

Inter-American Court of Human Rights

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

**Amicus Brief submitted by the Sabin Center for Climate Change
Law on Climate Science and Human Rights Obligations**

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Statement of Interest

The Sabin Center for Climate Change Law at Columbia Law School submits this *amicus curiae* brief in the matter of the Request for Advisory Opinion submitted by the Republic of Colombia and the Republic of Chile to the Inter-American Court of Human Rights (IACtHR or the Court) regarding the Climate Emergency and Human Rights. The Sabin Center is an academic center dedicated to advancing action on climate change through legal scholarship and engagement. We track developments in global climate change law and litigation, conduct research on the development of legal strategies and legal structures to address climate change, and provide training and educational resources to the legal community. As part of our work, we collaborate with climate scientists as well as a wide range of governmental, non-governmental and academic organizations.

The purpose of this brief is to explain how climate science can help inform the Court's assessment of State obligations to respect, protect, and fulfill human rights in the context of climate change. Our analysis is based on our collective knowledge of climate law, human rights law, and how scientific evidence factors into legal assessments of government obligations to prevent, prepare for, and respond to the effects of climate change.¹

¹ See MICHAEL BURGER & MARIA ANTONIA TIGRE, GLOBAL CLIMATE LITIGATION REPORT: 2023 STATUS REVIEW (Sabin Center for Climate Change Law, Columbia Law School & United Nations Environment Programme, 2023), <https://www.unep.org/resources/report/global-climate-litigation-report-2023-status-review>; KATELYN HORNE, MARIA ANTONIA TIGRE, & MICHAEL GERRARD, STATUS REPORT ON PRINCIPLES OF INTERNATIONAL AND HUMAN RIGHTS LAW RELEVANT TO CLIMATE CHANGE (Sabin Center for Climate Change Law, 2023), https://scholarship.law.columbia.edu/faculty_scholarship/3924/; Maria Antonia Tigre, Natalia Urzola, & Alexandra Goodman, *Climate Litigation in Latin America: Is the Region Quietly Leading a Revolution?* 14(1) J. HUM. RTS. & ENVT. 67 (2023), <https://www.elgaronline.com/view/journals/jhre/14/1/article-p67.xml>; Maria Antonia Tigre, *Climate Change and Indigenous Groups: The Rise of Indigenous Voices in Climate Litigation*, 9(3) E-PUBLICA 214 (2022), https://scholarship.law.columbia.edu/sabin_climate_change/196/; Michael Burger, Jessica Wentz, & Daniel J. Metzger, *Climate Science and Human Rights: Using Attribution Science to Frame Government Mitigation and Adaptation Obligations*, in LITIGATING THE CLIMATE EMERGENCY (César Rodríguez-Garavito, ed. Cambridge University Press 2022), <https://www.cambridge.org/core/books/litigating-the-climate-emergency/climate-science-and-human-rights/01D494CAB875536C9FC859D602F34326>; Michael Burger, Jessica Wentz, & Radley Horton, *The Law and Science of Climate Change Attribution*, 45(1) COLUM. J. ENVT. L. 57 (2020), <https://journals.library.columbia.edu/index.php/cjel/article/view/4730>; Michael Burger & Jessica Wentz, *Climate Change and Human Rights*, in HUMAN RIGHTS AND THE ENVIRONMENT: LEGALITY, INDIVISIBILITY, DIGNITY AND GEOGRAPHY (James R. May and Erin Daly eds., Elgar Encyclopedia of Environmental Law series, Vol. 7, 2019), <https://www.e-elgar.com/shop/usd/human-rights-and-the-environment-9781788111454.html>; MICHAEL BURGER & JESSICA WENTZ, HUMAN RIGHTS AND CLIMATE CHANGE (United Nations Environment Programme 2015), https://scholarship.law.columbia.edu/sabin_climate_change/119/.

Introduction and Summary

The Court has been asked to provide an advisory opinion “clarifying the scope of State obligations, in their individual and collective dimension, to respond to the climate emergency within the framework of international human rights law, taking into account the differentiated effects that such emergency has on the people of different regions and population groups, nature and human survival on our planet.”² The Request raises a number of specific questions about State obligations related to climate change mitigation, adaptation, loss and damage, and the protection of vulnerable groups such as children, women, and indigenous peoples.

Underpinning these legal questions are scientific questions about the nature of anthropogenic climate change, its impacts on human and natural systems, and the relative contributions of different State actors to those impacts. For example, as noted in the Request, interpreting the “shared but differentiated responsibilities” of States in relation to climate change requires differentiating the contribution that each State has made to climate change and its impacts.³ State responsibilities must also be interpreted in light of the need to “avoid, minimize, and address the damages and losses” caused by climate change, and the “need to generate mechanisms and practices that allow for reparation and adaptation at the national, regional, sub-regional and global levels in a fair, equitable and sustainable manner.”⁴

This brief provides insights on how climate science can inform the Court’s assessment of State obligations to prevent, minimize, provide redress for, or otherwise respond to the harmful effects of climate change. Part I begins with an overview of relevant scientific research, specifically: (i) climate change detection and attribution research, which examines the causal links between human activities, climate change, and effects on people and ecosystems; (ii) projections of future climate change at different warming levels and under different emissions scenarios; and (iii) research on the amount of greenhouse gases (GHGs) that can still be released into the atmosphere without exceeding warming thresholds such as 1.5 or 2°C. Part II explains the connection between scientific evidence of injuries attributable to climate change and threats to specific rights protected

² Request for Advisory Opinion on Climate Emergency and Human Rights to the Inter-American Court of Human Rights from the Republic of Colombia and the Republic of Chile (January 9, 2023).

³ *Id.* at 7.

⁴ *Id.*

under the American Convention on Human Rights (American Convention), the Protocol of San Salvador, and other human rights instruments. Part III describes how the science can factor into the Court’s assessment and characterization of State obligations related to GHG mitigation, climate change adaptation, climate finance, loss and damage, access to information, public participation, and access to justice.

Key Conclusions: First, there is strong evidentiary support for the finding that climate change poses an “actual” and “imminent” threat to a broad range of human rights. The science shows that climate change is already causing pervasive harm to human and natural systems across the planet, in many cases posing a direct threat to human health, lives, livelihoods, culture, development, self-determination, and the ecosystems and natural resources that humans depend on for all of these values. The severity of the harm will increase with every increment of warming, and many more people and ecosystems will be at risk of severe or catastrophic harm if anthropogenic warming is not limited to 1.5°C or “well below” 2°C.

Second, it is clear that States must achieve deep and rapid reductions in GHG emissions *in the next decade* in order to have a chance of limiting global warming to 1.5°C or “well below” 2°C. Researchers estimate that the remaining carbon budget for a 50% chance of limiting global warming to 1.5°C was only 250 gigatons of carbon dioxide (GtCO₂) as of January 2023, equal to approximately six years of current CO₂ emissions.⁵ Thus, meeting global climate targets will require ambitious efforts on the part of all States to reduce GHG emissions, with an aim of achieving net zero emissions as quickly as possible, taking into account their respective capabilities and resources. States will need to enact regulations aimed at phasing out fossil fuel use and controlling GHG emissions from other sectors, including emissions attributable to agriculture, livestock, deforestation and other land use decisions. States should seek to reduce emissions of both CO₂ and more potent GHGs such as methane (CH₄), which have a larger effect on near-term warming.

⁵ Piers M. Forster et al., *Indicators of Global Climate Change 202: Annual Update of Large-Scale Indicators of the State of the Climate System and Human Influence*, 15(6) ESSD 2295 (2023), <https://essd.copernicus.org/articles/15/2295/2023/>; Robin D. Lamboll et al., *Assessing the Size and Uncertainty of Remaining Carbon Budgets*, NAT. CLIM. CHANG. (2023), <https://www.nature.com/articles/s41558-023-01848-5>.

Third, there are a number of ways in which climate science can be used to characterize the differentiated responsibilities of States with regards to GHG emissions and climate damages. For example, climate attribution research can be used to assess and, in some cases, quantify State contributions to climate change-related harms, which is relevant when assessing the adequacy of State ambition with regards to GHG mitigation, climate finance, and compensation for loss and damage. In addition, research on the equitable allocation of carbon budgets (i.e., “fair share” research) can be used to evaluate the sufficiency of GHG reduction targets, and research on mitigation pathways can be used to evaluate whether a State’s climate policies reflect the greatest possible ambition.

Fourth, the science indicates that, even with ambitious GHG mitigation, States will still need to make substantial investments in adaptation to protect human rights from the harmful impacts of climate change. The science also provides critical insights on the ways in which climate change is affecting specific regions, communities, and individuals and the types of adaptation measures that are most urgently needed to protect human rights. This information can be used to evaluate the reasonableness of State adaptation measures.

Finally, it is important to recognize that climate change is a dynamic process and scientific understanding of this process is constantly evolving. States will need to periodically reassess and revise their responses to climate change in light of new scientific evidence. In addition, State obligations related to public participation, access to information, and access to justice should be characterized in a way that will promote science-based decision-making in policy, administrative, and judicial contexts.

I. Overview of Climate Science

Climate science encompasses a range of research aimed at understanding the structure and dynamics of the Earth's climate system and its interactions with other human and natural systems.⁶ One key goal of the science is to characterize the mechanisms and consequences of observed climate change. The Intergovernmental Panel on Climate Change (IPCC), the leading scientific authority in this field,⁷ has found “unequivocal” evidence that humans are influencing the climate system through GHG emissions and other climate forcers,⁸ resulting in “[w]idespread changes in the atmosphere, ocean, cryosphere, and biosphere.”⁹ Scientists have also amassed a substantial body of evidence on the specific drivers and effects of climate change, including evidence of pervasive harms that are already occurring and will become more severe with additional warming.

This brief focuses on several areas of research that are particularly relevant to the Court's assessment of human rights and State obligations:

- **Detection and attribution science**, which provides insights on the nature and magnitude of anthropogenic climate change and its impacts, as well as the relative contributions of different sources, including State actors, to those impacts.
- **Climate change projections**, which provide insights on the possible future effects of climate change under different warming and emissions trajectories.
- **Carbon budget estimates**, which provide insights on the remaining amount of GHG emissions that can be released into the atmosphere without exceeding warming thresholds such as 1.5 or 2 °C.

⁶ The “climate system” is comprised of the atmosphere, hydrosphere, cryosphere, lithosphere, and biosphere, and the interactions between these components.

⁷ The IPCC was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) as the leading scientific body for the assessment and synthesis of research on climate change. The IPCC was awarded the Nobel Peace Prize in 2007 for its role in synthesizing and disseminating climate research. The IPCC is widely recognized by courts and other legal authorities as an authoritative and credible source of climate science, and IPCC findings have been cited in essentially every major legal decision on climate change. See Maria L. Banda, *Climate Science and the Courts: A Review of U.S. and International Judicial Pronouncements*, ENVIRONMENTAL LAW INSTITUTE (2020), <https://www.eli.org/research-report/climate-science-courts-review-us-and-international-judicial-pronouncements>; Burger, Wentz, & Horton (2020), *supra* note 1.

⁸ A “climate forcer” is any substance that affects the flow of energy coming into or out of the global climate system, thus affecting the amount of heat retained within the system. Anthropogenic climate forcers include GHGs, aerosols, and changes in land use that make land reflect more or less solar energy.

⁹ IPCC, CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE SIXTH ASSESSMENT REPORT OF THE IPCC 4 (2021) [hereinafter IPCC AR6 WGI] at 6, 148, <https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/>.

The sections below include a description of each research area and a summary of key findings from the latest IPCC assessment report (AR6) and other scientific resources.¹⁰

A. Detection and Attribution of Climate Change

Detection and attribution methods are used to determine whether and to what extent observed changes in the climate and other interconnected systems can be attributed to human influence on climate.¹¹ In past work,¹² we have identified four interrelated components of attribution research that correspond with different links in the causal chain connecting human activities to climate change impacts: (i) **climate change attribution**, which examines how human activities, in the aggregate, affect the climate system;¹³ (ii) **extreme event attribution**, which examines how human-induced changes in the climate system affect the frequency, magnitude, and other characteristics of extreme events;¹⁴ (iii) **impact attribution**, which examines how human-induced changes in the climate system affect other interconnected natural and human systems;¹⁵ and (iv) **source attribution**, which examines the relative contributions of different sectors, activities, and entities to climate change and its impacts.¹⁶

Attribution studies rely on multiple lines of evidence, including physical understanding of the climate system, observational datasets, paleoclimate reconstructions, statistical methods, and

¹⁰ This section also briefly discusses research on mitigation and adaptation pathways, which is relevant to the Court’s assessment because it provides insights on how States can achieve climate targets. However, an in-depth discussion of that research and its application to the legal questions posed in the Petition is beyond the scope of this brief.

¹¹ “Detection” refers to the process of demonstrating that a particular variable has changed in a statistically significant way without assigning cause. “Attribution” involves sifting through a range of causative factors to determine the role of one or more drivers with respect to the detected change.

¹² Burger, Wentz & Horton (2020), *supra* note 1.

¹³ Climate change attribution, as defined here, would include, e.g., studies examining the relationship between increases in atmospheric concentrations of GHGs and long-term changes in climate variables such as global mean surface temperature, atmospheric water vapor, ocean heat content, and global mean sea level.

¹⁴ Extreme weather is part of the global climate system, and thus extreme event attribution can be viewed as a subset of climate change attribution. However, there are unique challenges associated with extreme event attribution because it deals with climatological extremes and specific events rather than changes in long-term average variables. There is also overlap with impact attribution, as many extreme event studies deal with event characteristics and outcomes that are not purely climatological (e.g., flood damages, wildfire acres burned, or heat wave-related deaths).

¹⁵ Impact attribution would include, e.g., studies aimed at characterizing the effects of climate change on human health, ecosystems, infrastructure, agricultural systems, food security, and water security.

¹⁶ Source attribution includes research aimed at calculating the emissions attributable to specific sources, as well as research that utilizes emissions data to characterize a particular source’s contribution to climate change-related trends and impacts, such as sea level rise and increased temperatures.

climate models that can be used to simulate conditions both without and with anthropogenic forcing on climate.¹⁷ Much of the research is quantitative in nature, providing insights on the magnitude of change attributable to human forcing (e.g., increases in average temperature, sea level rise), as well as the extent to which human forcing has influenced the probability or risk of certain extreme events and impacts (e.g., heatwaves, storms, floods). Qualitative research methods are also used, particularly in impact attribution studies that deal with difficult-to-quantify variables.

Detection and attribution research is relevant to discussions about legal responsibility for climate change because it provides insights on both the injuries attributable to climate change and the contribution of specific sources to those injuries. It also provides broader insights on the overall consequences of climate change, the speed at which we are approaching critical targets and tipping points, and the potential consequences should we surpass those targets. This type of information is pertinent when considering State obligations related to GHG mitigation, adaptation, risk disclosure, and loss and damage, among others.

