United Nations Children's Fund (UNICEF), *Children in monetary poverty in Brazil*, pp. 1-41 at 17 (2022) (Approximately 40% or 21 million children in Brazil live in poverty) <https://www.unicef.org/brazil/media/18866/file/children-in-monetary-poverty-in-brazil.pdf>; United Nations Children's Fund (UNICEF), *Alianza Erradicación de la Pobreza Infantil, Nacer y crecer en pobreza y vulnerabilidad*, pp. 1-436 at 21 (2021) (Approximately 22.9% or nearly 1 million children in Chile live in multidimensional poverty) (last accessed Dec. 6, 2023); UNICEF, *Pobreza y privaciones múltiples en la infancia en Uruguay*, at 9 (2016) (Approximately 18.4% or 144,300 children in Uruguay live in poverty) <https://www.unicef.org/lac/sites/unicef.org.lac/files/2019-10/PrivacionesMultiplesUruguay.pdf> (last accessed Dec. 6, 2023); UNICEF Ecuador, *Privaciones múltiples en la niñez y adolescencia en Ecuador: una aproximación desde el enfoque de derechos a partir de los resultados de la Encuesta Nacional de Salud y Nutrición 2018*, at 43 (Approximately 57.5% or 3.1 million children in Ecuador live in multidimensional poverty) (2022) https://www.ecuadorencifras.gob.ec/documentos/web-inec/Bibliotecas/Libros/cuadernos_trabajo/Privaciones%20UNICEF_12_09.pdf (last accessed Dec. 6, 2023); <https://www.unicef.org/chile/media/6311/file/Nacer%20y%20crecer%20en%20pobreza%20Final%200.pdf>; United Nations Children's Fund (UNICEF), *Pobreza y privaciones múltiples en la infancia en Uruguay*, pp. 1-132 at 9 (2016) (Approximately 18.4% or 144,300 children in Uruguay live in poverty) <https://www.unicef.org/lac/sites/unicef.org.lac/files/2019-10/PrivacionesMultiplesUruguay.pdf>; UNICEF Ecuador, *Privaciones múltiples en la niñez y adolescencia en Ecuador: una aproximación desde el enfoque de derechos a partir de los resultados de la Encuesta Nacional de Salud y Nutrición 2018*, pp. 1-63 at 43 (2022) (Approximately 57.5% or 3.1 million children in Ecuador live in multidimensional poverty) https://www.ecuadorencifras.gob.ec/documentos/web-inec/Bibliotecas/Libros/cuadernos_trabajo/Privaciones%20UNICEF_12_09.pdf.

³⁸ See e.g. Cadey J. Gaskin et al., *Factors associated with the climate change vulnerability and the adaptive capacity of people with disability: A systematic review*, *Weather Clim. Soc.*, 9:801-814 (2017) <https://doi.org/10.1175/WCAS-D-16-0126.1>; See United Nations Children's Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, pp. 1-125 at 73 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>.

Figure C.3. Using the example of heatwaves, climate change adversely impacts health not only through instantaneous death and bodily injury. Many of the most harmful health impacts operate “below the surface” and therefore may not be immediately apparent to a casual observer.³⁹



- C.18. A single climate event can harm child physical and mental health through multiple, overlapping pathways:⁴⁰ By introducing an entirely new health problem that the child did not have before the event (such as asthma, a laceration, or an emotional trauma);
- By triggering or exacerbating a **pre-existing health problem**;
 - By interacting with pollutants already in the environment to introduce a **new kind of risk** to child health (such as floodwaters spreading industrial chemicals to contaminate cropland or drinking water);
 - By **destroying physical items** that are necessary to meet a child's needs (such as a house, school, health clinic, water main, road, or crop); and
 - By **destabilizing social arrangements** that the child's welfare depends on (such as their family, school, health care system, economy, or government).
- C.19. As multiple harms from a single climate event ripple through a child's environment, those harms interact with one another and compound. **As harms from climate events compound, they overdetermine** the child's susceptibility to adverse health

³⁹ Cecilia Sorensen et al., *Heat illness in clinical practice*, BMJ, 378(e070762):1-7 at 3 (2022) <https://doi.org/10.1136/bmj-2022-070762> (restricted access, available upon request).

⁴⁰ Laura Anderko, et al., *Climate changes reproductive and children's health: A review of risks, exposures, and impacts*, *Pediatr. Res.*, 87:414-419 (2020) <https://doi.org/10.1038/s41390-019-0654-Z>; and Anthony J. McMichael, *Globalization, climate change, and human health*, *N. Engl. J. Med.*, 368:1335-1343 at 1338 (2013) <https://www.nejm.org/doi/full/10.1056/nejmra1109341>.

outcomes such as poor nutrition, impaired child development, mental health problems, infectious diseases, and poor health in adulthood (see Figure C.4).⁴¹

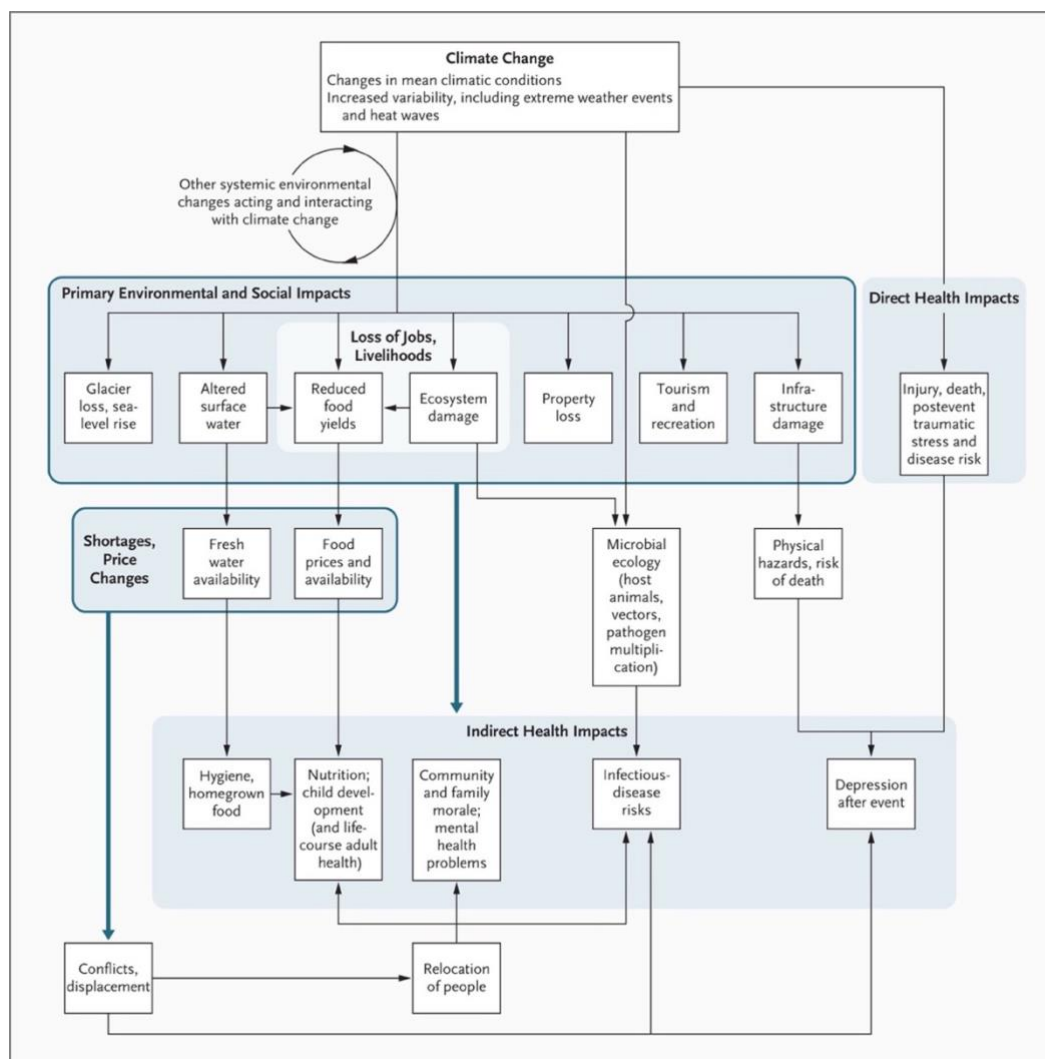


Figure C.4. A single climate-change event can easily affect child health through multiple pathways. These pathways compound with one another to overdetermine a child's susceptibility to infectious diseases, depression, and poor health in adulthood.⁴²

C.20. Compound exposure is already happening. **90% of children** in Latin America are already exposed to **at least two climate-related shocks** (such as heatwaves and flooding),⁴³ and these numbers will rise insofar as the atmospheric concentration of greenhouse gases—especially CO₂—continues to increase.

⁴¹ Anthony J. McMichael, *Globalization, climate change, and human health*, N. Engl. J. Med., 368:1335-1343 at 1339 (2013) <https://www.nejm.org/doi/full/10.1056/nejmra1109341>.

⁴² Anthony J. McMichael, *Globalization, climate change, and human health*, N. Engl. J. Med., 368:1335-1343 at 1339 (2013) <https://www.nejm.org/doi/full/10.1056/nejmra1109341>.

⁴³ United Nations Children's Fund (UNICEF), *9 out of 10 children in Latin America and the Caribbean are*

C.21. Many effects of climate change harm child health **in the long term, through adulthood**. These long-term harms include permanent cognitive changes, predispositions to adult mental illnesses,⁴⁴ and reduced educational achievement and earning potential which leads to poverty.⁴⁵

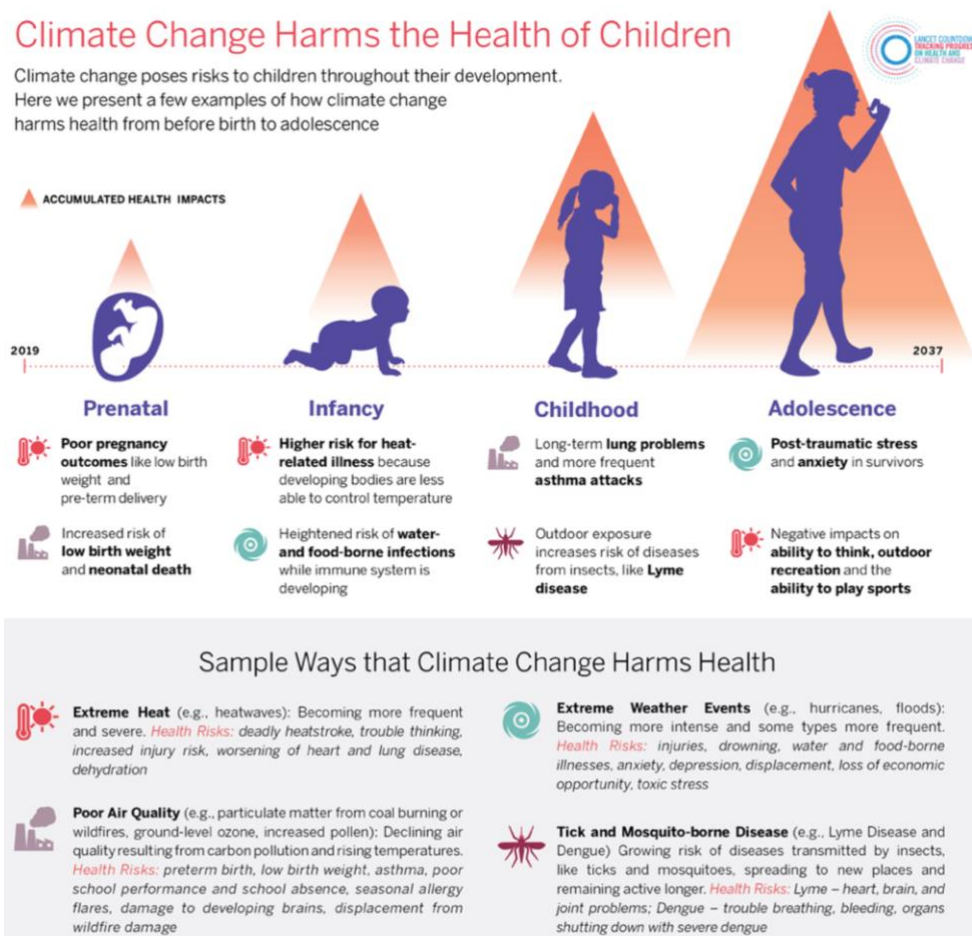


Figure C.5. Climate change harms children over the long term throughout their development, from birth to adulthood.⁴⁶

exposed to at least two climate and environmental shocks, <https://www.unicef.org/lac/en/press-releases/children-latin-america-and-caribbean-are-exposed-climate-climate-environmental-shocks> (last accessed Dec. 6, 2023).

⁴⁴ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, Clin. Psychol. Sci., 10(4):767–785 at 769 (2022), <https://doi.org/10.1177/2167702621104078>.

⁴⁵ Phoebe C.M. Williams et al., *Ethical considerations regarding the effects of climate change and planetary health on children*, J. Paediatr. Child Health, 57(11):1775–1780 at 1778 (2021) <https://doi.org/10.1111/jpc.15704>.

⁴⁶ Harvard T.H. Chan School of Public Health, *2019 Lancet countdown on health and climate change: Policy brief for the U.S.*, <https://www.hsph.harvard.edu/c-change/news/2019-lancet-countdown/> (last accessed Dec. 6, 2023).

C.22. The next sections will present evidence documenting how specific climate-change events harm child health. This evidence will be presented in the following order:

- a. Harms from extreme heat and heatwaves;
- b. Harms from severe weather disasters such as storms, floods, hurricanes, landslides, and droughts;
- c. Harms exacerbated by dangerous air quality due to fossil fuels;
- d. Climate-related harms to mental health; and
- e. Amplified harms to children who have additional risk factors.

Key finding #3:
Child health is uniquely vulnerable to heatwaves

C.23. Heatwaves are prolonged periods of excessive heat.⁴⁷ Exposure to extreme heat is one of the gravest health threats in the 21st century due to global warming.⁴⁸ Globally, children under the age of one year were exposed to 2.35 million more person-days of heatwaves each year in 2012-2021 as compared to 1996-2005.⁴⁹ In 2022, 559 million children were exposed to high frequencies of heatwaves, and by 2050, the figure is predicted to increase nearly **four-fold** to over 2 billion affecting virtually every child on earth.⁵⁰

C.24. The number of heat-related deaths in South America has been increasing since 2000.⁵¹ In Argentina, heat-related deaths have nearly doubled since 2000.⁵² In Paraguay they have *more* than doubled; in Chile, they have *more than tripled*, and in Ecuador they have increased **over 15-fold**.⁵³ Currently, anthropogenic climate change is causing **more than 60%** of all heat-related deaths in Colombia, Ecuador,

⁴⁷ S. E. Perkins-Kirkpatrick & S.C. Lewis, *Increasing trends in regional heatwaves*, Nat. Commun., 11(3357):1-8 at 2 (2020) <https://doi.org/10.1038/s41467-020-16970-7>.

⁴⁸ Marjan Mosalman Haghighi et al., *Impacts of high environmental temperatures on congenital anomalies: A systematic review*, Int. J. Environ. Res. Public Health, 18(4910):1-15 at 2 (2021) <https://doi.org/10.3390/ijerph18094910>.

⁴⁹ Stella M. Hartinger et al., *The 2022 South America report of the Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, Lancet Reg. Health - Am., 20(100470):1-35 at 2, 8 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

⁵⁰ United Nations Children's Fund (UNICEF), *The coldest year of the rest of their lives: Protecting children from the escalating impacts of heatwaves*, pp. 1-48 at 6, 9 (2022) <https://www.unicef.org/media/129506/file/UNICEF-coldest-year-heatwaves-and-children-EN.pdf>.

⁵¹ Stella M. Hartinger et al., *The 2022 South America report of the Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, Lancet Reg. Health - Am., 20(100470):1-35 at 8 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

⁵² Stella M. Hartinger et al., *The 2022 South America report of the Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, Lancet Reg. Health - Am., 20(100470):1-35 at 8 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

⁵³ Stella M. Hartinger et al., *The 2022 South America report of the Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, Lancet Reg. Health - Am., 20(100470):1-35 at 8 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

Peru, Brazil, Costa Rica, and Guatemala; more than 40% of those in Chile, Paraguay, Panama, and Mexico; and 20% in Argentina and Uruguay.⁵⁴

C.25. For each additional 1.0°C rise in ambient temperature above 29.0°C, adults experience a 1%-3% increase in mortality.⁵⁵ For children, the increase is 50-100% higher.⁵⁶ Infants and children under 5 are even more vulnerable.⁵⁷ In other words, **every degree of temperature rise creates an increased chance of death that is orders of magnitude higher for children.**

C.26. There are **twenty-seven different ways** that a heatwave can kill a person.⁵⁸ Put differently, heat triggers twenty-seven physiological pathways, each of which can lead to organ failure and death.⁵⁹ Each pathway consists of a heat-triggered physiological response (i.e. ischemia, heat cytotoxicity, inflammation, disseminated intravascular coagulation, and/or rhabdomyolysis) that acts on one of seven vital organs (brain, heart, intestines, kidneys, liver, lungs, and pancreas).⁶⁰ These pathways are diagrammed in Figure C.6 and illustrated in Figure C.7.

⁵⁴ Ana M. Vicedo-Cabrera et al., *The burden of heat-related mortality attributable to recent human-induced climate change*, Nat. Clim. Change, 11:492-509 at 497 (2021) <https://www.nature.com/articles/s41558-021-01058-x> (restricted access, available on request).

⁵⁵ Joshua Graff Zivin et al., *Temperature extremes, health, and human capital*, Future Child., 26(1):31-50 at 35 (2016) <https://files.eric.ed.gov/fulltext/EJ1101427.pdf>; see also Jean Calleja-Agius et al., *The effect of global warming on mortality*, Early Hum. Dev., 155(105222):1-5 at 3 (2021) (“[A]t temperatures above 27°C, the daily mortality rate increases more rapidly per degree rise compared to when it drops below 27°C.”) <https://doi.org/10.1016/j.earlhumdev.2020.105222>.

⁵⁶ Joshua Graff Zivin et al., *Temperature extremes, health, and human capital*, Future Child., 26(1):31-50 at 35 (2016) <https://files.eric.ed.gov/fulltext/EJ1101427.pdf>.

⁵⁷ Joshua Graff Zivin et al., *Temperature extremes, health, and human capital*, Future Child., 26(1):31-50 at 35 (2016) <https://files.eric.ed.gov/fulltext/EJ1101427.pdf>; United Nations Children's Fund (UNICEF), *Protecting Children from heat stress: A technical note*, pp. 1-44 (2023) <https://www.unicef.org/media/139926/file/Protecting-children-from-heat-stress-A-technical-note-2023.pdf>; Instituto Mexicano del Seguro Social, *Qué onda con el calor* (2023) <https://www.imss.gob.mx/sites/all/statics/pdf/guarderias/onda-calor.pdf>.

⁵⁸ Camilo Mora et al., *Twenty-seven ways a heat wave can kill you: Deadly heat in the era of climate change*, Circ: Cardiovasc. Qual. Outcomes, 10(11):1-3 at 1 (2017) <https://doi.org/10.1161/CIRCOUTCOMES.117.004233>.

⁵⁹ Camilo Mora et al., *Twenty-seven ways a heat wave can kill you: Deadly heat in the era of climate change*, Circ: Cardiovasc. Qual. Outcomes, 10(11):1-3 at 2 (2017) <https://doi.org/10.1161/CIRCOUTCOMES.117.004233>.

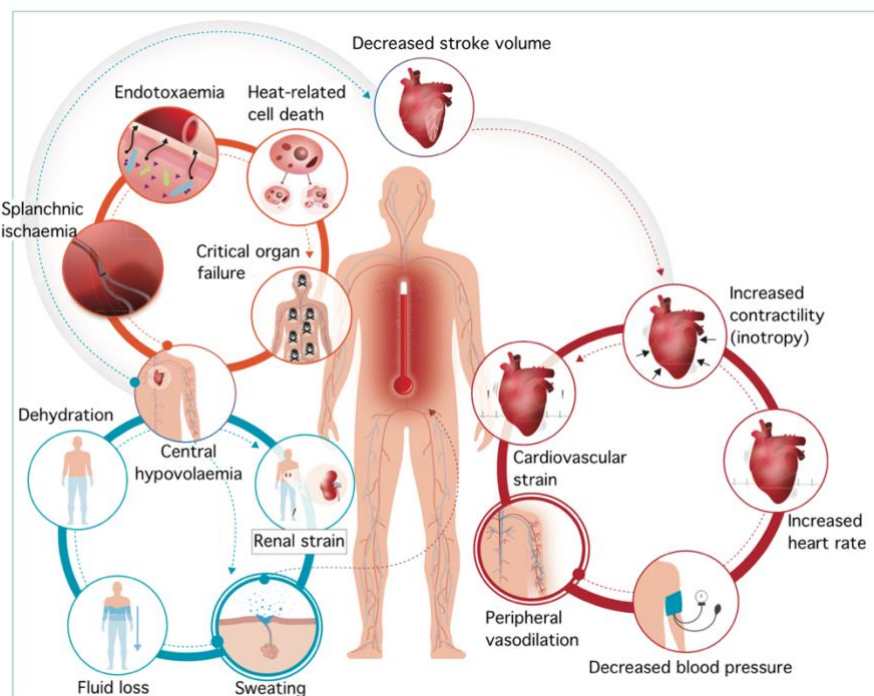
⁶⁰ Camilo Mora et al., *Twenty-seven ways a heat wave can kill you: Deadly heat in the era of climate change*, Circ: Cardiovasc. Qual. Outcomes, 10(11):1-3 at 2 (2017) <https://doi.org/10.1161/CIRCOUTCOMES.117.004233>.

Organs Damaged by Physiological Mechanisms Triggered by Heat Exposure

Organs	Mechanisms				
	Ischemia	Heat Cytotoxicity	Inflammatory Response	Disseminated Intravascular Coagulation	Rhabdomyolysis
Brain	①	⑦	⑬	⑳	
Heart	②	⑧	⑭		
Intestines	③	⑨	⑮	㉑	
Kidneys	④	⑩	⑯	㉒	㉕
Liver	⑤	⑪	⑰	㉓	㉖
Lungs		⑫	⑱	㉔	㉗
Pancreas	⑥		⑲		

Figure C.6. The 27 pathways through which heat exposure kills.⁶¹

Figure C.7.
The physiological processes through which heat exposure damages organs.⁶²



⁶¹ Camilo Mora et al., *Twenty-seven ways a heat wave can kill you: Deadly heat in the era of climate change*, *Circ: Cardiovasc. Qual. Outcomes*, 10(11):1-3 at 2 (2017) <https://doi.org/10.1161/CIRCOUTCOMES.117.004233>.

⁶² Kristie L. Ebi et al., *Hot weather and heat extremes: Health risks*, *Lancet*, 398(10301):698–708 at 700 (2021) [https://doi.org/10.1016/S0140-6736\(21\)01208-3](https://doi.org/10.1016/S0140-6736(21)01208-3).

- C.27. Even when heat exposure does not prove fatal, it can still cause heat rash (miliaria),⁶³ heat exhaustion,⁶⁴ dehydration, heat stroke,⁶⁵ kidney disease,⁶⁶ liver injury,⁶⁷ respiratory illnesses,⁶⁸ and electrolyte imbalance.⁶⁹ Because heat lowers sleep quality, heatwaves indirectly cause diabetes, higher blood pressure, and lower immune functionality.⁷⁰ Due to their developing physiology, infants and children are at a higher risk of developing heat-related illnesses than are healthy adults.⁷¹
- C.28. Heat triggers seizures.⁷² Seizures harm health because they cause brain damage.⁷³ The higher a child's body temperature is during a seizure, the worse the brain damage that results.⁷⁴ Seizures can also cause death.⁷⁵ Currently, an estimated 10% of people suffer at least one seizure in their lifetime,⁷⁶ and 3% of children suffer from febrile seizures.⁷⁷ These seizures can be triggered by body temperature that becomes too hot for any reason, including a very hot day.⁷⁸ People with epilepsy are at especially high risk of heat-related seizure. An estimated 0.6% of people have

⁶³ Karla C. Cuerra, *Miliaria*, Nat'l. Lib. of Med. and Nat'l. Center for Biotech. Info., (2023) <https://www.ncbi.nlm.nih.gov/books/NBK537176/>.

⁶⁴ Courtney Mangus et al., *Heat-related illness in children in an era of extreme temperatures*, *Pediatr. Rev.*, 40(3):97–107 at 98 (2019) <https://renaissance.stonybrookmedicine.edu/system/files/Heat-Related-Illness-in-Children.pdf>.

⁶⁵ Kristie L. Ebi et al., *Hot weather and heat extremes: Health risks*, *Lancet*, 398(10301):698–708 at 699 (2021) [https://doi.org/10.1016/S0140-6736\(21\)01208-3](https://doi.org/10.1016/S0140-6736(21)01208-3).

⁶⁶ Cecilia Sorensen et al., *A new era of climate medicine: Addressing heat-triggered renal disease*, *N. Engl. J. Med.* 381:693–696 at 693 (2019) <https://www.nejm.org/doi/full/10.1056/NEJMp1907859>.

⁶⁷ Cecilia Sorensen et al., *Heat illness in clinical practice*, *BMJ*, 378(e070762):1-7 at 5 (2022) <https://doi.org/10.1136/bmj-2022-070762> (restricted access, available upon request).

⁶⁸ Cecilia Sorensen et al., *Heat illness in clinical practice*, *BMJ*, 378(e070762):1-7 at 1 (2022) <https://doi.org/10.1136/bmj-2022-070762> (restricted access, available upon request); Kristie L. Ebi et al., *Hot weather and heat extremes: Health risks*, *Lancet*, 398(10301):698–708 at 698-699 (2021) [https://doi.org/10.1016/S0140-6736\(21\)01208-3](https://doi.org/10.1016/S0140-6736(21)01208-3).

⁶⁹ Cecilia Sorensen et al., *Heat illness in clinical practice*, *BMJ*, 378(e070762):1-7 at 5 (2022) <https://doi.org/10.1136/bmj-2022-070762> (restricted access, available upon request).

⁷⁰ Newton R. Matandirotya et al., *Chapter 15: Assessing the climate change-related health hazards in Africa* In: *Climate Change and Health Hazards*, pp. 293-305 at 294-295 (2023) https://link.springer.com/chapter/10.1007/978-3-031-26592-1_15 (restricted access; available upon request).

⁷¹ Courtney Mangus et al., *Heat-related illness in children in an era of extreme temperatures*, *Pediatr. Rev.*, 40(3):97–107 at 99 (2019) (children's risk of heat illness is similar to that of adults with cardiovascular disease) <https://renaissance.stonybrookmedicine.edu/system/files/Heat-Related-Illness-in-Children.pdf>.

⁷² Medine I. Gulcebi et al., *Climate change and epilepsy: Insights from clinical and basic science studies*, *Epilepsy Behav.*, 116(107791):1-11 at 2 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9386889/>.

⁷³ Medine I. Gulcebi et al., *Climate change and epilepsy: Insights from clinical and basic science studies*, *Epilepsy Behav.*, 116(107791):1-11 at 2, 6, 7 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9386889/>.

⁷⁴ Medine I. Gulcebi et al., *Climate change and epilepsy: Insights from clinical and basic science studies*, *Epilepsy Behav.*, 116(107791):1-11 at 2, 6, 7 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9386889/>.

⁷⁵ Medine I. Gulcebi et al., *Climate change and epilepsy: Insights from clinical and basic science studies*, *Epilepsy Behav.*, 116(107791):1-11 at 2, 3 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9386889/>.

⁷⁶ World Health Organization (WHO), *Epilepsy*, <https://www.who.int/news-room/fact-sheets/detail/epilepsy> (last accessed Dec. 6, 2023).

⁷⁷ Medine I. Gulcebi et al., *Climate change and epilepsy: Insights from clinical and basic science studies*, *Epilepsy Behav.*, 116(107791):1-11 at 4 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9386889/>.

⁷⁸ Medine I. Gulcebi et al., *Climate change and epilepsy: Insights from clinical and basic science studies*, *Epilepsy Behav.*, 116(107791):1-11 at 4 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9386889/>.

epilepsy,⁷⁹ a number that is expected to rise because maternal exposure to heat during pregnancy increases the incidence of low birthweight,⁸⁰ which increases risk of epilepsy.⁸¹

C.29. Heat illness can cause mental illness.⁸² Higher temperatures are associated with increased substance abuse and mental health disorders, including depression.⁸³ Numerous studies have documented a correlation between increased ambient temperatures and suicides.⁸⁴ Increased heat also causes a marked increase in interpersonal violence, including domestic violence.⁸⁵

C.30. Heat makes it more difficult for children to learn on hot days.⁸⁶ Children perform school tasks approximately 20% better if classroom temperature is lowered from 30°C to 20°C, with the optimum temperature for learning being 22°C.⁸⁷ Cumulative

⁷⁹ World Health Organization (WHO), *Epilepsy*, <https://www.who.int/news-room/fact-sheets/detail/epilepsy> (last accessed Dec. 6, 2023).

⁸⁰ World Health Organization (WHO), *Epilepsy*, <https://www.who.int/news-room/fact-sheets/detail/epilepsy> (last accessed Dec. 6, 2023).

⁸¹ Yuelian Sun et al., *Gestational age, birth weight, intrauterine growth, and the risk of epilepsy*, *Am. J. Epidemiol.*, 167(3):262–270 at 262, 267 (2008) <https://doi.org/10.1093/aje/kwm316>.

⁸² Cecilia Sorensen et al., *Heat illness in clinical practice*, *BMJ*, 378(e070762):1-7 at 1, 3 (2022) <https://doi.org/10.1136/bmj-2022-070762> (restricted access, available upon request).

⁸³ See Maria I. Rinderu et al., *Climate, aggression and violence (CLASH): A cultural-evolutionary approach*, *Curr. Opin. Psychol.*, 19:113-118 (2018) https://research.vu.nl/ws/portalfiles/portal/72579474/Climate_aggression_and_violence_CLASH_a_cultural_evolutionary_approach.pdf; and Haris Majeed et al., *The impact of climate change on youth depression and mental health*, *Lancet*, 1(3):e94-e95 (2017) <https://www.thelancet.com/action/showPdf?pii=S2542-5196%2817%2930045-1>.

⁸⁴ Hyewon Lee et al., *Chapter 8: Heat exposure and mental health in the context of climate change* In: *Heat exposure and human health in the context of climate change*, Elsevier, pp. 155-187 at 172–174 (2023) <https://doi.org/10.1016/B978-0-12-819080-7.00008-2>.

⁸⁵ Hyewon Lee et al., *Chapter 8: Heat exposure and mental health in the context of climate change* In: *Heat exposure and human health in the context of climate change*, Elsevier, pp. 155-187 at 174 (2023) (“The link between heat exposure and violence has been studied for a very long time. It has been consistently observed that high ambient temperature caused aggressive or violent behaviors of individuals towards others.”) <https://doi.org/10.1016/B978-0-12-819080-7.00008-2>; and Isabel Maria L. Silva et al., *Chapter 4: Climate change impact on mental health: Is nature fighting us back?* In: *Climate change and health hazards*, Springer, pp. 57-73 at 65, 67 (2023) https://link.springer.com/chapter/10.1007/978-3-031-26592-1_4 (restricted access, available upon request).

⁸⁶ Pawel Wargocki et al., *The relationship between classroom temperature and children's performance in school*, *Build. Environ.*, 157:197-204 (2019) <https://doi.org/10.1016/j.buildenv.2019.04.046>; see also Jose Guillermo Cedeño Laurent et al., *Reduced cognitive function during a heat wave among residents of non-air-conditioned buildings: An observational study of young adults in the summer of 2016*, *PLoS Med.*, 15(7):1-20 at 11 (2018) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039003/pdf/pmed.1002605.pdf>.

⁸⁷ Pawel Wargocki et al., *The relationship between classroom temperature and children's performance in school*, *Build. Environ.*, 157:197-204 (2019) <https://doi.org/10.1016/j.buildenv.2019.04.046>; see also Pawel Wargocki et al., *The effects of moderately raised classroom temperatures and classroom ventilation rate on the performance of schoolwork by children*, *HVAC&R Res.*, 13(2):193-220 (2007) (Classroom temperature and ventilation affect school performance.) https://www.researchgate.net/publication/233004128_The_Effects_of_Moderately_Raised_Classroom_Temperatures_and_Classroom_Ventilation_Rate_on_the_Performance_of_Schoolwork_by_Children_RP-1257.

heat exposure further inhibits child cognitive development.⁸⁸

C.31. Maternal exposure to heatwaves during pregnancy harms newborn health.⁸⁹ When pregnant mothers are exposed to heatwaves, it substantially increases the incidence of miscarriage,⁹⁰ stillbirth,⁹¹ preterm birth,⁹² and low birth weight,⁹³ and also increases risk of birth defects.⁹⁴

C.32. **Preterm birth** harms child health in many ways. Ten percent of babies born prematurely die directly as a result of their prematurity.⁹⁵ Another 10% die from complications of preterm birth, such as infections.⁹⁶ Preterm babies who survive infancy have an elevated risk of significant lifelong disability, and preterm birth currently accounts for 3.1% of all disabilities globally.⁹⁷ Thus, when climate change increases the number of unusually hot days, it reduces newborn' odds of being born alive and healthy, increases their risk of dying shortly after birth, and increases their

⁸⁸ See Joshua Goodman et al., *Heat and learning*, American Economic J.: Economic Policy, 12(2):1-58 at 26 (2018) https://www.nber.org/system/files/working_papers/w24639/w24639.pdf.

⁸⁹ Maryia Bakhtsiyarava et al., *Ambient temperature and term birthweight in Latin American cities*, Environ. Int., 167(107412):1-11 at 6 (2022) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9376808/>; Louisa Samuels et al., *Physiological mechanisms of the impact of heat during pregnancy and the clinical implications*, Int. J. Biometeorol., 66:1505-1513 at 1505 (2022) <https://link.springer.com/article/10.1007/s00484-022-02301-6>.

⁹⁰ Tamás Hajdu et al., *Climate change and the mortality of the unborn*, J. Environ. Econ. Manag., 118(102771):1-12 (2023) <https://www.sciencedirect.com/science/article/pii/S0095069622001243>.

⁹¹ Tamás Hajdu et al., *Climate change and the mortality of the unborn*, J. Environ. Econ. Manag., 118(102771):1-12 (2023) <https://www.sciencedirect.com/science/article/pii/S0095069622001243>; Linn B. Strand et al., *Maternal exposure to ambient temperature and the risks of preterm birth and stillbirth in Brisbane, Australia*, Am. J. Epidemiol., 175(2):99-107 (2012) <https://academic.oup.com/aje/article/175/2/99/82520>; Jenna Kanner et al., *Ambient temperature and stillbirth: Risks associated with chronic extreme temperature and acute temperature change*, Environ. Res., 189(109958):1-8 (2020) <https://doi.org/10.1016/j.envres.2020.109958> (restricted access, available upon request).