1. Climate Change Attribution

IPCC AR6 found “unequivocal” evidence that human influence has warmed the atmosphere, oceans, and land, primarily through GHG emissions from fossil fuel combustion and other industrial sources.¹⁸ This warming trend is unprecedented in at least the last 2000 years and it is “already affecting every inhabited region across the globe.”¹⁹ As of 2019, the decadal average global surface temperature had increased approximately 1.1°C over pre-industrial levels, with larger increases over land (1.59°C) than the ocean (0.88°C).²⁰ A study using more recent emissions

¹⁷ The effect of GHG emissions on the atmosphere is an example of anthropogenic “climate forcing” or “radiative forcing”, i.e., a change in the energy flux within the Earth’s atmosphere. Positive radiative forcing occurs when the Earth receives more incoming energy from sunlight than it radiates into space, and this net gain of energy causes warming. There are a number of natural processes that can affect net radiative forcing – these include changes in the percentage of incoming solar radiation absorbed by the earth, volcanic activity, orbital cycles, and changes in global biochemical cycles (discussed below). There are also other human drivers that can affect atmospheric energy flux – for example, land use changes can have positive or negative effects on radiative forcing, and aerosol emissions have negative radiative forcing and thus contribute to cooling of the climate system. A climate “forcer” is any substance or process that has the potential to affect the energy flux of the atmosphere.

¹⁸ IPCC AR6 WGI at 4.

¹⁹ *Id.*

²⁰ *Id.* at 5.

data estimated that human-induced surface warming had reached approximately 1.26°C in 2022.²¹ Based on these estimates, there is a high probability that humans will cause global warming in excess of 1.5°C within a decade or less.²² Some of the other consequences of human influence on the climate system include: (i) ocean warming, which is the primary driver of sea level rise and ocean deoxygenation,²³ (ii) ocean acidification, which occurs due to the dissolution of CO₂ in seawater;²⁴ (iii) substantial declines in sea ice, glaciers, and snowpack;²⁵ (iv) changes in atmospheric and ocean circulation, which play a major role in regional weather patterns;²⁶ and (v) changes in the hydrological cycle, with both increases and decreases in precipitation depending on the region.²⁷

2. Extreme Event Attribution

As recognized in IPCC AR6, there have been major advances in extreme event attribution over the past decade, and it is now an “established fact” that anthropogenic climate forcing has increased the frequency and/or intensity of some weather and climate extremes, particularly heat extremes.²⁸ There is also evidence linking human influence to increases in the severity and frequency of heavy precipitation, flooding, droughts, tropical cyclones, and wildfires. Table I.A.2 (next page) summarizes the level of scientific confidence in the attribution of different extremes, based on the IPCC’s synthesis of research through 2019.²⁹

²¹ Forster et al. (2023), *supra* note 5. This study also looked at decadal averages and estimated that human-induced warming had reached approximately 1.14 °C averaged over the 2013-2022.

²² See *infra* § I(C) (“Carbon Budgets, Emission Limits, and Fossil Fuel Production Horizons”).

²³ The IPCC estimates that ocean warming has accounted for 91% of the total warming in the climate system, and that total ocean heat content increased by 0.396 [0.329 – 0.463 *likely* range] yottajoules between 1971 and 2018. IPCC AR6 WGI at 283, 1214.

²⁴ IPCC AR6 WGI at 714.

²⁵ *Id.* at 1215-1216.

²⁶ *Id.* at 70, 1237.

²⁷ *Id.* at 1057, 1080-81.

²⁸ *Id.* at 1517.

²⁹ See *id.* at 67 (Table TS-2), Chapter 11. The IPCC uses five qualifiers to express level of scientific confidence in findings: very high, high, medium, low, and very low). The following terms are used to indicate the assessed likelihood of an outcome or a result: virtually certain 99–100% probability, very likely 90–100%, likely 66–100%, more likely than not >50–100%, about as likely as not 33–66%, unlikely 0–33%, very unlikely 0–10%.

Table I.A.2. Scientific Confidence in Extreme Event Attribution (IPCC AR6)

Type of extreme	Likelihood / confidence in attribution
Extreme heat (including marine heatwaves)	Virtually certain
Extreme precipitation	Likely / high confidence
Extreme precipitation associated with tropical cyclones	Likely / high confidence
Concurrent heatwaves and droughts	Likely / high confidence
Increase in compound flooding	Medium confidence
Increase in agricultural and ecological drought	Medium confidence
Increase in fire weather	Medium confidence
Intensity of tropical cyclones	Medium confidence

Note: These attribution findings reflect the IPCC’s assessment of whether human influence on climate is causing an increase in the frequency and/or severity of the extremes listed here, at a global level. The IPCC AR6 WGI report also discusses regional differences in attribution findings for extreme events (*see, e.g.,* Figure SPM.3).

Research on extreme event attribution has continued to advance since 2019, with new studies lending greater confidence to the attribution of wildfires, droughts, tropical cyclones, and other events.³⁰ The research has revealed a particularly strong link between anthropogenic climate change and increases in the prevalence of wildfire weather and wildfire severity.³¹ Researchers have also identified an increasing number of extreme events that would be virtually impossible or extremely unlikely without human influence on the climate system.³²

³⁰ See, e.g., Mireia Ginesta et al., *A Methodology for Attributing Severe Extratropical Cyclones to Climate Change Based on Reanalysis Data: The Case Study of Storm Alex 2020*, CLIM. DYN. (2022), <https://link.springer.com/article/10.1007/s00382-022-06565-x>; Michael Goss et al., *Climate Change is Increasing the Likelihood of Extreme Autumn Wildfire Conditions Across California*, 15 ENVIRO. RES. LETT. 094016 (2020), <https://iopscience.iop.org/article/10.1088/1748-9326/ab83a7>; G.G. Riberio Neto et al., *Attributing the 2015/2016 Amazon Basin Drought to Anthropogenic Influence*, CLIMATE RESIL. SUSTAIN. (2022), <https://rmets.onlinelibrary.wiley.com/doi/10.1002/cli2.25>.

³¹ See, e.g., Marco Turco et al., *Anthropogenic Climate Change Impacts Exacerbate Summer Forest Fires in California*, 120(25) PROC. NATL. ACAD. SCI. U.S.A. e2213815120 (2023), <https://www.pnas.org/doi/full/10.1073/pnas.2213815120> (finding that nearly half of the increase in summer burned forest area in California over the past half-century was attributable to anthropogenic climate change); Zhongwei Liu et al., *The April 2021 Cape Town Wildfire: Has Anthropogenic Climate Change Altered the Likelihood of Extreme Fire Weather?*, 104 BULL. AM. METEOROL. SOC. E298 (2023), <https://journals.ametsoc.org/view/journals/bams/104/1/BAMS-D-22-0204.1.xml> (finding that climate change had increased the likelihood of wildfire weather like that experienced in the 2021 Cape Town fire by a factor of 1.9).

³² See, e.g., A. Ciavarella et al., *Prolonged Siberian Heat of 2020 Almost Impossible Without Human Influence*, CLIM. CHANGE (2021), <https://link.springer.com/article/10.1007/s10584-021-03052-w>.

The latest findings on extreme heat and climate change are particularly alarming. In 2023, numerous global heat records were surpassed by unprecedented margins. The period of June through August was the warmest on record, with an average global surface temperature 1.15°C above the 20th century average of 15.6°C (exceeding the previous record by an astonishing 0.43°C).³³ The record-breaking heat continued in September, with average global surface temperature 1.44°C above the 20th century average (the largest temperature anomaly of *any* month on record).³⁴ August and September 2023 also set records for the highest monthly sea surface temperature anomalies (both 1.03°C above average) and the lowest global sea ice extent on record.³⁵

Many regions experienced record-breaking heatwaves during this period, exacerbated by climate change.³⁶ South America experienced its highest ever average monthly temperature anomalies for the months of July (2.19°C above average), August (2.40°C above average), and September (2.48°C above average), as well as a prolonged heatwave lasting from July through September with maximum temperatures exceeding 40°C.³⁷ Attribution researchers have estimated that climate change increased the likelihood of this event by at least 100 times, and that the heatwave would have been 1.4 to 4.3°C cooler in the absence of anthropogenic warming.³⁸ Extreme sea surface temperatures have also resulted in a mass coral bleaching event with major consequences for Latin American and Caribbean countries.³⁹ The effects of extreme heat on the region are discussed in further detail below.⁴⁰

³³ U.S. National Oceanic and Atmospheric Administration (NOAA), *Monthly Global Climate Reports* (2023), available at <https://www.ncei.noaa.gov/access/monitoring/monthly-report/>.

³⁴ *Id.*

³⁵ *Id.*

³⁶ *Extreme Heat in North America, Europe and China in July 2023 Made Much More Likely by Climate Change* (World Weather Attribution, July 25, 2023), <https://www.worldweatherattribution.org/extreme-heat-in-north-america-europe-and-china-in-july-2023-made-much-more-likely-by-climate-change/>.

³⁷ NOAA (2023), *supra* note 33.

³⁸ Sarah Kew et al., *Strong Influence of Climate Change in Uncharacteristic Early Spring Heat in South America* WORLD WEATHER ATTRIBUTION PROJECT (Oct. 10, 2023), <https://spiral.imperial.ac.uk/handle/10044/1/106753> (evaluating how climate change influenced 10-day maximum temperatures in the area most affected by the heatwave).

³⁹ Allison Chinchar, *Coral Bleaching in the Caribbean*, METMATTERS (Royal Meteorological Society, September 14, 2023), <https://www.rmets.org/metmatters/coral-bleaching-caribbean>.

⁴⁰ See *infra* Table I.A.3.

3. Impact Attribution

Human-induced climate change is already causing “widespread adverse impacts and related losses and damages” to people and ecosystems across the planet.⁴¹ Observed increases in the severity and frequency of extreme events have been linked to “widespread, pervasive impacts to ecosystems, people, settlements, and infrastructure,”⁴² including increases in heat-related human mortality, coral bleaching and mortality, increases in drought-related tree mortality, increases in areas burned by wildfires, and increases in storm-related losses and damages.⁴³ Slow-onset processes, such as ocean acidification, sea level rise, and changes in average precipitation, are also having pervasive effects on human and natural systems.

The existing body of research leaves no question that climate change poses an enormous risk to human health and well-being. The IPCC estimates that approximately 3.3 to 3.6 billion people live in contexts that are highly vulnerable to climate change,⁴⁴ and there are many interrelated pathways through which climate change adversely affects human lives, physical and mental health, food and water security, livelihoods, property, critical infrastructure (e.g., sanitation, transportation, and energy systems), socioeconomic development, and cultural practices. Some of the key ways in which climate change causes harm include:

- **Ecosystem degradation:** IPCC AR6 expressed *high confidence* that climate change has already caused “substantial damages, and increasingly irreversible losses” in terrestrial, freshwater, and marine ecosystems, including “[w]idespread deterioration of ecosystem structure and function, resilience and natural adaptive capacity.”⁴⁵ For example, AR6 expressed *very high confidence* that climate change has caused widespread coral bleaching and mortality, primarily due to heat stress associated with ocean warming, resulting in deterioration to and loss of coral reef ecosystems across the planet.⁴⁶ Other ecosystems that are uniquely sensitive to and affected by climate change include tropical forests, island ecosystems, coastlines, wetlands, mountains, and polar regions.

⁴¹ IPCC, CLIMATE CHANGE 2022: IMPACTS, ADAPTATION, AND VULNERABILITY, WORKING GROUP II CONTRIBUTION TO THE SIXTH ASSESSMENT REPORT OF THE IPCC (2022), https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf [hereinafter IPCC AR6 WGII] at 9.

⁴² *Id.*

⁴³ *Id.*

⁴⁴ IPCC, *Summary for Policymakers*, CLIMATE CHANGE 2023: SYNTHESIS REPORT, CONTRIBUTION OF WORKING GROUPS I, II, AND III TO THE SIXTH ASSESSMENT REPORT FOR THE IPCC (2023) [hereinafter IPCC AR6 SYR], ¶ A.2.2, <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>.

⁴⁵ *Id.*

⁴⁶ IPCC AR6 WGII at § 3.4.2.1.

- **Extreme events:** The increasing severity and frequency of climate and weather extremes is a major source of injury to people and nature. AR6 expressed *very high confidence* that increasing temperatures and heatwaves have increased mortality and morbidity in all regions.⁴⁷ Some studies have quantified the increases in heat- and disaster-related mortality attributable to climate change, e.g., Vicedo-Cabrera et al. (2021) examined data from 732 locations in 43 countries and found that 37% (range 20.5-76.3%) of warm season heat-related deaths can be attributed to climate change.⁴⁸
- **Food and water security:** Climate change is already threatening food and water security in many regions, including some of the most vulnerable regions of the world, and these impacts will be much more severe if we surpass 1.5 or 2 °C of warming.⁴⁹ For example, IPCC AR6 expressed *high confidence* that climate change has “affected the productivity of all agricultural and fishery sectors, with negative consequences for food security and livelihoods” and, moreover, that it “has contributed to malnutrition in all its forms in many regions... especially for pregnant women, children, low-income households, Indigenous Peoples, minority groups and small-scale producers.”⁵⁰
- **Food, water, and vector-borne diseases:** Climate change is affecting the spread of communicable diseases as a result of changes in temperature, humidity, rainfall, sea level rise, and extreme weather. IPCC AR6 expressed *high confidence* that higher temperatures and other climate impacts are already causing an increase in vector-borne diseases, including dengue, Lyme disease, West Nile fever, Rift Valley fever, tick-borne encephalitis, and chikungunya virus, as well as food- and water-borne illnesses.⁵¹
- **Submergence of low-lying coastal areas and islands:** Coastal areas and islands are increasingly experiencing adverse impacts such as submergence, flooding, erosion, and saltwater intrusion due to sea level rise, more severe storms, and storm surge. These impacts have adverse effects on humans and infrastructure as well as coastal and estuarine ecosystems (which provide critical services to coastal communities). Many people are already facing an imminent threat of forced displacement, and some island states and communities will become uninhabitable due to sea level inundation even if global warming is limited to 2 °C.⁵² IPCC AR6 expressed *very high confidence* that small islands and low-

⁴⁷ IPCC AR6 WGII at 51.

⁴⁸ A.M. Vicedo-Cabrera et al., *The Burden of Heat-Related Mortality Attributable to Recent Human-Induced Climate Change*, 11 NAT. CLIM. CHANGE 492 (2021), <https://pubmed.ncbi.nlm.nih.gov/34221128/>.