⁹² Matthew Francis Chersich et al., *Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: Systematic review and meta-analysis*, BMJ, 371(m3811):1-13 (2020) <https://doi.org/10.1136/bmj.m3811>; and Lara Cushing et al., *Extreme heat and its association with social disparities in the risk of spontaneous preterm birth*, Paediatr. Perinat. Epidemiol., 36:13-22 (2021) <https://onlinelibrary.wiley.com/doi/epdf/10.1111/ppe.12834>.

⁹³ Maryia Bakhtsiyarava et al., *Ambient temperature and term birthweight in Latin American cities*, Environ. Int., 167(107412):1-11 at 6 (2022) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9376808/>; Pin Wang et al., *Temperature variability and birthweight: Epidemiological evidence from Africa*, Environ. Int'l., 173(107792):1-9 at 1-2 (2023) <https://doi.org/10.1016/j.envint.2023.107792>; and Daniel Helldén et al., *Climate change and child health: A scoping review and an expanded conceptual framework*, Lancet, 5(3):e164-175 at e170 (2021) <https://www.thelancet.com/action/showPdf?pii=S2542-5196%2820%2930274-6>.

⁹⁴ Marjan Mosalman Haghighi et al., *Impacts of high environmental temperatures on congenital anomalies: A systematic review*, Int'l. J. Environ. Res. Public Health, 18(4910):1-15 at 2 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8124753/pdf/ijerph-18-04910.pdf>.

⁹⁵ Christopher P. Howson et al., *Born too soon: Preterm birth matters*, Reprod. Health, 10(Supp. 1):1-9 at 1 (2013) <https://pubmed.ncbi.nlm.nih.gov/24625113/>.

⁹⁶ Christopher P. Howson et al., *Born too soon: Preterm birth matters*, Reprod. Health, 10(Supp. 1):1-9 at 1 (2013) <https://pubmed.ncbi.nlm.nih.gov/24625113/>.

⁹⁷ Christopher P. Howson et al., *Born too soon: Preterm birth matters*, Reprod. Health, 10(Supp. 1):1-9 at 1 (2013) <https://pubmed.ncbi.nlm.nih.gov/24625113/>.

chance of being born with a lifelong disability.

- C.33. Babies born with **low birth weight** have a much greater risk of dying during childhood or having poor neurocognitive development, poor educational attainment, and a greater risk of chronic diseases such as heart disease and diabetes in adulthood.⁹⁸ Babies born underweight have worse health outcomes in childhood and adulthood than their normal birth-weight peers.⁹⁹ The percentage of newborns born underweight is expected to increase as the climate crisis intensifies.¹⁰⁰
- C.34. **Birth defects** caused by maternal heat exposure during pregnancy include defects of the heart,¹⁰¹ hypospadias, congenital cataracts, renal agenesis/hypoplasia, spina bifida, and craniofacial defects.¹⁰² Risk of birth defects generally increases with duration and intensity of maternal heat exposure.¹⁰³
- C.35. Increased heat raises the risk of future **pandemics**¹⁰⁴ by expanding the geographical and seasonal habitats of the **mosquitoes and ticks** that are vectors for malaria, dengue, Zika, and Lyme disease.¹⁰⁵
- C.36. Regarding malaria, children are more likely than adults to die from malaria or suffer complications such as anaemia, cerebral malaria, and long-term nerve problems.

⁹⁸ Pin Wang et al., *Temperature variability and birthweight: Epidemiological evidence from Africa*, *Environ. Intl.*, 173(107792):1-9 at 1-2 (2023) <https://doi.org/10.1016/j.envint.2023.107792>; Mabel Andalón et al., *Weather shocks and health at birth in Colombia*, *World Dev.*, 82:69–82 at 69 (2016) <https://doi.org/10.1016/j.worlddev.2016.01.015> (restricted access, available upon request).

⁹⁹ Mabel Andalón et al., *Weather shocks and health at birth in Colombia*, *World Dev.*, 82:69–82 at 69 (2016), <https://doi.org/10.1016/j.worlddev.2016.01.015> (restricted access, available upon request).

¹⁰⁰ Daniel Helldén et al., *Climate change and child health: A scoping review and an expanded conceptual framework*, *Lancet*, 5(3):e164-e175 at e170 (2021) [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(20\)30274-6/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30274-6/fulltext); Pin Wang et al., *Temperature variability and birthweight: Epidemiological evidence from Africa*, *Environ. Intl.*, 173(107792):1-9 at 1-2 (2023) <https://doi.org/10.1016/j.envint.2023.107792>.

¹⁰¹ Marjan Mosalman Haghighi et al., *Impacts of high environmental temperatures on congenital anomalies: A systematic review*, *Int'l. J. Environ. Res. Public Health*, 18(4910):1-15 at 4 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8124753/pdf/ijerph-18-04910.pdf>.

¹⁰² Marjan Mosalman Haghighi et al., *Impacts of high environmental temperatures on congenital anomalies: A systematic review*, *Int'l. J. Environ. Res. Public Health*, 18(4910):1-15 at 1 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8124753/pdf/ijerph-18-04910.pdf>.

¹⁰³ Marjan Mosalman Haghighi et al., *Impacts of high environmental temperatures on congenital anomalies: A systematic review*, *Int'l. J. Environ. Res. Public Health*, 18(4910):1-15 at 2, 12 (2021) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8124753/pdf/ijerph-18-04910.pdf>.

¹⁰⁴ UN Environment Programme, *Preventing the next pandemic: Zoonotic diseases and how to break the chain of transmission*, <https://www.unep.org/resources/report/preventing-future-zoonotic-disease-outbreaks-protecting-environment-animals-and> (last accessed Dec. 6, 2023).

¹⁰⁵ World Health Organization (WHO), *Dengue: The region of the Americas*, <https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON475#:~:text=Since%20the%20beginning%20of%202023,the%20entire%20year%20of%202022> (last accessed Dec. 6, 2023); United Nations, *Spike in dengue cases due to global warming, warns WHO*, <https://news.un.org/en/story/2023/07/1138962> (last accessed Dec. 6, 2023).

- C.37. Dengue has increased **eight-fold** globally since 2000, largely due to climate change.¹⁰⁶ Incidence is rising throughout Latin America,¹⁰⁷ No treatment for dengue exists, and current medicines treat only its symptoms (fever and severe pain).¹⁰⁸ According to UNICEF, children are at especially risk of dying from dengue.¹⁰⁹ For example, Peru's 2023 dengue outbreak killed 31 children.¹¹⁰
- C.38. **Diarrhoeal diseases** are already a leading cause of death for children under 5 years old globally,¹¹¹ and heat increases the range of diarrhoea-causing pathogens such as cholera. Warmer waters also encourage blooms of toxic algae.¹¹²
- C.39. Children spend more time **playing outdoors** than adults, which generally benefits their physical and mental health.¹¹³ However, more frequent heatwaves make it harder—and at some temperatures, dangerous—to play outdoors.¹¹⁴
- C.40. Children in situations of poverty are particularly vulnerable to the adverse health impacts of extreme heat due to **poor access to air conditioning**, shelter, clean water, and healthcare facilities.¹¹⁵

¹⁰⁶ World Health Organisation (WHO), *Spike in dengue cases due to global warming, warns WHO*, <https://news.un.org/en/story/2023/07/1138962> (last accessed Dec. 6, 2023); Marina Romanello et al., *The 2022 report of the Lancet countdown on health and climate change: Health at the mercy of fossil fuels*, *Lancet*, 400:1619–1654 at 1635 (2022) [https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(22\)01540-9.pdf](https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(22)01540-9.pdf).

¹⁰⁷ José Luis San Martín et al., *The epidemiology of dengue in the Americas over the last three decades: A worrisome reality*, *Am. J. Trop. Med. Hyg.*, 82(1):128–135 at 128 (2010) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2803522/>; and see also Roberto Tapia-Conyer et al., *Dengue: An escalating public health problem in Latin America*, *Paediatr. Int. Child Health*, 32:14–17 at 14 (2012) (Dengue has increased significantly throughout Latin America since 1980) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3381443/>.

¹⁰⁸ World Health Organization (WHO), *Spike in dengue cases due to global warming, warns WHO*, <https://news.un.org/en/story/2023/07/1138962> (last accessed Dec. 6, 2023).

¹⁰⁹ United Nations Children's Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, 1-125 at 43 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>.

¹¹⁰ Sanjeet Bagcchi, *Dengue outbreak in Peru affects adults and children*, *Lancet*, 23(9):e339 at e339 (2023) [https://doi.org/10.1016/S1473-3099\(23\)00229-3](https://doi.org/10.1016/S1473-3099(23)00229-3).

¹¹¹ Margaret Mokomane et al., *The global problem of childhood diarrhoeal diseases: emerging strategies in prevention and management*, *Ther. Adv. Infectious Dis.*, 5(1):29-43 at 29 (2018) <https://doi.org/10.1177/2049936117744429>.

¹¹² Andrew W. Griffith et al., *Harmful algal blooms: A climate change co-stressor in marine and freshwater ecosystems*, *Harmful Algae*, 91(101590):1-12 at 6 (2020) <https://doi.org/10.1016/j.hal.2019.03.008>.

¹¹³ Early Childhood Learning and Knowledge Center, *Going outside improves children's health*, <https://eclkc.ohs.acf.hhs.gov/learning-environments/supporting-outdoor-play-exploration-infants-toddlers/going-outside-improves-childrens-health> (last accessed Dec. 6, 2023).

¹¹⁴ Gregory W. McGarr et al., *Heat strain in children during unstructured outdoor physical activity in a continental summer climate*, *Temperature*, 8(1):80-89, at 80 (2021) <https://doi.org/10.1080/23328940.2020.1801120>.

¹¹⁵ United Nations Children's Fund (UNICEF), *The coldest year of the rest of their lives: Protecting children from the escalating impacts of heatwaves*, <https://www.unicef.org/media/129506/file/UNICEF-coldest-year-heatwaves-and-children-EN.pdf> (last accessed Dec. 6, 2023).

- C.41. **Children who work outdoors** are at especially high risk for heat-related illness and death. Central America has recently seen an alarming rise in deaths of agricultural-working children and young adults from **heat-related kidney failure**.¹¹⁶ The rise is so extreme that this heat-related form of kidney failure is now the **second leading cause of death** in Nicaragua and El Salvador.¹¹⁷ These children are often exposed to extreme heat without adequate acclimatization or preventive measures to avoid heat-related illness.¹¹⁸ Yet because of climate change, “[w]e may have now reached a physiological limit, in terms of heat exposure, at which acclimatization and behavioral modifications can no longer overcome the biologic stressors of [working outdoors] in these hot spot communities.”¹¹⁹
- C.42. In 2020, heat waves exposed **98 million more people** globally to food insecurity per year as compared to 1981-2010.¹²⁰ That is because rising temperatures reduce the duration of crop growth in many countries, which in turn reduces crop yields—and increases the risk of child malnutrition.¹²¹
- C.43. For all of these reasons, heat is among the most dangerous of climate hazards for children.¹²² Therefore, climate-linked heatwaves put the health and survival of children at risk.¹²³

¹¹⁶ Pedro Ordúñez et al., *Chronic kidney disease mortality trends in selected Central America countries, 1997–2013: Clues to an epidemic of chronic interstitial nephritis of agricultural communities*, J. Epidemiology Community Health, 72:280–286 (2018) <http://dx.doi.org/10.1136/jech-2017-210023>; see also Eleni Geladari et al., *Failing kidneys in a failing planet; CKD of unknown origin*, Rev. Environ. Health, 38(1):125–135 (2023) <https://doi.org/10.1515/reveh-2021-0109>; see also Cecilia Sorensen et al., *A new era of climate medicine: Addressing heat-triggered renal disease*, N. Engl. J. Med., 381:693–696 (2019) <https://www.nejm.org/doi/full/10.1056/NEJMp1907859>.

¹¹⁷ Cecilia Sorensen et al., *A new era of climate medicine: Addressing heat-triggered renal disease*, N. Engl. J. Med. 381:693–696 at 693 (2019) <https://www.nejm.org/doi/full/10.1056/NEJMp1907859>.

¹¹⁸ Alexandra Adams et al., *Climate change and human health in Montana: A special report of the Montana Climate Assessment*, 1-187 (2021) <https://scholarworks.montana.edu/xmlui/handle/1/16028>.

¹¹⁹ Cecilia Sorensen et al., *A new era of climate medicine: Addressing heat-triggered renal disease*, N. Engl. J. Med., 381:693–696 at 693 (2019) <https://www.nejm.org/doi/full/10.1056/NEJMp1907859>.

¹²⁰ Marina Romanello et al., *The 2022 report of the Lancet countdown on health and climate change: Health at the mercy of fossil fuels*, Lancet, 400(10363):1619-1654 at 1631 (2022) [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(22\)01540-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)01540-9/fulltext).

¹²¹ Marina Romanello et al., *The 2022 report of the Lancet countdown on health and climate change: Health at the mercy of fossil fuels*, Lancet, 400(10363):1619-1654 at 1630 (2022) [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(22\)01540-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)01540-9/fulltext).

¹²² World Health Organization (WHO), *Heatwaves*, https://www.who.int/health-topics/heatwaves#tab=tab_1 (last accessed Dec. 6, 2023).

¹²³ Stella M. Hartinger et al., *The 2022 South America report of the Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, Lancet Reg. Health - Am., 20(100470):1–35 at 2 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

Key finding #4:

Child health is uniquely vulnerable to storms, floods, landslides, and droughts

C.44. Storms (including hurricanes), floods, landslides, and droughts are on the rise in the Americas due to climate change.¹²⁴ These disasters kill thousands in Latin America every year, with children being especially vulnerable.¹²⁵

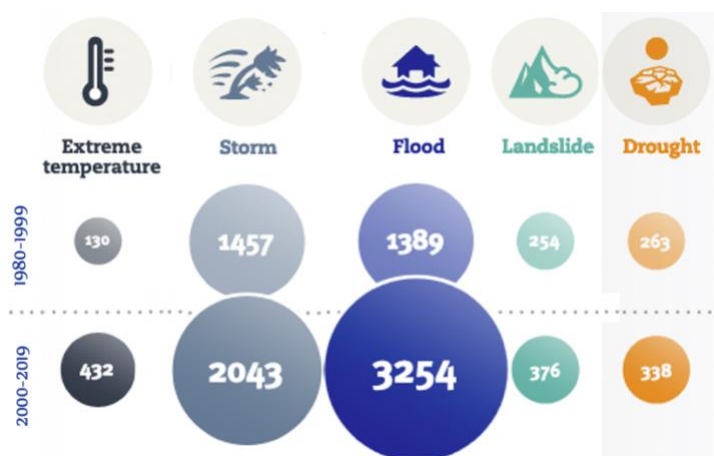


Figure C.7. A comparison of the total number of disaster events by type from 1980-1999 vs. 2000-2019.¹²⁶

C.45. Storms (including cyclones) unleash heavy rains that can trigger **landslides**.¹²⁷ Landslides have increased **tenfold** in the past 50 years, and 81% of the people killed in landslides in Latin America and the Caribbean live in poor or informal settlements.¹²⁸ The victims are often children. For example, a single landslide in Guatemala triggered by hurricanes Eta and Iota killed between 22 and 30 children.¹²⁹

¹²⁴ Centre for Research on the Epidemiology of Disasters and the UN Office for Disaster Risk Reduction, *The human cost of disasters: An overview of the last 20 years (2000-2019)*, <https://www.undrr.org/publication/human-cost-disasters-overview-last-20-years-2000-2019> (last accessed Dec. 6, 2023).

¹²⁵ Stella M. Hartinger et al., *The 2022 South America report of the Lancet countdown on health and climate change: Trust the science. Now that we know, we must act*, *Lancet Reg. Health - Am.*, 20(100470):1-35 at 8, 23 (2023) <https://doi.org/10.1016/j.lana.2023.100470>.

¹²⁶ Centre for Research on the Epidemiology of Disasters and the UN Office for Disaster Risk Reduction, *The human cost of disasters: An overview of the last 20 years (2000-2019)*, <https://www.undrr.org/publication/human-cost-disasters-overview-last-20-years-2000-2019> (last accessed Dec. 6, 2023).

¹²⁷ Ugur Ozturk et al., *How climate change and unplanned urban sprawl bring more landslides*, *Nature*, 608: 262-265 at 262 (2022) <https://doi.org/10.1038/d41586-022-02141-9>.

¹²⁸ Ugur Ozturk et al., *How climate change and unplanned urban sprawl bring more landslides*, *Nature*, 608:262-265 at 262 (2022) <https://doi.org/10.1038/d41586-022-02141-9>; Diana, Renee, *Brazil flood death toll reaches 335*, *McClatchy-Tribune Business News* (Jan. 13, 2011) (2,000 homes destroyed in Brazil in January 2011 from mudslides triggered by flooding and heavy rains).

¹²⁹ BBC News Mundo, *Huracanes Eta e Iota: la crisis humanitaria que dejaron en Centroamérica las tormentas (agravada por la pandemia)*, <https://www.bbc.com/mundo/noticias-america-latina-55479861> (last accessed Dec. 6, 2023).

- C.46. Storms also produce **floods**, which are the deadliest of all climate-related disasters. In 2019, floods were responsible for **43.5% of all deaths** (including those of children) **from weather events** globally.¹³⁰
- C.47. In the Caribbean, the number of children displaced by storms and floods grew **six-fold** between 2013-2019 due to climate change.¹³¹
- C.48. Floods increase the spread of numerous vector-borne diseases.¹³²
- C.49. Homes damaged by floodwaters tend to harbor mold, mycotoxins, and dust mites, which cause respiratory problems for families when they move back into their water-damaged houses.¹³³ Exposure to mold triggers inflammation, upper airway symptoms, cough, wheeze, and asthma, among other adverse health impacts.¹³⁴
- C.50. Floods damage water infrastructure. Such damage contaminates drinking water with sewage and toxic agro-industrial chemicals.¹³⁵ Contaminated water also exposes children to infectious diseases such as cholera;¹³⁶ typhoid;¹³⁷ respiratory infections;¹³⁸ skin diseases;¹³⁹ and gastrointestinal illness.¹⁴⁰ In adults,

¹³⁰ Centre for Research on the Epidemiology of Disasters, *Natural disasters 2019: Now is the time to not give up*, (2020) https://www.preventionweb.net/files/73050_asdr.pdf.

¹³¹ UNICEF, *As impact of climate crisis worsens, Caribbean islands see six-fold increase in number of children displaced by storms, new UNICEF report shows*, <https://www.unicef.org/press-releases/impact-climate-crisis-worsens-caribbean-islands-see-six-fold-increase-number> (last accessed Dec. 6, 2023).

¹³² Friederike Suhr et al., *Epidemiology of floods in sub-Saharan Africa: A systemic review of health outcomes*, BMC Public Health, 22(268):1-15 at 2 (2022) <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-022-12584-4>.

¹³³ Nathalie Acevedo et al., *House dust mite allergy under changing environments*, Allergy Asthma Immunol. Res., 11(4):450-469 at 457 (2019) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6557771/pdf/aaair-11-450.pdf>; and Janette Hope, *A review of the mechanism of injury and treatment approaches for illness resulting from exposure to water-damaged buildings, mold, and mycotoxins*, Sci. World J., 1-20 at 2 (2013) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3654247/pdf/TSWJ2013-767482.pdf>.

¹³⁴ See e.g., Institute of Medicine of the National Academies, *Damp indoor spaces and health*, Washington DC: National Academies Press (2004) https://www.ncbi.nlm.nih.gov/books/NBK215643/pdf/Bookshelf_NBK215643.pdf.

¹³⁵ Amin Kiaghadi, *Environmental damage associated with severe hydrologic events: A LiDAR-based geospatial modeling approach*, Nat. Hazards, 103(3):2711-2729 at 2726 (2020) <https://doi.org/10.1007/s11069-020-04099-1>; Defensoría del Pueblo Ecuador, *Agua y saneamiento en situaciones de emergencia y desastres naturales*, at 10, 14 (2016) https://www.cndh.org.mx/sites/default/files/doc/OtrosDocumentos/Doc_2016_046.pdf.

¹³⁶ Pan American Health Organization (PAHO), *Cholera in disaster situation*, <https://www.paho.org/en/health-emergencies/cholera-disaster-situationss> (last accessed Dec. 6, 2023).

¹³⁷ World Health Organization (WHO), *Typhoid*, <https://www.who.int/news-room/fact-sheets/detail/typhoid> (last accessed Dec. 6, 2023).

¹³⁸ Naciones Unidas, *Las enfermedades transmitidas por el agua amenazan a más de medio millón de niños en Haití*, <https://news.un.org/es/story/2021/09/1496322> (last accessed Dec. 6, 2023).

¹³⁹ Dr. Mónica Pun Chinarro, *Impacto del agua en la salud pública*, Ministerio de Salud Perú, Dirección General de Intervenciones Estratégicas en Salud Pública, (2016) <https://www.paho.org/es/file/57050/download?token=RISQWJZE>.

¹⁴⁰ United Nations Children's Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children's*

gastrointestinal diseases are often mild, but for children they are much more severe,¹⁴¹ and can be fatal.¹⁴² Waterborne infections cause diarrhea,¹⁴³ one of the biggest killers of children globally.¹⁴⁴

C.51. Floods disrupt food systems through at least three pathways. First, floods destroy crops.¹⁴⁵ Second, polluted floodwaters carry industrial and agricultural chemicals, which contaminate cropland and future crops.¹⁴⁶ Third, floods wash away topsoil, especially in areas that have been deforested or overgrazed, thereby reducing future crop productivity.¹⁴⁷ By disrupting the food supply, floods increase food insecurity and contribute to child malnutrition.¹⁴⁸

C.52. **Droughts**, too, contribute to child undernutrition. Droughts dry out fields, lower water availability, reduce seed germination, change the dynamics of crop diseases, lower the nutritional value of crops, and sometimes result in the full loss of a harvest.¹⁴⁹ Drought-induced crop failure and economic hardship are already causing food insecurity in Central America,¹⁵⁰ particularly in children ages 5 and younger,¹⁵¹ which will worsen as warming is allowed to continue.¹⁵²

climate risk index, pp. 1-125 at 33 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>; Naciones Unidas, *Las enfermedades transmitidas por el agua amenazan a más de medio millón de niños en Haití*, <https://news.un.org/es/story/2021/09/1496322> (last accessed Dec. 6, 2023).

¹⁴¹ See Instituto Mexicano del Seguro Social, *Enfermedades gastrointestinales* (2023) (children under 5 years are at greatest risk of gastrointestinal illness) <http://www.imss.gob.mx/salud-en-linea/enfermedades-gastrointestinales>.

¹⁴² U.S. Environmental Protection Agency, *Effects of global change on human health*, in *Analyses of the effects of global change on human health and welfare and human systems*, pp. 2-1-2-78 at 2-9 (2008) <https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=197244>.

¹⁴³ Carolyn Kousky, *Impacts of natural disasters on children*, *Future Child.*, 26(1):73-92 at 73, 79-80 (2016) <https://files.eric.ed.gov/fulltext/EJ1101425.pdf>.

¹⁴⁴ United Nations Children's Fund (UNICEF), *The climate crisis is a child rights crisis: Introducing the children's climate risk index*, pp. 1-125 at 33 (2021) <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf>.

¹⁴⁵ See e.g., Yoshito Takasaki et al., *Smoothing income against crop flood losses in Amazonia: Rain forest or rivers as a safety net?*, *Rev. Dev. Econ.*, 14(1):48-63 at 49 (2010) <https://doi.org/10.1111/j.1467-9361.2009.00538.x>.

¹⁴⁶ FAO and ITPS, *Status of the world's soil resources: Main report*, pp. 1-607 at 119 (2015) <https://www.fao.org/3/i5199e/i5199e.pdf>.

¹⁴⁷ FAO and ITPS, *Status of the world's soil resources: Main report*, pp. 1-607 at 365, 371, 374 (2015) <https://www.fao.org/3/i5199e/i5199e.pdf>.

¹⁴⁸ Carolyn Kousky, *Impacts of natural disasters on children*, *Future Child.*, 26(1):73-92 at 73 (2016) <https://files.eric.ed.gov/fulltext/EJ1101425.pdf>.

¹⁴⁹ Daniel Helldén et al., *Climate change and child health: A scoping review and an expanded conceptual framework*, *Lancet*, 5(3):e164-175 at e169 (2021) <https://www.thelancet.com/action/showPdf?pii=S2542-5196%2820%2930274-6>.

¹⁵⁰ Food and Agricultural Organization of the UN, *Dry corridor Central America: Situation report June 2016*, <https://www.fao.org/3/br092e/br092e.pdf> (last accessed Dec. 6, 2023).

¹⁵¹ Migration Policy Institute, *Climate extremes, food insecurity, and migration in Central America: A complicated nexus*, <https://www.migrationpolicy.org/article/climate-food-insecurity-migration-central-america-guatemala> (last accessed Dec. 6, 2023).

¹⁵² IPCC, *Chapter 12: Central and South America* In: *Climate Change 2022: Impacts, Adaptation and*

- C.53. Droughts increase children's risk of infectious diseases such as cholera because drought limits families' access to clean water for drinking, cooking, hygiene, and sanitation.¹⁵³
- C.54. **Severe weather** cuts off access to medical care by washing out roads, damaging medical facilities, or forcing facilities to close due to lack of water.¹⁵⁴ Such injuries to the health system exacerbate the health crises that accompany climate disasters.
- C.55. Storms, floods, landslides, and drought have all been associated with mental health disorders (see ¶¶ C.70 et seq.) and increased violence against children.¹⁵⁵
- C.56. Alone, each of these severe weather events affects food security and has long-term effects on child nutrition, with the most disadvantaged children being at the greatest risk.¹⁵⁶ When such crises overlap, their cumulative impacts are extreme.
- C.57. Due to overlapping climate impacts, some regions are particularly vulnerable to climate-induced **migrations and displacements**. In Latin America, the regions most vulnerable to climate-induced displacement are the Andes, northeastern Brazil, and northern Central America.¹⁵⁷

Key finding #5:

Child health is uniquely vulnerable to air pollution caused directly and indirectly by fossil fuel combustion

- C.58. Although combustion of coal, oil, and natural gas causes climate change, it also creates a parallel crisis of air pollution. Combustion of these fuels releases massive amounts of dangerous air pollutants including fine particulate matter (airborne fine respirable particles with an aerodynamic diameter of 2.5 µm or less, also known as PM_{2.5}), sulfur dioxide, nitrogen oxides, polycyclic aromatic hydrocarbon, mercury, and volatile chemicals that form ground-level ozone.

Vulnerability, Working Group II, Sixth Assessment Report, pp. 1689–1816 at 1699 (2022) https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter12.pdf.

¹⁵³ Ankush K. Niranjana et al., *Resurgence of cholera in the COVID-19 era: A global health concern*, Ann. Med. Surg., 85(4):1321–1322 at 1321 (2023) <https://dx.doi.org/10.1097/MS9.0000000000000415>.

¹⁵⁴ Carolyn Kousky, *Impacts of natural disasters on children*, Future Child., 26(1):73–92 at 73 (2016) <https://files.eric.ed.gov/fulltext/EJ1101425.pdf>.

¹⁵⁵ See Jorge Cuartas et al., *The climate crisis and violence against children*, Lancet Child Adolesc. Health, 7(9):605–607 at 605 (2023) [https://doi.org/10.1016/S2352-4642\(23\)00137-2](https://doi.org/10.1016/S2352-4642(23)00137-2) (restricted access, available upon request).

¹⁵⁶ Daniel Helldén et al., *Climate change and child health: A scoping review and an expanded conceptual framework*, Lancet, 5(3):e164–e175 at e169 (2021) <https://www.thelancet.com/action/showPdf?pii=S2542-5196%2820%2930274-6>.

¹⁵⁷ IPCC, *Chapter 12: Central and South America* In: Climate Change 2022: Impacts, Adaptation and Vulnerability, Working Group II, Sixth Assessment Report, pp. 1689–1816 at 1691 (2022) https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter12.pdf.

- C.59. Burning fossil fuels also increases the frequency and intensity of wildfires.¹⁵⁸ Wildfire smoke pollutes the air up to thousands of kilometers away.¹⁵⁹
- C.60. The World Health Organization (WHO) establishes safety limits for pollutants resulting from fossil fuel combustion and smoke.¹⁶⁰ 99% of the world's population breathe air that exceeds those limits.¹⁶¹ WHO estimates that 7 million people, many of them children, die prematurely early every year from breathing these pollutants.¹⁶²
- C.61. These pollutants take a major toll on child health through multiple pathways.¹⁶³
- C.62. Being closer to the ground increases children's exposure to air pollution from car exhausts.¹⁶⁴
- C.63. When a pregnant mother is exposed to air pollution from burning fossil fuels, her exposure increases the newborn's risk of serious medical conditions including

¹⁵⁸ Kristina A Dahl et al., *Quantifying the contribution of major carbon producers to increases in vapor pressure deficit and burned area in western US and southwestern Canadian forests*, Environ. Res. Letters, 18(6):1-10 (2023) <https://iopscience.iop.org/article/10.1088/1748-9326/acbce8>.

¹⁵⁹ Marshall Burke et al., *The contribution of wildfire to PM2.5 trends in the USA*, Nature, 622:761-766 (2023) <https://doi.org/10.1038/s41586-023-06522-6>.

¹⁶⁰ World Health Organization (WHO), *WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide*, <https://www.who.int/publications/i/item/9789240034228> (last accessed Dec. 6, 2023).

¹⁶¹ World Health Organization (WHO), *Ambient (outdoor) air pollution*, [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health) (last accessed Dec. 6, 2023).

¹⁶² World Health Organization (WHO), *Ambient (outdoor) air pollution*, [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health) (last accessed Dec. 6, 2023).

¹⁶³ Federica Perera et al., *Climate change, fossil-fuel pollution, and children's health*, N. Engl. J. Med., 386:2303-2314 at 2303 (2022) <https://www.nejm.org/doi/full/10.1056/NEJMra2117706>; Federica Perera, *Multiple threats to child health from fossil fuel combustion: Impacts of air pollution & climate change*, Environ. Health Perspect., 125(2):141-148 at 142 (2017) <https://ehp.niehs.nih.gov/doi/epdf/10.1289/EHP299>; Yali Zhang et al., *The impact of fossil fuel combustion on children's health and the associated losses of human capital*, Global Transitions 5:117-124 (2023) <https://www.sciencedirect.com/science/article/pii/S2589791823000154>.

¹⁶⁴ UNICEF, *Childhood air pollution exposure key messages*, https://www.unicef.org/media/123156/file/Childhood_Air_Pollution_Key_Messages_2022.pdf (last accessed Dec. 6, 2023).

cancer,¹⁶⁵ autism,¹⁶⁶ behavior problems,¹⁶⁷ high blood pressure,¹⁶⁸ obesity,¹⁶⁹ and lung problems including asthma.¹⁷⁰

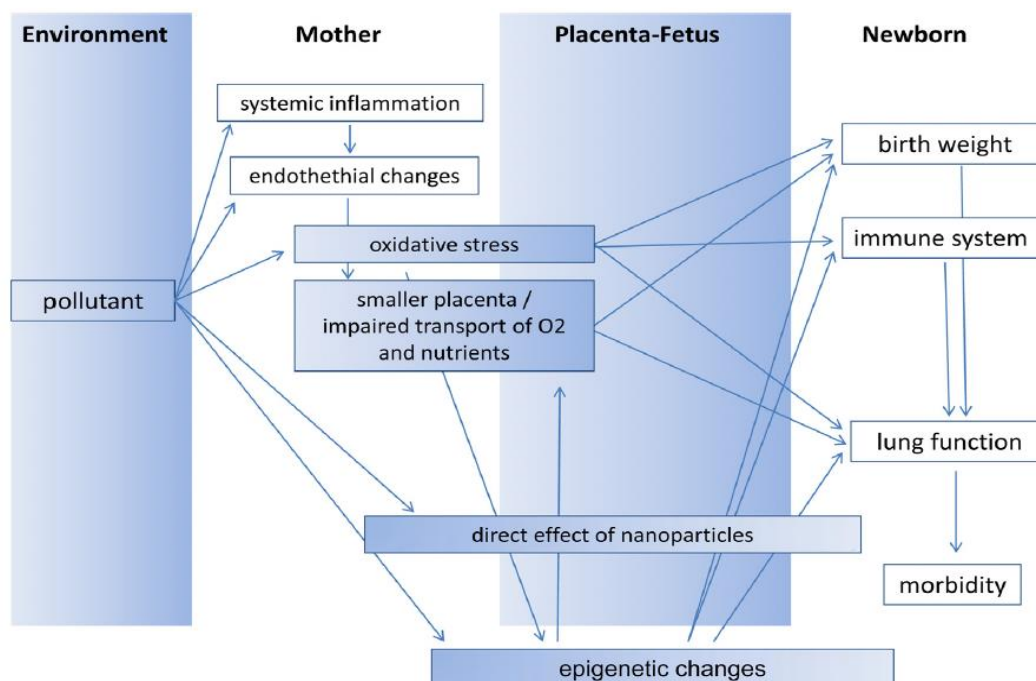


Figure C.8. Impacts of air pollution during pregnancy on birth outcomes and lung development.¹⁷¹

¹⁶⁵ Jo Kay C. Ghosh et al., *Prenatal exposure to traffic-related air pollution and risk of early childhood cancers*, *Am. J. Epidemiol.*, 178(8):1233-1239 (2013) <https://academic.oup.com/aje/article/178/8/1233/83907?login=false>; see also Vickie Boothe et al., *Residential traffic exposure and childhood leukemia: A systematic review and meta-analysis*, *Am. J. Prev. Med.*, 46(4):413-422 at 413 (2018) <http://europepmc.org/articles/pmc5779082?pdf=render>.

¹⁶⁶ Juleen Lam et al., *A systematic review and meta-analysis of multiple airborne pollutants and autism spectrum disorder*, *PLoS ONE*, 11(9):1-27 (2016) <https://doi.org/10.1371/journal.pone.0161851>.

¹⁶⁷ Frederica Perera et al., *Early-life exposure to polycyclic aromatic hydrocarbons and ADHD behavior problems*, *PLoS ONE*, 9(11):1-9 (2014) <https://doi.org/10.1371/journal.pone.0111670>.

¹⁶⁸ Mingyu Zhang et al., *Maternal exposure to ambient particulate matter $\leq 2.5 \mu\text{m}$ during pregnancy and the risk for high blood pressure in childhood*, *Hypertension*, 72(1):194-201 (2018) <https://doi.org/10.1161/HYPERTENSIONAHA.117.10944>.

¹⁶⁹ Michael Jerrett et al., *Traffic-related air pollution and obesity formation in children: A longitudinal, multilevel analysis*, *Environ. Health*, 13(49):1-9 (2014) <https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-13-49>.

¹⁷⁰ Insa Korten et al., *Air pollution during pregnancy and lung development in the child*, *Paediatr. Respir. Rev.*, 21:38-46 (2017) <https://doi.org/10.1016/j.prrv.2016.08.008> (restricted access, available upon request).