⁴⁹ IPCC AR6 WGII, Ch. 4-5. There are many pathways through which climate change affects food and water systems (e.g., ocean warming, acidification, and deoxygenation adversely affect fisheries; changes in temperature and precipitation can adversely affect agricultural systems; drought and aridity can reduce freshwater availability).

⁵⁰ *Id.* at 49, 51.

⁵¹ *Id.* at 51. *See also id.*, Ch. 7.

⁵² This is one of the reasons that the UNFCCC Conference of the Parties (COP) revised its objective to limit global warming to “well below 2 °C” or 1.5 °C. However, current pledges under the UNFCCC are not sufficient to meet that objective, and it is likely that many islands and low-lying coastal areas will be inundated due to sea level rise under current emissions trajectories. *See infra* § I.B.

lying cities and settlements will face “severe disruption by 2100, and as early as 2050 in many cases” under *all* climate and socioeconomic scenarios.⁵³

- **Humanitarian crises, forced displacement, and migration:** Climate change is “contributing to humanitarian crises where climate hazards interact with high vulnerability.”⁵⁴ For example, flood and drought-related acute food insecurity and malnutrition have increased in Africa and Central and South America.⁵⁵ Climate and weather extremes are also driving displacement in all regions of the world, with Small Island States disproportionately affected.⁵⁶ Over 20 million people have been internally displaced annually by weather-related events since 2008, with storms and floods and the most common drivers.⁵⁷
- **Physical and mental health:** Climate change is adversely affecting physical and mental as a result of the hazards described above, including more severe and frequent extreme events, increased exposure to diseases, food and water insecurity, humanitarian conflict, and displacement.⁵⁸

The scientific evidence also demonstrates that the harmful impacts of climate change are disproportionately affecting “the most vulnerable people and systems” and some natural and human systems have already been “pushed beyond their ability to adapt.”⁵⁹

Table I.A.3 (next page) summarizes some of the ways in which climate change is specifically affecting Latin America and the Caribbean, based on findings from IPCC AR6 as well as more targeted studies of climate impacts in the region.⁶⁰

⁵³ IPCC AR6 WGII at 62.

⁵⁴ *Id.* at 11.

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ *Id.* at 48.

⁵⁸ *Id.* at 11.

⁵⁹ *Id.*

⁶⁰ See, e.g., IPCC AR6 WGII, Ch. 12 (“Central and South America”); Ch. 15 (“Small Islands”); USAID, *Eastern and Southern Caribbean Climate Vulnerability Assessment: 2022 Update* (May 2022), <https://www.climatelinks.org/resources/eastern-and-southern-caribbean-climate-vulnerability-assessment>; Jerónimo Giorgi & Irene Torres, *Impactos das mudanças climáticas na América Latina e no Caribe*, INTER-AMERICAN INSTITUTE FOR GLOBAL CHANGE RESEARCH (2022), https://latinoamerica21.com/wp-content/uploads/2022/11/PORT_Impactos-das-mudancas-climaticas-na-America-Latina-e-no-Caribe.pdf; Christopher P.O. Reyer et al., *Climate Change Impacts in Latin America and the Caribbean and their Implications for Development*, 17 REG. ENVIRON. CHANGE 1601 (2017), <https://link.springer.com/article/10.1007/s10113-015-0854-6>; L.J.S. Anjos, & P.M. De Toledo, *Measuring resilience and assessing vulnerability of terrestrial ecosystems to climate change in South America*, 13(30 PLoS ONE 1 (2018), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5858834/>; V.R. Barros et al., *Climate change in Argentina: trends, projections, impacts and adaptation*, 6(2) WILEY INTERDISCIP. REV. CLIM. CHANGE 151–169 (2015), <https://wires.onlinelibrary.wiley.com/doi/10.1002/wcc.316>; Uruguay Ministerio de Ambiente, *Cambio Climático*, <https://www.gub.uy/ministerio-ambiente/cambio-climatico>; Chile, Ministerio del Medio Ambiente, *Publicaciones Destacadas*, <https://cambioclimatico.mma.gob.cl/publicaciones-destacadas/>; México ante el Cambio Climático,

Table I.A.3. Impacts of Climate Change on Latin America and the Caribbean	
Extreme heat	Extreme heat events are becoming increasingly severe and frequent throughout Latin America and the Caribbean, causing harm to people, infrastructure, and ecosystems. ⁶¹ The region has experienced a number of record-breaking extreme heat events in recent years, often exacerbating other natural hazards such as drought and glacier melt. ⁶² In 2023, South America experienced an unprecedented winter heatwave, with temperatures surpassing 35°C in the Andes and 40°C in other areas. ⁶³ The Caribbean basin and Gulf of Mexico also experienced an unprecedented marine heatwave in 2023, with ocean temperatures surpassing 32 °C, which triggered a large-scale bleaching coral bleaching event that was more intense and longer in duration than any event on record. ⁶⁴
Extreme precipitation, glacier melt, flooding, and landslides	Extreme precipitation events and glacier loss are contributing to a higher incidence of floods and landslides that pose a risk to human life and infrastructure. ⁶⁵ Glaciers in the Andes have lost 30% or more of their area since the 1980s, and some glaciers in Peru have lost more than 50% of their area. Extreme precipitation has also increased in many regions, and floods and landslides triggered by heavy rainfall have led to hundreds of fatalities and billions of dollars (USD) in economic losses. ⁶⁶ Social inequalities, urban expansion, and inadequate city planning increase exposure to these natural hazards. ⁶⁷
Coastal hazards	Sea level rise, more severe storms, and compound storm surge pose a risk to coastal residents and communities. It is estimated that 6-8% of the population in Latin America and the Caribbean face high risk associated with sea level rise and coastal hazards. ⁶⁸ The Caribbean is most impacted: as of 2017, an estimated 22 million people in the Caribbean lived less than six meters above sea level, and the region faces uniquely high exposure to tropical cyclones. ⁶⁹

Sistema De Información Sobre El Cambio Climático, <https://cambioclimatico.gob.mx>; Mexico Programa de Investigación en Cambio Climático, <https://www.pincc.unam.mx/publicaciones/reporte-mexicano/>.

⁶¹ IPCC AR6 WGII, Ch. 12, 15; WORLD METEOROLOGICAL ORGANIZATION (WMO), STATE OF THE CLIMATE IN LATIN AMERICA AND THE CARIBBEAN 2021 (2022), <https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate/LAC>.

⁶² Central America, in particular, has been identified as a “hot spot” for high-risk heatwaves. Vikki Thompson et al., *The Most At-Risk Regions in the World for High-Impact Heatwaves*, 14 NATURE COMMUNICATIONS 2152 (2023), <https://www.nature.com/articles/s41467-023-37554-1>.

⁶³ *Winter Heat Wave in Chile Offers ‘Window’ to Warmer World*, REUTERS (August 3, 2023), <https://www.reuters.com/world/americas/winter-heat-wave-chile-offers-window-warmer-world-2023-08-03/>.

⁶⁴ Allison Chinchar, *Coral Bleaching in the Caribbean*, METMATTERS (Royal Metrological Society, September 14, 2023), <https://www.rmets.org/metmatters/coral-bleaching-caribbean>.

⁶⁵ IPCC AR6 WGII at 1691-92.

⁶⁶ World Meteorological Organization (WMO), *Climate Change Vicious Cycle Spirals in Latin America and the Caribbean* (July 5, 2023), <https://public.wmo.int/en/media/press-release/climate-change-vicious-cycle-spirals-latin-america-and-caribbean>. See also José Alex do Nascimento Bento et al., *Impacto das mudanças climáticas sobre o nível de renda na América Latina*, 62(2) REVISTA DE ECONOMIA E SOCIOLOGIA RURAL (2024), https://www.scielo.br/j/resr/a/y8h4LSFSYnjh_gt6rWkkkBYn/.

⁶⁷ IPCC AR6 WGII at 1714.

⁶⁸ *Id.* at 1225.

⁶⁹ *Id.* at 2045. In 2017 alone, 22 of 29 Caribbean islands were affected by at least one Category 4 or 5 tropical cyclone. Many of these storms had devastating impacts, e.g., Tropical Cyclone Maria destroyed nearly all of Dominica’s infrastructure, with losses amounting to over 225% of the country’s annual GDP. *Id.*

Table I.A. Impacts of Climate Change on Latin America and the Caribbean (continued)	
Drought and water scarcity	The frequency and intensity of droughts has increased in South America, Central America, and the Caribbean, primarily due to rainfall deficit. ⁷⁰ The social and economic consequences of drought are already evident in many contexts, for example, in Central America’s so-called “Dry Corridor” in El Salvador, Guatemala, Honduras, and Nicaragua, where there is now a growing dependence on food imports as well as greater food insecurity. ⁷¹ The “Central Chile Mega Drought”, which has been ongoing since 2010, is the longest drought that the region has seen in at least 1,000 years. The Caribbean faces compound risks to water supply due to a combination of drought, sea level rise, and more severe storms. Glacier retreat is also contributing to water scarcity in glacier-fed water basins.
Agriculture and food production	Extreme temperatures, changes in the timing and magnitude of precipitation, and drought are negatively affecting agricultural systems as well as subsistence farming in some regions., compromising food security. ⁷² Marine heat waves, ocean acidification, coral reef loss, and other forms of marine ecosystem degradation are also threatening the health and productivity of fisheries in the region, particularly Caribbean fisheries, which are considered to be among the most vulnerable in the world to climate change. ⁷³
Ocean and coastal ecosystems	Ocean and coastal ecosystems in the region, such as coral reefs, estuaries, salt marshes, mangroves, and sandy beaches, are highly sensitive and negatively impacted by climate change. ⁷⁴ The loss of coral reef ecosystems, in particular, poses a significant threat to the region. ⁷⁵ Massive, region-wide decline of corals has been observed across the entire Caribbean basin for decades – e.g., the average stony coral cover on reefs declined by 80% between 1977 and 2001, ⁷⁶ and marine heatwaves continue to cause widespread declines in tropical corals, kelps, seagrasses, mangroves, and other marine species and other marine habitat forming communities. This important implications for a range of ecosystem services, including food production, carbon storage, and storm protection. ⁷⁷
Forest ecosystems	Climate change is causing disruption and damage to forest ecosystems in the region. The Amazon Forest, one of the world’s largest biodiversity and carbon repositories, is under severe stress as a result of droughts, higher temperatures, and wildfires, all of which are linked to climate change, as well as land use practices. ⁷⁸ The southern portion of the Amazon has become a net carbon source, rather than a sink, in the past decade. ⁷⁹

⁷⁰ IPCC AR6 WGII at 1697, 1736.

⁷¹ *Id.* at 1736.

⁷² E.g., the crop growth duration for maize in impacted regions was reduced by at least 5% between 1981-2020 and 2015-2019. IPCC AR6 WGII at 1691.

⁷³ *Id.* at 2075.

⁷⁴ *Id.* at 1691.

⁷⁵ FAO, Impacts of Climate Change on Fisheries and Aquaculture, FAO Technical Paper 627 (2018), <https://www.fao.org/3/i9705en/i9705en.pdf>.

⁷⁶ Toby A. Gardner et al., *Long-Term Region-Wide Declines in Caribbean Corals*, 301 SCIENCE 958 (2003), <https://www.science.org/doi/10.1126/science.1086050>.

⁷⁷ Dan A. Smale et al., *Marine heatwaves threaten global biodiversity and the provision of ecosystem services*, 9 NAT. CLIM. CHANGE 306 (2019), <https://www.nature.com/articles/s41558-019-0412-1>.

⁷⁸ IPCC AR6 WGII at 1691.

⁷⁹ *Id.* at 1693.

Table I.A. Impacts of Climate Change on Latin America and the Caribbean (continued)	
Infectious diseases	Climate change has significantly increased risks associated with some infectious diseases in the region. For example, the reproduction potential for the transmission of dengue increased between 17% and 80% for the period 1950-1954 to 2016-2021. ⁸⁰
Public health	Climate change affects public health through multiple vectors, including extreme weather, infectious diseases, ecosystem degradation, and food and water insecurity. ⁸¹ For example, extreme heat is already affecting public health in the region. One meta-analysis focused on South America found that heat-related deaths are increasing across regions ⁸² and children <1 year are now exposed to 2.35 million more person-days of heatwaves each year, relative to a 1996-2005 baseline. ⁸³ Climate change has also substantially increased human heat stress in the Caribbean, ⁸⁴ but public health data is more limited for this region. ⁸⁵
Wildfires	Exceptionally high temperatures, low humidity, and severe drought have contributed to record-breaking wildfires, causing damage to both ecosystems and human communities. ⁸⁶
Migration and displacement	Migration and displacement associated with climatic hazards are becoming more frequent in Latin America and the Caribbean. ⁸⁷ People living in low-lying coastal areas and islands are at risk of displacement due to sea level rise, coastal submergence, saltwater inundation, and tropical cyclones. ⁸⁸ Other drivers of displacement and migration include prolonged drought, water scarcity, and food insecurity. ⁸⁹ Displaced people often face heightened exposure and vulnerability to climate change-related threats. ⁹⁰ Researchers predict that there will be approximately 17 million internal climate migrants in Latin America by 2050 unless concerted action is taken to reduce GHG emissions, adapt to climate change, and promote more inclusive development. ⁹¹

⁸⁰ IPCC AR6 WGII at 1691.

⁸¹ See, e.g., S.C. Bauch et al., *Public Health Impacts of Ecosystem Change in the Brazilian Amazon*, 112(24) PROC. NATL. ACAD. SCI. 7414 (2015), <https://www.pnas.org/doi/full/10.1073/pnas.1406495111>.

⁸² Stella M. Hartinger et al., *The 2022 South America Report of the Lancet Countdown on Health and Climate Change*, 20 LANCET REGIONAL HEALTH – AMERICAS (2023), [https://www.thelancet.com/journals/lanam/article/PIIS2667-193X\(23\)00044-3/fulltext](https://www.thelancet.com/journals/lanam/article/PIIS2667-193X(23)00044-3/fulltext) at 2.

⁸³ *Id.*

⁸⁴ Claudia Di Napoli et al., *Heat Stress in the Caribbean: Climatology, Drivers, and Trends of Human Biometeorology Indices*, 43(1) INT. J. CLIMATOL. 405 (2023), <https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/joc.7774>; Marisol Yglesias-González et al., *Code Red for Health response in Latin America and the Caribbean: Enhancing People's Health Through Climate Action*, 11 LANCET REGIONAL HEALTH – AMERICAS 100248 (2022), [https://www.thelancet.com/journals/lanam/article/PIIS2667-193X\(22\)00065-5/fulltext](https://www.thelancet.com/journals/lanam/article/PIIS2667-193X(22)00065-5/fulltext).

⁸⁵ See Nina Rise, *Climate Change and Health in the Caribbean: A Review Highlighting Research Gaps and Priorities*, 8 J. CLIM. CHANGE HEALTH 100126 (2022), <https://www.sciencedirect.com/science/article/pii/S2667278222000153>.

⁸⁶ WMO (2023), *supra* note 66.

⁸⁷ IPCC AR6 WGII at 1767-68.

⁸⁸ E.g., Puerto Rico experienced a 14% population decline in 2 years following Hurricane Maria (2017) and the entire population of Ragged Island in the Bahamas was forcibly displaced by Hurricane Irma (2017). *Id.* at 1084, 2069-70.

⁸⁹ IPCC AR6 WGII at 1768.

⁹⁰ See, e.g., Adelle Thomas & Lisa Benjamin, *Climate Justice and Loss and Damage: Hurricane Dorian, Haitians and Human Rights*, GEOGRAPHICAL J. (2022), <https://rgs-ibg.onlinelibrary.wiley.com/doi/abs/10.1111/geoj.12484>.

⁹¹ KANTA KUMARI RIGAUD ET AL., GROUNDSWELL: PREPARING FOR INTERNAL CLIMATE MIGRATION (World Bank 2018), <https://openknowledge.worldbank.org/handle/10986/29461>.

4. Source Attribution

Although most attribution studies deal with the aggregate effect of human activities on the climate system, researchers are now using source attribution data to isolate the contribution of specific entities to changes in the climate system, extreme events, and impacts. In some cases, it is even possible to isolate the effects of GHG emissions on a per-ton basis.⁹² Some of the research focuses on state-level contributions to climate change-related harms. For example, Otto et al. (2017) demonstrated that it is possible to quantify the proportional contribution of individual countries to specific extreme events, using the example of the Argentinian heatwave of 2013-14.⁹³ An earlier attribution study had found that anthropogenic climate change had made the heatwave approximately five times more likely to occur.⁹⁴ Using climate models, Otto et al. determined that emissions from the U.S. and EU had increased the likelihood of that event by 28% and 37%, respectively.⁹⁵ The same technique can be applied to other events, for example, a 2022 heatwave in Argentina and Paraguay, which scientists estimate was *60 times more likely to occur* due to anthropogenic climate change, and the 2023 South American heatwave, which scientists estimate was at least *100 times more likely to occur* due to anthropogenic climate change.⁹⁶

Researchers have also developed techniques for estimating economic damages attributable to state-level emissions. For example, Callahan & Mankin (2022) used historical emissions data and climate models to quantify each country's responsibility for historical temperature-driven income changes in all other countries.⁹⁷ They found that the top five emitters (U.S., China, Russia, Brazil,

⁹² E.g., there is a near-linear relationship between cumulative CO₂ emissions and observed declines in September sea ice (the month when Arctic sea ice typically reaches its minimum extent). Based on this, researchers have estimated that each metric ton of CO₂ that is released into the atmosphere may result in a sustained loss of 3 ± 0.3 square meters of September sea ice in the Arctic. Dirk Notz & Julienne Stroeve, *Observed Arctic sea-ice loss directly follows anthropogenic CO₂ emission*, 354 SCIENCE 747 (2016), <https://www.science.org/doi/10.1126/science.aag2345>.

⁹³ Friederike Otto et al., *Assigning Historic Responsibility for Extreme Weather Events*, 7 NAT. CLIM. CHANGE 757 (2017), <https://www.nature.com/articles/nclimate3419>.

⁹⁴ A. Hannart et al., *Causal Influence of Anthropogenic Forcings on the Argentinian Heat Wave of December 2013*, 96(12) BULL. AM. METEOROL. SOC. S41, <https://journals.ametsoc.org/view/journals/bams/96/12/bams-d-15-00137.1.xml>.

⁹⁵ Otto et al. (2017), *supra* note 93.

⁹⁶ Kew et al. (2023), *supra* note 38; Juan Antonio Rivera et al., *Climate Change Made Record Breaking Early Season Heat in Argentina and Paraguay About 60 Times More Likely* (World Weather Attribution Project, Dec. 21, 2022), <https://www.worldweatherattribution.org/wp-content/uploads/WWA-Argentina-Scientific-report.pdf>.

⁹⁷ C.W. Callahan & J.S. Mankin, *National Attribution of Historical Climate Damages*, 172 CLIM. CHANGE 40 (2022), <https://link.springer.com/article/10.1007/s10584-022-03387-y>.

and India) had collectively caused US\$6 trillion in income losses from warming since 1990, and that many other countries are responsible for billions in losses. The study also found that the distribution of warming impacts from emitters is highly unequal, with high-income, high-emitting countries actually accruing economic benefits while low-income, low-emitting countries are experiencing severe economic losses as a result of climate change.

While these studies highlight how far attribution research can go in terms of quantifying state-level contributions to climate impacts, it is also possible to draw inferences about state responsibility for climate impacts based on the State's relative contribution to global emissions. There are a number of different ways to account for state emissions, all of which provide complementary insights on the nature of State contributions to and responsibility for climate change. These include: (i) historical, present, and future emissions; (ii) territorial, consumption-based, and extraction-based emissions;⁹⁸ and (iii) total emissions, per capita emissions, and various metrics of emissions intensity. Climate science does not dictate which of these accounting methods should prevail, but source attribution research provides the underlying emissions data.

B. Projections of Future Climate Change

Climate change projections provide insights on the magnitude and scope of changes and impacts that may occur under different emission trajectories and warming scenarios. Like attribution research, climate projections are based on physical understanding, climate datasets, statistical methods, and climate models. Such projections are relevant when assessing the foreseeability of future climate harms and corresponding legal obligations to control GHG emissions and prepare for the effects of climate change.

There is no question that the effects of climate change will become increasingly severe and pervasive as GHGs continue to accumulate in the atmosphere. However, the relationship between emissions, changes in the global climate system, and corresponding impacts is not always linear – for example, there are potential tipping points, feedback cycles, and cascading impacts that could

⁹⁸ Territorial emissions are generated from combustion, industrial processes, and land use changes within a State's borders. Consumption-based emissions are the emissions embodied in the products consumed within a state. Extraction-based emissions are the emissions embodied in the fossil fuels produced within a State. *See* PETER ERICKSON & MICHAEL LAZARUS, ACCOUNTING FOR GREENHOUSE GAS EMISSIONS ASSOCIATED WITH THE SUPPLY OF FOSSIL FUELS (Stockholm Environment Institute 2013), <https://www.sei.org/publications/accounting-for-greenhouse-gas-emissions-associated-with-the-supply-of-fossil-fuels/>.

result in acceleration of certain trends such as sea level rise. Even with these complexities, the IPCC has stated that global climate models can provide credible quantitative estimates of future climate change for most variables at large geographic scales.⁹⁹

IPCC AR6 found that “global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered”, and that “global warming of 1.5°C and 2°C will be exceeded during the 21st century” unless there are deep reductions in GHG emissions in the next few decades.¹⁰⁰ In the near term, global warming is *more likely than not* to reach 1.5°C even under a very low GHG emission scenario (SSP1-1.9), and this level of warming will cause “unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans (*very high confidence*).”¹⁰¹

The science indicates that the loss and damage caused by anthropogenic climate change will be severe for some regions and communities even if humans limit global warming to 1.5 or 2.0°C, and significantly worse if we exceed those thresholds (see Table 1.B, next page).¹⁰² The effects of climate change will also interact with non-climatic risks, creating “compound and cascading risks that are more complex and difficult to manage.”¹⁰³ IPCC AR6 expressed *very high confidence* that “[n]ear-term actions that limit global warming to close to 1.5°C would substantially reduce projected losses and damages related to climate change in human systems and ecosystems, compared to higher warming levels, but cannot eliminate them all.”¹⁰⁴

⁹⁹ IPCC AR6 WGI, Ch. 4.

¹⁰⁰ IPCC AR6 WGI at 14.

¹⁰¹ IPCC AR6 WGII at 13.

¹⁰² IPCC, 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 5 (2018), <https://www.ipcc.ch/sr15/> [hereinafter IPCC 1.5°C REPORT].

¹⁰³ *Id.*

¹⁰⁴ IPCC AR6 WGII SPM, ¶ B3.

Table I.B. Select Impacts of Climate Change at Different Levels of Warming (AR6)¹⁰⁵

Projected Impacts	Global Temperature Increase			
	1.5°	2.0°	3.0°	4.0°
Water availability and water-related hazards. Risks in physical water availability and water-related hazards will continue to increase by the mid- to long-term in all assessed regions, with greater risk at higher global warming levels (<i>high confidence</i>).				
People in urban areas exposed to water scarcity from severe droughts	+ 350 million	+ 410 million		
Projected decline in snowmelt water availability for irrigation in some snowmelt dependent river basins		20% decline		40 % decline
Adaptation limits for islands and glacier/snowmelt dependent regions	>1.5°C, limited freshwater resources pose potential hard limits for small islands and regions dependent on glacier and snow-melt.			
Projected increases in direct flood damages, without adaptation		↑ 1.4 - 2x compared to 1.5°C	↑ 2.5 - 3.9x compared to 1.5°C	
Food Production and Access. Climate change will increasingly put pressure on food production and access, especially in vulnerable regions, undermining food security and nutrition (<i>high confidence</i>).				
Risk of food insecurity in vulnerable regions	Moderate risk	High risk	Risk “expands substantially” compared with 2°C	
Biodiversity. Biodiversity loss and degradation, damages to and transformation of ecosystems are already key risks for every region due to past global warming and will continue to escalate with every increment of global warming (<i>very high confidence</i>). Risks to ecosystem integrity, functioning and resilience are projected to escalate with every tenth of a degree increase in global warming (<i>very high confidence</i>).				
Percent of assessed species in terrestrial ecosystems likely facing a “very high risk” of extinction	3-14%	3-18%	3- 29%	3-39%
Risk of biodiversity loss in ocean and coastal ecosystems	moderate - very high risk	moderate – very high risk	high - very high risk	
Loss of warm-water coral reefs	70-90% decline	>99% decline		
Biodiversity hotspots	24% of species face “very high extinction risk”			
Polar, mountain, and coastal ecosystems	>1.5°C, irreversible impacts on some ecosystems, particularly those impacted by ice-sheet melt, glacier melt, and sea level rise.			

Some impacts and hazards do not scale linearly with emissions and are highly sensitive to even minor increases in temperature. For example, even “relatively small incremental increases in global warming (+0.5°C) cause statistically significant changes in extremes” including

¹⁰⁵ These impacts were selected based on the availability of information about the magnitude of the impact at specific warming levels in IPCC AR6 WGII. This is not intended to be an exhaustive or comprehensive list of climate impacts.

temperature extremes (*high confidence*), precipitation extremes (*high confidence*), tropical cyclones (*medium confidence*), and the worsening of droughts in some regions (*medium confidence*).¹⁰⁶ The IPCC also predicts that sea level rise will exponentially increase flooding risk in some regions, including the Caribbean.¹⁰⁷ Ecosystem impacts are another example of a non-linear hazard: climate change causes cascading and compounding disruptions to ecosystems, such that small increases in warming can have major impacts on ecological health and biodiversity, which may in turn have significant impacts on human rights.

A recent study on the human costs of global warming found that current climate policies, which are projected to result in 2.7°C of warming by end-of-century (2080-2100), would leave up to one third (22-39%) of people outside of the “human climate niche”, i.e., the climatic conditions in which most humans have historically survived, and would expose approximately 22% of people to extreme heat ($\geq 29^{\circ}\text{C}$).¹⁰⁸ In comparison, limiting global warming to 1.5°C would reduce the number of people outside of the climate niche by approximately half, and only 5% of people would be exposed to extreme heat.¹⁰⁹ The study also looked at country-level exposure to extreme heat, as well as how country-level per capita GHG emissions increased population exposure to extreme heat, thus providing insights on State responsibility and State injury under different warming scenarios. This analysis provides further evidence of the inequity inherent in climate change: whereas countries in the global north are responsible for most climate forcing, the vast majority of projected exposure to extreme heat under a 2.7°C scenario will occur in the Global South, including Latin America and the Caribbean (see Figure I.B, next page).

¹⁰⁶ IPCC AR6 WGI at 1517.

¹⁰⁷ IPCC AR6 WGII, Ch. 15 (“Small Islands”).

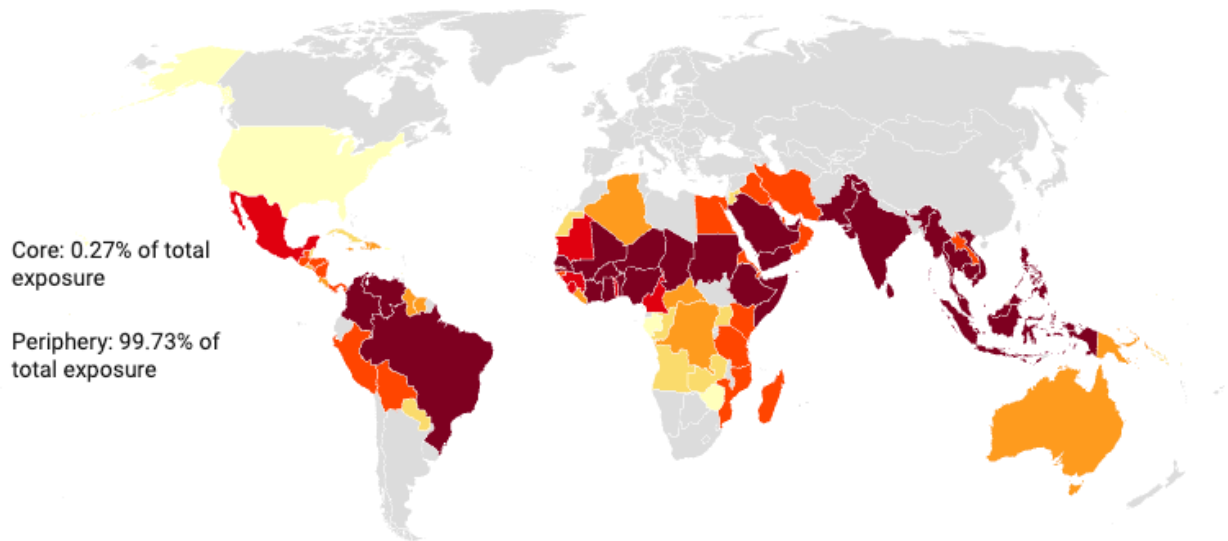
¹⁰⁸ Timothy M. Lenton et al., *Quantifying the Human Cost of Global Warming*, NAT. SUSTAIN. (2023), <https://www.nature.com/articles/s41893-023-01132-6>.

¹⁰⁹ *Id.*

Figure 1.B: Projected Exposure to Extreme Heat at 2.7°C

Exposure to extreme heat

2 billion people will be exposed to extreme heat in a world warmed by 2.7 degrees



Extreme heat is defined here as Mean Annual Temperature $\geq 29^{\circ}\text{C}$, which is presently very rare. Population figures are based on a projected global population of 9.5 billion in 2070.