¹⁷¹ Insa Korten et al., *Air pollution during pregnancy and lung development in the child*, *Paediatr. Respir. Rev.*, 21:38-46 at 43 (2017) <https://doi.org/10.1016/j.prrv.2016.08.008> (restricted access, available upon request).

- C.64. Maternal exposure to air pollution during pregnancy also increases the newborn's risk of being stillborn,¹⁷² born preterm, underweight, or dying during infancy.¹⁷³ Babies born preterm or underweight who survive infancy have an elevated risk of lifelong disability¹⁷⁴ and poor health,¹⁷⁵ including heart disease and diabetes.¹⁷⁶
- C.65. In the brain, childhood exposure to air pollution can impact a child's ability to learn.¹⁷⁷ Such exposure has also been linked to higher rates of depression,¹⁷⁸ anxiety,¹⁷⁹ suicide risk,¹⁸⁰ and neurodevelopmental disorders such as autism.¹⁸¹ Such exposure has also been associated with increased risk of schizophrenia.¹⁸²
- C.66. Air pollution from burning fossil fuels can trigger or worsen juvenile idiopathic arthritis.¹⁸³

¹⁷² Kaili Zhang et al., *Association between atmospheric particulate matter and adverse pregnancy outcomes in the population*, Int. J. Clin. Exp. Med., 9(11):20594-20604 at 20600 (2016) (Regarding stillbirth, further studies are needed. Some studies have found a positive association between particulate matter and stillbirth, but results are inconsistent) <https://e-century.us/files/ijcem/9/11/ijcem0036940.pdf>.

¹⁷³ Insa Korten et al., *Air pollution during pregnancy and lung development in the child*, Paediatr. Respir. Rev., 21:38-46 at 43-44 (2017) <https://doi.org/10.1016/j.prrv.2016.08.008> (restricted access, available upon request).

¹⁷⁴ Christopher P. Howson et al., *Born too soon: Preterm birth matters*, Reprod. Health, 10(Supp. 1):1-9 at 1 (2013) <https://pubmed.ncbi.nlm.nih.gov/24625113/>.

¹⁷⁵ Mabel Andalón et al., *Weather shocks and health at birth in Colombia*, World Dev., 82:69-82 at 69 (2016), <https://doi.org/10.1016/j.worlddev.2016.01.015> (restricted access, available on request).

¹⁷⁶ Pin Wang et al., *Temperature variability and birthweight: Epidemiological evidence from Africa*, Environ. Intl., 173(107792):1-9 at 1-2 (2023) <https://doi.org/10.1016/j.envint.2023.107792>; Mabel Andalón et al., *Weather shocks and health at birth in Colombia*, World Dev., 82:69-82 at 69 (2016), <https://doi.org/10.1016/j.worlddev.2016.01.015> (restricted access, available on request).

¹⁷⁷ Annalisa Castagna et al., *Air pollution and neurodevelopmental skills in preschool- and school-aged children: A systematic review*, Neurosci. Biobehav. Rev., 136(104623) (2022) <https://www.sciencedirect.com/science/article/abs/pii/S0149763422001129>.

¹⁷⁸ Cristina Vert, *Effect of long-term exposure to air pollution on anxiety and depression in adults: A cross-sectional study*, Int. J. Hyg. Environ. Health, 220(6):1074-1080 (2017) <https://pubmed.ncbi.nlm.nih.gov/28705430/>.

¹⁷⁹ Isobel Braithwaite et al., *Air pollution (particulate matter) exposure and associations with depression, anxiety, bipolar, psychosis and suicide risk: A systematic review and meta-analysis*, Environ. Health Perspect., 127(12):1-23 (2019) <https://pubmed.ncbi.nlm.nih.gov/31850801/>.

¹⁸⁰ Isobel Braithwaite et al., *Air pollution (particulate matter) exposure and associations with depression, anxiety, bipolar, psychosis and suicide risk: A systematic review and meta-analysis*, Environ. Health Perspect., 127(12):1-23 (2019) <https://pubmed.ncbi.nlm.nih.gov/31850801/>.

¹⁸¹ Lucio G. Costa et al., *Effects of air pollution on the nervous system and its possible role in neurodevelopmental and neurodegenerative disorders*, Pharmacol. Ther., 210(107523):1-47 (2020) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7245732/>.

¹⁸² Henriette Thisted Horsdal et al., *Association of childhood exposure to nitrogen dioxide and polygenic risk score for schizophrenia with the risk of developing schizophrenia*, JAMA Network Open, 2(11):1-12 (2019) <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2753791>.

¹⁸³ Sylvia C.L. Farhat et al., *Air pollution in autoimmune rheumatic diseases: A review*, Autoimmun. Rev., 11(1):14-21 (2011) <https://www.sciencedirect.com/science/article/abs/pii/S1568997211001509> (restricted access, available on request).

- C.67. Exposure to environmental air pollutants can **increase a child's risk of developing asthma 60-fold**.¹⁸⁴
- C.68. Once a child has asthma, exposure to fossil fuel pollution can trigger or worsen asthma attacks.¹⁸⁵ Severe asthma attacks can be fatal.
- C.69. When pollutants from fossil fuel combustion interact with sunlight on a hot day, the combination produces tropospheric ozone (O₃). This pollutant increases asthmatic children's need for emergency medication and heightens allergies.¹⁸⁶
- C.70. Plants produce more pollen in response to higher atmospheric levels of CO₂, and children under 24 months are especially vulnerable to developing "early wheeze" as a result, especially in agricultural communities.¹⁸⁷

Key finding #6:

Climate change has particularly deleterious effects on child mental health

- C.71. Children are in a formative window of psychosocial development.¹⁸⁸ As a child develops through adolescence, their mental health loses plasticity and begins to take on a trajectory.¹⁸⁹ Although a trajectory is not destiny, exposure to severe stressors during childhood tends to have a formative impact on child mental health going forward in life.¹⁹⁰
- C.72. Dramatic disasters such as cyclones, floods, wildfires, and landslides negatively impact child mental health,¹⁹¹ and can be inherently traumatic.
- C.73. Slower-onset climate harms can be even more harmful. A meta-analysis of studies looking at the health impacts of extreme weather disasters on children found that "the cumulative stress brought on by **slower-onset but chronic** climate related

¹⁸⁴ Jessica Stern et al., *Asthma epidemiology and risk factors*, Semin. Immunopathol., 42:5-15 at 6, 10 (2020) <https://doi.org/10.1007/s00281-020-00785-1> (restricted access, available on request).

¹⁸⁵ See Susan C. Anenberg et al., *Long-term trends in urban NO₂ concentrations and associated paediatric asthma incidence: Estimates from global datasets*, Lancet, 6(1): e49-e58 at e49 (2022) <https://www.thelancet.com/action/showPdf?pii=S2542-5196%2821%2900255-2>.

¹⁸⁶ Gennaro D'Amato et al., *The effects of climate change on respiratory allergy and asthma induced by pollen and mold allergens*, Allergy, 75:2219-2228 at 2225 (2020) <https://doi.org/10.1111/all.14476>.

¹⁸⁷ Gennaro D'Amato et al., *The effects of climate change on respiratory allergy and asthma induced by pollen and mold allergens*, Allergy, 75(9):2219-2228 at 2223 (2020) <https://doi.org/10.1111/all.14476>.

¹⁸⁸ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, Clin. Psychol. Sci., 10(4):767-785 at 767 (2021) <https://doi.org/10.1177/21677026211040787>.

¹⁸⁹ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, Clin. Psychol. Sci., 10(4):767-785 at 769 (2021) <https://doi.org/10.1177/21677026211040787>.

¹⁹⁰ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, Clin. Psychol. Sci., 10(4):767-785 at 772-775 (2021) <https://doi.org/10.1177/21677026211040787>.

¹⁹¹ Nick Obradovich et al., *Empirical evidence of mental health risks posed by climate change*, PNAS, 115(43):10953-10958 at 10953 (2018) <https://doi.org/10.1073/pnas.18015281>.

changes like severe drought or sea-level rise” tend to lead to **the most “serious mental health problems** including depression and suicidality.”¹⁹²

- C.74. Severe climate stressors often leave children struggling with post-traumatic stress disorder,¹⁹³ depression, anxiety, phobias, sleep disorders, attachment disorders, substance abuse, and suicidality.¹⁹⁴
- C.75. These mental health struggles in turn can lead to problems with emotion regulation, cognition, learning, behavior, language development, and academic performance.
- C.76. Exposure to climate disasters also adversely affects children's ability to learn effectively due to family loss or separation, school interruption, scarcities of food or water, home evacuation, and public service outages during crucial stages of their growth and development.¹⁹⁵
- C.77. Climate change can impact a child's **sense of hope** by diminishing their ability to realistically imagine a viable future for themselves. A 2022 UNICEF poll of almost 250,000 respondents worldwide found that **two-thirds of young people** in Latin America and the Caribbean considered moving to another city or country because of climate change.¹⁹⁶

¹⁹² Susie E. L. Burke et al., *The psychological effects of climate change on children*, Curr. Psychiatry Rep. 20(35):1-8 at 3 (2018), <https://doi.org/10.1007/s11920-018-0896-9> (restricted access, available upon request).

¹⁹³ Compare Robert Kohn et al., *Psychological and psychopathological reactions in Honduras following Hurricane Mitch: Implications for service planning*, Pan Am. J. Public Health, 18:287-295 at 292 (2005) (10% of adult victims of Hurricane Mitch in Honduras developed PTSD) <https://pubmed.ncbi.nlm.nih.gov/16354426/> (restricted access, available upon request), with Annette M. La Greca et al., *Hurricane-related exposure experiences and stressors, other life events, and social support: Concurrent and prospective impact on children's persistent posttraumatic stress symptoms*, J. Consult. Clin. Psychol., 78(6):794-805 (2010) (33% of child victims of Hurricane Katrina in Louisiana developed PTSD) <https://doi.org/10.1037/a0020775> (restricted access, available upon request).

¹⁹⁴ Susie E. L. Burke et al., *The psychological effects of climate change on children*, Curr. Psychiatry Rep., 20(35):1-8 (2018) <https://doi.org/10.1007/s11920-018-0896-9> (restricted access, available upon request); Hanna-Andrea Rother et al., *Impact of extreme weather events on Sub-Saharan African child and adolescent mental health: The implications of a systematic review of sparse research findings*, J. Clim. Change Health, 5(100087):1-7 (2021) <https://doi.org/10.1016/j.joclim.2021.100087>; see also Lukoye Atwoli et al., *Mental health and climate change in Africa*, BJ Psych. Intl., 19(4):86-89 at 87 (2022) <https://www.cambridge.org/core/services/aop-cambridge-core/content/view/65A414598BA1D620F4208A9177EED94B/S2056474022000149a.pdf/mental-health-and-climate-change-in-africa.pdf>; Harvard School of Public Health, *Climate change and mental health* <https://www.hsph.harvard.edu/c-change/subtopics/climate-change-and-mental-health/> (last accessed Dec. 6, 2023).

¹⁹⁵ Federica Perera et al., *Climate change, fossil-fuel pollution, and children's health*, N. Engl. J. Med., 386:2303-2314 at 2304-2307 (2022) <https://www.nejm.org/doi/full/10.1056/NEJMra2117706>; Daniel Martinez Garcia et al., *Extreme weather-driven disasters and children's health*, Int. J. Health Serv., 46 (1):79 at 88 (2016) (“Abrupt disruptions in a child's life such as family loss or separation; school interruption; changes in food and water supply and shelter conditions; and public service outages may cause direct acute shock and other emotional trauma, as well as longer-term indirect effects.”) <https://doi.org/10.1177/0020731415625254>.

¹⁹⁶ UN News, *Young people reconsidering parenthood due to climate change, UNICEF poll reveals*, <https://news.un.org/en/story/2022/11/1130377> (last accessed Dec. 6, 2023).

C.78. More broadly, child mental health is negatively impacted by an awareness of the gravity and urgency of climate change, commonly referred to as climate anxiety.¹⁹⁷ A global survey of 10,000 children—including from low-middle income countries—found that,

[a] large proportion of children and young people around the world report emotional distress and a wide range of **painful, complex emotions** (sad, afraid, angry, powerless, helpless, guilty, ashamed, despair, hurt, grief, and depressed). Similarly, large numbers report experiencing some functional impact and have pessimistic beliefs about the future (people have failed to care for the planet; the future is frightening; humanity is doomed; they won't have access to the same opportunities their parents had; things they value will be destroyed; security is threatened; and they are hesitant to have children).¹⁹⁸

C.79. Children's climate anxiety is exacerbated by a **sense of betrayal at government actions** that continue to contribute to climate change, as well as woefully inadequate government efforts to address the problem.¹⁹⁹

C.80. Many children are exposed to multiple harms from climate change that cut across many layers of their lived experience. As the various layers of climate risk overlap and compound, they impose a mounting psychological toll on young people²⁰⁰ and

¹⁹⁷ Caroline Hickman et al., *Climate anxiety in children & young people and their beliefs about government and responses to climate change: A global survey*, Lancet Planet. Health., 5(12):e863-e873 at e870 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3); and Susie E. L. Burke et al., *The psychological effects of climate change on children*, Curr. Psychiatry Rep., 20(35):1-8 (2018) <https://doi.org/10.1007/s11920-018-0896-9> (restricted access, available upon request).

¹⁹⁸ Caroline Hickman et al., *Climate anxiety in children and young people and their beliefs about government and responses to climate change: A global survey*, Lancet Planet. Health, 5(12):e863-e873 at e870 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3) (emphasis added).

¹⁹⁹ Caroline Hickman et al., *Climate anxiety in children and young people and their beliefs about government and responses to climate change: A global survey*, Lancet Planet. Health, 5(12):e863-e873 at e870 (2021) [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3).

²⁰⁰ See, e.g., UNHCR, *Analytical study on the relationship between climate change and the full and effective enjoyment of the rights of the child*, A/HRC/35/13 at 18 (2017) <https://www.ohchr.org/en/documents/reports/analytical-study-relationship-between-climate-change-and-full-and-effective> ("Climate change and the impacts of traumatic stress connected to climate change, such as war/insecurity, sexual and physical violence and witnessing deaths and injury related to extreme weather disasters, negatively affect children's mental health. Children who lose a family member or experience life-threatening situations as a result of the impacts of climate change have a higher chance of experiencing post-traumatic stress, anxiety disorders, suicidal ideation, and depression. Disasters can also affect children's cognitive capacity with corresponding impacts on their emotional well-being. For example, children affected by El Niño during early childhood posted lower scores in language development, memory and spatial reasoning than other children of a similar age. [...] Lower cognitive functioning in early life has been shown to increase the risk of future mental health problems. [...]"); Zhiwei Xu et al., *Climate change and children's health: A call for research on what works to protect children*, Int. J. Environ. Res. Public Health, 9:3298-3316 at 3308 (2012) ("Climate change is threatening a number of fragile ecosystems [...]. Children's health depends on the continuous supply of various ecological services—'the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life' [...], and ecological services are underpinned by biodiversity which is also threatened by a number of climate change mechanisms. In addition,

can predispose them to having adverse mental health outcomes as adults.²⁰¹

C.81. These harms are exacerbated by the fact that mental health is under-resourced in Latin America. Latin America has only 9 mental health workers per 100,000 people, as compared to 69 in the Caribbean and 125 in the United States.²⁰² In addition, the mental health resources that currently exist in Latin America are generally not child- and adolescent-friendly due to a lack of professional training programs in child and adolescent mental health.²⁰³

Key finding #7:

Climate change especially burdens children in situations of intersectional vulnerability

C.82. Climate change operates as a risk multiplier. It compounds risks for populations that are already in situations of vulnerability because such populations have a more limited capacity to adapt to or avoid new threats and impacts.²⁰⁴ Thus, intensification of the climate emergency will further endanger child health by worsening global inequality and environmental injustice.²⁰⁵

C.83. Children in poverty bear a disproportionate burden.²⁰⁶ Due to a lack of structural and economic resources, children in low-middle income countries such as Bolivia, Haiti, Honduras, and Nicaragua²⁰⁷ are more susceptible to the consequences of climate change than are children living in high-income (and high emitting) countries such as the United States and Canada.²⁰⁸ Low-middle income countries will experience an increased burden of avoidable deaths among children under 5 years old due to the projected increase in diarrhea, malaria, and nutritional deficiencies that will be

rising sea levels and inundation of coastal areas, exacerbated by climate change, could render major disruption of social systems.”) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3499869/pdf/ijerph-09-03298.pdf> (last accessed Dec. 6, 2023).

²⁰¹ Susie E. L. Burke et al., *The psychological effects of climate change on children*, Curr. Psychiatry Rep., 20(35):1-8 (2018) <https://doi.org/10.1007/s11920-018-0896-9> (restricted access, available upon request).

²⁰² Robert Kohn et al., *Mental health in the Americas: An overview of the treatment gap*, Rev. Panam. Salud Publica, 42:1-10 at 4 (2018) <https://doi.org/10.26633/RPSP.2018.165>.

²⁰³ Robert Kohn et al., *Mental health in the Americas: An overview of the treatment gap*, Rev. Panam. Salud Publica, 42:1-10 at 5 (2018) <https://doi.org/10.26633/RPSP.2018.165>.

²⁰⁴ Francis Vergunst et al., *Climate change and children's mental health: A developmental perspective*, Clin. Psychol. Sci., 10(4):767–785 at 768 (2021) <https://doi.org/10.1177/21677026211040787>.

²⁰⁵ Frederica Perera, *Pollution from fossil-fuel combustion is the leading environmental threat to global pediatric health and equity: Solutions exist*, Int. J. Environ. Res. Public Health, 15(16):1-17 at 1 (2018) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5800116/pdf/ijerph-15-00016.pdf>.

²⁰⁶ Frederica Perera, *Pollution from fossil-fuel combustion is the leading environmental threat to global pediatric health and equity: Solutions exist*, Int. J. Environ. Res. Public Health, 15(16):1-17 at 1 (2018) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5800116/pdf/ijerph-15-00016.pdf>.

²⁰⁷ World Bank, *World bank country and lending groups* (2023) <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups> (last accessed Dec. 6, 2023).

²⁰⁸ The World Resources Institute, *This interactive chart shows changes in the world's top 10 emitters*, World Resources Institute, <https://www.wri.org/insights/interactive-chart-shows-changes-worlds-top-10-emitters> (last accessed Dec. 6, 2023).

caused by climate change.²⁰⁹ Low-middle income countries will also experience an increase in the risk of pregnancy complications, preterm delivery, and low birthweight due to the expected increase in malaria, dengue fever, and schistosomiasis among pregnant women due to climate change.²¹⁰

- C.84. Indigenous populations are at disproportionate risk of climate-related increases in infectious tropical disease due to inadequate access to healthcare, extreme poverty, and the fact that their native lands are often exploited for mining and other forms of environmental degradation.²¹¹ Such situations are unfolding among the Yanomami Indigenous people in Amazonian Venezuela and Brazil, the Wayuu in La Guajira in Colombia near the Venezuela border, and others.²¹²
- C.85. Although wildfire smoke causes two premature deaths per 100,000 people annually across South America on average, **wildfire smoke is twice as deadly in Indigenous territories**—and in some Indigenous territories in Bolivia and Brazil, it is **six times** as deadly.²¹³

Conclusion

- C.86. There are moments in history when simply following inherited norms by perpetuating an unjust status quo is insufficient and unacceptable. Instead, such moments call us to rise to the generational challenge and do what is necessary for continued human progress and survival. The climate emergency presents us with such a moment.
- C.87. When a newborn takes their first breaths in the world, their breaths should be clear and easy. That is their birthright. Yet as pediatricians, we see increasing number of newborns whose **first breaths are full of struggle, pain, and peril**. For what noble purpose are these tiny, innocent beings—who had no part in creating this crisis—making such a tremendous sacrifice? It is for no purpose other than to pay for States' desire to continue emitting greenhouse gases with indifference to the result.

²⁰⁹ Emmanuelle Arpin et al., *Climate change and child health inequality: A review of reviews*, Int. J. Environ. Res. Public Health, 18(10896):1-17 at 1-2 (2021)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8535343/pdf/ijerph-18-10896.pdf>; Rebecca P. Philipsborn et al., *Climate change and global child health*, Pediatrics, 141(6):1-5 at 1-2 (2018)

<https://doi.org/10.1542/peds.2017-3774> (restricted access, available upon request).

²¹⁰ Charlotta Rylander et al., *Climate change and the potential effects on maternal and pregnancy outcomes: An assessment of the most vulnerable — the mother, fetus, and newborn child*, Glob. Health Action, 6(19538):1-9 at 3 (2013) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3595418/pdf/GHA-6-19538.pdf>.

²¹¹ Peter J. Hotez et al., Central Latin America: Two decades of challenges in neglected tropical disease control, PLoS Negl. Trop. Dis., 14(3):1-7 at 5 (2020) <https://doi.org/10.1371/journal.pntd.0007962>.

²¹² Peter J. Hotez et al., Central Latin America: Two decades of challenges in neglected tropical disease control, PLoS Negl. Trop. Dis., 14(3):1-7 at 5 (2020) <https://doi.org/10.1371/journal.pntd.0007962>.

²¹³ Eimy X. Bonilla et al., *Health impacts of smoke exposure in South America: Increased risk for populations in the Amazonian Indigenous territories*, Environ. Res. Health, 1(021007):1-10 at 1 (2023) <https://doi.org/10.1088/2752-5309/acb22b>.

C.88. As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath **to prevent harm and to do no harm**. It is not within our power as pediatricians to compel States to change their behavior to stop making climate change worse. But **it is within this Court's power** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

ANNEX D

Important scientific studies on the limit of atmospheric CO₂ required to protect human rights

This annex presents a curated bibliography of important scientific studies, going back to 2008. These studies address why the annual mean concentration of CO₂ in Earth's atmosphere must fall from current levels of ~420 parts per million (a level currently resulting in ~1.1°C to 1.3°C of warming above pre-industrial levels) to below 350 parts per million (the 350 ppm limit) as soon as possible and no later than 2100 to avoid further exacerbating violations of human rights. Additionally, the studies discuss the dangers of remaining above the 350 ppm limit, and the associated risks of reaching and remaining at the Paris temperature target of 1.5°C of warming above pre-industrial levels.

Benjamin W. Abbott and 12 Others, *Accelerating the Renewable Energy Revolution to Get Back to the Holocene*, 11:9 *Earth's Future* 1 (2023)

Link: <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2023EF003639>

Synopsis: This scientific article explains that the UN's Paris Agreement goal of keeping global warming between 1.5°C and 2.0°C is dangerously obsolete, will result in hundreds of millions of pollution deaths, is poised to trigger multiple tipping elements in the Earth system, and imposes an immense burden on young people and future generations. The article further explores ways to avoid these harms via rapid defossilization and climate restoration efforts that are both technically feasible and economically viable.

Katherine Richardson and 28 Others, *Earth Beyond Six of Nine Planetary Boundaries*, 9:37 *Science Advances* 1 (2023)

Link: <https://www.science.org/doi/10.1126/sciadv.adh2458>

Synopsis: This research reinforces that: i) greenhouse gas emissions are one of the most important drivers of anthropogenic impacts on Earth's energy budget; ii) the planetary boundary for atmospheric CO₂ concentration is 350 ppm; iii) human activities brought the climate system outside of its safe operating space around 1988; and iv) today's level of atmospheric CO₂ concentration places Earth even further outside the safe operating space. The research suggests the possibility of extreme Earth system impacts even at 1.5°C warming, with risks already markedly increasing above 1.0°C of warming.

Johan Rockström and 50 Others, *Safe and Just Earth System Boundaries*, 619 *Nature* 102 (2023)

Link: <https://www.nature.com/articles/s41586-023-06083-8>

Synopsis: This study proposes various Earth system boundaries for maintaining the resilience and stability of the Earth system and minimizing exposure to significant harm to humans from Earth system change. The study determines that the just boundary for avoiding significant harm to tens of millions of people should be set at or below 1.0°C of average surface temperature

increase above pre-industrial levels, which is only achieved through keeping atmospheric CO₂ below 350 ppm.

Nico Wunderling and 7 Others, *Global Warming Overshoots Increase Risks of Climate Tipping Cascades in a Network Model*, 13 Nature Climate Change 75 (2022)

Link: <https://www.nature.com/articles/s41558-022-01545-9>

Synopsis: This study looks at a range of temperature overshoot scenarios using a stylized network model of four interacting climate tipping elements to investigate the danger of crossing tipping-point thresholds and the high likelihood of crossing these thresholds under current policies and actions. It also identifies a high climate-risk zone at or above 1.5°C and explains that to avoid tipping events final convergence temperatures must fall substantially below 1.5°C in the long run with safe levels found only at global temperatures lower than the current levels.

David Armstrong McKay and 9 Others, *Exceeding 1.5°C Global Warming Could Trigger Multiple Climate Tipping Points*, 377:6611 Science 1 (2022)

Link: <https://www.science.org/doi/10.1126/science.abn7950>

Synopsis: This scientific article identifies a series of irreversible climate tipping points in Earth's climate system that are increasingly likely to be triggered as global average surface temperature increases to 1.5°C or 2.0°C above pre-industrial levels, leading to dramatic and difficult to predict consequences for all other regions of the world. Avoiding such tipping points, or a safe climate system, is only possible by maintaining a climate with a global mean temperature less than 1.0°C.

Will Steffen and 17 Others, *Planetary Boundaries: Guiding Human Development on a Changing Planet*, 347:6223 Science 736 (2015)

Link: <https://www.science.org/doi/10.1126/science.1259855>

Synopsis: This article updates the planetary boundary framework to identify levels of anthropogenic perturbations below which the risk of destabilization of the Earth System is likely to remain low. Based on analysis of several human factors affecting Earth System functioning, the article narrows the planetary boundary to 350 to 450 ppm, with climate risks increasing above 350 ppm, and cautions against moving too far away from a Holocene-like state. It finds that the upper limit for a safe climate is atmospheric CO₂ <350 ppm.

James Hansen and 17 Others, *Assessing “Dangerous Climate Change”: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature*, 8:12 PLOS ONE 1 (2013)

Link: <https://doi.org/10.1371/journal.pone.0081648>

Synopsis: This scientific article analyzes different sets of climate data to conclude that society should reassess what constitutes a “dangerous level” of global warming. It uses the atmospheric CO₂ limit of <350ppm to determine the magnitude of emission reduction needed to stabilize the climate system and

avoid potentially disastrous impacts on young people, future generations, and nature.

Johan Rockström and 28 Others, *A Safe Operating Space for Humanity*, 461 Nature 472 (2009)

Link: <https://www.nature.com/articles/461472a>

Synopsis: This article identifies and proposes several planetary boundaries that, if transgressed, will increase the risk of irreversible climate change. It cautions that human changes to atmospheric CO₂ should not exceed 350 ppm by volume if human development is to continue.

James Hansen and 9 Others, *Target Atmospheric CO₂: Where Should Humanity Aim?*, 2 The Open Atmospheric Science Journal 217 (2008)

Link: <https://openatmosphericsciencejournal.com/contents/volumes/V2/TOASCJ-2-217/TOASCJ-2-217.pdf>

Synopsis: This study uses paleoclimate data to show that long-term climate has high sensitivity to climate forcings and that the global mean CO₂ of 385 ppm is in the dangerous zone. It further explains that an initial CO₂ target of 350 ppm is supported by the data and necessary to avoid irreversible catastrophic effects and maintain the climate to which humanity, wildlife, and the rest of the biosphere are adapted.

Annex E

The 1.5°C temperature target conflicts with numerous provisions of the American Convention on Human Rights, United Nations Framework Convention on Climate Change, and Paris Agreement and should be replaced with a science-aligned target that protects human rights for all

- E.1. It is well established that this Court has broad and non-restrictive authority to interpret other treaties concerning the protection of human rights in the American States.¹ This is relevant because the States of Colombia and Chile have asked this Court to address States' obligations to prevent climate phenomena in light of the American Convention on Human Rights ("Convention") **together with the Paris Agreement**.²
- E.2. While courts are often asked about States' obligations with respect to the temperature targets of 1.5°C-2.0°C set forth in Art. 2 §(1)(a) of the Paris Agreement, courts are **rarely** asked to carefully consider the broader commitments within the Paris Agreement and its relationship with human rights instruments.³ Consequently, the Court's opinion on this question asked by Colombia and Chile will set—and steer—the trajectory of this global conversation.
- E.3. Importantly, since all OAS Member States have also ratified the United Nations Framework Convention on Climate Change ("UNFCCC") and the Paris Agreement, States have dual obligations stemming from the Convention as well as the international climate instruments. In addition to the obligation to use best available science to address the climate crisis,⁴ the Convention, this Court's jurisprudence

¹ American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 64(1); and I/A Court H.R., *Juridical Condition and Rights of Undocumented Migrants*, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 53 (This Court "has established some guidelines on the interpretation of international norms other than the American Convention. Principally, it has considered that that Article 64(1) [...] when referring to the authority of the Court to provide an opinion on 'other treaties concerning the protection of human rights in the American States,' is broad and non-restrictive.") *see also* paras 48 and 54.

² I/A Court H.R., *Request for an Advisory Opinion submitted by Chile and Colombia on the Climate Emergency and Human Rights*, January 9, 2023, IV(A)(1).

³ *Amici* found two cases raising States' commitments under the Paris Agreement unrelated to Art. 2§(1)(a) however there could be more. See Land Court of Queensland, *Waratah Coal v. Youth Verdict*, QLC 21 (2022) (Raising the issue of nationally determined contributions and commitments to provide support in finance, technology, development and transfer and capacity building.) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2022/20221125_2020-QLC-33-2021-QLC-4-2021-QLC-36-2022-QLC-3-2022-QLC-4_decision.pdf; and Constitutional Court of Colombia, *Huffington Archbold v. Office of the President*, Sentencia, T-333/22 (commenting on adaptation obligations) https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2022/20220926_T-333-of-2022_decision.pdf.

⁴ United Nations Framework Convention on Climate Change, Art. 4 §2(d) (May 9, 1992); Paris Agreement, Preamble, Arts. 4 §1 and 14§1 (Dec. 12, 2015); Glasgow Climate Pact, I §1 (Nov. 13, 2021); I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, paras. 142, 172, 174.

and Advisory Opinions, the UNFCCC, and the Paris Agreement—obligate OAS Member States to:

- a. ensure equity;⁵
- b. support persons in vulnerable situations, especially children;⁶
- c. safeguard food security;⁷
- d. eradicate poverty;⁸
- e. protect the integrity of ecosystems and biodiversity;⁹

⁵ United Nations Framework Convention on Climate Change, Art. 3 §1 (May 9, 1992) (“The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity [...]”); Paris Agreement, Preamble, Arts. 2 §2, 4 §1, and 14 §1 (Dec. 12, 2015); American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 24; I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23. para. 67 (“[E]nvironmental damage ‘will be experienced with greater force in the sectors of the population that are already in a vulnerable situation’; hence, based on ‘international human rights law, States are legally obliged to confront these vulnerabilities based on the principle of equality and non-discrimination.’”).

⁶ Paris Agreement, Preamble (Dec. 12, 2015); American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 19; and I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23. para. 67 (“States are legally obliged to confront these vulnerabilities based on the principle of equality and non-discrimination. Various human rights bodies have recognized that [...] children [...] are especially vulnerable to environmental damage [...].”).

⁷ United Nations Framework Convention on Climate Change, Art. 2 (May 9, 1992) (“The ultimate objective of this Convention and any related legal instruments [...] is to achieve [...] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved [...] to ensure that food production is not threatened [...]”); Paris Agreement, Preamble and Art. 2 §1(b) (Dec. 12, 2015) (“Recognizing the fundamental priority of safeguarding food security [...]” and “foster[ing] climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production.”); I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 109 (“Among the conditions required for a decent life [...] access to, and the quality of [...] food [...] has been defined in the Court’s case law, indicating that these conditions have a significant impact on the right to a decent existence and the basic conditions for the exercise of other human rights.”) *see also* paras. 54, 66, 111, 117, 121.

⁸ United Nations Framework Convention on Climate Change, Preamble (May 9, 1992) (“[R]esponses to climate change should be [...] for the achievement of [...] the eradication of poverty.”); Paris Agreement, Art. 2 §1 (Dec. 12, 2015) (“This Agreement [...] aims to strengthen the global response to the threat of climate change, in the context of [...] efforts to eradicate poverty [...]”), *see also* Preamble, Arts. 4 §1 and 6 §8; and I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, Para. 67 (“States are legally obliged to confront these vulnerabilities based on the principle of equality and non-discrimination. Various human rights bodies have recognized that [...] people living in extreme poverty [...] are especially vulnerable to environmental damage.”), *see also* para. 22.

⁹ Paris Agreement, Preamble (Dec. 12, 2015) (“Noting the importance of ensuring the integrity of all ecosystems [...] and the protection of biodiversity [...]”), and I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 126 (“The Court notes that international environmental law contains numerous specific obligations [...] such as treaties and conventions on [...] biodiversity, and the protection of ecosystems or conservation of certain species.”) *see also* paras. 60, 142, 183.

- f. avert and minimize loss and damage associated with climate change;¹⁰ and
 - g. promote obligations to human rights and human health.¹¹
- E.4. Examples found throughout the main submission, Annex B, Annex C, the *Pediatric societies' declaration on responding to the impact of climate change on children* in Annex G, and Annex H together with an immense body of scientific evidence demonstrate how **1.5°C is wholly incompatible with, contrary to, and in some instances violates** numerous substantive commitments States have made pursuant to Convention, Paris Agreement, and underlying UNFCCC.¹² If the Court would like *Amici* to compile a synopsis of key scientific findings from the information included in this submission and/or other sources, we will do so upon request. However, the incompatibility of 1.5°C and human rights can be summed up the IPCC's consensus finding that,

“Warming of 1.5°C is not considered ‘safe’ [...] and poses significant risks to natural and human systems as compared to the current warming of 1°C [...]. The impacts of 1.5°C of warming would disproportionately affect disadvantaged and vulnerable populations through food insecurity, higher food prices, income losses, lost livelihood opportunities, adverse health impacts and population displacements [...]. Some of the worst impacts on sustainable development are expected to be felt among [...] children.”¹³

¹⁰ United Nations Framework Convention on Climate Change, Art. 3 §3 (May 9, 1992) (“Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.”); Paris Agreement, Art. 8 §1 (Dec. 12, 2015) (Recognizing “the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change [...]”); and I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 127 (The obligation of prevention “encompasses all the diverse measures that promote the safeguard of human rights.”), see also paras. 147, 171-174, 242(b).

¹¹ United Nations Framework Convention on Climate Change, Art. 4 §1(f) (May 9, 1992) (“[E]mploy appropriate methods [...] with a view to minimizing adverse effects [...] on public health [...]”); Paris Agreement, Preamble (Dec. 12, 2015) (“Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health [...]”); and I/A Court H.R., *The Environment and Human Rights*, Advisory Opinion OC-23/17 of November 15, 2017. Series A No. 23, para. 47 (“This Court has recognized the existence of an undeniable relationship between the protection of the environment and the realization of other human rights, in that environmental degradation and the adverse effects of climate change affect the real enjoyment of human rights.”) see also paras. 59, 109, 127, 221.