Source: Lenton et al. (2023)

Adaptation measures can play a significant role in mitigating certain risks, such as the risks associated with extreme precipitation and flooding. However, adaptation may not be as effective at mitigating other harmful impacts, such as those on biodiversity and ecosystems. Moreover, the effect of climate change on vulnerable populations and ecosystems often reduces their adaptive capacity, thus creating a compounding problem where adaptation becomes increasingly challenging and costly as climate change becomes more severe. Additionally, most adaptations involve tradeoffs, and there are risks of maladaptation and inequitable adaptation.

The impacts of climate change may also become significantly worse if and when the world surpasses certain “tipping points”, i.e., thresholds that, when exceeded, will result in large and typically irreversible changes in the climate and connected systems.¹¹⁰ Key examples of important tipping points within the climate system are the melting of the Greenland ice sheet (an essentially

¹¹⁰ The IPCC defines a tipping point as a “critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly”. IPCC AR6 WG1 at 95.

irreversible process that would ultimately trigger meters of sea level rise as well as changes in atmospheric and ocean dynamics), the melting of Arctic winter sea ice, the dieback of the Amazon rainforest, the loss of mountain glaciers, and the collapse of boreal permafrost. Some critical tipping point thresholds may have already been surpassed, although the full effects have not yet manifested due to time lags and/or incomplete understanding.¹¹¹ This highlights an important aspect of tipping points: surpassing thresholds can be “locked in” before the actual event occurs (e.g., the melting of the Greenland ice sheet may already be inevitable due to existing warming).¹¹² Although much is unknown about the timing and potential consequences of climate tipping points, there are significant risks associated with surpassing these thresholds, since consequences can be so large.¹¹³

C. Carbon Budgets, Emission Limits, and Fossil Fuel Production Horizons

Global GHG budgets define the maximum amount of GHGs that can be released into the atmosphere while still limiting global warming to pre-defined targets, such as 1.5°C or 2.0°C. Most of the research in this area deals with the global carbon budget, since CO₂ is the dominant source of anthropogenic warming and much is known about CO₂ emissions. Researchers have developed and are continuously updating estimates of the remaining global carbon budget based on assessments of carbon cycle sources and sinks on a global level, including estimates of anthropogenic emissions and land use changes.

Estimating carbon or GHG budgets involves several steps: (i) estimating the total amount of CO₂ and/or other GHGs that can be released into the atmosphere while limiting global warming to a specific temperature target, (ii) determining how much of the budget has already been utilized by historical emissions, and (iii) calculating the remaining share of the carbon budget for subsequent years (and how that budget may be allocated across those years). The global carbon

¹¹¹ David Armstrong McKay et al., *Exceeding 1.5° Global Warming Could Trigger Multiple Climate Tipping Points*, 377(6611) SCIENCE eabn7950 (2022), <https://www.science.org/doi/10.1126/science.abn7950>.

¹¹² Niklas Boers & Martin Rypdal, *Critical Slowing Down Suggests that the Western Greenland Ice Sheet is Close to a Tipping Point*, 118(21) PROC. NATL. ACAD. SCI. e2024192118 (2021), <https://www.pnas.org/doi/10.1073/pnas.2024192118> (finding that the Greenland Ice Sheet melt tipping point is between 0.8°C and 3.2°C of warming above pre-industrial levels).

¹¹³ Timothy M. Lenton et al., *Climate Tipping Points – Too Risky to Bet Against*, 575(7784) NATURE 592 (2019), <https://www.nature.com/articles/d41586-019-03595-0>.

budget is typically expressed in terms of a range of gigatons of CO₂ that can be emitted at a specified probability (e.g., 67%) of remaining within a temperature target.

IPCC AR6 synthesized research on the remaining carbon budget, and found that we would need to limit global CO₂ emissions to 400 billion tons from the start of 2020 in order to have a 67% probability of remaining within 1.5°C of warming, and 1150 billion tons in order to have a 67% probability of limiting warming to 2°C.¹¹⁴ More recent assessments have found that the remaining carbon budget for 1.5°C had shrunk to 250 billion tons of CO₂ as of January 2023 based on emissions data through 2022.¹¹⁵ At the current rate of emissions, the world will exhaust the remaining 1.5°C carbon budget before the end of 2030 (and possibly within the first half of the 2020s). The World Meteorological Organization (WMO) estimates that there is a 66% likelihood that annual average global surface temperature will be more than 1.5°C above preindustrial levels for at least one year between 2023 and 2027.¹¹⁶ Monthly average global temperature temporarily exceeded the 1.5°C threshold in July 2023, which was the hottest month on record.¹¹⁷

Estimates of the remaining CO₂ budget are based on assumptions about historical and future emissions of non-CO₂ forcings, such as methane (CH₄), nitrous oxide (N₂O), and various short-lived climate forcings. The assumed future emissions of non-CO₂ emissions can be thought of as “budgets” as well, since any emissions in excess of those assumptions will result in additional warming.¹¹⁸ Conversely, if countries are able to achieve more rapid reductions in non-CO₂ forcings, this would allow for a larger CO₂ budget. Most non-CO₂ forcings are also much more potent than CO₂ and reducing these highly potent GHGs can help limit near term warming.¹¹⁹

¹¹⁴ IPCC WGI at 29. See also IPCC AR6 WGIII at 6-7.

¹¹⁵ Forster et al. (2023), *supra* note 5; Lamboll et al., (2023), *supra* note 5.

¹¹⁶ WMO, GLOBAL ANNUAL TO DECADEAL CLIMATE UPDATE, TARGET YEARS: 2023-2027 (May 2023), <https://public.wmo.int/en/media/press-release/global-temperatures-set-reach-new-records-next-five-years>.

¹¹⁷ ECMWF, *July 2023 Sees Multiple Global Temperature Records Broken*, <https://climate.copernicus.eu/july-2023-sees-multiple-global-temperature-records-broken> (multiple temperature records were broken in July 2023 – for example, the 29 days from July 3-31 were the hottest 29 days in the global temperature record).

¹¹⁸ See, e.g., Global Carbon Project, <https://www.globalcarbonproject.org>; Marielle Saunio et al., *The Global Methane Budget 2000-2017*, 12(3) EARTH SYST. SCI. DATA 1561 (2020), <https://essd.copernicus.org/articles/12/1561/2020/>; CSIRO, *Global Methane Budget*, <https://www.csiro.au/en/research/environmental-impacts/emissions/global-greenhouse-gas-budgets/global-methane-budget>. IPCC AR6 WGI, Ch. 5 (“Global Carbon and Other Biogeochemical Cycles and Feedbacks”); Ch. 6 (“Short-Lived Climate Forcers”).

¹¹⁹ For example, methane (CH₄) is 84 times more potent than CO₂ when measured on a 20-year timespan, and its atmospheric lifetime is approximately 12 years, whereas the atmospheric lifetime of CO₂ is 300-1,000 years.

IPCC AR6 also examines emission trajectories and reduction pathways in reference to temperature targets and carbon budgets. Key findings are that:

- Models suggest that existing policies, as of 2019, would lead to global warming of 3.2 [2.2-3.5] °C.¹²⁰ Existing policies could result in warming at or above 4°C if climate sensitivity¹²¹ or carbon cycle feedbacks are larger than the best estimate.¹²²
- Deep, rapid and sustained GHG emissions reductions, reaching net zero CO₂ emissions and including strong emissions reductions of other GHGs, in particular CH₄, are necessary to limit warming to 1.5°C (>50%) or less than 2°C (>67%) by the end of century (*high confidence*).¹²³ Emission reductions must include deep reductions in energy system CO₂ and GHG emissions (*high confidence*), which will in turn require the rapid phase out of fossil fuels and increased production from low- and zero-emitting sources.¹²⁴
- Projected cumulative CO₂ emissions over the lifetime of existing fossil fuel infrastructure are expected to exceed the total cumulative net CO₂ emissions for limiting warming to 1.5°C, and are approximately equal to the total cumulative net CO₂ emissions for limiting warming to 2°C with a likelihood of 83%.¹²⁵ This means that there will inevitably be stranded fossil fuel assets if warming is limited to 2°C.¹²⁶
- Approximately 80% of coal, 50% of gas, and 30% of oil reserves must remain unused if warming is to be limited to 2°C, and significantly more reserves must remain unused if warming is to be limited to 1.5°C.¹²⁷ These figures could change through additional abatement – for example, the installation of carbon capture systems at power plants and industrial facilities – but current deployment of such systems is extremely limited.

The IPCC analysis is supplemented by the United Nations Environment Programme (UNEP) “Production Gap” reports, which examine the discrepancy between planned fossil fuel production and global production levels consistent with limiting warming to 1.5 or 2°C. The 2021 report found

¹²⁰ IPCC AR6 SYR at 57. A more recent assessment estimates that climate policies as of 2022 would likely result in 2.7°C [2.2-3.4°C] of warming. Climate Action Tracker, *Warming Projections Global Update: November 2022* (Climate Analytics & New Climate Institute, 2022), https://climateactiontracker.org/documents/1094/CAT_2022-11-10_GlobalUpdate_COP27.pdf.

¹²¹ “Climate sensitivity” refers to the sensitivity of the climate system to radiative forcing, e.g., how much warming will occur in response to a doubling of atmospheric CO₂ concentrations.

¹²² IPCC AR6 SYR at 57.

¹²³ *Id.*

¹²⁴ IPCC AR6 WGIII at 89.

¹²⁵ IPCC AR6 SYR at 58.

¹²⁶ IPCC AR6 WGIII at 698.

¹²⁷ *Id.*

that fossil fuel producers are planning to extract more than double the amount of oil, gas, and coal by 2030 than is consistent with limiting warming to 1.5°C.¹²⁸

There is also research on the equitable allocation of the global carbon budget among different countries and sectors, consistent with the UNFCCC discussions on State’s “common but differentiated” responsibilities and “fair share” obligations.¹²⁹ This area of research implicates physical climate science, but it also deals with ethical and normative questions – for example, how to account for historical emissions, population, development status, and other differences between countries when assigning responsibility for future emission reductions. The research identifies specific indicators or metrics that are relevant when assessing national fair shares (e.g., per capita emissions) and demonstrates how those indicators can be factored into quantitative assessments of GHG targets. The resulting estimates of “fair share obligations” depend on the weight assigned to these different metrics and the specific circumstances of the country being assessed.

D. Mitigation and Adaptation Pathways

As the global carbon budget for 1.5 and 2°C is rapidly shrinking, it is clear that governments and other decision-makers will need to pursue ambitious GHG reduction measures as well as adaptation programs to protect people from the harmful effects of climate change. There is a growing body of research on mitigation and adaptation pathways, some of which is summarized in IPCC reports. Some examples include: technical research on the efficacy, cost, availability, and feasibility of specific GHG reduction technologies for specific sectors and sources;¹³⁰ pathways to economy-wide decarbonization;¹³¹ and research on adaptation options for many different types of

¹²⁸ UNEP, 2021 PRODUCTION GAP REPORT, <https://www.unep.org/resources/report/production-gap-report-2021>.

¹²⁹ See, e.g., K.W. Steininger et al., *Sectoral carbon budgets as an evaluation framework for the built environment*, 1(1) BUILDINGS AND CITIES 337 (2020); Kaylin Lee et al. *Fair distributions of carbon dioxide removal obligations and implications for effective national net-zero targets*, 16 ENVIRON. RES. LETT. 094001 (2021); Jan S. Fuglestad & Steffen Kallbekken, *Climate Responsibility: Fair Shares?* 6 NAT. CLIM. CHANGE 19 (2016); Lavanya Rajamani et al., *National ‘fair shares’ in reducing greenhouse gas emissions within the principled framework of international environmental law*, 21(8) CLIM. POLICY 983 (2021); Jason Hickel, *Quantifying National Responsibility for Climate Breakdown: An Equality-Based Attribution Approach for Carbon Dioxide Emissions in Excess of the Planetary Boundary*, 4(9) LANCET PLANETARY HEALTH E399 (2020).

¹³⁰ See, e.g., João Carlos de Moraes Sá et al., *Low-carbon agriculture in South America to mitigate global climate change and advance food security*, 98 ENVIRON. INT. 102 (2017), <https://www.sciencedirect.com/science/article/abs/pii/S0160412016306341>.

¹³¹ See, e.g., *Deep Decarbonization Pathways*, <https://ddpinitiative.org>; Christopher Bataille et al., *Net-zero Deep Decarbonization Pathways in Latin America: Challenges and Opportunities* (Inter-American Development Bank Sept. 2020), *Deep Decarbonization Pathways in Latin America and the Caribbean (DDP-LAC) – An Assessment of*

climate impacts.¹³² Although this research is not the focus of our brief, it is still relevant to discussions about state responsibilities related to climate change as it provides insights on the viability of different options for achieving net zero emissions and adapting to climate change.

Low-Emission Development Strategies in Six LAC Countries, Special Edition: Energy Strategy Reviews (2020-2021), <https://publications.iadb.org/en/net-zero-deep-decarbonization-pathways-latin-america-challenges-and-opportunities>; CACIA PIMENTEL & MARIA JOAO ROLIM, CAMINHOS JURÍDICOS E REGULATÓRIOS PARA A DESCARBONIZAÇÃO NO BRASIL (2021).

¹³² See, e.g., Celia Harvey et al., *Climate Change Impacts and Adaptation Among Smallholder Farmers in Central America*, 7 AGRIC. FOOD. SECUR. 57 (2018), <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-018-0209-x>.

II. The Effect of Climate Change on Human Rights

The Request seeks additional clarification on “the grounds for, and the scope of, human rights affected by the climate emergency.”¹³³ Many human rights bodies, tribunals, and courts, including this Court, have recognized that climate change poses a threat to fundamental rights, such as the rights to life, health, food, water, housing, privacy and family life, culture, development, and a clean and healthy environment.¹³⁴ There is clear scientific support for this determination: existing research indicates that climate change threatens the effective enjoyment of a broad array of human rights, and that this threat is both “actual” and “imminent” in light of attributed climate impacts and projections of future climate change. The science also shows that climate change is disproportionately affecting certain groups and individuals, including groups that are owed special protection under human rights law.

A. Climate change threatens a broad array of human rights

As described in Part I, the scientific evidence shows that climate change is already having pervasive and harmful impacts on human and natural systems across the planet, and these impacts

¹³³ Request for Advisory Opinion at 6.