¹² 1.5°C is also incompatible with States’ obligations pursuant to a myriad of other treaties and international laws including the Stockholm Declaration on the Human Environment (1972), Convention on the Law of the Sea (1982), Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (1986), Rio Declaration on Environment and Development (1992), and the Convention on Biological Diversity (1992).

¹³ IPCC *Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C*, at 44 (2019) (Warming of 1.5°C is not considered “safe” [...] and poses significant risks to natural and human systems as compared to the current warming of 1°C [...]. The impacts of 1.5°C of warming would disproportionately affect disadvantaged and vulnerable populations through food insecurity, higher food

- E.5. In light of strong scientific consensus that 1.5°C is unsafe and unprotective of human rights, it would be within the Court's authority to find that Art. 2 §1(a) of the Paris Agreement is in conflict with States' existing human rights commitments pursuant to their international human rights obligations derived from the Convention and other Inter-American treaties¹⁴ and, in turn, obligate States to strengthen Art. 2 §1(a) to bring it into alignment with the best available science.

prices, income losses, lost livelihood opportunities, adverse health impacts and population displacements [...]. Some of the worst impacts on sustainable development are expected to be felt among [...] children [...].") https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_LR.pdf; see also Annex B.

¹⁴ American Convention on Human Rights, O.A.S. Treaty Series, No. 36 of November 22, 1969, Art. 64(1); and I/A Court H.R., Juridical Condition and Rights of Undocumented Migrants, Advisory Opinion OC-18/03 of September 17, 2003. Series A No. 18, para. 53 (This Court "has established some guidelines on the interpretation of international norms other than the American Convention. Principally, it has considered that that Article 64(1) [...] when referring to the authority of the Court to provide an opinion on 'other treaties concerning the protection of human rights in the American States,' is broad and non-restrictive.") see also paras 48 and 54.

Annex F

Synopsis and links: Roadmaps to transition States to 100% clean, renewable energy to curtail global warming, air pollution, and risks to energy security

Energy scientists, led by Dr. Mark Jacobson, have prepared country-by-country roadmaps for 20 out of the 23 States that are subject to the jurisdiction of this Court.¹ These roadmaps set forth a **technically feasible** path to replace 80% of existing fossil fuel energy by 2030 and 100% by no later than 2050, and as early as 2035. In addition to direct climate benefits, this transition to 100% renewables by 2050 is **economically beneficial** and **protective of human rights**. This transition would create jobs, reduce air pollution, and save costs and lives.

Totals from the Compilation of the Roadmaps

Once these 20 States convert from fossil fuels to 100% renewables, together they will:

- a. eliminate approximately 3.7 billion metric tons of CO₂ per year;
- b. save approximately \$2.7 trillion US dollars per year in social costs;²
- c. save over \$591 billion US dollars per year in annual energy costs;
- d. add net 1.29 million long-term, full-time jobs to the economy;
- e. prevent approximately 200,000 deaths related to air pollution each year; and
- f. reduce the amount of energy required to power the States by 56.7% because renewables are more energy efficient.

The transition to renewables will also substantially reduce the risks associated with energy security³ and the greatest benefits gained will be in the communities currently suffering the worst environmental injustice.⁴

¹ To ensure a conservative approach to assessing the benefits of transitions from fossil-fuel based energy systems to renewables and because of roadmap availability for the OAS Member States that have not ratified the American Convention on Human Rights, only the States that have ratified (and not denounced) the Convention were included in the compiled "Summary of Savings". However, the roadmaps for other OAS Member States are linked to in this Annex. *Amici* are happy to provide "Totals" that include Canada, Cuba, Trinidad and Tobago, the United States, and Venezuela upon request.

² The social savings are estimated by assessing a number of economic costs (e.g. health, loss of life, labor productivity, loss of property, and environmental costs) that are saved with every metric ton of CO₂ that is not emitted.

³ Mark Z. Jacobson et al., *Low-cost solutions to global warming, air pollution, and energy insecurity for 145 countries*, Energy Environ. Sci., 15:3343– 3359 (2022) <https://web.stanford.edu/group/efmh/jacobson/Articles/I/145Country/22-145Countries.pdf>.

⁴ Benjamin W. Abbott et al., *Accelerating the renewable energy revolution to get back to the Holocene*, Earth's Future, 11:1-14 at 6 (2023) <https://doi.org/10.1029/2023EF003639>.

Key Links

- **Roadmaps:** The roadmaps for the 145 countries Dr. Jacobson's team have examined can be accessed here: <https://web.stanford.edu/group/efmh/jacobson/Articles/I/WWWS-145-Countries.html>. Individual links to the countries subject to the jurisdiction of this Court are below.
- **Published study:** The published study about the roadmaps, *Low-cost solutions to global warming, air pollution, and energy insecurity for 145 countries*, is available here: <https://web.stanford.edu/group/efmh/jacobson/Articles/I/145Country/22-145Countries.pdf>.
- **Clickable global map.** An interactive map with links to each country's roadmap can be found here: <https://sites.google.com/stanford.edu/wws-roadmaps/home>.

Links to State Roadmaps, Parties to the American Convention on Human Rights

- | | |
|---------------------------------------|-------------------------------|
| 1. Argentina | 13. Guatemala |
| 2. Barbados (not available) | 14. Haiti |
| 3. Bolivia | 15. Honduras |
| 4. Brazil | 16. Jamaica |
| 5. Chile | 17. Mexico |
| 6. Colombia | 18. Nicaragua |
| 7. Costa Rica | 19. Panama |
| 8. Dominica (not available) | 20. Paraguay |
| 9. Dominican Republic | 21. Peru |
| 10. Ecuador | 22. Suriname |
| 11. El Salvador | 23. Uruguay |
| 12. Granada (not available) | |

Links to State Roadmaps, OAS Member States not party to the American Convention on Human Rights

- | | |
|--|---|
| 24. Antigua & Barbuda (not available) | 31. St. Lucia (not available) |
| 25. Bahamas (not available) | 32. St Vincent & the Grenadines (not available) |
| 26. Belize (not available) | 33. Trinidad and Tobago |
| 27. Canada | 34. United States |
| 28. Cuba | 35. Venezuela |
| 29. Guyana (not available) | |
| 30. St. Kitts and Nevi (not available) | |

About Dr. Mark Jacobson

Dr. Mark Jacobson obtained a B.S. in civil engineering, a B.A. in economics, and an M.S. in Environmental Engineering from Stanford University followed by a M.S. and Ph.D. in Atmospheric Sciences from University of California, Los Angeles. In 1994, Dr. Jacobson became an Assistant Professor in the Department of Civil & Environmental Engineering at Stanford and since 2007 has been a full professor in that Department. At Stanford, Dr. Jacobson is a co-founder and director of the university's Atmosphere/Energy Program as well as a Senior Fellow at Stanford's Precourt Institute for Energy and Woods Institute for the Environment.

Starting in 1999, Dr. Jacobson began examining clean, renewable energy solutions. Since 2008, he has been co-founder and director of The Solutions Project, an organization that utilizes the combined efforts of individuals in the fields of science, business, and culture to accelerate the transition to 100% renewable energy use in the United States. In 2017, this research culminated in the development of roadmaps to transition the all-sector energy infrastructures of 139 countries to 100% clean, renewable energy by 2050, which Dr. Jacobson updated in 2022 and expanded to include 145 countries.

Dr. Jacobson has published six textbooks and over 175 peer-reviewed journal articles. He has won numerous awards including the American Meteorological Society Henry G. Houghton Award, American Geophysical Union Award, Global Green Policy Design Award, Cozzarelli Prize from the Proceedings of the National Academy of Sciences, Judi Friedman Lifetime Achievement Award, and Clean Tech Influencer of the Year Award. He is ranked as the most impactful scientist in the world in the field of meteorology and atmospheric sciences for papers first published after 1985. Dr. Jacobson's career has focused on understanding air pollution and global warming problems and developing large-scale clean, renewable energy solutions to those problems.

ANNEX G

***Pediatric societies' declaration on responding to the impact of climate change
on children, In: The Journal of Climate Change and Health (2021)***

and

**Letters of support from medical associations and professionals worldwide in
relation to climate change and child health**



Contents lists available at ScienceDirect

The Journal of Climate Change and Health

journal homepage: www.elsevier.com/joclim



Pediatric societies' declaration on responding to the impact of climate change on children

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There is a crisis in the global response to the changing climate. Over the last five years, the world has failed to meet the targets established in the 2015 Paris Agreement. [1] Progress on reducing greenhouse gas emissions is lagging particularly far behind. Many high-income countries rank near the bottom in terms of performance on contributions to global ecological sustainability (measured as excess CO₂ emissions relative to 2030 targets). [2] Low-income countries rank near the top with regard to global ecological sustainability. [2] The United Nations Climate Change Conference (COP 26) in November 2021 in Glasgow, Scotland offers an important, indeed essential, opportunity to create sustained momentum for the policies and funding that are required to keep the global temperature rise under 1.5°C to protect human health and the planet.

In 2020 the International Society for Social Pediatrics and Child Health identified the need to rally pediatricians and child health professionals from around the world to address the climate crisis because of its adverse effects on child health. In response, a declaration on responding to the impact of climate change on children was drafted by the International Society for Social Pediatrics and Child Health and subsequently revised and adopted by the International Pediatric Association.

Responding to the impact of climate change on children

Children worldwide are demanding their views on climate change be heard, a right guaranteed by the United Nations Convention on the Rights of the Child. [3–5] They have reason to be concerned—the 2019 report of the Lancet Countdown and multiple other publications document the profound vulnerability of infants, children, and young people to the direct and indirect impacts of climate change on their health and well-being. [6–18]

Child health professionals and organizations must follow the lead of the world's youth and develop long-term relationships with them as we collaboratively respond to the existential threats of the climate crisis on children. No profession will bear witness to the effects of climate change on children to the extent of pediatricians. We are uniquely positioned to engage with other health professionals and child advocates in developing comprehensive strategies to prevent and mitigate the impact of the global climate crisis on children and youth.

We resolve to take the necessary actions to achieve an equitable and just transition to a sustainable planet for all children.

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Toward these ends

Whereas, the Intergovernmental Panel on Climate Change's fourth assessment report concluded the Earth is undergoing adverse global climate change and that man-made contributions are significant; [19] and

Whereas, climate changes have created conditions that affect public health, with disproportionate effects on certain life stages and circumstances, in particular children and those living in poverty and low-income countries; and

Whereas, children are particularly vulnerable because their bodies are growing and developing, they have unique behaviors and interactions with their environment, and they must rely on parents and caregivers to provide for their basic needs; and

Whereas, climate change will affect children's health as a result of their exposure to elevated temperatures; more frequent, severe, or longer-lasting extreme weather events; increasing transmission rates of food, water, and vector-borne diseases; increasing rates of mycotoxin-related illnesses; increases in air pollution from molds, pollens, and the burning of fossil fuels; and mental health stressors; [5–18] and

Whereas, displacement, destruction of infrastructure, and conflicts arising from competition for water, food and other resources will increasingly impact children's health, mental health, and well-being; [20,21] and

Whereas, excessive exploitation of the earth's natural resources by relentless deforestation and overfishing will affect the air quality and threaten the food security of generations to come; and

Whereas, conflict is not only a consequence of climate change (competing for dwindling resources), but also is a primary driver of the exploitation of natural resources to produce military hardware and transport it; and

Whereas, the digitization of our world consumes vast amounts of energy; and

Whereas, children experience different mental health effects than adults during and after disasters—that vary based on their developmental stage and level of cognitive and emotional maturity; [22–25] and

Whereas, the effects of climate change on mental health among children have been reviewed, and researchers have called for identification of "...ways to fortify the societal structures necessary for mental health that climate change threatens to erode" [24];

Therefore, be it resolved, that regional, national, and international pediatric organizations—together with multidisciplinary child health professionals, child advocates, youth, and families—commit to work individually and collectively to minimize the use of fossil fuels, decrease global carbon emissions, protect the earth's natural resources, mitigate the impact of climate change on children, and achieve climate justice in an ecologically grounded and sustainable world, such that, in unison they/we:

Advocate for:

- Local, national, and international policies and strategies that rapidly reduce greenhouse gas emissions and ensure preparedness for climate-associated extreme weather events;
- Sustainable and renewable electricity-generating systems, accessible transportation, plant-based food, and equitable access to green spaces that improve the lives of children and families;
- Sustainable, carbon neutral housing, and upgrading of existing housing stock as a means of reducing childhood respiratory conditions;

- Basic energy-saving strategies in homes, schools, hospitals, and workplaces;
 - Electric vehicles "fueled" by sustainable energy sources as a means of reducing air pollution;
 - Principles of sustainable development [26];
 - Advancing and supporting children and young people's own advocacy and mitigation endeavors on the climate crisis;
 - Engaging clinical and non-clinical staff in practices, hospitals, and health systems; and children, youth, and patients' families, as advocates; and
 - Reducing the carbon and environmental footprint of health facilities by increasing energy efficiency, incorporating renewable energy sources, and reducing waste.
- Educate:

- Child health professionals at all levels of training and in all venues of practice, on all aspects of the climate crisis, including: a) the science of climate change, b) the direct and indirect impact of climate change on child health and well-being, c) strategies for mitigating carbon emissions, d) approaches to preventing and responding to the impact of climate change on children's physical and mental health, and e) how to be effective child health advocates;
- Children and families on climate change and its impact on child health and well-being, in clinical practice and health venues (offices, clinics, hospitals), schools, and other places where children and adults live and learn;
- Elected officials on the risks that climate change poses to child health, by speaking at public hearings and providing expert testimony;
- The general public about the impact of climate change on child health, through letters to the editor and community engagement;
- Pediatric societies about the need to advance and fulfill targets for CO₂ reduction;
- Communities, including professionals and non-professionals of all ages, about how to advocate individually and collectively and work with children to raise awareness and respond to the climate crisis;
- Other child health professionals about integrative and collaborative movements, such as One Health, Planetary Health, and Traditional Ecological Knowledge, which identify the root civil-political, social, economic, cultural, ecological, and philosophical causes of climate change; and
- Families and communities about strategies to maintain resilient ecosystems, protect biodiversity, cultivate inter-species justice, and advance human rights, equity, and social justice.

Take the following additional actions:

- Use the framework of anticipatory guidance at office visits for discussing climate change with families;
- Serve as personal role models for practices that promote environmental sustainability;
- Purchase local and recycled goods and avoid disposable products;
- Develop and disseminate strategies and tools to ensure child health professionals have the capacity to translate the ecological elements of whole child health (such as the need for clean air and water, nutritious food, access to parks and green spaces) into practice;
- Reduce the carbon footprint associated with professional meetings by reducing flying; contracting with "Green" facilities and organizations; and offering primarily vegetarian, climate-conscious, and locally-sourced meals;

- Refuse sponsorship of pediatric meetings by the fossil fuel industry;
- End sponsorship of pediatric meetings by formula and baby food industries and promote breast feeding, which is more environmentally friendly than the production of formula and processed foods;
- Stop the commercial exploitation of children and mitigate its impact on consumerism across the life course;
- Collaborate with health departments, academic institutions, research facilities, and activist groups to enhance surveillance, analysis, and reporting of climate-sensitive health effects on children;
- Strengthen disaster preparedness, in particular as it relates to children and youth;
- Address the harm and manage the damage currently occurring secondary to the impact of climate change by supporting families displaced due to climate change, improving health services and access to care for vector-borne illnesses and heat stroke, expanding vaccine access, and improving housing;
- Participate in and advance research on effects of climate change on child health inequities, and catalyze transformative actions to translate this research into practice; and
- Advance reproductive justice for individuals and families.

Because human-induced climate changes adversely affect children and youth, child health professionals, societies, and organizations must acknowledge the global climate crisis as an existential and universal threat to children's health and well-being. They must proceed forcefully as individuals and jointly as organizations and societies to prevent, mitigate, and decisively correct this impact and fulfill the rights of children to optimal survival and development.

This Declaration builds on previous declarations including the 2012 Doha Declaration on Climate, Health and Wellbeing, [27], the 2019 Declaration of the World Association of Family Doctors, Planetary Health Alliance, Clinicians for Planetary Health Working Group [28] and the 2019 Helsinki Declaration [29]. It also draws on a 2015 policy statement from the American Academy of Pediatrics [7]. The Declaration is consistent with the *Children in All Policies 2030* initiative launched earlier this year [30].

The intended purposes of this Declaration are twofold, to: 1) explain the important roles and responsibilities of pediatricians in responding to climate change; 2) provide pediatricians in pediatric societies and professional organizations around the world with a tool to support advocacy with country delegations and missions leading up to the United Nations Climate Change Conference in 2021, and thereafter. The Declaration also provides information on which pediatricians can base recommendations and advice to their patients and communities [31].

Pediatricians often are invited to provide public testimony about the health effects of climate change, but they may not feel prepared to do so. A recent survey by Kotcher et al. [32] identified several concerns that health professionals may have about public engagement on climate change. The survey found that 22% of health professionals believed that their peers would not support such an effort, 16% believed that the topic was too controversial, and 14% believed that public engagement was too risky for them personally or professionally. This Declaration should help to allay each of these concerns by demonstrating a) that large international pediatric associations support public involvement of pediatricians in the climate crisis, b) that there is scientific consensus on the health effects of climate change, and c) that public engagement is expected of pediatricians.

By making this Declaration widely available, the International Society for Social Pediatrics and Child Health and the International Pediatric Association are inviting other global and national pediatric

societies and child health organizations to endorse and publicly support it. The Indian Academy of Pediatrics has already endorsed it. Others, including the Royal College of Paediatrics and Child Health in the UK, are preparing their own position statements on climate change and child health. The International Society for Social Pediatrics and Child Health and the International Pediatric Association encourage national pediatric societies and child health organizations and their members to engage more actively in addressing the urgent need to reduce greenhouse gas emissions. It takes a village to raise a child. But it will take all child health professionals speaking with one unified voice to ensure that the climate crisis does not steal that child's future.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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To: Inter-American Court on Human Rights

From: **Name of Organization**
Representing **Number** of pediatricians and/or pediatric organizations world wide

Date: **Date**

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

María Lucía Mesa Rubio
Presidenta
Sociedad Colombiana de Pediatría Regional Bogotá



Sociedad
Chilena
de Pediatría



To: Inter-American Court on Human Rights

From: **SOCIEDAD CHILENA DE PEDIATRÍA**

Date: **December 5th. 2023**

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

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Dr. Jorge Fabres B.
Presidente

SOCIEDAD CHILENA DE PEDIATRÍA



To: Inter-American Court on Human Rights

From: **ALAPE (ASOCIACION LATINOAMERICANA DE PEDIATRIA)**
Representing 21 pediatric organizations in Ibero and Latin America

Date: **November 24, 2023**

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Carlos Gilberto Alonso Rivera, MD
President



**ORGANISMO ANDINO DE SALUD
CONVENIO HIPOLITO UNANUE**

www.orasconhu.org

Annex G: Amicus Curiae Submission, December 11, 2023
Our Children's Trust, University Network for Human Rights, and Centro Mexicano para la
Defensa del Medio Ambiente, A.C.

Para: Corte Interamericana de Derechos Humanos

De: Dra. María del Carmen Calle Dávila

Secretaria ejecutiva del Organismo Andino de Salud-Convenio Hipólito Unanue

Representante del Perú en el Comité de Pediatría Social. Asociación Latinoamericana de
Pediatría

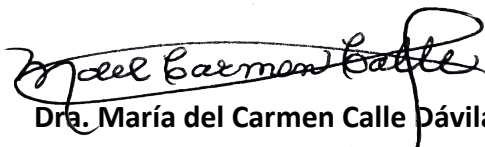
Fecha: 6 de diciembre de 2023

La crisis climática afecta de manera desproporcionada los derechos de la niñez; viola los derechos de las niñas, los niños y adolescentes a la vida, a la salud, a la integridad física y mental, y constituye una violación a la Convención sobre los Derechos del Niño. **Las niñas, los niños y adolescentes tienen derecho a estar libres de los impactos de la crisis climática.**

No está en nuestras manos obligar a los Estados a cambiar su comportamiento para dejar de empeorar el cambio climático. No obstante, se encuentra dentro de las competencias de la Corte instar a aclarar a los Estados que: a) Tienen la obligación legal de alterar su comportamiento para dejar de contribuir a la crisis climática; b) Tienen la responsabilidad de evitar que el cambio climático viole los derechos de la infancia. c) Deben dar prioridad al Interés Superior de la Infancia en todos los asuntos relacionados con la crisis climática.

Esta claridad es nuestra esperanza para avanzar en la garantía de los derechos de la infancia y de la naturaleza con justicia social y ambiental.

Atentamente,


Dra. María del Carmen Calle Dávila

Secretaria Ejecutiva

Organismo Andino de Salud

Convenio Hipólito Unanue





To: Inter-American Court on Human Rights
From: International Society for Social Pediatrics and Child Health
Representing 700 pediatricians world wide
Date: November 20, 2023

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Jeffrey Goldhagen, M.D.
President

December 4, 2023

To the Inter-American Court on Human Rights:

I am writing on behalf of the International Pediatric Association (IPA) in strong support of the statement on the Impact of Climate Change on Children being submitted to the Inter-American Court of Human Rights. The IPA represents approximately 1 million pediatricians from countries around the world.

Pediatricians understand that children have a particularly high risk of harm from the climate crisis. All decisions concerning them must be made in light of the best interests of the child. Pediatricians support intergenerational equity, which necessitates that all children have the right to live on a planet equal to or in better condition than their ancestors.

Our statement *Responding to the Impact of Climate Change on Children* was published in 2021 in the peer-reviewed *Journal of Climate Change and Health*, providing information about climate change and child health and urging pediatricians to take action.
<https://doi.org/10.1016/j.joclim.2021.100038>

We urge that the Inter-American Court to also take action to protect the health of future generations from the climate crisis.

Sincerely,



Naveen Thacker, MD
President



To: Inter-American Court on Human Rights

From: **International Child Health Group**
(Special Interest Group of the Royal College of Paediatrics & Child Health,
UK)
Representing >300 pediatricians and child health professionals world-wide

Date: **2nd December 2023**

As pediatricians and child health professionals, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath *to prevent harm and to do no harm*. It is not within our power, as pediatricians and child health professionals, to compel States to change their behavior to stop making climate change worse. But *it is within this Court's power* to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians and child health professionals. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Signature:

Name: Dr Helen Brotherton (MBChB, FRCPCH, DTM, PhD)

Title: Consultant Paediatrician/Neonatologist & Convenor of ICHG

Organization Address: RCPCH, 5-11 Theobalds Road, London, WC1X 8SH



Union of National African Paediatric Societies and Associations (UNAPSA)

c/o Paediatric Association of Nigeria, Medical and Dental Council of Nigeria Building
Oladipo Diya Street, by Prince & Princess Estate, Kaura District, Abuja.
Tel: +234 802 3346693, +234 803 623 3929, +234803 313 4290
www.unapsa.org, RC 105004.

To: Inter-American Court on Human Rights

From: **Union of National African Paediatric Societies and Associations (UNAPSA)**
Representing National Paediatric Societies and Associations from **37 countries in Africa**

Date: **05th December 2023**

As Pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath *to prevent harm and to do no harm*. It is not within our power, as Pediatricians, to compel States to change their behavior to stop making climate change worse. But *it is within this Court's power* to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Signature

Dr Dipesalema Joel MBBChBAO , B Med Sc (NUI). MRCPI
President of the Union of National African Paediatric Societies and Associations (UNAPSA)
c/o Paediatric Association of Nigeria
Medical and Dental Council of Nigeria Building
Oladipo Diya Street
By Prince and Princess Estate
Kaura District
Abuja
Nigeria



P.O Box 50110, Lusaka.
Zambia Pediatric Association
Pediatric Centre of Excellence, Children's Hospital
Email: zambiapaediatricassociation1@gmail.com
Website: zambiapaediatricassociation.org
Phone: +260 966 621 382 Facebook: Zambia Paediatric Association-zpa

To: Inter-American Court on Human Rights

From: Zambia Paediatric Association
Representing 150 pediatricians from Zambia

Date: December 1st, 2023

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.



Chalilwe chungu

Chalilwe Chungu
President
Zambia Paediatric Association

Union of National
European Paediatric
Societies and Associations



Board of Directors:

- M. Pettoello-Mantovani, Italy
- Mehmet Vural, Turkey. Treasurer
- Georgios Kostantinidis, Serbia
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- Eli Somekh, Israel
- Angel Carrasco-S. Spain
- L. Namazova-Baranova, Russia
- Tudor Pop, Romania
- Sir Terence Stephenson, UK
- Robert Cohen, France

To: **Inter-American Court on Human Rights**
From: **European Pediatric Association- Union of National European
Pediatric Societies and Associations (EPA-UNEPSA)**

Representing 52 European National Pediatric Societies and Organizations of pediatricians (about 150.000 European pediatricians)

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath to prevent harm and to do no harm. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But it is within this Court's power to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians.

Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Sincerely,

Massimo Pettoello-Mantovani, MD, PhD
President, EPA/UNEPSA, Berlin, Germany

HEADQUARTER:
Wandlitzstraße 10, 10318
Berlin, Germany

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Neuchâtel, Switzerland,
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email: info@epa-une psa.org
www.epa-unpsa.eu

To: *Inter-American Court on Human Rights*

From:



European Confederation of Primary Care Pediatricians ([ecpcp.eu](https://www.ecpcp.eu)) We are a confederation of Primary Pediatric Professional Organizations from countries within the definition of WHO Europe (<https://www.euro.who.int/en/> countries) and represent more than 25.000 primary pediatricians in 19 European countries organized in 23 organizations

Date: **November 22, 2023**

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath **to prevent harm and to do no harm**. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But **it is within this Court's power** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Dr Laura Reali
President

Dr Christine Magendie
Vice-President

EXECUTIVE BUREAU

PRESIDENT: Dr. Laura Reali (Associazione Culturale Pediatri-Italy); **VICEPRESIDENT:** Dr. Christine Magendie (AFPA-France);
GENERAL SECRETARY: Dr. María Aparicio Rodrigo (AEPAP - Spain); **TREASURER:** Dr. Andreas Werner (AFPA-France);
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DEPUTY TREASURER: Dr. Christoph Bornhöft (BVKJ-Germany); **PRESIDENT OF HONOR:** Dr. Elke Jaeger-Roman R.I.P. (BVKJ-Germany).



Association Française de Pédiatrie Ambulatoire

Siège social : Zone de La Fouquetière

155 rue Edouard Branly

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N° Déclaration FPC : 52 44 09951 44

N° SIREN : 401 255 914 - N° SIRET : 401 255 914 00111

Code NAF : 9499Z

Dr Andreas WERNER
Président

Courriel : pediatres@afpa.org

To: From:

Date:

Inter-American Court on Human Rights

Association Française de Pédiatrie Ambulatoire

1500 pediatricians

22/11/2023

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Docteur Andreas WERNER
Président de
l'Association Française de Pédiatrie Ambulatoire



Date: 03/12/2023

To: Inter-American Court on Human Rights

From: Spanish Society of Social Paediatrics

Representing: x number of paediatricians

Children have a right to a clean and healthy environment; therefore, every tonne of CO2 emissions that incrementally worsens climate change it also violates children's rights and magnifies existing inequities.

As paediatricians, we have taken an oath to treat our patients, to prevent harm and to do no harm, so we will continue to treat children as they come to us with health impacts from climate change.

However, it is not within our power, as paediatricians, to compel States to change their behaviour to stop making climate change worse. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behaviour to stop contributing to the climate crisis. Because climate change disproportionately affects children, continued emissions also discriminates against them.

Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

We appreciate the opportunity to join this effort

Carme Vidal

Presidenta Sociedad Española de Pediatría Social



To: Inter-American Court on Human Rights

From: **Società Italiana delle Cure Primarie Pediatriche**
Representing **over 1000** of pediatricians world wide

Date: **7 /12 /2023**

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

**Società Italiana delle
Cure Primarie Pediatriche
Il Presidente
Dr. Paolo Becherucci**



To: Inter-American Court on Human Rights

From: **ASSOCIATION OF PRIVATE PRACTICE PAEDIATRICIANS OF
NORTHERN GREECE**
Representing 200 of pediatricians and/or pediatric organizations world wide

Date: 23/11/2023

As pediatricians, we have taken an oath to treat our patients. Therefore, we will continue to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

OLGA TZETZI
PRESIDENT OF THE ASSOCIATION OF PRIVATE PRACTICE PAEDIATRICIANS
OF NORTHERN GREECE
129A VASILISSIS OLGAS STR. THESSALONIKI 54643 GREECE



Indian Academy of Pediatrics

Secretariat: Kamdhenu, Business Bay, 5th Floor, Plot No. 51, Sector 1,
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Phone: (022) 27710857, 27715578, 27716573, 27710118
Email: centraloffice@iapindia.org | Website: www.iapindia.org

Endorsement

The Indian Academy of Pediatrics is the sole representative professional body of Paediatricians in India. Representing over 44000 members across India.

We endorse as medical professionals, we will continue to treat our patients as they risk suffering exponential increases in acute or chronic health impacts associated with climate change from the moment they are conceived through adulthood as the delayed, cumulative, and long-term impacts of climate change set in. To prevent the coming generations from facing an even more dire future, we simply ask that the government join us in doing what is scientifically necessary.

For Indian Academy of Pediatrics


Dr Vineet Saxena
Hon. Secretary General, IAP





To: Inter-American Court on Human Rights

From: **Students' Health and Welfare Centres Organisation (SHAWCO)**
Representing over 1250 students from the University of Cape Town across the Health
Sciences, Humanities and Law Faculties

Date: **06 December 2023**

As future pediatricians, we have taken an oath to treat our patients. Therefore, we will begin to treat children as they come to us with health impacts from climate change—even as those impacts increase exponentially as the crisis intensifies. Yet, we have also taken an oath ***to prevent harm and to do no harm***. It is not within our power, as future pediatricians, to compel States to change their behavior to stop making climate change worse. But ***it is within this Court's power*** to do so. We therefore urge this Court to clarify to States that they have a legal obligation to alter their behavior to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than pediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Signature

Name: A/Prof Jackie Stewart

Title: Executive Director

Organization Address: Groote Schuur Hospital Observatory, Cape Town, South Africa



To: Inter-American Court on Human Rights

From: ACOPPHE (Africa Community of Planetary Partners for Health and Environment) Representing our diverse team of Child Health Professionals, Advocates for Africa, Indigenous Healers, our Relatives in the Web of Life, our Youth Partners, our Children, and all Future Generations—whom we lovingly serve with a spirit of deep planetary stewardship and solidarity

Date: December 10, 2023

We are grateful for this opportunity to share and to use our collective voices to advocate for substantive intergenerational justice.

Our beloved motherland of Africa is the common thread that brought our community together, and which unites us in our shared work to reconnect health and environment. Given that Africa is also the continent that is most impacted by climate change and which has the world's youngest population, our impassioned appeal and statement of solidarity is both urgent and appropriate.

Climate change serves as a paradigmatic illustration of planetary-scale interconnections, interdependencies, and relationships, along with the severe harm that results from excessively anthropocentric values and systems. It is a paramount imperative that we avoid replicating historical power divides through unjust perpetuation of inequitable exposures and impacts. Instead, we must continue to craft a truly transformative community of practice for planetary justice.

Climate change is a painfully vivid symptom of deep, longstanding, and widely pervasive human practices and priorities such as divisiveness, narrowness, selfishness, and entrenched short-term biases. When appropriately viewed as such, climate change powerfully manifests that harm to people and harm to planet earth are fundamentally interrelated. To this end, we view the current submission before the court as a vital opportunity to powerfully showcase climate and child health co-benefits and synergies, harmoniously balance legitimate needs, and accelerate the cause of climate justice.

Children are the foundational inspiration and motivation for our work and service. Consequently, we endeavor to collaboratively connect care for children with care for the earth, ensure that children's rights to a healthy environment and maximally actualized all over the world, join with friends and allies to advocate for robust rights-based reforms and sustainable system-level changes, and equitably and appropriately partner with children through mechanisms such as this compelling submission.

Our earnest request is for this court to join with us and the children we serve to emphatically stand on the side of justice.

With respect and gratitude,

Nathaniel Uchtmann, ACOPPHE Co-Founder and Executive Director; and Nightingale Wakigera, ACOPPHE Co-Founder and Executive Director and President



2 October 2023

BREAK THE CYCLE
OF HEALTH DISPARITIES INC

President:

I. Leslie Rubin, MD

Vice President:

Lilly C. Immergluck, MD

Treasurer:

Alan Sack, CPA

Administrator:

Janelle McDaniel, EdD

Advisors:

Martha Berger, MPA

Henry Falk MD MPH

Lillianne Lewis MD MPH

Nse Obot Witherspoon MPH

Research Assistant:

Ximena Guillen, BS

Visit us at:

www.breakthecycleprogram.org

To Whom it May Concern:

I am writing on behalf of Break the Cycle of Environmental Health Disparities Inc, to sign your statement on the *Impact of Climate Change on Children* being submitted soon to the Inter-American Court of Human Rights.

My organization represents five pediatric professionals and is based in Atlanta, Georgia, USA. We are dedicated to mentoring college and post-graduates in research and understanding the evidence basis of environmental exposures on the health of infants, children, and adolescents. We have trained over 160 students from countries in the Americas and Africa in the last 17 years. We encourage and assist students to explore the impact of climate change on children's health in their communities and inspire them to develop projects that will help mitigate these impacts. We build foundational understanding of the science, economics, and politics of climate change and provide safe spaces for exploring solutions that center on empowering students and the communities they represent, leading to informed pathways to justice.

As the full impact of climate change on the health of children continues to become more and more clear, the reality of these impacts is already affecting children throughout the world. As a developmental pediatrician, I am eager to see nations throughout the world commit to addressing climate change in order to protect the health and well-being of our next generations. I have studied the evidence and seen the impacts of climate change on children both as a clinician, as an educator, and as a public health professional, and find the mental and physical threats well documented and gravely critical, especially for children born into poverty and social disadvantage.

I appreciate the opportunity to join in this effort.

Respectfully,

I Leslie Rubin

I. Leslie Rubin, MD

Associate Professor of Pediatrics, Morehouse School of Medicine

Founder and President, Break the Cycle of Health Disparities, Inc.

Medical Director, The Rubin Center for Autism and Developmental Pediatrics


To: Inter-American Court on Human Rights

From: **Hajime Takeuchi; a board member of the Japanese Society for Social Medicine
a member of the Japan Pediatric Society**

Date: **the 26th of November, 2023**

I urge this Court to clarify to States that they have a legal obligation to alter their behaviour to stop contributing to the climate crisis.

No profession will bear witness to the impact of climate change more so than our paediatricians. Such clarity is our only hope for protecting the coming generations of children from facing an even more dire future.

Signature: 

Name: Hajime Takeuchi

Title: Professor

Address: Bukkyo University

ANNEX H

Andrea Rodgers et al., *The Injustice of 1.5°C-2°C: The Need for a Scientifically Based Standard of Fundamental Rights Protections in Constitutional Climate Change Cases*, In: Virginia Environmental Law Journal (2022)

THE INJUSTICE OF 1.5°C–2°C: THE NEED FOR A
SCIENTIFICALLY BASED STANDARD OF FUNDAMENTAL
RIGHTS PROTECTION IN CONSTITUTIONAL CLIMATE
CHANGE CASES

*Andrea Rodgers**
*Lauren E. Sancken***
*Jennifer Marlow****

In 2015, signatories to the Paris Agreement agreed to the goal of keeping global temperature rise this century to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. Although the adoption of the Paris Agreement was in many ways a political triumph, seven years later many climate advocates are presenting the Paris target to judicial bodies as the de facto legal standard for fundamental rights protection in climate change cases. Yet, the history leading up to the signatories' ultimate adoption of the Paris Agreement target suggests that the target is somewhat arbitrary and not a product of scientific debate, but rather the outcome of political diplomacy. There is no scientific support for the notion that 1.5°C or 2°C will stabilize the Earth's Energy Imbalance, a metric scientists deem fundamental for assessing the mitigation of climate change. The scientific consensus suggests that the impacts of 1.5°C or 2°C of global heating will result in the eradication of entire populations and places, causing devastating climate change impacts and placing many people in peril. The IPCC's Special Report on Global Warming of 1.5°C, as well as peer-reviewed climate science, illustrates that in a world 1.5°C warmer, humanity will suffer, with the most disadvantaged and vulnerable communities threatened the most.

This Article describes how the global community came to coalesce around the Paris Agreement target and asks a controversial question: whether a target obtained through international agreement should be used by climate advocates and judicial bodies as a proxy legal standard for fundamental rights protection and the fair administration of justice

* Andrea Rodgers, Senior Litigation Attorney, Our Children's Trust.

** Lauren E. Sancken, Associate Teaching Professor, University of Washington School of Law.

*** Jennifer Marlow, Assistant Professor, Cal Poly Humboldt.

The authors are indebted to John Boone for his thorough research assistance, Claire McMoy for her research assistance, the librarians at the Gallagher Law Library for their research support, Cindy Fester for her indispensable polishing skills, Julia Olson for her vision, and their children's teachers and caregivers, who helped make the writing of this article possible.

when the science says otherwise? Part One of this Article describes the history of the 1.5°C–2°C target and its subsequent acceptance and popularization as a limit based on “science.” Part Two analyzes how legal practitioners and courts are relying on the Paris Agreement as the basis for establishing legal standards of protection for fundamental rights in climate change litigation and how judicial endorsement of an unsafe target threatens human rights. Part Three proposes that science-based climate mitigation standards are a more appropriate legal standard for protecting human rights in climate change cases.

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INTRODUCTION

Judicial bodies are perilously adopting the Paris Agreement target, a limit negotiated by governments to limit global average heating to 1.5°C–2°C, as the legal standard for protecting fundamental rights in the climate

change context.¹ By design, the Paris Agreement target began as a heuristic intended to guide policy decisions addressing climate change. A review of the history leading up to the Paris Agreement reveals the target was based on intergovernmental compromise, not science.² Yet, the Paris Agreement target is frequently ascribed by climate advocates as “science based.”³ In fact, current climate science does not support the notion that limiting warming to 1.5°C or 2°C would stabilize the Earth’s Energy Imbalance (“EEI”), a metric scientists deem “fundamental” to determining “how well the world is doing in the task of bringing climate change under control,”⁴ or to avoid triggering several critical climate tipping points.⁵ This Article argues that climate change advocates should present judicial bodies with science-based standards to achieve climate stability, rather than rely on the Paris Agreement target, as the touchstone for compliance with governments’ human rights obligations.

Although the Paris Agreement target of “[h]olding the increase in the global average temperature to well below 2°C above industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels”⁶ has been tacitly accepted as the end goal in popular media and by many governments around the world, the Intergovernmental Panel on Climate Change (“IPCC”)—the consensus-based scientific body informing the United Nations Framework Convention on Climate Change (“UNFCCC”)—characterized 1.5°C of

¹ Paris Agreement art. 2, § 1(a), 12 Dec. 2015, 3156 U.N.T.S. 54113, https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

² Johannes Urpelainen, *Here’s What Political Science Can Tell Us About the Paris Climate Deal*, WASH. POST (Dec. 14, 2015), <https://www.washingtonpost.com/news/monkey-cage/wp/2015/12/14/heres-what-political-science-can-tell-us-about-the-paris-climate-deal/> (examining the political undertones behind the Paris Agreement); Samuel Randalls, *History of the 2°C Climate Target*, 1 WILEY INTERDISC. REV. CLIMATE CHANGE 598, 602 (2010) (noting briefly the political undertones behind the widespread acceptance of a 2°C target).

³ See, e.g., Reto Knutti, Joeri Rogelj, Jan Sedláček & Erich M. Fischer, *A Scientific Critique of the Two-Degree Climate Change Target*, 9 NATURE GEOSCIENCE 1, 1 (2016) [hereinafter Knutti et al.] (“This target was a political decision informed by science, but no scientific assessment ever defended or recommended a particular target.”); Randalls, *supra* note 2, at 601–02 (acknowledging the scientific skepticism surrounding the 2°C target, but noting that it has been widely embraced); Hans Joachim Schellnhuber, Stefan Rahmstorf & Ricarda Winkelmann, *Why the Right Climate Target Was Agreed in Paris*, 6 NATURE CLIMATE CHANGE 649, 653 (2016) (“Almost miraculously, the countries of the world . . . have agreed on a sensible, science-based climate target . . .”).

⁴ See Karina von Schuckmann et al., *Heat Stored in the Earth System: Where Does the Energy Go?*, 12 EARTH SYS. SCI. DATA, 2013, 2029, 2029 (2020) (defining the metric of stabilizing the Earth’s energy system imbalances).

⁵ See David I. Armstrong McKay et al., *Exceeding 1.5°C Global Warming Could Trigger Multiple Climate Tipping Points*, 377 SCIENCE 1171, 1171, 1178 (2022) (citing nine core tipping points, five of which have lower bounds that become likely at the Paris Agreement range of 1.5°C–2°C, and suggesting “that ~1°C is a level of global warming that minimizes the likelihood of crossing [climate tipping points]”).

⁶ Paris Agreement, *supra* note 1.

heating as “not . . . safe for most . . . communities.”⁷ Even at present levels of heating of approximately 1°C, climate impacts are devastating communities around the world, and the science suggests that any additional heating is highly dangerous, particularly for those most exposed to the impacts of climate change.⁸ In a 1.5°C–2°C warmer world, those most vulnerable to climate impacts—peoples who live in the Arctic and low-lying island nations, youth, and those already experiencing socioeconomic or political vulnerabilities, for example—will be denied the ability to exercise fundamental rights on this planet.⁹

This Article critiques the trend of climate advocates using the Paris Agreement target as a proxy symbolizing the outer bounds of global climate policy in the fundamental rights context. In addition, this Article argues that if the Paris Agreement target becomes the de facto equivalent legal standard for fundamental rights protections, multilateral environmental negotiators become the arbiters of the rights of peoples whose lives that very target expends. Although judicial bodies can and often do draw lines in the sand to define the scope of fundamental rights, legal standards for climate rights should not automatically be imported from the realm of political negotiations, particularly when the science says otherwise.

Part I of this Article describes the history of the Paris Agreement target as a vehicle of political consensus, its acceptance by the international political community, and the dangers of adopting the Paris Agreement target as the legal standard for protecting fundamental rights. Part II describes the role of *Juliana v. United States*, one of the first human rights-centered climate change cases, in utilizing scientific evidence to support recognition of a U.S. Constitutional right “to a climate system capable of sustaining human life,”¹⁰ as well as the international trend of advocates adopting the Paris Agreement target as protective of human

⁷ Joyashree Roy et al., *Sustainable Development, Poverty Eradication and Reducing Inequalities*, in GLOBAL WARMING OF 1.5°C: AN IPCC SPECIAL REPORT ON THE IMPACTS OF GLOBAL WARMING OF 1.5°C ABOVE PRE-INDUSTRIAL LEVELS AND RELATED GLOBAL GREENHOUSE GAS EMISSION PATHWAYS, IN THE CONTEXT OF STRENGTHENING THE GLOBAL RESPONSE TO THE THREAT OF CLIMATE CHANGE, SUSTAINABLE DEVELOPMENT, AND EFFORTS TO ERADICATE POVERTY 445, 447 (Valérie Masson-Delmotte et al. eds., 2018) [hereinafter GLOBAL WARMING OF 1.5°C], <https://www.ipcc.ch/sr15/chapter/chapter-5/>.

⁸ *Id.* (“Warming of 1.5°C is not considered ‘safe’ for most nations, communities, ecosystems and sectors and poses significant risks to natural and human systems as compared to current warming of 1°C The impacts of 1.5°C of warming would disproportionately affect disadvantaged and vulnerable populations”); Armstrong McKay et al., *supra* note 5, at 1171 (“We show that even the Paris Agreement goal of limiting warming to well below 2°C and preferably 1.5°C is not safe as 1.5°C and above risks crossing multiple tipping points.”).

⁹ *See id.*

¹⁰ *Juliana v. United States*, 217 F. Supp. 3d 1224, 1250 (D. Or. 2016).

rights to life, liberty, security of the person, and privacy, among others. Finally, Part III critiques the use of the Paris Agreement target from a legal perspective and proposes that advocates present the best available scientific evidence of EEI and urge the adoption of a scientifically based legal standard when seeking fundamental rights protections in climate change cases.

I. A LIMIT IS NOT A GOAL: HOW 2°C BECAME POPULARIZED AS A CLIMATE TARGET AND LEGAL STANDARD OF PROTECTION

This section chronicles the historic emergence of the Paris Agreement target across disciplines, its solidification in consensus-driven climate conferences, and its subsequent popularization and acceptance as a legal standard of protection.

A. The Acceptance and Popularization of 2°C as a Consensus-Driven Target

The first mentions of limiting warming to 2°C were largely tangential. After World War II, scientists within the U.S. Office of Naval Research took note of the rising levels of atmospheric carbon dioxide (“CO₂”) and began exploring what level of warming would result from a doubling of CO₂.¹¹ The science on this question continued to develop, and in 1967, Syukuro Manabe and Richard Wetherald co-authored a paper in the *Journal of Atmospheric Sciences*, *Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity*,¹² that estimated that a doubling of CO₂ concentrations in the atmosphere would result in warming of approximately 2°C.¹³ A decade later, in 1977, economics Professor William Nordhaus authored two papers noting that warming of more than 2°C would exceed historical limits:

According to most sources the range of variation between distinct climatic regimes is on the order of [around] 5°C, and at present time the global climate is at the high end of this range. If there were global temperatures more than 2 or 3°C above the current average temperature, this would take the climate outside of the

¹¹ Expert Report of James E. Hansen, Ph.D. at 8–9, *Juliana v. United States*, 217 F. Supp. 3d 1224 (D. Or. 2016) [hereinafter *Juliana*, Hansen Expert Report].

¹² Syukuro Manabe & Richard T. Wetherald, *Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity*, 24 J. ATMOSPHERIC SCI. 241 (1967).

¹³ *Id.* at 241. See also Piero Morseletto, Frank Biermann & Philipp Pattberg, *Governing by Targets: Reductio Ad Unum and Evolution of the Two-Degree Climate Target*, 17 INT’L ENV’T AGREEMENTS: POL., L. & ECON. 655, 658 (2017).

range of observations which have been made over the last several hundred thousand years.¹⁴

Although this was a tangential point in a paper otherwise focused on economics, it was, “perhaps, the first suggestion to use 2°C as a critical limit for climate policy”¹⁵ Importantly, in these early papers, the number appeared as a heuristic, not as normative policy guidance or as a limit grounded in science.¹⁶

In 1988, the 2°C threshold emerged as an aspirational warming limit in a World Meteorological Organization report, *Developing Policies for Responding to Climatic Change*, which summarized findings from two meetings of the Advisory Group on Greenhouse Gases (“AGGG”).¹⁷ The report offered “recommendations for the development of a climate convention by examining the underlying science and its implications for policy[makers].”¹⁸ At that time, 1988 had been the warmest year on record.¹⁹ This fact was made publicly known by NASA scientist Dr. James Hansen, who famously testified to the United States Congress that year about the causal link between a warming world and the emission of greenhouse gases (“GHGs”) and the impacts of an accumulation of CO₂ in the atmosphere on more frequent and extreme weather events.²⁰ He presented the following graph during his congressional testimony:²¹

¹⁴ See, e.g., William D. Nordhaus, *Strategies for the Control of Carbon Dioxide* 39–40 (Yale U. Cowels Found. for Rsch. in Econ., Working Paper No. 443, 1977). See generally *Two Degrees: The History of Climate Change’s Speed Limit*, CARBON BRIEF (Aug. 12, 2014, 10:45 AM), <https://www.carbonbrief.org/two-degrees-the-history-of-climate-changes-speed-limit> (noting Professor Nordhaus’s two papers).

¹⁵ Carlo C. Jaeger & Julia Jaeger, *Three Views of Two Degrees*, 11 REGUL. ENV’T CHANGE, at S15, S16 (2011).

¹⁶ Morsetto, Biermann & Pattberg, *supra* note 13, at 658.

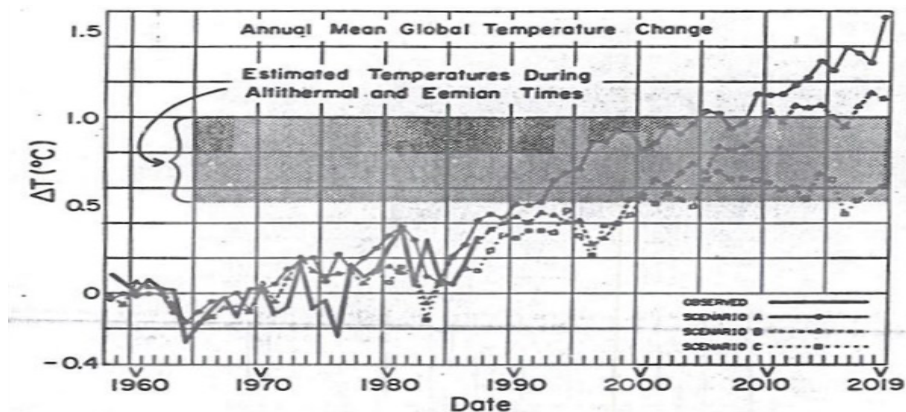
¹⁷ *Id.* For the report, see REPORT OF THE FIRST SESSION OF THE WMO/INEP INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Nov. 1988).

¹⁸ See Morsetto, Biermann & Pattberg, *supra* note 13, at 658.

¹⁹ *The Greenhouse Effect: Impacts on Current Global Temperature and Regional Heat Waves Before the Comm. on Energy & Nat. Res.*, 100th Cong. 39 (1988) (statement of Dr. James Hansen, Director, NASA Goddard Institute for Space Studies).

²⁰ *Id.*

²¹ *Id.* at 48 fig.3.



Dr. Hansen, while presenting the scientific data of global warming and stating a high degree of confidence that a cause-and-effect relationship between global warming and human-caused GHG emissions existed, did not offer guidance on a safe limit of warming, nor did he suggest that 1.5 $^{\circ}\text{C}$ –2 $^{\circ}\text{C}$ of warming is supported by the science as safe or desirable from a planetary science perspective.²²

Later that same year, the AGGG convened three working groups coordinated by the Stockholm Environmental Institute to specifically examine the impacts of warming at a rate of a 0.1 $^{\circ}\text{C}$ increase per decade and to analyze a 1 $^{\circ}\text{C}$ or 2 $^{\circ}\text{C}$ increase as potential temperature targets guiding policy-making efforts.²³ In 1990, these working groups compiled a “Targets and Indicators of Climate Change” report that recommended two absolute temperature targets for committed warming, each with a different level of risk: (i) “A maximum temperature increase of 1.0 $^{\circ}\text{C}$ above pre-industrial global mean temperature”; and (ii) “A maximum temperature increase of 2.0 $^{\circ}\text{C}$ above pre-industrial global mean temperature.”²⁴ The report assumed that “temperature changes greater than the lower limit may be unavoidable due to greenhouse gases already emitted,” but explicitly cautioned that “[a]n absolute temperature limit of 2.0 $^{\circ}\text{C}$ can be viewed as an upper limit beyond which the risks of grave damage to ecosystems, and of non-linear responses, are expected to increase rapidly.”²⁵ Importantly, this thirty-year-old report never condoned 2 $^{\circ}\text{C}$ as “safe.”

²² *Id.* at 39–46.

²³ Morseletto, Biermann & Pattberg, *supra* note 13, at 658.

²⁴ TARGETS AND INDICATORS OF CLIMATIC CHANGE, at viii (Frank R. Rijsberman & Rob J. Swart, R. J. eds., 1990) [hereinafter SEI TARGETS AND INDICATORS DRAFT REPORT].

²⁵ *Id.* at viii–ix.

The “Targets and Indicators of Climate Change” working group was aware of the advantages and shortcomings of using a “target approach” to frame allowable temperature increase:

The clear advantage of the target approach is that—once appropriate targets are universally adopted—progress towards them should be quantifiable and unambiguous. Other authors criticize the target approach because of the difficulty of setting appropriate targets that are generally acceptable.

Where there is no universal agreement over the usefulness of climate policy targets, there is certainly not yet agreement as to what such targets should be.²⁶

The working group also acknowledged that it was “difficult to obtain a good understanding of the implications of specific targets” given the complexity of the climate system and interrelated systems: “e.g., what the cost will be of adopting targets, and the impacts thereof on the economy.”²⁷ Indeed, it advocated for periodically reviewing and adjusting targets to accommodate new developments in science.

Efforts to create an objective limit of global warming emerged in the international political arena shortly after the convergence of these working groups. In 1990, the IPCC published an assessment report to provide objective scientific and technical assessments on global warming.²⁸ The IPCC “provide[s] policymakers with regular scientific assessments on climate change, its implications and potential future risks, [and] put[s] forward adaptation and mitigation options.”²⁹ As a quasi-political body of scientists, “[t]he IPCC is mandated to produce consensus”³⁰ and provides guidance that is “policy-relevant but not policy-prescriptive.”³¹ In keeping with its role, the IPCC has neither endorsed nor recommended the adoption of 1.5°C or 2°C as a target in its 1990 report nor in any subsequent reports; rather, the IPCC reports on the scientific consensus on climate impacts associated with different levels of warming. Although IPCC reports have summarized a significant body of science projecting that warming of 1.5°C or 2°C would be

²⁶ F.R. Rijsberman, G.W. Geil & B.T. Bower, *Setting Targets for Climate Policies*, in *id.* at 9 (internal citations omitted).

²⁷ *Id.*

²⁸ G.A. Res. 43/53, Protection of Global Climate for Present and Future Generations of Mankind (Dec. 6, 1988).

²⁹ *The Intergovernmental Panel on Climate Change*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [hereinafter *IPCC*], <https://www.ipcc.ch/> (last visited Sept. 10, 2022).

³⁰ Martin Mahony & Mike Hulme, *The Colour of Risk: An Exploration of the IPCC's “Burning Embers” Diagram*, 6 SPONTANEOUS GENERATIONS: J. HIST. & PHIL. SCI. 75, 81 (2012).

³¹ *IPCC*, *supra* note 29.

catastrophic,³² the IPCC does not dictate what temperature target should be adopted to be protective of fundamental rights.³³ Instead, IPCC assessments “present projections of future climate change based on different scenarios and the risks that climate change poses and discuss the implications of response options, but they do not tell policymakers what actions to take.”³⁴

The 1990 IPCC report indicated that the global mean temperature would likely increase “about 1°C above the present value by 2025 (about 2°C above that in the pre-industrial period), and 3°C above today’s value before the end of the next century (about 4°C above pre-industrial).”³⁵ These projections indicated that the impact of concurrent drought or heat stress could be severe, glaciers and ice sheets would decrease, permafrost would degrade, ecosystems would be dramatically altered, and major health impacts would be possible.³⁶ The report urged quick strategic action given the severity of these predictions: “The potentially serious consequences of climate change on the global environment . . . give sufficient reasons to begin by adopting response strategies that can be justified immediately even in the face of such significant uncertainties.”³⁷

The UNFCCC, which was adopted at the 1992 Rio Earth Summit and came into force in 1994,³⁸ was designed to achieve “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”³⁹ However, the treaty did not define “dangerous,” nor did it promote a specific numeric temperature target. The UNFCCC established a Conference of the Parties (“COP”), a “legislative-like body that meets annually and is charged with devising ways to implement the UNFCCC’s

³² See Jaeger and Jaeger, *supra* note 15, at S18.

³³ IPCC FACTSHEET: WHAT IS THE IPCC? 1 (July 2021), https://www.ipcc.ch/site/assets/uploads/2021/07/AR6_FS_What_is_IPCC.pdf. See also IPCC, *supra* note 29 (“IPCC reports are neutral, policy-relevant but not policy-prescriptive.”).

³⁴ See IPCC FACTSHEET: WHAT IS THE IPCC? 1 (July 2021), https://www.ipcc.ch/site/assets/uploads/2021/07/AR6_FS_What_is_IPCC.pdf.

³⁵ See *Preface to the IPCC Overview*, in THE IPCC FIRST ASSESSMENT REPORT 51, 52 (1990), https://www.ipcc.ch/site/assets/uploads/2018/05/ipcc_90_92_assessments_far_overview.pdf.

³⁶ *Id.* at 55–56.

³⁷ CLIMATE CHANGE: THE 1990 AND 1992 IPCC ASSESSMENTS 124 (June 1992), https://www.ipcc.ch/site/assets/uploads/2018/05/ipcc_90_92_assessments_far_full_report.pdf.

³⁸ U.N. Framework Convention on Climate Change, May 1992, 1771 U.N.T.S. 30822 [hereinafter U.N. Framework]; *What is the United Nations Framework Convention on Climate Change?*, U.N. CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change> (last visited Sept. 10, 2022).

³⁹ U.N. Framework, *supra* 38, at art. 2.

goals.”⁴⁰ The Parties, currently 197 states and one regional economic integration organization,⁴¹ rely upon the reports issued by the IPCC to inform their negotiations and political decision-making, but the parties are by no means bound to heed the science. By the end of this period, in the early 1990s, consensus existed that there should be a target, but precisely what it should be was an open question that both scientists and policy makers continued to explore.

B. Promotion of the 2°C Target and its Influence on International Political Consensus

After the UNFCCC was established and before the first COP in 1995, European governmental institutions began honing in on 2°C as a numeric target to meet the narrative standard of “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”⁴² The number itself, however, was a “suitable simplification for non-specialists” and not intended to represent a warming limit informed by science or tied to the protection of fundamental rights.⁴³ In fact, the authors of the 1990 “Targets and Indicators” report recognized that the choice of a target for purposes of the UNFCCC process should be “a product of the political process of negotiation,” presumably because that is how international agreement among governments is achieved.⁴⁴ But, during this time, scientists’ “ability to understand the mechanisms driving global warming and predict the impacts more precisely had improved dramatically.”⁴⁵ Particularly, scientists gained “[a]nother layer of quantitative verification of [their] understanding of global climate change”: EEI.⁴⁶ According to Dr. James Hansen:

It had long been understood that when greenhouse gases such as CO₂ increase, they would cause a planetary energy imbalance by reducing Earth’s heat radiation to space: thus the energy in absorbed sunlight would temporarily exceed the energy returned to space. The planet must warm in response to this positive energy

⁴⁰ Michael B. Gerrard, *Introduction and Overview*, in GLOBAL CLIMATE CHANGE AND U.S. LAW 18 (Michael B. Gerrard ed., 2007).

⁴¹ *Status of Ratification of the Convention*, U.N. CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-convention/status-of-ratification/status-of-ratification-of-the-convention> (last visited Aug. 28, 2022).

⁴² U.N. Framework, *supra* note 38, at art. 2.

⁴³ Morseletto, Biermann & Pattberg, *supra* note 13, at 660.

⁴⁴ See SEI TARGETS AND INDICATORS DRAFT REPORT, *supra* note 24, at viii; see also Morseletto, Biermann & Pattberg, *supra* note 13, at 660.

⁴⁵ Juliana, Hansen Expert Report, *supra* note 11, at 17.

⁴⁶ *Id.* at 18. See also von Schuckmann et al., *supra* note 4, at 2014.

imbalance, but full response to the forcing could require a very long time, decades or even centuries, because of the great thermal inertia of the ocean. The question we undertook to study was the extent of such an energy imbalance and whether it was quantitatively consistent with estimates of climate sensitivity. . . . [O]n the basis of climate model simulations for the period 1979–1996 with several alternative representations of the ocean, there should have been a planetary energy imbalance of about $+0.5 \text{ W/m}^2$ averaged over the entire planet in 1979, and this would grow to as much as $0.7\text{--}1 \text{ W/m}^2$ at the end of the 20th century.

It is the ocean's thermal inertia that slows the planet's response to changing climate forcing, so the planetary energy imbalance (the net incoming energy) is largely flowing into the ocean. Much smaller amounts of energy go into a net melting of ice and a warming of the ground and atmosphere. . . .

. . . .

Measurements of ocean heat gain, and smaller heat gains inferred from melting ice and warming land and atmosphere, meant that Earth was substantially out of energy balance by the year 2000, by 0.5 to 1 W/m^2 .⁴⁷

As scientists were furthering their understanding of the causes and implications of global heating, the target selection process was less concerned with scientific precision and more concerned with forming international consensus. The eventual adoption of the 2°C target in the Paris Agreement is due, in large part, to the influence of the Netherlands and Germany.⁴⁸ Both nations adopted the target internally and subsequently promoted the target to other European nations. In 1996, the Council of the European Union, working closely with the German Advisory Council on Global Change, identified the 2°C target as a means to avoid dangerous risk, noting that “[g]iven the serious risk of such an increase [in temperature], the Council believes that global average temperatures should not exceed 2 degrees above pre-industrial level and that therefore concentration levels lower than 550 ppm CO_2 should guide global limitation and reduction efforts.”⁴⁹ The United States, by

⁴⁷ Juliana, Hansen Expert Report, *supra* note 11, at 18–19 (citing James E. Hansen et al., *Forcings and Chaos in Interannual to Decadal Climate Change*, 102 J. GEOPHYSICAL RSCH. 25679 (1997)).

⁴⁸ Morsetto, Biermann & Pattberg, *supra* note 13, at 660.

⁴⁹ European Commission Press Release PRES/96/188, 1939th Council Meeting Community Strategy on Climate Change (June 25–26, 1996), https://ec.europa.eu/commission/presscorner/detail/en/PRES_96_188.

contrast, opposed accepting any clear target during the early 2000s.⁵⁰ Although the United States was formally in favor of stabilizing GHG concentrations, it preferred that the IPCC lead this charge, not the AGGG.⁵¹ This created “instability at the political level” as the world’s two largest economic zones and emitters of GHGs proposed different global climate change policy approaches.⁵²

Meanwhile, by the early 2000s, according to Dr. Hansen’s testimony in the *Juliana v. United States* climate change case brought by twenty-one young Americans in 2015, scientists were becoming “reasonably convinced, mainly on the basis of [EEI and] paleoclimate evidence [to determine climate sensitivity], that 2°C global warming (equivalent to an atmospheric CO₂ concentration of approximately 450 ppm) would be highly dangerous.”⁵³ He explained that: “Our scientific understanding indicated an initial target of no more than 350 ppm CO₂ to avoid dangerous impacts, but the target must be continually evaluated as the world [makes] progress in turning around CO₂ growth (CO₂ in 2007 was already 358 ppm).”⁵⁴

Nevertheless, for the next decade, institutions around the world began embracing 2°C as a long-term, set-in-stone target, “even though there was substantial scientific evidence showing such a target was highly dangerous to humanity.”⁵⁵ For example, in 2005, the International Climate Change Taskforce⁵⁶ reported “a long-term objective of preventing average global surface temperature from rising by more than 2°C”⁵⁷ In 2009, the Major Economies Forum on Energy and Climate, a forum of seventeen international economies,⁵⁸ recognized that

⁵⁰ Morsetto, Biermann & Pattberg, *supra* note 13, at 660. *See generally* NATHANIEL RICH, LOSING EARTH: A RECENT HISTORY (2019) (summarizing the United States’ political role and influence in the UNFCCC process, and how the United States wielded its power to thwart meaningful progress on climate change on the international level by detailing the United States’ political machinations to avoid effective action on climate change in the domestic and international realms).

⁵¹ Morsetto, Biermann & Pattberg, *supra* note 13, at 660.

⁵² *Id.*

⁵³ *Juliana*, Hansen Expert Report, *supra* note 11, at 22.

⁵⁴ *Id.*

⁵⁵ *Id.* at 23.

⁵⁶ An alliance of the Institute for Public Policy Research in the United Kingdom, the Center for American Progress in the United States, and the Australia Institute. INTERNATIONAL CLIMATE CHANGE TASKFORCE, MEETING THE CLIMATE CHALLENGE: RECOMMENDATIONS OF THE INTERNATIONAL CLIMATE CHANGE TASKFORCE 9 (2005), https://www.ippr.org/files/images/media/files/publication/2011/05/meeting_the_climate_challenge_1331.pdf.

⁵⁷ *Id.* at 3.

⁵⁸ *President Obama Announces Launch of the Major Economies Forum on Energy and Climate*, WHITE HOUSE (Mar. 28, 2009), <https://obamawhitehouse.archives.gov/the-press-office/president-obama-announces-launch-major-economies-forum-energy-and-climate>. This forum of seventeen

global temperatures should not exceed 2°C.⁵⁹ Most notably, the 2009 Copenhagen and 2010 Cancun COPs recognized 2°C as an objective target.⁶⁰

At the 2009 COP in Copenhagen, 141 countries endorsed the 2°C target and suggested that they would consider a more ambitious target of 1.5°C—a number initially raised by small island states threatened by sea-level rise—in the future.⁶¹ However, consensus around the 2°C target was mainly symbolic and useless as a practical matter.⁶² The Parties did not specify any emissions reductions or a timeline for achieving it, which “depriv[ed] the target of both a specific context and instruments for its concrete fulfilment.”⁶³ Furthermore, the United States, China, and many other developing nations prioritized their economic growth over commitments toward a binding 2°C target.⁶⁴ Therefore, the target remained symbolically resilient, despite the dearth of scientific evidence supporting 2°C as a means to prevent dangerous climate change and protect fundamental human rights.

The 2°C temperature goal was ultimately memorialized into a major climate governance agreement in the 2015 Paris Agreement. The governments that signed the Paris Agreement agreed to the long-term goal of limiting the global average temperature increase to “well below 2°C above pre-industrial levels” and to “pursu[e] efforts to limit the temperature increase to 1.5°C above pre-industrial levels”⁶⁵ The ultimate acceptance of the 2°C limit with an aspiration toward 1.5°C was the product of negotiations around three target options. Negotiators

large economies brought together the G8 along with: Australia, Brazil, China, Indonesia, Korea, Mexico, Russia, and South Africa. *Id.*

⁵⁹ Morseletto, Biermann & Pattberg, *supra* note 13, at 662. *See Declaration of the Leaders the Major Economies Forum on Energy and Climate*, WHITE HOUSE (July 9, 2009), <https://obamawhitehouse.archives.gov/the-press-office/declaration-leaders-major-economies-forum-energy-and-climate>.

⁶⁰ Morseletto, Biermann & Pattberg, *supra* note 13, at 665.

⁶¹ *Id.* at 664; *Information Provided by Parties to the Convention Relating to the Copenhagen Accord*, U.N. CLIMATE CHANGE, <https://unfccc.int/process/conferences/pastconferences/copenhagen-climate-change-conference-december-2009/statements-and-resources/information-provided-by-parties-to-the-convention-relating-to-the-copenhagen-accord> (last visited Sept. 10, 2022).

⁶² Morseletto, Biermann & Pattberg, *supra* note 13, at 665.

⁶³ *Id.* at 664. The Copenhagen conference, originally touted as “Hopenhagen,” *see, e.g.*, Martin Mark Jones, “Hopenhagen” to “Nopenhagen”? *The Role of Public Expectation at the Copenhagen Summit*, E-INT’L REL. (July 3, 2011), <https://www.e-ir.info/2011/07/03/“hopenhagen”-to-“nopenhagen”-the-role-of-public-expectation-at-the-copenhagen-summit/>, failed to achieve meaningful implementation strategies largely due to the influence of the United States, which refused legally binding accords. Morseletto, Biermann & Pattberg, *supra* note 13, at 664.

⁶⁴ Morseletto, Biermann & Pattberg, *supra* note 13, at 664.

⁶⁵ Paris Agreement, *supra* note 1, at art. 2, § 1(a).

presented (1) a 2°C goal, (2) a 1.5°C goal, and (3) a 2°C goal with an aspiration toward 1.5°C.⁶⁶

Although the Paris Agreement was quickly adopted by most nations, like the predecessor agreements from Copenhagen and Cancun, the agreement lacked any legally binding emissions reduction targets or strict deadlines for achieving interim goals.⁶⁷ The drafters of the Paris Agreement were likely influenced by the perceived failures of the 1997 Kyoto Protocol and the non-ratification of the agreement by the United States Senate, which objected to the country-specific emissions targets.⁶⁸ The Paris Agreement, by contrast, and once again accommodating economic influencers such as the United States, avoided enforcement of specific emissions targets. It focused, instead, on achieving consensus through a loosely expressed target range of “well below 2°C” and through the promotion of nonbinding, voluntary Nationally Determined Contributions (“NDCs”), seemingly enforceable only if translated into national laws and policies.⁶⁹

Under the Paris Agreement, governments agreed to pursue “the highest possible ambition” when establishing their NDCs.⁷⁰ Yet, “target culture” typically leads to minimization, where “[e]ven if you say ‘this target is the minimum’, as the [Paris Agreement] does, politicians treat it as merely the line they need to cross.”⁷¹ Under current NDCs, for example, many countries are “pursuing efforts” that will result in approximately

⁶⁶ Hari Osofsky et al., *The 2015 Paris Agreement on Climate Change: Significance and Implications for the Future*, 46 ENV'T L. REP. NEWS & ANALYSIS 10267, 10271 (2016).

⁶⁷ Maria L. Banda, *The Bottom-Up Alternative: The Mitigation Potential of Private Climate Governance After the Paris Agreement*, 42 HARV. ENV'T L. REV. 325, 331 (2018).

⁶⁸ See, e.g., *id.* at 332.

⁶⁹ See, e.g., *Commune de Grande-Synthe v. France* [CE] [highest administrative court], July 1, 2021,

<http://climatecasechart.com/climate-change-litigation/non-us-case/commune-de-grande-synthe-v-france/> (issuing a decision on July 1, 2021 ordering the government to “take all the measures necessary” to reduce GHG emissions in line with its Paris Agreement commitment by 40% in 2030 compared to 1990 levels, “noting that . . . current climate regulations were insufficient to meet the target” and “[t]he Council ordered the government to take the necessary measures by March 31, 2022”). See generally Lisa Benjamin & Adelle Thomas, *1.5°C to Stay Alive?: AOSIS and the Long Term Temperature Goal in the Paris Agreement* (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3392503.