¹³⁴ See, e.g., Inter-American Court of Human Rights, Advisory Opinion OC-23/17 (Nov. 15, 2017), https://www.corteidh.or.cr/docs/opiniones/seriea_23_ing.pdf; UN Human Rights Council, Res. A/HRC/RES/50/9 (July 14, 2022), <https://www.ohchr.org/en/climate-change/human-rights-council-resolutions-human-rights-and-climate-change>; UN General Assembly, *The Human Right to a Clean, Healthy and Sustainable Environment*, A/RES/76/300 (July 28, 2022), <https://digitallibrary.un.org/record/3983329>; Inter-American Commission of Human Rights (IACHR), Resolution 3/2021, *Climate Emergency: Scope of Inter-American Human Rights Obligations* (2021), https://www.oas.org/en/iachr/decisions/pdf/2021/resolucion_3-21_ENG.pdf; UN Human Rights Committee, *Billy et al. v. Australia*, Communication No. 3624/2019, Doc. No. CCPR/C/135/D/3624/2019 (Sept. 22, 2022), https://ccprcentre.org/files/decisions/CCPR_C_135_D_3624_2019_34335_E.pdf; *Urgenda Foundation v. The State of The Netherlands* [2019] ECLI:NL:HR:2019:2006, <https://climatecasechart.com/non-us-case/urgenda-foundation-v-kingdom-of-the-netherlands/>; *Future Generations v. Ministry of the Environment and Others*, Corte Suprema de Justicia [C.S.J.] [Supreme Court], abril 5, 2018, M.P: L. Villabona, Expediente : 11001-22-03-000-2018-00319-01 (Colomb.), <https://climatecasechart.com/non-us-case/future-generation-v-ministry-environment-others/>; *Neubauer, et al. v. Germany*, Bundesverfassungsgericht [BVerfG] [Federal Constitutional Court], Mar. 24, 2021, Case No. BvR 2656/18/1, BvR 78/20/1, BvR 96/20/1, BvR 288/20, <https://climatecasechart.com/non-us-case/neubauer-et-al-v-germany/>; *Leghari v. Pakistan*, (2015) W.P. No. 25501/201, <https://climatecasechart.com/non-us-case/ashgar-leghari-v-federation-of-pakistan/>; UN Committee on the Rights of the Child, *Sacchi v. Argentina*, Communication No. 107/2019, Doc. No. CRC/C/88/D/104/2019 (Oct. 8, 2021), <https://climatecasechart.com/non-us-case/sacchi-et-al-v-argentina-et-al/> (although *Sacchi v. Argentina* was dismissed for failure to exhaust remedies, the tribunal acknowledged the threat that climate change posed to petitioners’ human rights); Brussels Court of First Instance, *VZW Klimaatzaak v. Kingdom of Belgium & Others*, 17 November 2021, <https://climatecasechart.com/non-us-case/vzw-klimaatzaak-v-kingdom-of-belgium-et-al/>; Municipal Court in Prague, *Klimatická žaloba ČR v. Czech Republic*, Judgment No. 14A 101/2021, 15 June 2022, <https://climatecasechart.com/non-us-case/klimaticka-zaloba-cr-v-czech-republic/>; Federal Supreme Court of Brazil, *PSB et al. v. Brazil (on Climate Fund)*, ADPF 708, 1 July 2022, <https://climatecasechart.com/non-us-case/psb-et-al-v-federal-union/>.

will become increasingly severe with each additional increment of warming.¹³⁵ Some of the most prevalent sources of injury include more frequent and severe extreme events, resulting in greater exposure to conditions that endanger lives, livelihoods, health, property, infrastructure, cultural practices, and community cohesion; food and water insecurity; the submergence of low-lying coastal areas and islands; pervasive impacts on ecosystems and disruption of critical ecosystem services; forced displacement due to sea level rise, natural hazards, and other climate drivers; impaired physical and mental health; and the contribution of climate change-related hazards to humanitarian crises and conflict.

These harmful impacts have clear implications for the enjoyment, protection, and fulfillment of human rights. For example, the pervasive impacts of climate change on ecosystems and natural processes directly affect the right to a healthy environment; increases in the frequency and severity of extreme events and communicable diseases affect the rights to life and health, among others; and the inundation of low-lying islands and coastal areas, and subsequent displacement of people, has implications for a broad array of rights, including the rights to life, health, housing, property, food, water, culture, and self-determination. Table II.A.1 (next page) provides a more comprehensive list of human rights that are affected by climate change, accompanied by descriptions of relevant climate impacts, and citations to legal authorities finding that climate change poses a threat to the specific right.

Due to the breadth and magnitude of harm attributable to climate change, the UN High Commissioner for Human Rights has characterized climate change as the biggest threat to human rights that the world has ever seen.¹³⁶ The Inter-American Commission on Human Rights (IACHR) has also recognized that climate change “is one of the greatest threats to the full enjoyment and exercise of human rights of present and future generations.”¹³⁷

¹³⁵ See IPCC AR6 WGII; IPCC 1.5°C REPORT.

¹³⁶ See Speech Michelle Bachelet, the UN High Commissioner for Human Rights, 42nd session of the Human Rights Council, <https://www.ohchr.org/en/statements/2019/09/global-update-42nd-session-human-rights-council> (declaring that “the human implications of currently projected levels of global heating are catastrophic” and that “the world has never seen a threat to human rights of this scope”). See also U.N. Human Rights Committee, General Comment No. 36 on Article 6: Right to Life, para 62, CCPR/C/GC/36 (Sept. 3, 2019), <https://www.ohchr.org/en/calls-for-input/general-comment-no-36-article-6-right-life> (characterizing climate change as one of the most pressing and serious threats to the ability of present and future generations to enjoy the right to life).

¹³⁷ IACHR Resolution 3/2021 at 8.

Table II.A.1. Scope of Human Rights Affected by Climate Change

Affected Right	Climate Impacts	Legal Authorities*
<p>Right to life</p> <p>States have an affirmative obligation to protect the right to life from threats associated with climate change.</p> <p>(Am. Convention, Art. 4.)</p>	<ul style="list-style-type: none"> • Mortality and morbidity from heatwaves, floods, and other climate extremes • Increased exposure to vector-, water-, and food-borne diseases • Food and water insecurity • Destruction of ecosystem services that people depend on for subsistence and survival • Humanitarian crises, conflict, and forced displacement 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN Human Rights Council (HRC), Human Rights and Climate Change, A/HRC/Res/10/4; UN Office of the High Commissioner for Human Rights (OHCHR), Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/61; Views adopted by the UN Human Rights Committee under article 5(4) of the Optional Protocol, concerning communication No. 3624/2019, CCPR/C/135/D/3624/2019; UN Human Rights Committee (CCPR), General Comment No. 36 on Article 6: Right to Life, CCPR/C/GC/36; UN Committee on the Rights of the Child (CRC), General Comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change, CRC/C/GC/26 • Urgenda v. Netherlands; Neubauer v. Germany; VZW Klimaatzaak v. Belgium; Future Generations v. Ministry of Environment; Klimatická žaloba ČR v. Czech Republic
<p>Right to a safe, clean, healthy and sustainable environment</p> <p>States have an obligation to ensure that activities under their control do not cause significant environmental damage.</p> <p>(Protocol of San Salvador, Art. 11)</p>	<ul style="list-style-type: none"> • Pervasive harm to terrestrial, marine, and freshwater ecosystems across the planet • Irreversible impacts on vulnerable ecosystems and species, including coral reefs, low-lying coastlines and islands, polar and mountain regions, biodiversity hotspots, endemic species, and many others • Destruction of coastal habitats as a result of sea level rise 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN HRC, The Human Right to a Clean, Healthy, and Sustainable Environment, A/HRC/RES/38/13 • UN General Assembly, The Human Right to a Clean, Healthy and Sustainable Environment, A/RES/76/300; UN CRC, General Comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change, CRC/C/GC/26 • Klimatická žaloba ČR v. Czech Republic; Greenpeace Mexico v. Ministry of Energy and Others (on the National Electric System Policies)
<p>Right to health</p> <p>States must take measures to ensure that all people enjoy the highest level of physical, mental, and social well-being.</p> <p>(Protocol of San Salvador, Art. 10)</p>	<ul style="list-style-type: none"> • Mortality, injury, and trauma from extreme events (including mental trauma) • Exposure to vector- water- and food- borne diseases • Injury and mortality from food and water insecurity • Disruptions to livelihoods and cultural practices • Impaired ecosystem services • Humanitarian crises, conflict, and forced displacement 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN HRC, Analytical Study on the Relationship Between Climate Change and the Human Right of Everyone to the Enjoyment of the Highest Attainable Standard of Physical and Mental Health, A/HRC/32/23; UN HRC, Resolution: Human Rights and Climate Change, A/HRC/Res/10/4; UN OHCHR, Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/6; UN CRC, General Comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change, CRC/C/GC/26 • Neubauer v. Germany, Klimatická žaloba ČR v. Czech Republic; Future Generations v. Ministry of Environment (Colombia)

Table II.A.1. Scope of Human Rights Affected by Climate Change (continued)		
<p>Right to food</p> <p>States must take measures to ensure that all people have access to nutrition which guarantees the possibility of enjoying the highest level of physical, emotional, and intellectual development.</p> <p>(Protocol of San Salvador, Art. 12)</p>	<ul style="list-style-type: none"> • Agricultural production is threatened by extreme heat, drought, changes in precipitation, ecosystem degradation, and other impacts • Fishery productivity is threatened by ocean acidification, marine heatwaves, deoxygenation, and corresponding ecosystem impacts (e.g., coral reef destruction) 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN HRC, Report of the Secretary General: The Adverse Impact of Climate Change on the Full Realization of the Right to Food, A/HRC/53/47 • UN HRC, Resolution: Human Rights and Climate Change, A/HRC/Res/10/4; UN OHCHR, Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/61 • Future Generations v. Ministry of Environment
<p>Right to water and sanitation</p> <p>States must make efforts to ensure access to safe drinking water and sanitation services for present and future generations.</p> <p>(The Human Right to Safe Drinking Water and Sanitation, AG/RES. 2760 (XLII-O/12))</p>	<ul style="list-style-type: none"> • Decreases in average precipitation and more severe droughts contribute to water shortages • Sea level rise causes saltwater intrusion into freshwater resources on islands and in other low-lying areas • Extreme events, including heavy precipitation and storms, pose hazards to water and sanitation systems 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN HRC, Resolution: Human Rights and Climate Change, A/HRC/Res/10/4; UN OHCHR, Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/61
<p>Right to housing and shelter</p> <p>States must make efforts to ensure adequate housing for all sectors of the population.</p> <p>(OAS Charter; American Declaration on the Rights and Duties of Man)</p>	<ul style="list-style-type: none"> • Homes destroyed by extreme events such as floods, storms, and wildfires • Homes destroyed due to sea level rise • Access to shelter needed to protect people from extreme heat, storms, and other hazards associated with climate change 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN HRC, Resolution: Human Rights and Climate Change, A/HRC/Res/10/4; UN OHCHR, Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/61
<p>Right to work and livelihoods</p> <p>States must protect and promote the right to work, which includes the opportunity to secure the means for living a dignified and decent existence, as well as access to just, equitable, and satisfactory conditions of work.</p> <p>(Protocol of San Salvador, Arts. 6-7)</p>	<ul style="list-style-type: none"> • Climate change threatens the livelihoods of many people, particularly subsistence farmers, fishermen, and others who depend on local ecosystem services • Extreme heat and other extreme weather conditions threaten the safety and well-being of workers, particularly outdoor workers and indoor workers without access to A/C in hot climates 	<ul style="list-style-type: none"> • UN OHCHR, Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/61 • Klimatická žaloba ČR v. Czech Republic
<p>Right to property</p> <p>States may not arbitrarily deprive people of their property.</p> <p>(Am. Convention, Art. 21)</p>	<ul style="list-style-type: none"> • Extreme events and slow-onset processes such as sea level rise threaten private property 	<ul style="list-style-type: none"> • Neubauer v. Germany, Klimatická žaloba ČR v. Czech Republic

Table II.A.1. Scope of Human Rights Affected by Climate Change (continued)		
<p>Rights to private and family life</p> <p>States may not arbitrarily interfere with private, family, and home life, and must take steps to safeguard the ability of people to form families and provide for children.</p> <p>(Am. Convention, Art. 11; Protocol of San Salvador, Art. 15)</p>	<ul style="list-style-type: none"> • Most climate change-related injuries have the potential to affect private and family life • Key examples include people who are displaced or at risk of displacement, people whose health and livelihoods are adversely affected by climate change, and people who are unable to pursue cultural and spiritual practices due to the effects of climate change 	<ul style="list-style-type: none"> • UN CCPR, Views adopted by the Committee under article 5(4) of the Optional Protocol, concerning communication No. 3624/2019, CCPR/C/135/D/3624/2019 • Urgenda v. Netherlands, VZW Klimaatzaak v. Belgium; Klimatická žaloba ČR v. Czech Republic
<p>Rights to culture, self-determination, and development</p> <p>States must take steps to safeguard the ability of all people to take part in cultural practices and community life, as well as the rights of people to self-determination and development.</p> <p>(Am. Convention, Art. 26; Protocol of San Salvador, Art. 14; Am. Declaration on the Rights of Indigenous Peoples)</p>	<ul style="list-style-type: none"> • Many Small Island States and indigenous peoples face severe threats to their culture, development, and self-determination due to the adverse effects of climate change • Some States and communities face existential risks due to climate change, e.g., low-lying coastal areas and islands are being inundated by sea level rise (and rapidly becoming uninhabitable) • Certain areas may become uninhabitable due to extreme heat, drought, and the destruction of food sources 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN HRC, Resolution: Human Rights and Climate Change, A/HRC/Res/10/4; UN OHCHR, Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/61; UN CRC, General Comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change, CRC/C/GC/26 • UN CCPR, Views adopted by the Committee under article 5(4) of the Optional Protocol, concerning communication No. 3624/2019, CCPR/C/135/D/3624/2019 • Klimatická žaloba ČR v. Czech Republic
<p>Rights to culture, self-determination, and development</p> <p>States must take steps to safeguard the ability of all people to take part in cultural practices and community life, as well as the rights of people to self-determination and development.</p> <p>(Am. Convention, Art. 26; Protocol of San Salvador, Art. 14; Am. Declaration on the Rights of Indigenous Peoples)</p>	<ul style="list-style-type: none"> • Many Small Island States and indigenous peoples face severe threats to their culture, development, and self-determination due to the adverse effects of climate change • Some States and communities face existential risks due to climate change, e.g., low-lying coastal areas and islands are being inundated by sea level rise (and rapidly becoming uninhabitable) • Certain areas may become uninhabitable due to extreme heat, drought, and the destruction of food sources 	<ul style="list-style-type: none"> • IACtHR Advisory Opinion OC-23/17 • IACHR Resolution 3/2021 • UN HRC, Resolution: Human Rights and Climate Change, A/HRC/Res/10/4; UN OHCHR, Report on the Relationship Between Climate Change and Human Rights, A/HRC/10/61; UN CRC, General Comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change, CRC/C/GC/26 • UN CCPR, Views adopted by the Committee under article 5(4) of the Optional Protocol, concerning communication No. 3624/2019, CCPR/C/135/D/3624/2019 • Klimatická žaloba ČR v. Czech Republic