⁷⁰ Paris Agreement, *supra* note 1, at art. IV, § 3. See also *Key Aspects of the Paris Agreement*, U.N. CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement/key-aspects-of-the-paris-agreement>.

⁷¹ George Monbiot, Opinion, *Let's Abandon Climate Targets, and Do Something Completely Different*, GUARDIAN (Jan. 29, 2020), <https://www.theguardian.com/commentisfree/2020/jan/29/climate-targets-committee-on-climate-change-report>.

2.9°C or higher of heating;⁷² a strategy that has irreversible consequences.⁷³ Many countries that purport to align domestic emissions laws to the Paris Agreement's target are woefully off track, thereby illustrating that political ambition does not necessarily equate to changes on the ground without enforcement mechanisms in place.⁷⁴

Notwithstanding persistent pleas for more aggressive, enforceable limits on the amount of allowable heating,⁷⁵ the Copenhagen Accord enshrined 2°C as the central goal of international climate politics, stating only that countries would "consider" limiting temperature increases to less than 1.5°C (no country did at the time).⁷⁶ Similarly, the Paris Agreement agreed only to "pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels."⁷⁷ All the while, these agreements, rightly celebrated as successes in international diplomacy, obfuscate the reality that there is no scientific support for the notion that achieving such goals will restore EEI, avert dangerous climate change, or protect human rights. The Paris Agreement target, if achieved, essentially sanctions dangerous climatic interference by setting allowable levels of global heating too high, which begs the question of its relevance in the realm of fundamental rights protection.

⁷² CLIMATE ACTION TRACKER: PARIS AGREEMENT TURNING POINT 1 (Dec. 2020), https://climateactiontracker.org/documents/829/CAT_2020-12-01_Briefing_GlobalUpdate_Paris5Years_Dec2020.pdf.

⁷³ Monbiot, *supra* note 71. See also Martin Parry, Jason Lowe & Clair Hanson, *Overshoot, Adapt and Recover*, 458 NATURE 1102 (2009) (arguing that more attention should be paid to the importance of adaptation); W. Neil Adger & Jon Barnett, *Four Reasons for Concern about Adaptation to Climate Change*, 41 ENV'T & PLAN. A: ECON. & SPACE 2800 (2009) (expressing concern about the ability to successfully adapt to the realities of climate change).

⁷⁴ See *Australia*, CLIMATE ACTION TRACKER (Aug. 2, 2022), <https://climateactiontracker.org/countries/australia> (rating Australia's NDC under the Paris Agreement as "insufficient" because "its recent support for new gas projects and ongoing backing of fossil fuel projects indicates a discrepancy with its new NDC target"); *Canada*, CLIMATE ACTION TRACKER (Sept. 15, 2022), <https://climateactiontracker.org/countries/canada> (rating Canada's NDC under the Paris Agreement as "highly insufficient" because "[r]ecent climate policy developments, while positive, are insufficient to address the climate crisis" and their "2030 target is not quite Paris compatible" and "are only in line with 4°C warming"); *USA*, CLIMATE ACTION TRACKER (Aug. 16, 2022), <https://climateactiontracker.org/countries/usa/> (rating the United States' NDC under the Paris Agreement as "insufficient" because while "President Biden signed into law the Inflation Reduction Act (IRA), the most ambitious and potentially impactful climate policy in US history," the "US will need to implement additional policies to reach its proposed 50-52% reduction target").

⁷⁵ Robin Webster, *A Brief History of the 1.5C Target*, CLIMATE HOME NEWS (Oct. 12, 2015), <https://www.climatechangenews.com/2015/12/10/a-brief-history-of-the-1-5c-target/>. Since at least 2008, a key demand of the Alliance of Small Island States ("AOSIS") has been to limit global heating to 1.5°C as compared to pre-industrial levels. *Id.*

⁷⁶ *Id.*

⁷⁷ Paris Agreement, *supra* note 1, at art. 2, § 1(a).

C. The Popularization and Acceptance of the 2°C Target as a Standard to Protect Fundamental Rights

The Paris Agreement target became popularized and accepted because it brought a complex, multi-dimensional problem down to a scale that was “readable for policymakers” while still, in theory, “retaining the flexibility needed to integrate both scientific and political uncertainties.”⁷⁸ A more blunt assessment of the forward-looking target is that it enabled countries to continue emitting vast quantities of GHG emissions, passing the conundrum of decarbonizing economies onto the young and future generations. One clear value of the target is that it communicates the policy direction adopted by the international community, even if it obscures other scientific complexities and truths. A downside is that such oversimplification tends to focus on a single, static indicator (e.g., an absolute temperature target), when, in fact, attention to the relationship between a series of scientifically supported and measurable indicators (e.g., EEI) would allow for a more precise, equally manageable policy prescription.⁷⁹

Despite the known risks of oversimplification and the lack of scientific support, the 2°C target nevertheless grew in popularity as it was echoed and repeated throughout social and political outlets leading up to and after the Paris Agreement. An analysis of media communications regarding 2°C, for example, reveals that, throughout the 1990s and leading up to Copenhagen in 2009, news reports around the world relied on the use of “anonymous expertise to legitimate claims of a two degree dangerous limit.”⁸⁰ In fact, major newspapers began to report that there was a “growing consensus around two degrees” and indicated that scientists had endorsed this number, noting it was “determined on the basis of the science” or the opinion of unidentified “many scientists.”⁸¹ Moreover, news coverage of the G8 Summit in 2009 championed that world leaders

⁷⁸ Béatrice Cointe, Paul-Alain Ravon & Emmanuel Guérin, *2°C: The History of a Policy–Science Nexus* 1 (IDDRI SciencesPo, Working Paper No. 19, 2011), https://www.researchgate.net/publication/303018742_2C_the_history_of_a_policy-science_nexus.

⁷⁹ See Knutti et al., *supra* note 3, at 1 (noting that temperature increase was only one of many available metrics for measuring dangerous anthropogenic warming. Other targets assessed included limits to GHG concentrations, energy uptake, sea-level rise, ocean acidification, rates of temperature change, regional climate change, specific local impacts, emissions reductions, and avoidance of tipping points like loss of the Greenland ice sheet); *see also* von Schuckmann et al., *supra* note 4, at 2015 (explaining that EEI is the most crucial measure of climate change because “EEI is less subject to decadal variations associated with internal climate variability than global surface temperature and therefore represents a robust measure of the rate of climate change”).

⁸⁰ Christopher Shaw, *Choosing a Dangerous Limit for Climate Change: Public Representations of the Decision Making Process*, 23 GLOB. ENV'T CHANGE 563, 567 (2013).

⁸¹ *Id.*

had embraced the 2°C target. A representative headline stated: “World leaders last night pledged to stop the planet’s temperature rising by more than two degrees.”⁸² If the science itself supported a lower target, as explained by Dr. Hansen and others, how did such a value become so widely accepted?

One theory is that the target found favor with political leaders because it was “‘the vaguest and the least directly binding’ target.”⁸³ Political leaders could endorse the 2°C target, secure with the knowledge that the “target [was] vague enough to avoid the perils of policy implications,” particularly those that are politically difficult to achieve.⁸⁴ In fact, according to John Holdren, President Barack Obama’s Science Advisor, “[t]he 2°C figure was agreed [to] not because it would be ‘safe’, but because multiple analyses had indicated that doing much better would be extremely difficult technologically and economically.”⁸⁵ However, these analyses did not change what was scientifically necessary for the planet. In addition, scholars have observed that the “primary function of the two degree limit is not to accurately communicate scientific knowledge about likely future climate impacts so much as to act as an anchoring device that frames climate change in a language commensurate with policy making and simplifies complexities for a non-expert, public audience.”⁸⁶ In short, from a policy perspective, many held the opinion that “any limit is better than no limit at all.”⁸⁷

Policymakers and many others presumed the 2°C target was “science based,” an assumption now advanced by many climate change advocates today. Even subsequent publications of the UNFCCC are at odds with its own mandate.⁸⁸ Some scholars have postulated that the implicit trust in viewing 2°C as an acceptable target may have been a product of the “opportunism of policymakers in placing responsibility for action onto the scientists or on misinterpretation by policymakers of the meaning and

⁸² *Id.*

⁸³ Morseletto, Biermann & Pattberg, *supra* note 13, at 663.

⁸⁴ *Id.*

⁸⁵ Eric Larson et al., Princeton Univ., Net-Zero America: Potential Pathways, Infrastructure, and Impacts, at 4 (Dec. 15, 2020), https://environmenthalfcenury.princeton.edu/sites/g/files/toruqf331/files/2020-12/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf.

⁸⁶ Shaw, *supra* note 80, at 568.

⁸⁷ *Id.*

⁸⁸ See Knutti et al., *supra* note 3, at 1 (“Following the Copenhagen Accord in 2009, the UNFCCC formally decided in 2012 to pursue actions in line with a 2 °C global temperature increase target. This target was a political decision informed by science, but no scientific assessment ever defended or recommended a particular target. Policymakers like to hide behind scientific evidence, ask for ‘actionable science’ and claim to make ‘science-based decisions’. Some argue that this process ‘has more in common with a salad bar — where people pick and choose convenient studies — than with the balanced search for truth that science aspires to’.”).

implications of the 2°C target.”⁸⁹ Whatever the reason, the 2°C target was assigned scientific support it simply lacks. According to Sir David King, Chief Scientific Advisor to the UK government from 2007–2013, the Foreign Secretary’s Permanent Special Representative on Climate Change from 2013–2017, and a highly influential negotiator leading up to the Paris Agreement’s embrace of the 1.5°C aspirational target: “The analyses of the IPCC show that even an average temperature rise from 1.5 to 2.0 degrees C above pre-industrial levels would severely impact on [sic] human well-being, worldwide.”⁹⁰ As a result, he said, “I have now changed my position. I’m now saying to everyone, I was wrong. 1.5 degrees is far too much,” a conclusion clearly supported by the science as described below.⁹¹

D. The Impacts of Current Warming and Projected Heating of 1.5°C–2°C Impacts Human Rights

There is near-universal scientific agreement that planetary heating of 1.5°C–2°C will have disastrous consequences. Our current situation, after all, is wholly unprecedented.⁹² In 2020, global average CO₂ levels reached 412.5 ppm.⁹³ May 2021 saw a monthly average of 419 ppm:

[This] is now comparable to where it was during the Pliocene Climatic Optimum, between 4.1 and 4.5 million years ago, when CO₂ was close to, or above 400 ppm. During that time, sea level was about 78 feet higher than today, the average temperature was 7 degrees Fahrenheit higher than in pre-industrial times, and studies indicate large forests occupied areas of the Arctic that is now tundra.⁹⁴

⁸⁹ Morseletto, Biermann & Pattberg, *supra* note 13, at 661 (internal citations omitted).

⁹⁰ Zoe Blackler, *Defence Statement by Sir David King in Support of Five Extinction Rebellion Defendants*, EXTINCTION REBELLION (Jan. 31, 2020), <https://extinctionrebellion.uk/2020/01/31/defence-statement-by-sir-david-king-in-support-of-five-extinction-rebellion-defendants/>. See also Alberto Lidji, *Guest Profile: Sir David King*, CLIMATE REPAIR (Oct. 4, 2020), <https://www.lidji.org/sir-david-king>.

⁹¹ Lidji, *supra* note 90.

⁹² BRUNO LATOUR, DOWN TO EARTH 44 (Catherine Porter trans., 2018) (“We understand nothing about the vacuity of contemporary politics if we do not appreciate the stunning extent to which the situation [of the Anthropocene] is unprecedented.”). See also SUMMARY FOR POLICYMAKERS 6 (2021), https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf (reflecting a summary of the major findings in the Sixth Assessment Report conducted by the IPCC in 2021).

⁹³ *Despite Pandemic Shutdowns, Carbon Dioxide and Methane Surged in 2020*, NOAA RSCH. NEWS (Apr. 7, 2021), <https://research.noaa.gov/article/ArtMID/587/ArticleID/2742/Despite-pandemic-shutdowns-carbon-dioxide-and-methane-surged-in-2020>.

⁹⁴ *Carbon Dioxide Peaks Near 420 Parts Per Million at Mauna Loa Observatory*, NOAA RSCH. NEWS (June 7, 2021) (internal citations omitted), <https://research.noaa.gov/article/ArtMID/587/ArticleID/2764/Coronavirus-response-barely->

Already, impacts at current levels of warming ($\sim 1.0^{\circ}\text{C}$ – 1.2°C)⁹⁵ are threatening entire irreplaceable ecosystems and harming the communities around the globe who depend on them, disproportionately burdening the most poor and vulnerable—especially the young.⁹⁶ In regions such as the Arctic, for instance, the migration of climate zones toward the poles is causing a “new climate state,” with such shifts “changing the geography of the planet.”⁹⁷

Because warming is not equally distributed across the globe, a 2 degree C average warming across the globe implies a 4 to 6 degrees C warming in the Arctic. This means seasonal sea ice cover will be gone, [the] Greenland ice sheet will melt almost completely and all Antarctic ice shelves will break up and disappear, entraining rapid speed up of the glaciers and multiple meter[s] of sea level rise per century.⁹⁸

Other physical systems, such as the Amazon Rainforest and permafrost, are similarly nearing irrecoverable tipping points. Coral reefs are already in “considerable irreversible decline,” and “restraining warming to ‘well below’ 2°C (equivalent to approximately 450 ppm of CO_2) will still result in the loss of 90% of today’s corals.”⁹⁹

slows-rising-carbon-dioxide. See also *Highest-Ever Mauna Loa CO2 Levels*, CO2-EARTH, <https://www.co2.earth/co2-records> (last visited Aug. 28, 2022) (recording 422.06 ppm of CO_2 in the Earth’s atmosphere on April 26, 2021, the highest level ever recorded).

⁹⁵ At present, current figures estimate that human activities are responsible for causing 1.0°C of global warming. SUMMARY FOR POLICYMAKERS, *supra* note 92, at 5.

⁹⁶ *Climate Justice*, U.N. SUSTAINABLE DEV. GOALS (May 31, 2019), <https://www.un.org/sustainabledevelopment/blog/2019/05/climate-justice/>.

⁹⁷ Andrew Glikson, *Polar-Ward Climate Zones Shift and Consequent Tipping Points*, ARCTIC NEWS (Dec. 4, 2020), <https://arctic-news.blogspot.com/2020/12/polar-ward-climate-zones-shift-and-consequent-tipping-points.html>. See generally Laura Landrum & Marika M. Holland, *Extremes Become Routine in an Emerging New Arctic*, 10 NATURE CLIMATE CHANGE 1108 (2020).

⁹⁸ Expert Report of Eric Rignot, Ph.D. at 2, *Juliana v. United States*, 339 F. Supp. 3d 1062 (D. Or. 2018) (No. 262-1).

⁹⁹ Expert Report of Ove Hoegh-Guldberg, Ph.D. at 8, *Juliana v. United States*, 339 F. Supp. 3d 1062 (D. Or. 2018) (No. 21-11) (internal citations omitted). See also Armstrong McKay et al., *supra* note 5, at 1177, 1178.

In 2020 alone, deadly wildfires burned in Australia,¹⁰⁰ Siberia,¹⁰¹ the American West,¹⁰² and South America,¹⁰³ and torched a quarter of Brazil's Pantanal, the world's largest tropical wetland, in some instances with devastating health consequences.¹⁰⁴ In 2021, "heat domes" shrouded the Western U.S., smashing temperature records in June and baking an already desiccated landscape, setting the stage for more deadly wildfires.¹⁰⁵ The heat wave of 2021 "erased" the Canadian town of Lytton, British Columbia, with incalculable consequences for its residents.¹⁰⁶ In 2022, Malaysia experienced heavy rain and massive flooding forcing the evacuation of nearly 125,000 people,¹⁰⁷ Antarctica had an unprecedented heat wave in March setting a new world record for

¹⁰⁰ Matthew Cappucci, *Australian Fires Had Bigger Impact on Climate than Covid-19 Lockdowns in 2020*, WASH. POST (July 27, 2021), <https://www.washingtonpost.com/weather/2021/07/27/australian-bushfires-smoke-climate-covid/> ("More than 42 million acres burned in an unprecedented outbreak of extreme fires, which produced lightning, launched smoky aerosols into the stratosphere and turned New Zealand's glaciers brown with ash. The suffocating smoke was blamed for hundreds of deaths.").

¹⁰¹ *Why Forest Fires in Siberia, Russia Threaten Us All*, BBC NEWS (Sept. 17, 2020), <https://www.bbc.com/news/av/science-environment-54126762> ("Wildfires in Siberia have been releasing record amounts of greenhouse gases, scientists say, contributing to global warming.").

¹⁰² *A Wall of Smoke on the U.S. West Coast*, EARTH OBSERVATORY (Sept. 9, 2020), <https://earthobservatory.nasa.gov/images/147261/a-wall-of-smoke-on-the-us-west-coast> ("Wildfires continue to rage in the Western United States. . . . The smoke was so thick and widespread that it was easily visible from 1.5 million kilometers (1 million miles) away from Earth.").

¹⁰³ Uki Goñi, Sam Cowie & William Costa, *'Total Destruction': Why Fires Are Tearing Across South America*, GUARDIAN (Oct. 9, 2020), <https://www.theguardian.com/environment/2020/oct/09/a-continent-ablaze-why-fires-are-tearing-across-south-america> ("Argentina, Brazil, Paraguay and Bolivia this year have seen a raging tsunami of fires, in what may become the longest and most destructive environmental crisis faced by the four neighboring countries.").

¹⁰⁴ Catrin Einhorn, Maria Magdalena Arréllaga, Blacki Migliozi & Scott Reinhard, *The World's Largest Tropical Wetland Has Become an Inferno*, N.Y. TIMES (Oct. 13, 2020), <https://www.nytimes.com/interactive/2020/10/13/climate/pantanal-brazil-fires.html>. See, e.g., Yisi Liu et al., *Health Impact Assessment of the 2020 Washington State Wildfire Smoke Episode: Excess Health Burden Attributable to Increased PM_{2.5} Exposures and Potential Exposure Reductions*, 5 GEOHEALTH 1, 6 (2021), <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2020GH000359> ("According to [the] health impact assessment using the [concentration reform function] for total PM_{2.5}, the 13-day exposure to wildfire smoke exposure may have led to 92.2 (95% CI: 0.0, 178.7) cases of excess all-cause mortality.").

¹⁰⁵ Matthew Cappucci, *Yet Another Major Heat Wave Is Set to Roast the Western U.S. and Canada by the Weekend*, WASH. POST (July 15, 2021), <https://www.washingtonpost.com/weather/2021/07/14/western-heat-wave-rockies/>.

¹⁰⁶ Vjosa Isai, *Heat Wave Spread Fire That 'Erased' Canadian Town*, N.Y. TIMES (July 10, 2021), <https://www.nytimes.com/2021/07/10/world/canada/canadian-wildfire-british-columbia.html>.

¹⁰⁷ *Malaysia Floods Hit Seven States Forcing Thousands to Evacuate*, CNN WORLD (Jan. 2, 2022), <https://www.cnn.com/2022/01/02/asia/malaysia-floods-evacuation-intl-hnk/index.html>.

the largest temperature increase above normal,¹⁰⁸ India had its hottest March in 122 years,¹⁰⁹ and Yellowstone National Park had so much rainfall it caused substantial flooding and mudslides.¹¹⁰

This current planetary emergency is simultaneously triggering a societal emergency. Climate-induced migration is but one example. Although it is difficult to know the true number of people displaced directly or indirectly by climate change, estimates range from 25 to over 200 million.¹¹¹ In 2018 alone, sudden-onset natural disasters displaced 17.2 million people.¹¹² In March 2021, it was reported that “[o]ver 12 million people around the world have been pushed out of their homes in the last six months . . . 80 percent of whom were displaced due to natural and climate-related disasters.”¹¹³ In August 2022, unprecedented flooding resulted in a third of Pakistan being underwater, with a half a million people forced to flee their homes.¹¹⁴ A second example of societal turmoil comprises the profound and worsening health impacts of climate change, especially on those, including children, who are most susceptible. A recent United Nations report, which introduces a children’s climate risk index, frames the climate crisis as a “child rights crisis” that creates

¹⁰⁸ *Antarctic Heatwave: A Rapid Analysis of the March 2022 Dome C Record Heatwave*, BERKELEY EARTH (Apr. 12, 2022), <https://berkeleyearth.org/antarctic-heatwave-rapid-attribution-review-dome-c-record/>.

¹⁰⁹ Soumya Sarkar, *India Experiences its Hottest March in 122 Years*, QUARTZ INDIA (Apr. 19, 2022), <https://qz.com/india/2156332/india-experiences-its-hottest-march-in-122-years/>.

¹¹⁰ Jim Robbins, Thomas Fuller & Christine Chung, *Flooding Chaos in Yellowstone, a Sign of Crises to Come*, N.Y. TIMES (June 15, 2022), <https://www.nytimes.com/2022/06/15/us/yellowstone-national-park-floods.html>.

¹¹¹ KANTA KUMARI RIGAUD ET AL., GROUNDSWELL: PREPARING FOR INTERNAL CLIMATE MIGRATION 21 (2018), <https://openknowledge.worldbank.org/handle/10986/29461>; VIVIANE CLEMENT ET AL., GROUNDSWELL PART 2: ACTING ON INTERNAL CLIMATE MIGRATION, at xx, xxii (2021), <https://openknowledge.worldbank.org/handle/10986/36248> (noting that “[t]he two reports’ combined findings provide, for the first time, a global picture of the potential scale of internal climate migration . . . allowing for a better understanding of how [slow-onset] climate change impacts, population dynamics, and development contexts shape mobility trends”); *Climate Change Could Displace 216 Million by 2050: Report*, ALJAZEERA (Sept. 14, 2021), <https://www.aljazeera.com/news/2021/9/14/climate-change-could-displace-216-million-by-2050-report>.

¹¹² GLOBAL REPORT ON INTERNAL DISPLACEMENT 1 (2019), <http://www.internal-displacement.org/sites/default/files/publications/documents/2019-IDMC-GRID.pdf>.

¹¹³ Katelyn Weisbrod, *Warming Trends: Climate Refugees, Ocean Benefits and Tropical Species Moving North*, INSIDE CLIMATE NEWS (Mar. 20, 2021), <https://insideclimatenews.org/news/20032021/warming-trends-natural-disasters-create-the-most-refugees-new-climate-benefits-from-ocean-protections-and-tropical-species-moving-to-the-southern-us/>.

¹¹⁴ Emily Atkinson, *Pakistan Floods: Third of Country Under Water with Half a Million Forced from Homes*, INDEPENDENT (Aug. 29, 2022), <https://www.independent.co.uk/climate-change/news/pakistan-floods-climate-minister-b2155169.html>.

“incredibly challenging environments for children to live, play and thrive.”¹¹⁵

In a world with 1.5°C of warming, virtually all natural and human systems will be altered, and disadvantaged and vulnerable communities will be hit the hardest.¹¹⁶ As the IPCC acknowledges, “Compared to current conditions, 1.5°C of global warming would nonetheless pose heightened risks to eradicating poverty, reducing inequalities and ensuring human and ecosystem well-being.”¹¹⁷ The IPCC concludes:

Warming of 1.5°C is not considered ‘safe’ for most nations, communities, ecosystems and sectors and poses significant risks to natural and human systems as compared to the current warming of 1°C (*high confidence*). The impacts of 1.5°C of warming would disproportionately affect disadvantaged and vulnerable populations through food insecurity, higher food prices, income losses, lost livelihood opportunities, adverse health impacts and population displacements (*medium evidence, high agreement*). Some of the worst impacts . . . are expected to be felt among agricultural and coastal dependent livelihoods, indigenous people, children and the elderly, poor labourers, poor urban dwellers in African cities, and people and ecosystems in the Arctic and Small Island Developing States (SIDS) (*medium evidence, high agreement*).¹¹⁸

Experiencing these impacts firsthand, climate vulnerable states have advocated for a revised target below 1.5°C. The International Indigenous Peoples’ Forum on Climate Change,¹¹⁹ CARICOM (Caribbean

¹¹⁵ NICHOLAS REES ET AL., THE CLIMATE CRISIS IS A CHILD RIGHTS CRISIS: INTRODUCING THE CHILDREN’S CLIMATE RISK INDEX 6 (2021), <https://www.unicef.org/media/105376/file/UNICEF-climate-crisis-child-rights-crisis.pdf> (“Almost every child on earth is exposed to at least one climate and environmental hazard, shock or stress such as heatwaves, cyclones, air pollution, flooding and water scarcity. But a record-breaking 850 million—approximately one-third of all children—are exposed to four or more stresses . . .”).

¹¹⁶ Ove Hoegh-Guldberg et al., *Impacts of 1.5°C of Global Warming on Natural and Human Systems*, in GLOBAL WARMING OF 1.5°C, *supra* note 7, at 178, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter3_Low_Res.pdf

¹¹⁷ Joyashree Roy et al., *Sustainable Development, Poverty Eradication and Reducing Inequalities*, in GLOBAL WARMING OF 1.5°C, *supra* note 7, at 446, <https://www.ipcc.ch/sr15/chapter/chapter-5/>.

¹¹⁸ *Id.*

¹¹⁹ Press Release, International Indigenous Peoples Forum on Climate Change, Durban Platform for Enhanced Action (ADP) Negotiations, Bonn, Germany (June 4, 2014), https://www.forestpeoples.org/sites/default/files/news/2014/06/ADP_IIPFCC2_0.pdf.

Community),¹²⁰ and the Climate Vulnerable Forum¹²¹ have called for limiting global average surface warming to well *below* 1.5°C above pre-industrial levels, with the Climate Vulnerable Forum further requiring the “long-term stabilisation of atmospheric greenhouse gas concentrations at well below 350ppm [sic].”¹²² Coalitions of the world’s most climate-vulnerable nations have taken on the additional role of gap-filling IPCC science, given its “overly-conservative”¹²³ nature as a consensus body that does not conduct the primary scientific research “compared to the most recent, real-world observations and peer-reviewed literature.”¹²⁴ Although those most susceptible to the consequences of climate change may not have a powerful voice at the UNFCCC negotiating tables, they are documenting their stories in judicial fora around the world, presenting judicial bodies with important legal questions as to how to uphold fundamental rights in the face of the climate crisis.

II. THE ROLE OF COURTS IN ADJUDICATING FUNDAMENTAL RIGHTS IN THE CLIMATE CHANGE CONTEXT

This section briefly surveys several judicial decisions that have considered climate change as a fundamental rights issue and identifies the legal risks inherent in an advocate’s use of the Paris Agreement target as a proxy legal standard designed to protect fundamental rights.

A. Courts Are Finding Climate Change Infringes Fundamental Rights

Legal arguments that climate change infringes fundamental rights have largely succeeded. The central challenge for judicial bodies hearing climate change cases has been assigning a remedy that actually protects fundamental rights. Although an increasing number of climate change

¹²⁰ Press Release, CARICOM, CARICOM Declaration for Climate Action (June 5, 2015), <https://caricom.org/caricom-declaration-for-climate-action/>.

¹²¹ Press Release, Climate Vulnerable Forum, Declaration of the Climate Vulnerable Forum (Nov. 10, 2009), <https://daraint.org/wp-content/uploads/2010/12/Declaration-of-the-CVF-FINAL2.pdf>.

¹²² *Id.*

¹²³ Declaration of Kevin E. Trenberth in Support of Plaintiffs’ Urgent Motion Under Circuit Rule 27-3(b) for Preliminary Injunction at 4–5, *Juliana v. United States*, 947 F.3d 1159 (9th Cir. 2020) (No. 18-36082).

¹²⁴ *Id.* See also Indigenous Women of the Americas Defenders of Mother Earth Treaty Compact, Sept. 27, 2015, <http://indigenousandwomenrising.org/defenders-of-mother-earth-treaty/> (stating that the natural laws “have been violated to such an extreme degree that the sacred system of life is now threatened and does not have the capacity for life to continue safely in the way in which it has existed for millions of years” and calling for women to “[n]onviolently rise up with others in [their] communities and around the world to demand immediate changes in the laws that have created the destruction”).

cases appear in courts today,¹²⁵ climate change cases have been litigated for over thirty years, and thus the central legal issues have evolved over time.¹²⁶ In some of the early climate change cases, judges struggled with the quandary of an injury that appeared too distant or hypothetical.¹²⁷ But, more recently, plaintiffs have been able to surmount the injury threshold.¹²⁸ As a Belgian court recently acknowledged in *Klimaatzaak*

¹²⁵ Jocelyn Timperley, *The Law That Could Make Climate Change Illegal*, BBC (July 7, 2020), <https://www.bbc.com/future/article/20200706-the-law-that-could-make-climate-change-illegal>; Matthew Green, Valerie Volcovici & Emma Farge, *Climate Battles Are Moving into the Courtroom, and Lawyers Are Getting Creative*, REUTERS (July 2, 2020, 4:15 PM), <https://www.reuters.com/article/us-climate-change-lawsuits/climate-battles-are-moving-into-the-courtroom-and-lawyers-are-getting-creative-idUKKBN2433G5?edition-redirect=uk>; Holding Redlich, *Climate Change Litigation and the Human Rights Act 2019*, LEXOLOGY (July 1, 2020), <https://www.lexology.com/library/detail.aspx?g=9d4ee4ae-68c8-440c-bf02-aa4963b5deb4>. See also Ellen M. Gilmer, *Climate Cases Poised for Bigger Fights as Courts Clear Hurdles*, BLOOMBERG L. (June 2, 2020, 3:01 AM), <https://news.bloomberglaw.com/environment-and-energy/climate-cases-poised-for-bigger-fights-as-courts-clear-hurdles?context=article-related>; Quinn Emanuel Urquhart & Sullivan, LLP, *May 2020: A Critical Period for Climate Change Litigation*, JD SUPRA (June 1, 2020), <https://www.jdsupra.com/legalnews/may-2020-a-critical-period-for-climate-65829/>.

¹²⁶ See, e.g., *Found. on Econ. Trends v. Watkins*, 731 F. Supp. 530, 530–31, 533 (D.D.C. 1990) (hearing plaintiffs' complaint against the Secretaries of Interior, Agriculture, and Energy for "authorizing, carrying out, approving, funding, or participating in programs that contribute to the 'greenhouse effect'" without evaluating environmental impacts of the actions under the National Environmental Policy Act and denying defendants' motion to dismiss as plaintiffs were not seeking an advisory opinion, claims were ripe, and plaintiffs had standing); *Los Angeles v. Nat'l Highway Traffic Safety Admin.*, 912 F.2d 478, 485, 490 (D.C. Cir. 1990) (finding that cities and state had standing to challenge NHTSA's decision not to prepare environmental impact statements under the National Environmental Policy Act prior to issuing Corporate Average Fuel Economy Standards for automobiles, but deciding the agency's decision was not arbitrary, capricious, or otherwise contrary to law), *overruled by* *Fla. Audubon Soc'y v. Bentsen*, 94 F.3d 658 (D.C. Cir. 1996) (en banc); *Border Power Plant Working Grp. v. Dep't of Energy*, 260 F. Supp. 2d 997, 1016, 1023 (S.D. Cal. 2003) (holding that the environmental impact of Mexican power plants had to be considered under the National Environmental Policy Act and agency determination that the operation of the power plants would not have significant impact on ecologically critical area was arbitrary and capricious); *Native Vill. of Kivalina v. ExxonMobil Corp.*, 696 F.3d 849, 853, 858 (9th Cir. 2012) (holding that the Clean Air Act preempted federal common law, thus precluding plaintiff's public nuisance claim); *Am. Elec. Power Co. v. Connecticut*, 564 U.S. 410, 420, 424 (2011) (an equally divided Court held that plaintiff-states had standing to sue, but a majority held that the Clean Air Act "displace[d] any federal common-law right to seek abatement of . . . emissions from fossil-fuel fired powerplants").

¹²⁷ See, e.g., *Massachusetts v. EPA*, 549 U.S. 497, 541–42 (2007) (Roberts, C.J., dissenting) (noting that "[t]he very concept of global warming seems inconsistent with this particularization requirement" and "accepting a century-long time horizon and a series of compounded estimates [of sea level rise] renders requirements of imminence and immediacy utterly toothless"); *Ctr. for Biological Diversity v. U.S. Dep't of Interior*, 563 F.3d 466, 478 (D.C. Cir. 2009) ("Petitioners can only aver that any significant adverse effects of climate change 'may' occur at some point in the future. This does not amount to the actual, imminent, or 'certainly impending' injury required to establish standing.").

¹²⁸ See *Juliana v. United States*, 947 F.3d 1159, 1168 (9th Cir. 2020) (noting that "'it does not matter how many persons have been injured' if the plaintiffs' injuries are 'concrete and personal'" (quoting *Massachusetts*, 549 U.S. at 517)); see also *Cath. League for Religious & C.R. v. City &*

ASBL v. Belgium, “[i]n the current state of climate science . . . there can no longer be any doubt that there is a real threat of dangerous climate change with a direct negative effect on the daily lives of current and future generations”¹²⁹ Similarly, in *Juliana v. United States*, the Ninth Circuit Court of Appeals recognized that climate change is affecting the plaintiffs “now in concrete ways and will continue to do so unless checked.”¹³⁰

The severity of climate change injuries has prompted courts and international bodies to recognize that climate injuries implicate rights fundamental to human existence. In *Klimaatzaak*, the court held that “in pursuing their climate policy, the [government] defendants infringe the fundamental rights of the plaintiffs, and more specifically Articles 2 and 8 of the [European Convention on Human Rights], by failing to take all necessary measures to prevent the effects of climate change on the plaintiffs’ life and privacy[.]”¹³¹ In *Neubauer v. Germany*, the German Constitutional Court recognized that “[t]he state’s [constitutional] duty of protection . . . also includes the duty to protect life and health against the risks posed by climate change.”¹³²

In denying the federal government and fossil fuel industry intervenors’ motions to dismiss in *Juliana*, Oregon District Court Judge Ann Aiken became the first judge to recognize a climate-specific fundamental right, closely tied to the rights to life and liberty secured by the U.S. Constitution:

Exercising my “reasoned judgment,” I have no doubt that the right to a climate system capable of sustaining human life is fundamental to a free and ordered society. Just as marriage is the “foundation of the family,” a stable climate system is quite literally the foundation “of society, without which there would be neither civilization nor progress.”

. . . .

In this opinion, this Court simply holds that where a complaint alleges governmental action is affirmatively and substantially

Cnty. of San Francisco, 624 F.3d 1043, 1048–53 (9th Cir. 2010); *Novak v. United States*, 795 F.3d 1012, 1018 (9th Cir. 2015); *Jewel v. Nat’l Sec. Agency*, 673 F.3d 902, 910 (9th Cir. 2011); *Newdow v. Lefevre*, 598 F.3d 638, 642 (9th Cir. 2010), *cert. denied*, 562 U.S. 1271 (2011).

¹²⁹ *ASBL Klimaatzaak v. Belgium*, Civ. [Tribunal of First Instance] Brussels (4th ch.), June 17, 2021, p. 61 [hereinafter *Klimaatzaak*], https://prismic-io.s3.amazonaws.com/affaireclimat/18f9910f-cd55-4c3b-bc9b-9e0e393681a8_167-4-2021.pdf.

¹³⁰ *Juliana*, 947 F.3d at 1168.

¹³¹ *Klimaatzaak*, *supra* note 129, at 83.

¹³² *Neubauer v. Germany*, BVerfG, 1 BvR 2656/18 et al., March 24, 2021, ¶ 148 [hereinafter *Neubauer*] (internal citations omitted), http://climatecasechart.com/wp-content/uploads/sites/16/non-us-case-documents/2021/20210324_11817_order-1.pdf.

damaging the climate system in a way that will cause human deaths, shorten human lifespans, result in widespread damage to property, threaten human food sources, and dramatically alter the planet's ecosystem, it states a claim for a due process violation[.] To hold otherwise would be to say that the Constitution affords no protection against a government's knowing decision to poison the air its citizens breathe or the water its citizens drink. Plaintiffs have adequately alleged infringement of a fundamental right.¹³³

Although *Juliana* is the only U.S. federal court to date to recognize a climate-specific right,¹³⁴ some state courts, such as the Hawai'i Supreme Court, have followed suit and ruled that the state's constitutional right to a clean and healthful environment "subsumes a right to a life-sustaining climate system."¹³⁵ In the U.S. state of Montana, Judge Kathy Seeley held that sixteen youth plaintiffs sufficiently alleged that Montana's fossil fuel energy policy implicated their right to a clean and healthy environment secured by the Montana Constitution.¹³⁶ Some state supreme court justices in dissenting opinions have followed Judge Aiken's lead in acknowledging the existence of a fundamental climate right. Justices Peter Maassen and Susan Carney, in a youth climate change case before the Alaska Supreme Court, wrote in dissent:

I disagree with the court's rejection of declaratory relief as serving no useful purpose. In my view, a balanced consideration of prudential doctrines requires that we explicitly recognize a constitutional right to a livable climate – arguably the bare minimum when it comes to the inherent human rights to which the Alaska Constitution is dedicated.¹³⁷

¹³³ *Juliana v. United States*, 217 F. Supp. 3d 1224, 1250 (D. Or. 2016) (internal citations omitted), *rev'd and remanded*, 947 F.3d 1159 (9th Cir. 2020).

¹³⁴ In Washington state, King County Superior Judge Hollis Hill found, in the context of a climate change case brought by youth plaintiffs, that the "fundamental and inalienable right of the people of the State of Washington to live in a healthful and pleasant environment" codified in statute, WASH. REV. CODE § 43.21A.010 (1970), constitutes a retained right under Article I, Section 30 of the Washington State Constitution. *Foster v. Wash. State Dep't of Ecology*, No. 14-2-25295-1 SEA (Wash. Super. Ct. Nov. 19, 2015) (internal citations omitted); DEP'T OF ECOLOGY, WASHINGTON GREENHOUSE GAS EMISSION REDUCTION LIMITS (Dec. 2014) ("Climate change is not a far off risk. It is happening now globally and the impacts are worse than previously predicted, and are forecast to worsen. . . . If we delay action by even a few years, the rate of reduction needed to stabilize the global climate would be beyond anything achieved historically and would be more costly.").

¹³⁵ *In re Maui Elec. Co.*, 506 P.3d 192, 202 n.15 (Haw. 2022).

¹³⁶ *Held v. Montana*, No. CDV-2020-307, at 14 (Mont. First Jud. Dist. Ct. Lewis & Clark Cnty. Aug. 4, 2021), http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2021/20210804_docket-CDV-2020-307_order.pdf.

¹³⁷ *Sagoonick v. Alaska*, 503 P.3d 777, 805 (Alaska 2022) (Maassen, J., dissenting in part). See also *Aji P. v. State of Washington*, 497 P.3d 350, 353 (Wash. 2021) (Gonzalez, J., dissenting)

Several other decisions from the international circuit, including Belgium, Canada, Colombia, Germany, Norway, Portugal, and Pakistan have opened the door for climate protections based on other fundamental rights, such as the right to life, personal security, or privacy.¹³⁸ The Netherlands Supreme Court found that “no other conclusion can be drawn but that the State is required . . . to take measures to counter the genuine threat of dangerous climate change” to protect the rights to life and respect for private and family life secured by Articles 2 and 8 of the European Convention on Human Rights, which “encompass[] the positive obligation to take reasonable and appropriate measures to protect individuals against possible serious damage to their environment.”¹³⁹ In Canada, Judge Carole J. Brown recognized that youth’s climate change claims against the province of Ontario engaged the Canadian Charter of

(“[T]he court should not avoid its constitutional obligations that protect not only the rights of these youths but all future generations who will suffer from the consequences of climate change.”).

¹³⁸ Norway’s Supreme Court heard a climate change case over seven days involving Article 112 of its constitution and Arctic oil exploration in Norway’s Barents Sea. *See* Alexandru Gociu & Suryapratim Roy, *Norway’s Supreme Court Is Set to Rule on Whether the Country Can Keep Searching for New Arctic Oil*, ARCTIC TODAY (Nov. 3, 2020), <https://www.arctictoday.com/norways-supreme-court-is-set-to-rule-on-whether-the-country-can-keep-searching-for-new-arctic-oil/> (“The case focuses on Article 112 of the Norwegian Constitution, which focuses on sustainability and protection of the environment. In 2014, [Article 112] was updated to introduce a duty of care on the government to provide a livable environment for current and future generations.”).

In September 2020, a group of Portuguese youth activists filed a climate change lawsuit in the European Court of Human Rights. The suit was filed against thirty-three countries and argued that those countries needed to make more ambitious emissions cuts to safeguard their future physical and mental well-being. While the European Court of Human Rights has yet to hear the merits of the case, the court did order the thirty-three governments to respond to the plaintiffs’ allegations. The court also asked the governments to explain whether their failure to reduce their emissions violated various articles of the European Convention on Human Rights. *Claudio Duarte Agostinho v. Portuga*, App. No. 39371/20, at 2–5 (Nov. 30, 2020), https://www.nhri.no/wp-content/uploads/2020/11/DUARTE-AGOSTINHO-and-others-vs-PORTUGAL-and-32-others-unofficial-translation-fr.en_.pdf.

In 2015, a lawsuit was brought by a Pakistani farmer who argued that Pakistan had failed to live up to the country’s own climate plans, specifically with regard to increasing the country’s resilience to climatic change. Noting that the “delay and lethargy” of the state “offend[ed]” fundamental rights, such as the rights to life and human dignity, under the Pakistani Constitution, the judge ordered the Pakistani government to establish a national commission on climate change with a clear remit to ensure steps would be taken to improve climate resiliency. *Leghari v. Fed’n of Pak.*, (2015) W.P. No. 25501 (High Ct. Lahore) (Pak.) 1, 2, 6–7, https://elaw.org/system/files/pk.leghari.090415_0.pdf.

See also Rechtbank Den Haag 24 juni 2015 (Stichting Urgenda/Staat der Nederlanden) (Neth.), ¶ 2.38, http://climatecasechart.com/wp-content/uploads/sites/16/non-us-case-documents/2015/20150624_2015-HAZA-C0900456689_decision-1.pdf; *Sharma ex rel. Sister Marie Brigid Arthur v. Minister for the Env’t* [No. 2] (2021) FCA 774 (Austl.), ¶ 58–59, <https://equitygenerationlawyers.com/wp/wp-content/uploads/2021/07/Sharma-v-Minister-No-2-2021-FCA-774.pdf>.

¹³⁹ HR 20 december 2019, RvdW 2020 (De Staat der Nederlanden/Stichting Urgenda) (Neth.), ¶¶ 5.6.2, 5.2.3 [hereinafter *Urgenda* Supreme Court Opinion].

Rights and Freedoms rights to life, liberty, security of the person, and equality, such that they were entitled to a trial to challenge the province's GHG emissions target and plan to reduce GHG emissions.¹⁴⁰

International bodies, such as the United Nations Human Rights Office of the High Commissioner, acknowledge that the first step toward an effective remedy is a declaration that because climate change threatens the enjoyment of the full suite of human rights, states have an “obligation to prevent the foreseeable adverse effects of climate change and ensure those affected by it, particularly those in vulnerable situations, have access to effective remedies and means of adaptation to enjoy lives of human dignity.”¹⁴¹

Courts are also coming to grips with the multicausal reality that defines climate change cases and are acknowledging the influential role governments play in setting policies that result in GHG emissions.¹⁴² In recognizing that the youth had proffered sufficient evidence to show that the U.S. government's role in contributing to climate change by purposefully promoting a climate polluting fossil-fuel energy system was a “substantial factor in causing the plaintiffs' injuries,” the majority in *Juliana* summarized the U.S. federal government's role as follows:

[T]he federal government has long understood the risks of fossil fuel use and increasing carbon dioxide emissions. As early as 1965, the Johnson Administration cautioned that fossil fuel emissions threatened significant changes to climate, global temperatures, sea levels, and other stratospheric properties. In 1983, an Environmental Protection Agency (“EPA”) report projected an increase of 2 degrees Celsius by 2040, warning that a “wait and see” carbon emissions policy was extremely risky. And, in the 1990s, the EPA implored the government to act before it was too late. Nonetheless, by 2014, U.S. fossil fuel emissions had climbed to 5.4 billion metric tons, up substantially from 1965. This growth shows no signs of abating. From 2008 to 2017, domestic petroleum and natural gas production increased by nearly 60%, and the country is now expanding oil and gas extraction four times faster than any other nation.¹⁴³

¹⁴⁰ *Mathur v. Ontario*, [2020] O.N.S.C. 6918, ¶¶ 143–47, 267–68 (Can. Ont. Sup. Ct.) [hereinafter *Mathur*], <https://ecojustice.ca/wp-content/uploads/2020/11/Reasons-for-Decision-CJB-FINAL-signed-2020-11-12.pdf>.

¹⁴¹ *OHCHR and Climate Change*, U.N. HUM. RTS. OFF. HIGH COMM'R, <https://www.ohchr.org/en/climate-change#:~:text=States> (last visited Aug. 7, 2022).

¹⁴² The attribution science is tremendously helpful on the causation issue. See Michael Burger, Jessica Wentz & Randle Horton, *The Law and Science of Climate Change Attribution*, 45 COLUM. J. ENV'T L. 57, 112–13 (2020).

¹⁴³ *Juliana v. United States*, 947 F.3d 1159, 1166 (9th Cir. 2020).

The Ninth Circuit went on to reject the argument that “the causal chain is too attenuated because it depends in part on the independent actions of third parties.”¹⁴⁴ Other courts have similarly declined to endorse the argument that governments should not be held accountable for their conduct that contributes to climate change simply because the problem may have many contributing factors. For example, according to the Supreme Court of the Netherlands in *Netherlands v. Urgenda Foundation*:

Partly in view of the serious consequences of dangerous climate change . . . the defence that a state does not have to take responsibility because other countries do not comply with their partial responsibility, cannot be accepted. Nor can the assertion that a country’s own share in global greenhouse gas emissions is very small and that reducing emissions from one’s own territory makes little difference on a global scale, be accepted as a defence. Indeed, acceptance of these defences would mean that a country could easily evade its partial responsibility by pointing out other countries or its own small share. If, on the other hand, this defence is ruled out, each country can be effectively called to account for its share of emissions and the chance of all countries actually making their contribution will be greatest¹⁴⁵

Similarly, in the *Klimaatzaak* case in Belgium, the court found that “[t]he global dimension of the problem of dangerous global warming does not exempt the Belgian public authorities from their pre-described obligation under Articles 2 and 8 of the [European Convention on Human Rights].”¹⁴⁶

In *Mathur v. Her Majesty the Queen in Right of Ontario*, a case brought by a group of Ontario youth challenging the provincial government’s 2030 GHG emission target and climate change plan as insufficiently ambitious and violative of constitutional rights, the court recognized that “the government is acting to cause the harm in question. By lowering the target for Ontario, the government is essentially authorizing, incentivizing, and itself creating the very GHGs that are the cause of the alleged *Charter* violations in the Application.”¹⁴⁷ The court acknowledged that “Ontario is actively authorizing and creating the very emissions that are causing harm.”¹⁴⁸

¹⁴⁴ *Id.* at 1169.

¹⁴⁵ *Urgenda* Supreme Court Opinion, *supra* note 139, ¶ 5.7.7. See also *Neubauer*, *supra* note 132, ¶ 200.

¹⁴⁶ *Klimaatzaak*, *supra* note 129, at 61.

¹⁴⁷ *Mathur*, *supra* note 140, ¶ 194.

¹⁴⁸ *Id.* ¶ 200. The Applications point out that “Ontario established a target that essentially allows GHG emitters to continue to emit GHGs into the atmosphere, thereby causing harm.” *Id.* ¶ 218.

In light of the recognition that climate change can implicate individual constitutional and human rights in legally cognizable ways, the question presented to advocates is how to present climate change injury and causation stories to the courts so as to justify not only recognition of the individual's climate change injuries and a challenged entity's role in causing climate change, but to support a finding of liability and imposition of a legal remedy that actually protects the rights from being infringed.¹⁴⁹ In nearly all climate change cases being litigated today, the remedy remains the holy grail. The issuance of a remedy requires judicial bodies to feel secure in deciding the standard by which to gauge a violation of fundamental rights.¹⁵⁰

B. The Unfortunate Trend of Advocates Adopting the 1.5°C–2°C Paris Target as the Legal Standard Protective of Fundamental Rights

In several recent climate change cases, judicial bodies have begun to equate the Paris Agreement temperature target to the legal standard that gauges a government's compliance with its obligations to protect fundamental rights. For example, the Dutch Supreme Court's well-known and precedent-setting *Urgenda* decision characterizes 1.5°C of heating as "safe" and leaves decision makers assured in their course of conduct pursuing policies that result in such increases in temperature, regardless of what the science says will ensue at such levels of warming.¹⁵¹ More recently, in *Neubauer*, the court upheld as "constitutionally permissible" the legislature's decision to incorporate the Paris Agreement temperature target into Germany's climate law, finding that the Paris Agreement target:

[M]ust indeed also be understood as being a specification of the climate action required under constitutional law. This is primarily supported by the fact that the [1.5°C and 2°C] climate target[s] . . . [are] the internationally agreed temperature limit[s] of Art. 2(1)(a) PA, which the legislator has deliberately and explicitly taken as a basis. [Their] constitutional law significance

¹⁴⁹ See David B. Owens, Comment, *Fourth Amendment Remedial Equilibration: A Comment on Herring v. United States and Pearson v. Callahan*, 62 STAN. L. REV. 563, 563–65 (2010) (quoting *Marbury v. Madison*, 5 U.S. (1 Cranch) 137, 163 (1803)) (citing Chief Justice Marshall's "general and indisputable rule" that "where there is a legal right, there is also a legal remedy by suit or action at law, whenever that right is invaded" while noting that "without a remedy there is no right," such that "even if a court says a lot about the value of a right, the manner in which it vindicates that right is really what determines its value").

¹⁵⁰ *Id.* at 565.

¹⁵¹ *Urgenda* Supreme Court Opinion, *supra* note 139, ¶ 2.1 ("In recent years, new insights have shown that the temperature can only safely rise by no more than 1.5°C, which translates into a greenhouse gas concentration level of no more than 430 ppm in the year 2100.").

goes beyond the consent given by the German legislator to the Paris Agreement in passing the act of approval.¹⁵²

In Brazil, four political parties filed a case challenging the federal government's failure to adopt administrative measures to implement the statutorily created National Climate Change Fund, which was designed to ensure funding for climate mitigation and adaptation activities.¹⁵³ The parties alleged that while the Ministry for the Environment was legally obligated to prepare an annual plan for the Climate Fund, it had been inoperative and unfunded, which violated constitutional obligations to protect and preserve the environment, forests, fauna, and flora; Brazil's commitments under the Paris Agreement; and separation of powers.¹⁵⁴ Calling climate change "one of the defining issues of our time" that "may put at risk the survival of man on Earth,"¹⁵⁵ the Brazilian Supreme Court ruled that there was a constitutional duty to make the Climate Fund operative.¹⁵⁶ While the court made no findings as to what temperature target would protect human rights, the court held that environmental treaties like the Paris Agreement "are a species of the genus human rights treaties," which enjoy "supranational status," and define the contours of the constitutional duty to fund climate mitigation under Brazilian law.¹⁵⁷

Rather than looking to peer-reviewed scientific evidence to decide the standard of protection for fundamental rights, some courts appear to be defaulting to acceptance of the Paris Agreement target, and whether a government's conduct aligns with its commitments under the Paris Agreement, as the litmus test for fundamental rights protection. As two legal scholars reflected, "the [*Urgenda*] court was relieved of the need to articulate detailed normative implications of the science, given that plaintiffs sought only to hold the . . . government to its own previously stated commitments."¹⁵⁸ But, if judicial bodies are to be "relieved" of the exercise of reviewing the actual scientific evidence in climate change cases, which appears to be the trend,¹⁵⁹ how can advocates ensure that

¹⁵² *Neubauer*, *supra* note 132, ¶ 209.

¹⁵³ PSB v. Brazil, S.T.F. 708, *Apelação Cível*, Relator: Luís Roberto Barroso, 1.7.2022 (Braz.), <http://climatecasechart.com/non-us-case/psb-et-al-v-federal-union/>.

¹⁵⁴ *See generally id.*, http://climatecasechart.com/wp-content/uploads/sites/16/non-us-case-documents/2022/20220701_ADPF-708_decision-1.pdf (unofficial translation).

¹⁵⁵ *Id.* ¶¶ 6, 7.

¹⁵⁶ *Id.* ¶ 37.

¹⁵⁷ *Id.* ¶ 17.

¹⁵⁸ R. Henry Weaver & Douglas A. Kysar, *Courting Disaster: Climate Change and the Adjudication of Catastrophe*, 93 NOTRE DAME L. REV. 295, 339, 339 n.312 (2017) (citing the Dutch government's commitments under the 2020 Cancun Agreements).

¹⁵⁹ *E.g.*, *Klimaatzaak*, *supra* note 129, at 64 ("The scientific community agrees on the need to contain the concentration of GHGs to 450 ppm by 2100, whereas currently the concentration of GHGs is already above 400 ppm.").

protection of fundamental rights extends to those most vulnerable to climate harms?

Because of the devastating climate harms associated with 1.5°C–2°C of heating, judicial decisions calibrating the protection of fundamental rights to the Paris Agreement target implicitly endorse the infringement of certain (often minoritized) clients' rights. In these cases, even if there is a "win" for lawyers who seek to enforce compliance with Paris Agreement commitments,¹⁶⁰ there is a net loss for people and other life on our planet. In other words, in these cases, legal climate advocates may "fulfil their legal duty, even if they fail to fulfil their wider duty of care."¹⁶¹ The science suggests that blind adherence to the Paris Agreement target locks us into disaster *even if* the target is achieved, and thus a different approach is worth exploring when the ultimate goal is the protection of universal fundamental rights.

III. INTRODUCING A SCIENTIFICALLY BASED STANDARD OF PROTECTION IN FUNDAMENTAL RIGHTS BASED CLIMATE CHANGE CASES

The work of defining and protecting fundamental rights falls squarely within the province of judicial bodies, and it is imperative that such bodies have a full understanding of the underlying science when rendering such existential decisions. This section proposes a specific evidence-based and scientifically supported standard for stabilizing the climate system as an alternative to the Paris Agreement target, analyzes whether this standard is justiciable, and argues that advocates should use it instead of the Paris Agreement target to define the legal standard of protection of fundamental rights in climate change cases.

A. The Scientific Prescription to Stabilize the Climate System and Protect Fundamental Rights

Fundamental rights protection requires a climate system standard that is not only safe for humanity, but scientifically supported and measurable

¹⁶⁰ These decisions are rightfully classified as a "win" in the realm of global climate litigation for a variety of reasons, including, for example, in *Urgenda*, the court's ruling as to the justiciability of climate change claims under the ECHR and the Dutch Constitution and its ultimate holding that the government of the Netherlands is legally obligated to reduce its GHG emissions. *Urgenda* Supreme Court Opinion, *supra* note 139. See also *Commune de Grande-Synthe v. France* [CE] [highest administrative court] July 1, 2021, <http://climatecasechart.com/climate-change-litigation/non-us-case/commune-de-grande-synthe-v-france/> (representing the first ruling of its kind in France).

¹⁶¹ Monbiot, *supra* note 71. See also Weaver & Kysar, *supra* note 158, at 354 (citing First Amended Complaint at 5, 36, 87, 93, *Juliana v. United States*, 339 F. Supp. 3d 1062 (D. Or. 2018) (No. 6:15-cv-01517)) (noting that the *Juliana* plaintiffs, although alleging constitutional violations, "also speak in the register of tort, invoking a 'duty of care' on the part of the trustee governments").

as well. When representing clients before judicial bodies, advocates have a duty of care to seek an evidence-based, peer-reviewed prescription as a fundamental rights standard of protection. The very foundation of judicial systems around the world relies on the use of best evidence to assure fair, impartial, and just remedies. There is no controversy with respect to advocates using scientific evidence to document how climate change is injuring individuals and how government decisions are causing and contributing to those injuries; the science of EEI should similarly be used as evidence to define the legal standard of human rights protection and appropriate remedies.¹⁶²

EEI determines the “temporal evolution of Earth’s climate,” which scientists have characterized as “[t]he most practical way to monitor climate state, variability and change.”¹⁶³ Scientists advise that “[t]his simple number, EEI, is the most fundamental metric that the scientific community and public must be aware of as the measure of how well the world is doing in the task of bringing climate change under control.”¹⁶⁴ It is vital for judicial bodies to understand the extent of EEI because it “is the most critical number defining the prospects for continued global warming and climate change,”¹⁶⁵ indicating the severity of the human rights infringement.

The restoration of Earth’s energy balance would approximate the Earth’s climate system in which human civilization was able to develop and thrive during the last several thousand years, which fluctuated at the naturally slow, glacial pace over the millions of years of Earth’s history. Today there are two aspects of human-caused climate change that scientists tell us are dangerous. First, atmospheric CO₂ levels are much higher today than at any time in human civilization.¹⁶⁶ Second, the

¹⁶² “An intelligent evaluation of facts is often difficult or impossible without the application of some scientific, technical, or other specialized knowledge.” FED. R. EVID. 702 advisory committee’s note to 1972 proposed rules.

¹⁶³ von Schuckmann et al. explain: “All energy entering or leaving the Earth climate system does so in the form of radiation at the top of the atmosphere (TOA). The difference between incoming solar radiation and outgoing radiation, which is the sum of the reflected shortwave radiation and emitted longwave radiation, determines the net radiative flux at TOA. Changes of this global radiation balance at TOA – the so-called Earth energy imbalance (EEI) – determine the temporal evolution of Earth’s climate: If the imbalance is positive (i.e., less energy going out than coming in), energy in the form of heat is accumulated in the Earth system, resulting in global warming – or cooling if the EEI is negative. . . . Contemporary estimates of the magnitude of the Earth’s energy imbalance range between about 0.4 and 0.9 w/m⁻² . . . and are directly attributable to increases in carbon dioxide and other greenhouse gases in the atmosphere from human activities.” von Schuckmann et al., *supra* note 4, at 2014–15 (internal citation omitted).

¹⁶⁴ *Id.* at 2014.

¹⁶⁵ *Id.*

¹⁶⁶ See, e.g., Henry Fountain, *Carbon Dioxide Levels Are Highest in Human History*, N.Y. TIMES (June 3, 2022), <https://www.nytimes.com/2022/06/03/climate/carbon-dioxide-record.html>.

increase in the amount of greenhouse gases (such as methane and CO₂) in our atmosphere, and thus the rate of climatic change, is largely unprecedented in the Earth's history, according to the scientific record.¹⁶⁷ According to recent calculations, the United States alone is emitting carbon into the atmosphere at a rate that is at least the same order of magnitude, or more than double the rate, that resulted in the end-Permian extinction 251.9 million years ago that resulted in the disappearance of 95% of marine species.¹⁶⁸

Dr. James Hansen, one of the most prominent scientists that has studied EEI, in an expert report submitted for *Juliana v. United States*, has explained that “in light of approaching points of no return,” the current state of EEI justifies an initial target of returning to less than 350 ppm of CO₂ by 2100. A global mitigation trajectory that is consistent with achieving global atmospheric CO₂ concentrations of below 350 ppm would result in a mid-century peak of approximately 1.3°C before temperatures begin to cool again, with global surface temperatures stabilizing at ~1°C above pre-industrial temperatures by 2100 and reducing even further in the twenty-second century as the EEI corrects. In the *Juliana* litigation, Dr. Hansen testified:

The enormity of the potential consequences of . . . [the] loss of coastal cities and extermination of countless species, demanded reassessment of what constituted “dangerous human-made interference with the climate system,” which the global community sought to avoid by ratifying the United Nations Framework Convention on Climate Change in 1992. That reassessment led me and others to conclude in 2008 that the political guardrail of 2°C of warming (corresponding approximately to an atmospheric CO₂ concentration of ~450 ppm) is highly dangerous, and that an initial target of < 350 ppm CO₂ is justified by the relevant science.

Particularly in light of approaching points of no return, it is, in my expert opinion, essential to commence serious and sustained action to return atmospheric CO₂ to < 350 ppm without further delay; essential, that is, to preserve coastal cities from rising seas

¹⁶⁷ See Tik Root, *Earth Is Now Trapping an 'Unprecedented' Amount of Heat, NASA Says*, WASH. POST (June 16, 2021, 4:00 PM), <https://www.washingtonpost.com/climate-environment/2021/06/16/earth-heat-imbalance-warming/>.

¹⁶⁸ See S.D. Burgess, J.D. Muirhead & S.A. Bowring, *Initial Pulse of Siberian Trap Sills as the Trigger of the End-Permian Mass Extinction*, 8 NATURE COMM'NS 1, 2 (2017); Gavin L. Foster, Pincelli Hull, Daniel J. Lunt & James, *Placing Our Current 'Hyperthermal' in the Context of Rapid Climate Change in Our Geological Past*, 376 PHIL. TRANSACTIONS ROYAL SOC'Y, Aug. 7, 2018, at 3–4; Justin L. Penn & Curtis Deutsch, *Avoiding Ocean Mass Extinction from Climate Warming*, 376 SCI. 524, 525–26 (2022); see also Personal Conversation with Anders Carlson, Climate Analyst, Our Children's Trust (May 17, 2022) (on file with authors).

and floods (caused in part by melting of Antarctic and Greenland ice) and superstorms, and otherwise to restore a viable climate system on which the life, liberty, and property prospects of Plaintiffs, young citizens of America, and future generations so thoroughly depend.¹⁶⁹

The 350 ppm standard is becoming more significant given the increasing EEI trend.¹⁷⁰ A positive EEI manifests as “symptoms” of climate change harms, such as global temperature rise, increased ocean warming, ocean acidification, and sea level rise.¹⁷¹ For example, in 2020 one study showed that “[t]he world’s oceans absorbed 20 sextillion joules of heat due to climate change and warmed to record levels.”¹⁷² The quantity of warming—20,000,000,000,000,000,000,000 joules—is equal to the energy of ten Hiroshima atomic bombs being detonated every second of the year, or the amount required to take 1.3 trillion trips to the moon.¹⁷³ According to a scientific paper by Dr. Hansen, co-author Karina von Schuckmann, and dozens of respected scientists across the world:

Stabilization of climate, the goal of the universally agreed UNFCCC and the Paris Agreement, requires that EEI be reduced to approximately zero to achieve Earth’s system quasi-equilibrium. The change of heat radiation to space for a given greenhouse gas change can be computed accurately. The amount of CO₂ in the atmosphere would need to be reduced from 410 to 353 ppm (i.e., a required reduction of -57+/- 8 ppm) to increase

¹⁶⁹ *Juliana*, Hansen Expert Report, *supra* note 11, at 4–5. See also von Schuckmann et al., *supra* note 4, at 2014.

¹⁷⁰ See von Schuckmann et al., *supra* note 4, at 2015 (citing Karina von Schuckmann, et al., *An Imperative to Monitor Earth’s Energy Imbalance*, 6 NAT. CLIMATE CHANGE 138 (2016)); Ryan J. Kramer et al., *Observational Evidence of Increasing Global Radiative Forcing*, 48 GEOPHYSICAL RSCH. LETTERS 1, 1 (2021) (finding radiative forcing has increased 0.53 +/- 0.11 W/m² from 2003 to 2018 and confirming “that rising greenhouse gas concentrations account for most of the increases in the radiative forcing, along with reductions in reflective aerosols. This serves as direct evidence that anthropogenic activity has affected Earth’s energy budget in the recent past”); Norman G. Loeb et al., *Satellite and Ocean Data Reveal Marked Increase in Earth’s Heating Rate*, 48 GEOPHYSICAL RS. LETTERS 1, 1 (2021) (“Satellite and in situ observations independently show an approximate doubling of Earth’s Energy Imbalance (EEI) from mid-2005 to mid-2019.”); see *Juliana*, Hansen Expert Report, *supra* note 11, at 7 (“Because EEI is such a fundamental property of the climate system, the implications of an increasing EEI trend are far reaching.”).

¹⁷¹ Loeb et al., *supra* note 170, at 7 (internal citation omitted) (“A positive EEI is manifested as ‘symptoms’ such as global temperature rise, increased ocean warming, sea level rise, and intensification of the hydrological cycle.”).

¹⁷² Ben Deacon, *Climate Change Pushed Ocean Temperatures to Record High in 2020, Study Finds*, ABC NEWS (Jan. 17, 2021, 12:15 PM), <https://www.abc.net.au/news/2021-01-18/ocean-temperatures-reached-record-high-in-2020-study-finds/13062628>.

¹⁷³ *Id.*; *The World Continued to Warm in 2020*, CAMBRIDGE NETWORK (Jan. 18, 2021), <https://www.cambridgenetwork.co.uk/news/world-continued-warm-2020>; Personal Conversation with Anders Carlson, Climate Analyst, Our Children’s Trust (on file with authors).

heat radiation to space by 0.87 W/m^2 , bringing Earth back towards energy balance¹⁷⁴

Other scientific experts have similarly expressed the necessity of the 350 ppm standard, given the importance of restoring Earth's energy balance. Dr. Ove Hoegh-Guldberg, one of Australia's preeminent experts on coral reefs, testified in *Juliana* about the risks of acidification:

[P]resent levels of atmospheric CO₂, as with any level above 350 parts per million (ppm), presents serious and ongoing threat through dangerous acidification of the world's oceans.

. . . In fact, even achieving the goals of the Paris Climate Agreement . . . and restraining warming to "well below" 2°C (equivalent to approximately 450 ppm of CO₂) will still result in the loss of 90% of today's corals.

At today's level of ~410 ppm, most reefs worldwide are committed to a considerable irreversible decline. The rate, extent, and nature of this decline will become increasingly severe if atmospheric CO₂ concentrations continue to increase above current levels. Returning the atmosphere to a safe level of CO₂ for coral reefs requires atmospheric CO₂ concentrations below 350 ppm and achieving long-term targets of a maximum temperature peak of 1.3°C above the Pre-Industrial Period with a gradual cooling below those levels through the end of this century and beyond.¹⁷⁵

Dr. Eric Rignot, an expert on ice sheets, has testified that "[a]s an interim step to returning to preindustrial CO₂ concentrations, we should at minimum aim to return to no more than 350 ppm by 2100" to preserve ice sheets in Antarctica and Greenland.¹⁷⁶

It is thus vital for advocates to present judicial bodies with primary scientific evidence of how to stabilize the climate system and protect these vital planetary systems, as opposed to solely what levels of heating have been deemed to be politically palatable by governments under the Paris Agreement. If advocates do not at least present judicial bodies this critical scientific information and urge that it be used to define the legal standard of protection in the fundamental rights context, there is a formidable risk that the rights of the most climate vulnerable populations on the planet get erased. There are also strategic legal reasons for presenting judicial bodies with the best available scientific information

¹⁷⁴ von Schuckmann et al., *supra* note 4, at 2029 (internal citations omitted).

¹⁷⁵ Expert Report of Ove Hoegh-Guldberg, Ph.D. at 8, *Juliana v. United States*, 339 F. Supp. 3d 1062 (D. Or. 2018) (No. 15-cv-01517) (internal citations omitted).

¹⁷⁶ Expert Report of Eric Rignot, Ph.D. at 2, *Juliana v. United States*, 339 F. Supp. 3d 1062 (D. Or. 2018) (No. 15-cv-01517) (internal citation omitted).

as opposed to a politically negotiated target, including the need to overcome justiciability arguments currently impeding many climate change cases from going to trial.

Some may say it is too late, or impossible, to limit global average temperature rise to below 1.5°C, and that the Paris Agreement target is the best we can achieve. Surely, global temperature has already surpassed 1°C. However, many experts have opined that, while challenging, achieving a science-based prescription to restore Earth's energy balance is still feasible.¹⁷⁷ Such feasibility, however, becomes more precarious the longer that emissions continue to rise without an appropriate judicial check consistent with a scientifically backed standard. It would be a tragedy to advocate for a standard of global heating that does not reflect the current state of climate science and knowingly exacerbates existing climate injuries. The physical principles at play in EEI, and the resulting climate change, will not accommodate the political compromises captured in the Paris Agreement. Human laws should be consistent with the laws of physics, as should advocates' presentation of evidence before judicial bodies.

B. Scientific Evidence Can Be Judicially Manageable

Many governments in climate change cases take the position that there are no judicially manageable standards to decide the question of whether conduct that causes climate change infringes fundamental rights.¹⁷⁸ In essence, the argument is that there are no standards by which to judge when a government's contribution to climate change, or its failure to reduce GHG emissions, crosses the fundamental rights threshold. The argument is attractive because its endorsement essentially gives the political branches of government full, unreviewable discretion to continue their conduct that contributes to climate change despite the known danger, viable alternatives, and their own legal commitments to

¹⁷⁷ See, e.g., James Hansen et al., *Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature*, 8 PLOS ONE 1, 2 (2013); BEN HALEY ET AL., 350 PPM PATHWAYS FOR THE UNITED STATES 6 (2019), <https://irp-cdn.multiscreensite.com/be6d1d56/files/uploaded/350PPMPathwaysfortheUnitedStates.pdf>; Mark Jacobson, et al., *100% Clean and Renewable Wind, Water, and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World*, 1 JOULE 108, 108 (2017); Expert Report of James H. Williams, Ph.D. at 11, *Juliana v. United States*, 339 F. Supp. 3d 1062 (D. Or. 2018) (No. 15-cv-01517); Expert Report of G. Philip Robertson at 3, *Juliana v. United States*, 339 F. Supp. 3d 1062 (D. Or. 2018) (No. 15-cv-01517).