Table II.A.1. Scope of Human Rights Affected by Climate Change (continued)		
<p>Right to freedom, non-discrimination, and equity</p> <p>States must guarantee human rights without discrimination.</p> <p>(Protocol of San Salvador, Art. 3)</p>	<ul style="list-style-type: none"> Climate change causes disproportionate harm to certain groups (e.g., indigenous peoples), typically those who are least responsible for it State failures to reduce GHG emissions in the near-term place a disproportionate burden on young people and future generations Many buildings and other places of cultural significance are destroyed by flooding 	<ul style="list-style-type: none"> Neubauer v. Germany (finding that Germany had violated petitioners' right to freedom by adopting insufficient GHG reduction targets through 2030, which would place a disproportionate mitigation burden on German residents after 2030) UN OHCHR, Frequently Asked Questions on Climate Human Rights and Climate Change: Fact Sheet No. 38 (2021); UN CRC, General Comment No. 26 (2023) on children's rights and the environment, with a special focus on climate change, CRC/C/GC/26
<p>Rights of special groups</p> <p>States have special obligations regarding the protection of rights for certain groups.</p> <p>(Am. Declaration on the Rights of Indigenous Peoples; Protocol of San Salvador, Arts. 15-18.)</p>	<p>Groups and individuals that are disproportionately affected by climate change include:</p> <ul style="list-style-type: none"> Children Women Older people Indigenous peoples Poor people and socially marginalized groups Subsistence farmers and fishermen People living on small islands and in low-lying coastal areas Displaced people and migrants Future generations 	<ul style="list-style-type: none"> IACHR Resolution 3/2021 UN HRC, The Impacts of Climate Change on the Human Rights of People in Vulnerable Situations, A/HRC/50/57; UN HRC, Analytical Study on the Promotion and Protection of the Rights of Older Persons in the Context of Climate Change, A/HRC/47/46; UN HRC, Analytical Study on the Promotion and the Protection of the Rights of Persons with Disabilities in the Context of Climate Change, A/HRC/44/30; UN HRC, Analytical Study on Gender-Responsive Climate Action for the Full and Effective Enjoyment of the Rights of Women, A/HRC/41/26; UN HRC, The Slow Onset Effects of Climate Change and Human Rights Protection for Cross-Border Migrants, A/HRC/37/CRP.4; Analytical Study on the Relationship Between Climate Change and the Full and Effective Enjoyment of the Rights of the Child, A/HRC/35/13; UN CRC, General comment No. 26 on children's rights and the environment with a special focus on climate change, CRC/C/GC/26.
<p>* The "legal authorities" listed in this table are limited to decisions and declarations from human rights bodies, tribunals, and courts that explicitly recognize the threat posed by climate change to each specific right.</p>		

B. The threat to human rights is both "actual" and "imminent"

The scientific research also shows that climate change poses a threat to human rights that is "actual" and "imminent", and not merely a future or hypothetical threat. In particular, impact attribution research provides ample evidence of rights-related injuries that have already occurred and are ongoing, and climate projections provide insights on foreseeable future injuries and when they may occur. For example, the research shows that many low-lying coastal areas and small islands are already experiencing acute impacts due to sea level rise and other coastal hazards, which cause direct harm to people, homes, and infrastructure, and also threaten the ecosystems

upon which people depend.¹³⁸ Even under moderate emission scenarios, many small islands and coastal areas are projected to become uninhabitable by the end of the century, and some areas may become uninhabitable by mid-century or even earlier.¹³⁹ The IPCC estimates that approximately 896 million people (almost 11% of the global population) live in low-lying coastal zones that are affected and will be affected by sea level rise and other coastal hazards.¹⁴⁰

Accordingly, courts and human rights tribunals have issued decisions recognizing that the injuries associated with climate change are sufficiently urgent and concrete to provide a basis for legal action. Even future harms may give rise to a legally cognizable injury. For example, in *Urgenda v. Netherlands*, the Supreme Court of the Netherlands found that future sea level rise “could render part of the Netherlands uninhabitable” and found that this constituted a violation of human rights even though “this risk will only be able to materialise a few decades from now and that it will not impact specific persons or a specific group of persons but large parts of the population.”¹⁴¹

The decision in *Urgenda* dealt with the aggregate effects of climate change on Dutch citizens, rather than the effects on a specific set of plaintiffs. At that scale of analysis, there is little question that climate change poses an actual and imminent threat to rights. However, courts and tribunals may still confront factual disputes about whether and to what extent climate change threatens the rights of specific individuals or communities. The UN Human Rights Committee recently adjudicated one such dispute in *Billy et al. v. Australia*, where it held that the government of Australia had violated the rights of the indigenous Melanesian people of the Torres Strait Islands due to inadequate action on climate change (see Box II.A.2, next page).¹⁴² Courts encounter these

¹³⁸ See IPCC AR6 WGII, Ch. 15.

¹³⁹ Notably, researchers predict that low-lying areas and islands will become uninhabitable well before permanent inundation, due to the effects of sea level rise on extreme sea level events, freshwater supplies, and ecosystem services, among other things. *Id.* See also D.J. Rasmussen et al., *Extreme sea level implications of 1.5°C, 2.0°C, and 2.5°C temperature stabilization targets in the 21st and 22nd centuries*, 13(3) ENVIRO. RES. LETT. 034040 (2018), <https://iopscience.iop.org/article/10.1088/1748-9326/aaac87> (comparatively small changes in mean sea level can result in large increases in the frequency of extreme sea level events, potentially rendering areas uninhabitable well before the time of permanent inundation); C. Storlazzi et al., *Most atolls will become uninhabitable by the mid-21st century because of sea-level rise exacerbating wave-driven flooding*, 4 SCIENCE ADVANCES eaap9741 (2018), <https://www.science.org/doi/10.1126/sciadv.aap9741>;

¹⁴⁰ IPCC AR6 WGII at 32, ¶ D.3.3.

¹⁴¹ *Urgenda Foundation v. The State of The Netherlands*, *supra* note 134, ¶ 5.6.2.

¹⁴² *Billy et al. v. Australia*, *supra* note 134.

types of disputes when adjudicating standing as well as the merits of claims – to guarantee access to justice, States and courts should ensure that petitioners have adequate opportunities to submit evidence in support of injury and causation before courts reach a definitive decision on standing.¹⁴³

Box II.A.2. The UN Human Rights Committee’s Decision in *Billy et al. v Australia*

In 2019, the Committee received a communication from indigenous Torres Strait Islanders alleging that the government of Australia had violated their rights to life, culture, privacy, home, and family life due to inadequate action on climate change. The authors described numerous ways in which climate change is affecting and will continue to affect their lives – e.g., sea level rise is causing flooding and erosion, property and ecosystem damage, inundating ancestral grave sites, and interfering with traditional gardening practices; higher temperatures and ocean acidification are causing coral bleaching, reef death, and the decline of sea-grass beds and other nutritionally and culturally important marine species; and changes in precipitation, temperature, and monsoon seasons have made it harder to pass on and subsist on their traditional ecological knowledge.¹⁴⁴ The islanders also face an imminent threat of forced and permanent displacement, as scientists predict that some islands are at “serious risk of becoming unfit for human habitation” in the near future (e.g., the next ten years) due to sea level rise and compounding storm surge events.¹⁴⁵

Despite this information, the State of Australia insisted that the authors were merely asserting “future hypothetical violations” of rights because “the alleged adverse effects of climate change have yet to be suffered, if at all, by the authors.”¹⁴⁶ The Committee rejected Australia’s position and found that the Torres Strait Islanders had provided adequate evidence of “real predicaments that they have personally and actually experienced owing to disruptive climate events and slow-onset processes such as flooding and erosion... [that] have already compromised their ability to maintain their livelihoods, subsidence, and culture.”¹⁴⁷ The Committee subsequently found that Australia had violated the authors’ rights to privacy, home, and family life, and the right to indigenous culture, primarily due to the state’s “failure to adapt” and protect the authors and their communities from harmful climate change impacts.¹⁴⁸

¹⁴³ See *infra* § III.E.3 (“Access to Justice”).

¹⁴⁴ Communication Under the Optional Protocol to the International Covenant on Civil and Political Rights, *Billy et al. v. Australia*, CCPR/C/135/D/3624/2019 (13 May 2019).

¹⁴⁵ *Id.* at ¶¶ 77-79; Annex 14 (full report).

¹⁴⁶ State Party’s Submission on Admissibility and Merits, *Billy et al. v Australia*, CCPR/C/135/D/3624/2019 (29 May 2020) at ¶¶ 24, 41.

¹⁴⁷ *Billy et al. v. Australia*, *supra* note 134, at ¶ 7.10.

¹⁴⁸ *Id.* at ¶ 9. The Committee did not find an imminent violation of the right to life in this particular case because the authors had not “indicated that they have faced or presently face adverse impacts to their own health or a real and reasonably foreseeable risk of being exposed to a situation of physical endangerment or extreme precarity that could threaten their right to life.” *Id.* at para 8.6. It did, however, acknowledge that the authors’ right to life would be violated if and when their islands become uninhabitable, but that there was time for Australia to implement adaptation measures that *may* be sufficient to protect that right. *Id.* at para 8.7 Several committee members published independent opinions in which they stated that they would have also found a violation of the right to life. See Annex III: Joint opinion by Committee Members Arif Bulkan, Marcia V.J. Kran and Vasilka Sancin (partially dissenting); Opinión individual del miembro del Comité Hernán Quezada (parcialmente disidente).

C. Climate change disproportionately affects certain groups and individuals

IPCC AR6 and other scientific authorities have found that climate change has disproportionate effects on certain individuals and groups, including children, women, the elderly, poor people, disabled people, indigenous peoples, subsistence farmers and fishermen, people living in informal settlements, and people who are already face social marginalization or vulnerability due to pre-existing inequalities and discrimination.¹⁴⁹ In many cases, those who suffer the greatest harms from climate change are also those who have contributed the least to this problem through GHG emissions, and who have fewer resources at their disposal for adaptation and resilience measures.¹⁵⁰ Some of examples of those who are disproportionately affected include:

- **Indigenous peoples:** Many indigenous communities are uniquely affected by changes in weather patterns, extreme events, and ecological disruptions due to their close connection to and dependence on local ecosystems and natural processes for subsistence, cultural practices, and livelihoods.¹⁵¹ Some indigenous communities face the risk of forced displacement due to sea level rise, food and water insecurity, and other climate change-related phenomena.¹⁵² This adversely affects indigenous peoples' rights to culture, self-determination, and territorial integrity, as well as those rights shared by all people (e.g., the rights to life and health).¹⁵³
- **Children:** Children are uniquely vulnerable to many of the adverse health effects associated with climate change, including extreme heat, infectious diseases, food and water insecurity, and increases in air pollution (e.g., from wildfire smoke and increased ground

¹⁴⁹ See, e.g., IPCC AR6 WGII at 1692, 1765; E.B. Barbier & J.P. Hchard, *The Impacts of Climate Change on the Poor in Disadvantaged Regions*, 12(1) REV. ENVIRON. ECON. POLICY 26 (2018), <https://www.journals.uchicago.edu/doi/full/10.1093/reep/rex023>; E. Parraguez-Vergara et al., *Impacts of Climate Change in the Andean Foothills of Chile: Economic and Cultural Vulnerability of Indigenous Mapuche Livelihoods*, 32(4) J. DEV. SOC. 454 (2016), <https://journals.sagepub.com/doi/abs/10.1177/0169796X16667874>.

¹⁵⁰ "Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected (high confidence)." IPCC AR6 SYR SPM at page 5, para A.2.

¹⁵¹ For example, increased ocean temperature and acidity are dominant drivers of coral reef death, which has enormous implications for the subsistence needs and cultural practices of many coastal communities. One recent study found that 50% of the world's coral reef ecosystems have been lost since 1950. Tyler D. Eddy et al., *Global Decline in Capacity of Coral Reefs to Provide Ecosystem Services*, 4(9) ONE EARTH P1278 (2021), <https://www.sciencedirect.com/science/article/pii/S2590332221004747>.

¹⁵² See Rights of Indigenous People in Addressing Climate-Forced Displacement, Complaint Submitted to U.N. Special Rapporteurs (January 15, 2020), <https://climatecasechart.com/non-us-case/rights-of-indigenous-people-in-addressing-climate-forced-displacement/>.

¹⁵³ See American Declaration on the Rights of Indigenous Peoples (2016), Art. III (self-determination and cultural development), Art. IV (territorial integrity), Art. VI (collective right to culture); Art. XIII (cultural identity and integrity), <https://www.oas.org/en/sare/documents/DecAmIND.pdf>.

level ozone during hot temperatures).¹⁵⁴ In addition, children are uniquely vulnerable to stress and trauma from extreme events, displacement, and other harmful impacts. Children will also experience increasingly severe impacts from climate change during their lifetimes, as compared with adults. These impacts threaten children's rights to physical development, adequate nutrition, and all other core human rights.¹⁵⁵ The UN Committee on the Rights of the Child (CRC) has characterized climate change as a form of "structural violence against children" and a significant threat to children's rights, and has recognized a corresponding obligation on the part of States to ensure a clean, healthy and stable environment (and climate system) to respect, protect, and fulfill children's rights.¹⁵⁶

- **Women and mothers:** Climate change also poses unique risks to the health and safety of women, especially mothers. For example, research has shown that women and girls are more likely to die in heatwaves, tropical cyclones, and other extreme events in certain countries, and they are more likely to suffer poor mental health, partner violence, and food insecurity following extreme weather and other environmental shocks.¹⁵⁷ Pregnant and breastfeeding mothers are also uniquely vulnerable to environmental hazards such as extreme heat and wildfire smoke. Climate change thus threatens women's right to gender equity as well as the rights of mothers to "special care and assistance" before and after childbirth.¹⁵⁸
- **Inhabitants of small islands:** Small islands and their inhabitants are among the most vulnerable and acutely affected by climate change, as they are already experiencing acute burdens due to rising sea levels and other coastal hazards, their adaptation options are limited, and many islands face an existential threat due to sea level rise and its effects on habitability.

¹⁵⁴ See Council on Environmental Health, *Global Climate Change and Children's Health*, 136(5) *Pediatrics* 992 (2015), <https://pubmed.ncbi.nlm.nih.gov/26504130/>; EPA, *Climate Change and Children's Health and Well-Being in the United States* (2023), <https://www.epa.gov/cira/climate-change-and-childrens-health-and-well-being-united-states-report>.