¹⁷⁸ See, e.g., Defendants State of Florida, the Florida Department of Agriculture and Consumer Services, Commissioner Nikkie Fried, and the Florida Public Service Commission's Motion to Dismiss the First Amended Complaint at 8–10, *Reynolds v. Florida*, No. 84521673 (App. Ct. Fla. 2019); *La Rose v. Her Majesty the Queen*, [2020] F.C. 1008 (Can. Ont.); *Mathur*, *supra* note 140, ¶ 123.

reduce GHG emissions. It is also alluring to raise during the initial stages of litigation, such as in the context of a motion to dismiss, as it is an easier argument to make in the abstract, without the benefit of a fully developed factual record that can be reviewed for whether the standard, as presented and applied, was in fact manageable.

Courts routinely adopt and apply a panoply of legal standards when deciding claims of infringement of fundamental rights in a variety of different factual contexts.¹⁷⁹ For example, courts in the United States have been hearing and deciding Fifth Amendment substantive due process and equal protection claims, the type of constitutional legal claims raised in *Juliana v. United States*, for decades. In 1882, the U.S. Supreme Court acknowledged that the substantive due process clause is “of that character which it is intended the courts shall enforce when cases involving their operation and effect are brought before them.”¹⁸⁰ In such cases, government “policies that classify on suspect bases or infringe on fundamental rights are strongly presumptively unconstitutional; they can be upheld only if necessary to serve a compelling governmental interest.”¹⁸¹ The U.S. Supreme Court has stated that the fundamental standard of culpability for state-created danger in a substantive due process claim, one of the claims in the *Juliana* litigation, is deliberately indifferent behavior that “shocks the conscience.”¹⁸² Only “conduct intended to injure in some way unjustifiable by any government interest” would rise to a conscience-shocking level for purposes of due process.¹⁸³

In many (but not all) countries, it is the courts, not political bodies, who are ultimately charged with upholding individual fundamental rights

¹⁷⁹ See Richard H. Fallon, Jr., *Implementing the Constitution*, 111 HARV. L. REV. 54, 67 (1997) (identifying “eight relatively common kinds of tests, all employed by the Court (either alone or in combination) in some areas of constitutional law to help define constitutional limits on governmental powers”).

¹⁸⁰ *United States v. Lee*, 106 U.S. 196, 218, 220 (1882) (“Courts of justice are established, not only to decide upon the controverted rights of the citizens as against each other, but also upon rights in controversy between them and the government, and the docket of this court is crowded with controversies of the latter class.”).

¹⁸¹ Fallon, Jr., *supra* note 179, at 88. See also *Washington v. Glucksberg*, 521 U.S. 702, 720 (1997) (“The [Due Process] Clause also provides heightened protection against government interference with certain fundamental rights and liberty interests.”).

¹⁸² *Cnty. of Sacramento v. Lewis*, 523 U.S. 833, 846 (1998). The Court recognized that “[r]ules of due process are not . . . subject to mechanical application in unfamiliar territory,” and “preserving the constitutional proportions of substantive due process demands an exact analysis of circumstances before any abuse of power is condemned as conscience shocking.” *Id.* at 850. See also *Farmer v. Brennan*, 511 U.S. 825, 832–34 (1994) (deliberate indifference to violence from other prisoners); *Wilson v. Seiter*, 501 U.S. 294, 302–04 (1991) (deliberate indifference to conditions of confinement); *Estelle v. Gamble*, 429 U.S. 97, 104–05 (1976) (deliberate indifference to serious medical needs of prisoners).

¹⁸³ *Lewis*, 523 U.S. at 849.

against claims of compelling state interest. As U.S. Supreme Court Justice Elena Kagan noted during a recent oral argument, courts are the arbiters of rights: “[I]sn’t the point of a right that you don’t have to ask Congress? Isn’t the point of a right that it doesn’t really matter what Congress thinks or what the majority of the American people think as to that right?”¹⁸⁴ In fact, “[t]he Court retains an independent constitutional duty to review factual findings when constitutional rights are at stake. . . . Uncritical deference to Congress’ factual findings in these [constitutional] cases is inappropriate.”¹⁸⁵

The U.S. Supreme Court has explained: “In determining what lines are unconstitutionally discriminatory, we have never been confined to historic notions of equality, any more than we have restricted due process to a fixed catalogue of what was at a given time deemed to be the limits of fundamental rights.”¹⁸⁶ Familiar legal standards that both define fundamental rights and set the standards of infringement are applied by courts in a wide variety of factual scenarios, even some that are politically contentious such as the death penalty, abortion, and guns. Even when the legal standard is informed by constitutional “text-and-history” as opposed to science, as relevant in the Second Amendment context under U.S. law, the Supreme Court has acknowledged that these are legal standards capable of being applied by courts.¹⁸⁷ That some injuries are caused by climate change, a complex scientific issue with “political implications,”¹⁸⁸ should not automatically exempt the issue of climate change from a court’s application of familiar legal standards in the fundamental rights context; nor should it excuse the parties from

¹⁸⁴ Transcript of Oral Argument at 75, *Whole Woman’s Health v. Jackson*, 142 S. Ct. 522 (2021) (No. 21-463).

¹⁸⁵ *Gonzales v. Carhart*, 550 U.S. 124, 165–66 (2007).

¹⁸⁶ *Harper v. Va. State Bd. of Elections*, 383 U.S. 663, 669 (1966).

¹⁸⁷ *N.Y. State Rifle & Pistol Ass’n, Inc. v. Bruen*, 142 S. Ct. 2111, 2130 n.6 (2022) (finding that petitioners have a constitutional right to bear arms in public for self-defense based on a plain text reading of the Second Amendment and on a historical review of the American tradition of firearm regulation).

¹⁸⁸ Courts in many jurisdictions reject the notion that cases are nonjusticiable merely “because the issues have political implications . . .” *INS v. Chadha*, 462 U.S. 919, 943 (1983). Under Canadian law, claims that the government has interfered with a plaintiffs’ rights have never been held to be non-justiciable simply because they raise complex social, political, and economic issues. *See, e.g.*, *Carter v. Canada*, [2015] 1 S.C.R. 331 (Can.); *Canada v. Bedford*, [2013] 3 S.C.R. 1101 (Can.); *Canada v. PHS Cmty. Serv. Soc’y*, [2011] 3 S.C.R. 134 (Can.); *Chaoulli v. Quebec*, [2005] 1 S.C.R. 791 (Can.); *Victoria v. Adams*, [2009] B.C.C.A. 563 (Can.). The Netherlands Supreme Court also recognized that while the government and parliament “have a large degree of discretion to make the political considerations that are necessary,” “[i]t is up to the courts to decide whether, in availing themselves of this discretion, the government and parliament have remained within the limits of the law by which they are bound.” *Urgenda* Supreme Court Opinion, *supra* note 139, ¶ 8.3.2.

withholding from the court the best available scientific evidence needed to decide the case.

The inquiry relevant to this Article is how legal standards can be manageably applied with respect to claims based on injuries related to climate change. Climate change is a scientific phenomenon that is objectively measurable in terms of GHG emissions and the extent to which GHG emissions are contributing to EEI. Ultimately, in order to avert the worst impacts of climate change and thus prevent further injury, Earth must be brought back toward energy balance.¹⁸⁹ A legal standard measuring the challenged conduct against its impact on the ability to restore Earth's energy balance, i.e., reducing atmospheric CO₂ concentrations to below 350 ppm by 2100, can be established as a matter of scientific evidence.¹⁹⁰ Once that is established as the legal standard needed to preserve fundamental rights, it becomes an exercise of applying the facts to the law to ascertain whether the challenged conduct exceeds this standard, a familiar judicial task that courts should begin to undertake.

The argument that some claims are “beyond the competence of courts” is not unique; as “[s]ome make the same point as regards the problem of equal protection in cases involving racial segregation,”¹⁹¹ as in other areas. How can a court decide when the government is violating one's right to life, liberty, or property. one's right to private family life; one's right to be free from cruel and unusual punishment; one's right to privacy; or one's right to bear arms? On the flip side, how do courts determine whether a state's interest outweighs an individual's rights, such as a state's interest in “potential life” weighed against the rights of a woman to her privacy and bodily autonomy? For better or worse, making those calls is the proper role of the courts when interpreting constitutions or other laws that secure fundamental rights, and science in many cases can and should inform where courts ought to draw the line in the sand. As U.S. Supreme Court Justice Clarence Thomas recently acknowledged in the case of *New York State Rifle & Pistol Ass'n v. Bruen*, these kinds of constitutional inquiries are not made in the abstract because courts decide cases based upon the record compiled by the parties, and that often includes scientific evidence.¹⁹²

¹⁸⁹ See von Schuckmann et al., *supra* note 4, at 2029.

¹⁹⁰ See, e.g., *Juliana*, Hansen Expert Report, *supra* note 11, at 25.

¹⁹¹ *Baker v. Carr*, 369 U.S. 186, 245 (1962) (Douglas, J., concurring) (“Adjudication is often perplexing and complicated.”)

¹⁹² *N.Y. State Rifle & Pistol Ass'n, Inc. v. Bruen*, 142 S. Ct. 2111, 2130 n.6 (2022); see also *Roper v. Simmons*, 543 U.S. 551, 569 (2005) (referencing the “scientific and sociological studies” in the record that differentiated juveniles and adults to justify holding that imposing the death penalty on juvenile offenders violates the Eighth Amendment of the U.S. Constitution).

The complexity or novelty of the issue, whether it be climate change, racial segregation, gun rights, or discrimination on the basis of sex or gender, is no basis for courts to shrink from their role to hear and decide constitutional cases. As Judge Staton noted in her dissenting opinion in *Juliana*: “There is no justiciability exception for cases of great complexity and magnitude.”¹⁹³ The Canadian Supreme Court has similarly ruled: “The fact that the matter is complex, contentious or laden with social values does not mean that the courts can abdicate the responsibility vested in them by our Constitution . . . when citizens challenge it.”¹⁹⁴ If courts decide not to draw the line simply because the issue is complex, novel, or politically charged, the fundamental rights at stake technically become meaningless.¹⁹⁵

Justice Carol J. Brown in Ontario, Canada, recently recognized the manageability of constitutional climate change claims based upon scientific evidence in the *Mathur* case: “[T]his Application is capable of scientific proof and the Applicants have already included many facts based on scientific and social science findings.”¹⁹⁶ Justice Brown said that she was “satisfied that appropriate levels of global GHG emissions can be established through scientific evidence, based on the past and projected emission levels” and that “the Applicants cite various facts that are capable of scientific proof and about which courts are capable of making determinations, based on expert evidence”¹⁹⁷ Judge Staton, in her dissenting opinion in *Juliana*, agreed: “Here, the right at issue is fundamentally one of a discernable standard: the amount of fossil-fuel emissions that will irreparably devastate our Nation. That amount can be established by scientific evidence like that proffered by the plaintiffs.”¹⁹⁸ She pointed out that “[n]either the government nor the majority has articulated why the courts could not weigh scientific and prudential

¹⁹³ *Juliana v. United States*, 947 F.3d 1159, 1185 (9th Cir. 2020) (Staton, J., dissenting).

¹⁹⁴ *Chaoulli v. Quebec*, [2005] 1 S.C.R. 791, 844 (Can.).

¹⁹⁵ ERWIN CHERMERINSKY, CLOSING THE COURTHOUSE DOOR: HOW YOUR CONSTITUTIONAL RIGHTS BECAME UNENFORCEABLE 206 (2017) (“But enforcement of the Constitution should never be left to the political process. The Constitution exists to limit the government, those limits have meaning only if they are enforceable, and to think that the political process will address such issues is usually to indulge a fiction.”).

¹⁹⁶ *Mathur*, *supra* note 140, ¶ 171. See also *id.* ¶ 94 (internal citation omitted) (“Lastly, the Applicants cite decisions in other countries to demonstrate that their claim is capable of scientific proof. For example, in *Urgenda* . . . the Supreme Court of the Netherlands affirmed that reduction in emissions was necessary for the Dutch government to protect human rights. The court recognized that ‘each additional molecule of GHG in the atmosphere causes a demonstrable increase in the harm, with a single molecule of carbon dioxide causing a warming effect.’”).

¹⁹⁷ *Id.* ¶ 96.

¹⁹⁸ *Juliana*, 947 F.3d at 1187 (Staton, J., dissenting).

considerations—as we often do—to put the government on a path to constitutional compliance.”¹⁹⁹ Furthermore:

In sum, resolution of this action requires answers only to scientific questions, not political ones. . . .

. . . .

. . . Nothing about climate change, however, is *inherently* political. The majority is correct that redressing climate change will require consideration of scientific, economic, energy, and other policy factors. But that endeavor does not implicate the way we elect representatives, assign governmental powers, or otherwise structure our polity.²⁰⁰

Judicial bodies are often well-equipped to hear and decide cases involving a wide range of scientific evidence.²⁰¹ For example, the U.S. Supreme Court has developed a well-established litmus test for the admission of expert scientific testimony. In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, Justice Blackmun ruled that judges in their evidentiary “gatekeeping” role “must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.”²⁰² As to reliability:

[I]n order to qualify as “scientific knowledge,” an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation—*i.e.*, “good grounds,” based on what is known. In short, the

¹⁹⁹ *Id.* at 1189.

²⁰⁰ *Id.* at 1189–90 (emphasis added).

²⁰¹ See, e.g., FED. R. EVID. 702 (“A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if: (a) the expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert has reliably applied the principles and methods to the facts of the case.”). See also Jeff Tollefson, *Inside the US Supreme Court’s War on Science*, 609 NATURE 460 (2022) (discussing recent U.S. Supreme Court decisions that, in contrast to earlier cases, dismiss rather than defer to science), <https://www.nature.com/articles/d41586-022-02920-4>.

²⁰² *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 589, 597 (1993). Further, despite Chief Justice Rehnquist’s fear that the *Daubert* standard turns judges into “amateur scientists,” the rules of evidence do not require it. *Id.* at 600–01 (Rehnquist, C.J., concurring in part and dissenting in part). Brian Leiter, *The Epistemology of Admissibility: Why Even Good Philosophy of Science Would Not Make for Good Philosophy of Evidence*, 1997 BYU L. REV. 803, 816 (“[T]he discovery of truth is only *one* of the aims of adjudication under the Federal Rules. The rules of evidence serve distinctly nonepistemic purposes as well: the promotion of various policy objectives (like encouraging the repair of dangerous conditions) and the efficient and timely resolution of disputes.”). Both nonepistemic purposes apply directly to any evidence presented on the dangerous urgency of the climate crisis.

requirement that an expert's testimony pertain to "scientific knowledge" establishes a standard of evidentiary reliability.²⁰³

Many factors are considered as to whether the proffered scientific testimony is admissible, including whether the scientific theory or technique can be or has been tested, whether it has been subject to peer review, "the known or potential rate of error," and its "general acceptance" in the relevant scientific community.²⁰⁴ A criterion notably absent from this list is whether the scientific evidence has been accepted through international political consensus. In fact, in *Rucho v. Common Cause*,²⁰⁵ the U.S. Supreme Court explicitly cautioned that a judicially manageable standard must be "clear, manageable, and *politically neutral*."²⁰⁶ Advocates asking judicial bodies to interpret and protect fundamental rights in climate change cases can and should present genuine climate science, not overlook it, substitute for it, or avoid it altogether.

Other courts outside the U.S. have been able to at least partially navigate the divide between justiciable and political issues in climate change cases. In *Klimatzaak*, the Belgian court declared that Belgium's climate policy infringed the fundamental rights of the plaintiffs but declined to issue an injunction requiring Belgium to reduce its GHG emissions by certain percentages requested by the plaintiffs. The court found that "while it is within the remit of the tribunal to note a failure on the part of the federal state and the three regions [defendants], this does not authorise it, by virtue of the principle of separation of powers, to itself set targets for reducing Belgium's GHG emissions."²⁰⁷ The court thus felt comfortable making a determination that Belgium crossed the standard of protection, but was unwilling to announce where that line was. In *Urgenda*, on the other hand, the Netherlands court not only found a violation of fundamental rights but ordered a reduction in emissions. Although these reductions were in line with the government's earlier political commitments and not based on genuinely supported scientific prescriptions, one wonders whether the outcome would have been

²⁰³ *Daubert*, 509 U.S. at 590.

²⁰⁴ *Id.* at 593–94.

²⁰⁵ *Rucho* is the primary case relied upon by two of three judges in *Juliana v. United States* to justify dismissal of the youth's constitutional climate change case on redressability grounds, even though the majority explicitly stated it did not find the claims to raise a political question. Compare *Juliana v. United States*, 947 F.3d 1159, 1173–74, 1174 n.9 (9th Cir. 2020) with *id.* at 1189–90 (Stanton, J., dissenting) (identifying the flaws in the majority's reliance on *Rucho*).

²⁰⁶ *Rucho v. Common Cause*, 139 S. Ct. 2484, 2498 (2019) (quoting *Vieth v. Jubelirer*, 541 U.S. 267, 307–08 (2004) (plurality opinion)).

²⁰⁷ *Klimaatzaak*, *supra* note 129, at 82.

different had the court been presented with the science of EEI.²⁰⁸ *Urgenda's* win can equally be considered a loss if the goal was to protect the fundamental rights of the Netherlands' most climate vulnerable, including the youth and future generations who face devastating climate harms at 1.5°C–2°C of warming.

The unfortunate default “action” by many judicial bodies (particularly in the United States) deciding climate cases has been judicial restraint—dismissing these cases before hearing the evidence on the merits.²⁰⁹

²⁰⁸ *Urgenda* Supreme Court Opinion, *supra* note 139, ¶¶ 8.3.4, 8.3.5.

²⁰⁹ See *Am. Elec. Power Co. v. Connecticut*, 564 U.S. 410, 420, 424 (2011) (holding that while some plaintiffs had standing to sue defendant fossil-fuel power plants to seek abatement of their contribution to global warming, the Clean Air Act displaced any federal common law right plaintiffs had to pursue their claim); *Lujan v. Defs. of Wildlife*, 504 U.S. 555, 564, 568 (1992) (holding that plaintiffs did not assert a sufficiently imminent injury to have Article III standing and that plaintiffs' claimed injury was not redressable); *City of New York v. Chevron Corp.*, 993 F.3d 81, 95 (2d Cir. 2021) (holding that plaintiff's state-law nuisance action against defendant multinational oil companies implicated federal common law rather than New York state law, and federal common law, in turn, was displaced by the Clean Air Act); *Juliana v. United States*, 947 F.3d 1159, 1170–71, 1174 (9th Cir. 2020) (holding that plaintiffs' suit, which called for declaratory and injunctive relief against the United States to stop the continued federal permitting, authorization and subsidization of fossil fuel extraction, as well as development, consumption and exportation of the same, presented a nonjusticiable political question and that plaintiffs' failed to show redressability); *Wash. Env't Council v. Bellon*, 732 F.3d 1131, 1147 (9th Cir. 2013) (holding that plaintiffs lacked Article III standing to assert their claim that the state of Washington was required, under the Clean Air Act, to regulate greenhouse gas emissions released by the state's five oil refineries); *Clean Air Council v. United States*, 362 F. Supp. 3d 237, 249 (E.D. Penn. 2019) (dismissing plaintiffs' claim that their rights were violated by the Executive branch's “rolling back” of environmental laws and regulations on the ground plaintiffs failed to state an injury redressable by court action); *Amigos Bravos v. Bureau of Land Mgmt.*, 816 F. Supp. 2d 1118, 1138–39 (D.N.M. 2011) (dismissing suit by six environmental groups, who alleged that the BLM failed to fully consider the issue of climate change when the agency approved several oil and gas lease sales, on the ground the plaintiffs failed to demonstrate both an injury-in-fact and a particularized interest in the land at issue and that plaintiffs failed to establish causation); *City of New York v. BP P.L.C.*, 325 F. Supp. 3d 466, 471–72, 475 (S.D.N.Y. 2018) (holding that New York City's federal common law nuisance suit, which sought to recover for injuries the City suffered due to rising sea levels that the City alleged were caused by emissions of greenhouse gases sold by the defendants, was displaced by the Clean Air Act and that the City's claims were otherwise barred by the presumption against extraterritoriality); *WildEarth Guardians v. Salazar*, 880 F. Supp. 2d 77, 86 (D.C. Cir. 2012) (holding that plaintiffs, who challenged the decision by several federal agencies to authorize the lease of public lands for coal mining, lacked standing to challenge the lease decision based on climate change impacts to plaintiffs' recreational, aesthetic and economic interests); *Animal Legal Def. Fund v. United States*, 404 F. Supp. 3d 1294, 1300–01 (D. Or. 2019) (holding that plaintiffs, who claimed that the government's failure to protect them from the effects of climate change on federally owned and managed lands violated their constitutional right to a safe and sustainable environment, lacked constitutional standing and that their suit was not a justiciable case or controversy); *Comer v. Murphy Oil USA, Inc.*, 839 F. Supp. 2d 849, 862, 865, 868 (S.D. Miss. 2012) (holding that suit by plaintiffs, property owners who asserted public and private nuisance claims alleging that defendant oil companies release of emissions increased global warming that caused damage to plaintiffs' properties, was barred by res judicata, collateral estoppel, the lack of standing, preemption by the Clean Air Act, and the implication of non-justiciable political questions).

Scholars, and some dissenting state supreme court justices, have referred to such judicial restraint as resulting in a judicial “nihilism,” whereby courts assert supreme power by their inaction.²¹⁰ Reasons for such nihilism point more to ideology largely perpetuated by fossil fuel producers—that climate change is a special policy preference exempt from judicial review—than to a lack of judicially manageable standards or an inability to grapple with scientific evidence.²¹¹ Nevertheless, some judges are beginning to reject the notion that courts should sit on the sidelines of the climate crisis. As expressed by the Washington Supreme Court’s Chief Justice Steven C. González and Justice G. Helen Whitener in their dissent in *Aji P. v. Washington*:

We recite that we believe the children are our future, but we continue actions that could leave them a world with an environment on the brink of ruin and no mechanism to assert their rights or the rights of the natural world. This is our legacy to them described in the self-congratulatory words of judicial restraint. . . .

. . . .

The court should not avoid its constitutional obligations that protect not only the rights of these youths but all future generations who will suffer from the consequences of climate change.²¹²

This sentiment reflects an important evolution in the history of climate change cases. If judicial bodies are becoming open to hearing and deciding these cases, as is happening in Montana state court in the *Held*

²¹⁰ Weaver & Kysar, *supra* note 158, *passim*. Cf. Hollis Hill, Opinion, *Let Youth Have Day in Court Over Climate Change*, SEATTLE TIMES (Oct. 1, 2021, 1:53 PM), <https://www.seattletimes.com/opinion/let-youth-have-day-in-court-over-climate-change/> (“Washingtonians must face the hard truth: Climate change is happening, and if we do not change course, it will only get worse. As a former judge, I know it is critical that all three branches of government use every tool at their disposal to turn the tide.”). Cf. Alfred T. Goodwin, *A Wake-Up Call for Judges*, BULLETIN (June 14, 2015), <http://www.bendbulletin.com/opinion/3222160-151/a-wake-up-call-for-judges> (“Whether grounded in Article III or state constitutional provisions, the third branch must now recognize its obligation to provide a check on government exercise of power over the public trust. The third branch can, and should, take another long and careful look at the barriers to litigation created by modern doctrines of subject-matter jurisdiction and deference to the legislative and administrative branches of government.”).

²¹¹ See, e.g., Weaver & Kysar, *supra* note 158, at 320–22 (providing some explanations for “nihilistic reading[s] of catastrophe” in tort climate change cases, including “societal consequences” and “popular backlash”).

²¹² *Aji P. v. Washington*, No. 99564-8, at 2, 5 (Wash. Oct. 6, 2021) (González, C.J., dissenting). See also *Held v. Montana*, No. CDV-2020-307, at 24 (Mont. First Jud. Dist. Ct. Lewis & Clark Cnty. Aug. 4, 2021) (denying state’s motion to dismiss constitutional climate change claims and allowing the case to proceed to trial).

case and in the *Mathur* case in Ontario, they should be presented with the best evidence to protect fundamental rights.

C. Litigators Should Present a Scientific Target Rather than the Paris Agreement Target to Define Fundamental Rights

There are several reasons, both legal and practical, for climate advocates to present judicial bodies with peer-reviewed science to define a constitutional standard of protection for fundamental rights. First, advocates that characterize the Paris Agreement target as the threshold for fundamental rights protection run the risk of enforcing an unfortunate trend; judicial bodies endorsing the Paris Agreement target as science based, safe, or protective of fundamental rights now and into the future when in fact it is catastrophic. Judicial endorsement has had the effect of legalizing and perpetuating the ongoing infringement of rights. As Justice Jackson foretold in his dissenting opinion in the tragic case of *Korematsu v. United States*:

[A] judicial construction of the due process clause that will sustain this [internment of Japanese citizens during World War II] order is a far more subtle blow to liberty than the promulgation of the order itself. . . . [O]nce a judicial opinion rationalizes such an order to show that it conforms to the Constitution, or rather rationalizes the Constitution to show that the Constitution sanctions such an order, the Court for all time has validated the principle of racial discrimination The principle then lies about like a loaded weapon ready for the hand of any authority that can bring forward a plausible claim of an urgent need.²¹³

Second, once a constitutional standard is embedded in law, history shows that policies that flow from that constitutional standard will inevitably allow full maximization of pollution levels that lead to the brink of that standard. For example, in the climate change context, very few governments achieve even the inadequate GHG emission targets (from a perspective of restoring Earth's energy balance) they commit to achieving under domestic or international law, and even fewer governments are able to increase ambition of existing commitments as the years of failure mount.²¹⁴

²¹³ *Korematsu v. United States*, 323 U.S. 214, 245–46 (1944) (Jackson, J., dissenting).

²¹⁴ For example, Canada has failed to meet its GHG emission reduction targets it set beginning in 1988. Statement of Claim to the Defendants ¶ 5, at 4, *La Rose v. Her Majesty the Queen* (Oct. 25, 2019), No. T-1750-19 (Can. Fed. Ct.), http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/non-us-case-documents/2019/20191025_T-1750-19_complaint.pdf. See also WASH. STATE DEP'T OF ECOLOGY, WASHINGTON STATE GREENHOUSE GAS EMISSION REDUCTION LIMITS: REPORT PREPARED UNDER RCW 70.235.040, at 16 (Dec. 2019) ("In terms of progress towards the greenhouse gas emission limits currently in

Third, a standard that characterizes 1.5°C or 2°C of heating as protective of fundamental rights undercuts plaintiffs' abilities to provide judicial bodies with present-day injury stories. The Paris Agreement on its face, without underlying scientific explanation, implies that the climate system, and the people within it, can withstand additional heating above and beyond what has occurred to date. Although such an assumption is untrue, it is a dangerous one to present to judicial bodies charged with protecting human rights, as exhibited in August 2022 when severe rains and flooding in Pakistan affected at least 33 million people, killing at least 1,033 people, including hundreds of children.²¹⁵ Relatedly, advocates' use of the Paris Agreement target as the legal standard of fundamental rights protection may make it even more difficult to establish a breach, since Earth has not yet reached such levels of warming. Scientists have confirmed that we are already in the danger zone at about 1°C of heating.²¹⁶ Although scientists agree that existing climate impacts will likely worsen as the heating increases,²¹⁷ the evidence provided to a judicial body should realistically portray the current catastrophe facing humanity, particularly those most vulnerable whose fundamental rights are most imminently at stake. According to John Holdren, who served as Science Advisor to President Barack Obama:

statute, as of 2017, Washington is 7.0 MMTCO₂e or 7.7% higher than the 2020 target.”); Joeri Rogelj et al., *Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development*, in GLOBAL WARMING OF 1.5°C, *supra* note 7, at 95, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf (“Under emissions in line with current pledges under the Paris Agreement (known as Nationally Determined Contributions, or NDCs), global warming is expected to surpass 1.5°C above pre-industrial levels, even if these pledges are supplemented with very challenging increases in the scale and ambition of mitigation after 2030”); *see also* Armstrong McKay et al., *supra* note 5, 1171 (“Currently the world is heading toward ~2 to 3°C of global warming; at best, if all net-zero pledges and nationally determined contributions are implemented it could reach just below 2°C. This would lower tipping point risks somewhat but would still be dangerous as it could trigger multiple climate tipping points.”).

²¹⁵ Michelle Velez & Teele Rebane, *Hundreds of Children Among 1,000 People Killed by Pakistan Monsoon Rains and Floods*, CNN (Aug. 28, 2022), <https://www.cnn.com/2022/08/28/asia/pakistan-flooding-intl/index.html>.

²¹⁶ U.S. DEP’T OF STATE & U.S. EXECUTIVE OFFICE OF THE PRESIDENT, THE LONG-TERM STRATEGY OF THE UNITED STATES: PATHWAYS TO NET ZERO GREENHOUSE GAS EMISSIONS BY 2050, at 10 (2021) (“Climate change already inflicts serious damage on the United States and the world, particularly the most vulnerable that are least equipped to adapt—and the science is clear that, without faster global action, these impacts will become much more frequent and severe.”); Joyashree Roy et al., *Sustainable Development, Poverty Eradication and Reducing Inequalities*, in GLOBAL WARMING OF 1.5°C, *supra* note 7, at 447, <https://www.ipcc.ch/sr15/chapter/chapter-5/> (“Warming of 1.5°C is not considered ‘safe’ for most nations, communities, ecosystems, and sectors and poses significant risks to natural and human systems as compared to current warming of 1°C”).

²¹⁷ SUMMARY FOR POLICYMAKERS, *supra* note 92, at 9–10.

At a mere 1°C or so above the average temperature of 120 years ago, the world is experiencing increases in the frequency and intensity of deadly heat waves in many regions; increases in torrential downpours and flooding in many others; large expansions in the annual area burned in regions prone to wildfires (and expansion of wildfires into regions not previously prone to them); an increase in the power of the strongest tropical storms; expanded impacts of pests and pathogens across large parts of the globe; disruptive changes in monsoons; other alterations in atmospheric and oceanic circulation patterns that, together with other impacts, are affecting agriculture and ocean fisheries; an accelerating pace of global sea-level rise; and ocean acidification arising from absorption of some of the excess carbon dioxide in the atmosphere.²¹⁸

Plaintiffs' present-day injury stories based on current impacts are often of critical import, spurring an increasing number of judicial bodies to step up, recognize a fundamental rights violation, and order a remedy.

Fourth, the use of politically negotiated as opposed to science-based standards increases the risk that judicial bodies will find climate change cases nonjusticiable. In the United States, federal courts have held in a limited number of cases that the political question doctrine bars judicial review of claims based on the political branches' involvement in foreign affairs.²¹⁹ Asking courts to define a government's obligation to protect individual fundamental rights based upon its international political commitments, or the commitments of other nations (provided they have not been enshrined into domestic law), presents a risk of the claim being found non-justiciable.²²⁰ Judicial bodies could find that if countries are working on climate change through international negotiations, there is no need to hold countries accountable on the domestic level.

²¹⁸ Larson et al., *supra* note 85, at 4.

²¹⁹ See, e.g., *El-Shifa Pharm. Indus. Co. v. United States*, 607 F.3d 836, 837–38, 845 (D.C. Cir. 2010) (dismissing for posing political questions the plaintiffs' declaratory and injunctive claims that the United States mistakenly destroyed a pharmaceutical plant via drone strike in Sudan as part of efforts to dismantle a terrorist network); *Bancoult v. McNamara*, 445 F.3d 427, 429, 436 (D.C. Cir. 2006) (dismissing for posing political questions the claims for injunctive relief raised by residents of the island of Chagos who alleged that they were systematically tortured and displaced to make way for a United States naval base).

²²⁰ See, e.g., *Baker v. Carr*, 369 U.S. 186, 211 (1962) ("There are sweeping statements to the effect that all questions touching foreign relations are political questions."); *Thompson v. Oklahoma*, 487 U.S. 815, 868 n.4 (1988) (Scalia, J., dissenting) (stating that "where there is not first a settled consensus among our own people, the views of other nations, however enlightened the Justices of this Court may think them to be, cannot be imposed upon Americans through the Constitution"). Courts in other nations appear to be more amenable to defining constitutional standards based upon international political commitments, see, e.g., *Urgenda* Supreme Court Decision, *supra* note 139, ¶¶ 2.1, 8.3.4, but this case raises the other problems associated with constitutional standards of protection that may not align with best available science.

Finally, a clear body of peer-reviewed science exists that contradicts the use of the Paris Agreement temperature target as a standard of “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”²²¹ and protect fundamental rights. It is impossible to forecast the precise role judicial bodies will play in resolving the climate crisis. But, if judges are only being asked to enforce the Paris Agreement, that will be the extent of what they do. If, on the other hand, advocates ensure judges are presented with the most current climate science and what scientists prescribe needs to be done to protect our vital planetary systems and people whose most fundamental rights depend upon the health of such systems, there is a greater chance that governments will address climate change in a way that respects and protects fundamental rights for all.

CONCLUSION

Although the Paris Agreement target began as a heuristic to serve as a guiding objective for policymakers seeking international consensus, it has since evolved into an oft-articulated legal standard for the protection of fundamental rights in constitutional climate change cases. The IPCC has never scientifically affirmed the Paris Agreement target as being “safe” or not dangerous, and, indeed, more current peer-reviewed science says otherwise.²²² Yet, it is becoming increasingly frequent for advocates, and judicial bodies to whom these arguments are presented, to characterize the 1.5°C–2°C target as somehow reflecting a scientific consensus as to what is needed to preserve fundamental rights in climate change cases.²²³ Judicial bodies’ universal adoption of the Paris Agreement target as a proxy for fundamental rights protections will have catastrophic consequences. Such an approach confines humanity to a world of political majoritarianism, where, absent legal remedies, constitutional redress for global heating becomes geophysically

²²¹ U.N. Framework, *supra* note 38, at art. 2.

²²² See, e.g., Yun Gao, Xiang Gao & Xiaohua Zhang, *The 2°C Global Temperature Target and the Evolution of the Long-Term Goal of Addressing Climate Change—From The United Nations Framework Convention on Climate Change to the Paris Agreement*, 3 *ENGINEERING* 272, 272–73 (2017). See also Armstrong McKay et al., *supra* note 5.

²²³ See, e.g., *Urgenda* Supreme Court Opinion, *supra* note 139, ¶ 2.1 (“There has long been a consensus in climate science—the science that studies climate and climate change—and in the international community that the average temperature on earth may not rise by more than 2°C compared to the average temperature in the pre-industrial era.”); *id.* ¶ 4.3 (“Climate science long ago reached a high degree of consensus that the warming of the earth must be limited to no more than 2°C and that this means that the concentration of greenhouse gases in the atmosphere must remain limited to a maximum of 450 ppm.”).

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impossible. If advocates do not present courts with scientifically based standards of fundamental rights protections in constitutional climate cases, then where does the law leave us? The emergent jurisprudence of climate catastrophe, after all, is one that should expand, not contract, the norms of justice.²²⁴

²²⁴ See Weaver & Kysar, *supra* note 158, at 298, 301.