¹⁵⁵ Protocol of San Salvador Arts. 15, 16. See also UN Committee on the Rights of the Child (UN CRC), General Comment No. 26 (2023): Children's rights and the environment with a special focus on climate change, <https://www.ohchr.org/en/documents/general-comments-and-recommendations/general-comment-no-26-2023-childrens-rights-and>.

¹⁵⁶ UN CRC, General Comment No. 26 (2023), *supra* note 155. See also *Held v. Montana*, CDV-2020-307 (Mont. Dist. Ct. Aug. 14, 2023), <https://climatecasechart.com/case/11091/> (finding that 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," Findings of Fact, ¶ 104; that the "physical and psychological harms are both acute and chronic" and accrue from many different types of climate change impacts, Findings of Fact, ¶ 108; that youth plaintiffs had proven that they were disproportionately harmed by climate impacts such that they had standing to sue the State of Montana for its climate policies; Conclusions of Law, ¶ 8; and that the State had violated the plaintiffs' rights to a clean and healthy environment by enacting a statute that prohibited analysis and disclosure of GHG emissions under the State's environmental review procedures, Order, ¶ 6).

¹⁵⁷ Carbon Brief, *How Climate Change Disproportionately Affects Women's Health* (October 29, 2020), <https://www.carbonbrief.org/mapped-how-climate-change-disproportionately-affects-womens-health/> (discussing findings from 130 studies on the gendered aspects of climate change).

¹⁵⁸ American Convention on Human Rights, Art. 1; Protocol of San Salvador, Art. 15(3)(a).

- **Future generations:** Future generations will suffer more extreme impacts as a result of climate change, and will also experience a much greater burden with regards to future GHG emissions reductions and adaptation if States do not undertake ambitious action now to control climate change. Future generations are entitled to human rights protections on the basis of international law, customary law, and treaty law,¹⁵⁹ and the Inter-American Democratic Charter explicitly recognizes that environmental protection is “essential” to protect the interests of both current and future generations.¹⁶⁰ Accordingly, this Court has also recognized that the human right to a healthy environment is “owed to both present and future generations.”¹⁶¹

¹⁵⁹ Maastricht Principles on the Human Rights of Future Generations (adopted February 3, 2023).

¹⁶⁰ Inter-American Democratic Charter, adopted at the first plenary session of the OAS General Assembly on September 11, 2001, during the twenty-eighth period of sessions, Art. 15.

¹⁶¹ Advisory Opinion OC-23/17 at ¶ 59.

III. State Obligations to Protect Human Rights in the Context of Climate Change

The Request raises questions about the nature of State obligations to prevent, minimize, provide redress for, and otherwise respond to the harmful effects of climate change within the framework of human rights law. This section describes how climate science can factor into the Court’s assessment of State obligations related to: (a) climate change mitigation, (b) climate change adaptation, (c) international cooperation and climate finance, (d) compensation for loss and damage, and (e) government procedures (including those related to access to information, public participation, and access to justice). There are a number of principles from human rights law, international law, and treaty law that are relevant to this assessment (see Table III).

Table III. Sources of Law Relevant to Assessing State Obligations and Climate Change		
Source of Legal Obligation	State Duty	Legal Authorities
Obligations to Respect, Protect and Guarantee Human Rights	In accordance with their customary and treaty obligations to respect and protect human rights, States must take action to limit their contributions to climate change, and otherwise safeguard human rights from threats associated with climate change. States are responsible for harm attributable to their GHG emissions, including extraterritorial harm.	See Table II.A.1, “Scope of Human Rights Affected by Climate Change”
United Nations Framework Convention on Climate Change (UNFCCC) (and see below)	State parties have agreed to “preserve the climate system for the benefit of present and future generations” and to “prevent dangerous anthropogenic interference with the climate system” by limiting global warming to “well below” 2°C or 1.5°C above pre-industrial levels. Accordingly, State parties have made commitments related to GHG mitigation, adaptation, information collection and disclosure, and international cooperation (including support to developing countries).	UNFCCC; Paris Agreement; UNFCCC COP Decision Documents; State-specific commitments articulated in Nationally Determined Contributions (NDCs)
Principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR)	This principle recognizes that State obligations with regards to collective problems like climate change should be interpreted in light of: (i) the State’s specific contribution to the problem, and (ii) the State’s capacity to respond to the problem. Accordingly, wealthier countries that have contributed more to climate change should take the lead in combating climate change and its adverse effects. The CBDR principle underpins discussions about States’ “fair share” obligations with regards to GHG emission reductions and climate finance.	UNFCCC Art 3(1); Paris Agreement Art. 4; Stockholm Declaration of the United Nations Conference on the Human Environment (1972); Rio Declaration on Environment and Development (1992), Principle 15

Table III. Sources of Law Relevant to Assessing State Obligations and Climate Change (cont'd)		
The “No Harm” Rule and Duty to Prevent Transboundary Harm	States must undertake due diligence to ensure that activities carried out within their jurisdiction or under their effective control do not harm the environment and territory of other States. This obligation extends to GHG emissions and their extraterritorial effects.	UNFCCC; Paris Agreement; Stockholm Declaration; Rio Declaration Principles 12 and 19; IACtHR Advisory Opinion OC-23/17 §C
Precautionary Principle	States should take a precautionary approach in the context of scientific uncertainty. In the context of climate change, this means that States should take actions to reduce GHG emissions in order to prevent or minimize potential harms from climate change even where there is uncertainty about the precise scope, nature, or timing of those harms.	UNFCCC Art. 3; Rio Declaration Principle 15; IACtHR Advisory Opinion OC-23/17 § B.2
Duty to Cooperate and Principle of Solidarity	States have a duty to cooperate when implementing international agreements and addressing international problems. States also have an obligation to assist other States without expectations of reciprocity, in order to address shared problems such as climate change. These two principles are closely related to the CBDR principle – i.e., wealthier nations have an obligation to provide financial assistance to those who are disproportionately affected by climate change, without expectation of reciprocity.	UNFCCC Art 3; Paris Agreement Art. 6; Rio Declaration Principle 5; American Convention, Art. 26; UN General Assembly, Resolution 3281 (XXIX): Charter of Economic Rights and Duties of States (12 December 1974), Art. 3; IACtHR Advisory Opinion OC-23/17 § B.3
Equity Under International Environmental Law	The principle of equity means that decisionmakers should account for considerations of justice and fairness in the establishment, operation or application of a rule of law. Again, this is closely related to the CBDR principle – e.g., the Paris Agreement shall “be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.” Art. 2(2).	UNFCCC Art. 3; Paris Agreement Arts. 2.2 & 4; Stockholm Declaration, Principles 1 & 12; Rio Declaration Principles 6 & 3; Johannesburg Declaration on Sustainable Development (2022)
Intergenerational Equity and Rights of Future Generations	This principle holds that there should be equity in the distribution of development benefits and burdens between different generations. Accordingly, legal scholars have recognized that future generations are legally entitled to human rights in accordance with international and humanitarian legal norms.	UNFCCC Art. 3, Paris Agreement preamble, Stockholm Declaration Principle 1; Rio Declaration Principle 3; Inter-American Democratic Charter (2001), Art. 15; IACtHR Advisory Opinion OC-23/17 ¶ 59; Maastricht Principles (2023)
<p>Note: This table is adapted from the Sabin Center’s <i>Status Report on Principles of International and Human Rights Law</i>, which contains a more comprehensive discussion of each principle and relevant legal authorities.¹⁶² The <i>Status Report</i> is included as an attachment to this brief.</p>		

¹⁶² Katelyn Horne, Maria Antonia Tigre, and Michael B. Gerrard, *Status Report on Principles of International Law and Human Rights Law Relevant to Climate Change* (Sabin Center for Climate Change Law, 2023), https://scholarship.law.columbia.edu/faculty_scholarship/3924/.

A. Mitigation Obligations

The Request seeks clarification on the nature of State duties to prevent harm and guarantee human rights, including the rights to life and a clean environment, in the face of climate change.¹⁶³ A number of legal authorities have found that States have an obligation to control and reduce GHG emissions from sources under their jurisdiction to prevent harm and protect fundamental human rights.¹⁶⁴ This obligation is rooted in principles of human rights law, international law, and treaty law, as well as domestic constitutional law, and is often assessed in relation to standards articulated in UNFCCC agreements. For example, courts have held that States must adopt GHG mitigation policies that reflect a fair share of the mitigation effort required to limit global warming to 1.5°C-2°C, consistent with the principle of common but differentiated responsibilities and respective capabilities (CBDR), and that State GHG reduction measures must be at least as ambitious as State commitments made pursuant to the UNFCCC, Paris Agreement, Nationally Determined Contributions (NDCs), and regional climate agreements.¹⁶⁵

Climate science serves as the principal evidentiary basis for characterizing State obligations with regards to GHG emission reductions and determining whether States have breached those obligations. As detailed below, the science provides core factual support for the general finding that states share responsibility for climate change and therefore have a “common” obligation to reduce GHG emissions. It also provides insights on the speed and scale at which GHG emissions

¹⁶³ Request for Advisory Opinion, § IV(A)-(B).

¹⁶⁴ See, e.g., IACHR Resolution 3/2021; *Urgenda v. Netherlands*, *supra* note 134; *Future Generations v. Ministry of the Environment and Others*, *supra* note 134; *Neubauer, et al. v. Germany*, *supra* note 134; *VZW Klimaatzaak v. Kingdom of Belgium & Others*, *supra* note 134; *Klimatická žaloba ČR v. Czech Republic*, *supra* note 134; *PSB et al. v. Brazil*, *supra* note 134; UN CRC, General Comment No. 26 (2023), *supra* note 155.

¹⁶⁵ See, e.g., *Urgenda v. Netherlands*, *supra* note 134 (ordering the Dutch government to limit GHG emissions to 25% below 1990 levels by 2020, consistent with UNFCCC and European Union (EU) targets, in order to protect rights to life and privacy); *Neubauer v. Germany*, *supra* note 134 (ordering the German government to enact policies aimed at achieving, at minimum, a 65% reduction in GHGs from 1990 levels by 2030, consistent with UNFCCC and EU targets, to protect rights to life, health, property, freedom, and intergenerational equity); *Future Generations v. Colombia*, *supra* note 134 (ordering the Colombian government to reduce deforestation in the Amazon, consistent with its NDC commitments); *VZW Klimaatzaak v. Belgium*, *supra* note 134 (finding that the Belgium government had breached its duty to protect rights to life and privacy due to inadequate ambition in GHG mitigation, but declining to set a GHG reduction target) (currently on appeal); *Klimatická žaloba ČR v. Czech Republic*, *supra* note 134 (ordering the Czech government to reduce GHGs by 55% in 2030 compared to 1990, based on the Paris Agreement and EU climate law) (remanded on appeal for additional clarification on the nature of plaintiffs injuries, and reconsideration of remedy); *PSB v. Brazil (on Climate Fund)*, *supra* note 134 (holding that the Brazilian government must execute and allocate its Climate Fund to mitigate GHG emissions and protect the right to a healthy environment, that it must avoid the regression of environmental protection, and that domestic laws must be consistent with the Paris Agreement and Brazil’s NDC).

must be reduced in order to limit global warming to 1.5 or “well below” 2°C and the emission sources that States must regulate in order to achieve these targets. Finally, the research provides insights on the relative contributions of States to climate change and injuries attributable to climate change, which is relevant when assessing States’ “differentiated responsibilities” (i.e., “fair share” obligations) with respect to GHG mitigation.

1. All States share responsibility for climate change

It is generally understood, as a matter of both human rights law and international environmental law, that States have responsibility for GHG emissions from sources that are under their jurisdiction or control. This basic understanding is at the heart of the CBDR principle as well as legal decisions finding that States have an obligation to reduce GHG emissions, and eventually reach net zero emissions, in order to protect human rights.¹⁶⁶ It is also consistent with the general principle that States are responsible for transboundary environmental harm originating from sources under their jurisdiction or control.¹⁶⁷

Nonetheless, some States have argued that it is not possible, as a legal matter, to attribute climate change to any particular State due to the collective and cumulative nature of the problem.¹⁶⁸ This position is at odds with legal precedent as well as the basic science of climate change, which shows that there is a causal nexus between the emissions attributable to a State and the harmful effects of climate change. Every unit of GHGs that is emitted into the atmosphere contributes to climate change, and although no one State can totally prevent climate change, every State measure that results in GHG reductions will help mitigate the harmful effects of climate change.

¹⁶⁶ See cases cited *supra* FN 165.

¹⁶⁷ IACtHR Advisory Opinion OC-23/17 (15 November 2017), § VII.C (“Obligations regarding transboundary damage”). See also *The South China Sea Arbitration (The Republic of Philippines v. The People’s Republic of China)*, PCA Case No. 2013-19, Award (July 12, 2016), <https://pca-cpa.org/en/cases/7/>, ¶ 941 (“The corpus of international law relating to the environment... requires that States ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control.”)

¹⁶⁸ For example, in response to the complaint filed by Torres Strait islanders, the government of Australia claimed that there was no “meaningful causation or connection between the alleged violations of their rights and the State party’s measures or alleged failure to take measures.” *Billy et al. v. Australia*, *supra* note 134, at ¶ 4.2. Australia even went so far as to claim, as a general matter, that “it is not possible under international human rights law to attribute climate change to a state party. As a legal matter, it is not possible to trace causal links between the State party’s contribution to climate change, its efforts to address climate change, and the alleged effects of climate change on the enjoyment of other’s rights.” *Id.* at ¶ 4.3

As discussed in Part I, scientists and economists have even developed techniques for quantifying State contributions to certain types of climate impacts – these include social cost of GHG metrics, and attribution techniques that can be used to quantify contributions to specific events, impacts, and processes. However, courts have never required that level of granularity or precision to support a determination of State responsibility for climate change mitigation. Rather, courts have found that responsibility exists based on the general causal link between GHG emissions and climate change, the State’s contribution to GHG emissions, and the extensive evidence of harmful impacts that are occurring as a result of climate change.¹⁶⁹

Climate science thus provides support for the legal determination that all States share responsibility for climate change, as a result of GHG emissions under their effective control, and therefore have a common obligation to prevent climate change-related injuries by taking action to limit and reduce those emissions. The fact that climate change is a collective and cumulative problem does not in any way relieve States of that responsibility. Rather, this fact reinforces another dimension of State responsibility in this area – specifically, that States have an obligation to cooperate in order to reduce global GHG emissions, consistent with the principle of solidarity. Indeed, this Court and other legal authorities have recognized that States have a general duty to cooperate to address environmental harm, particularly transboundary harm like that associated with climate change.¹⁷⁰

This Court has also recognized that States have an obligation to protect the human rights of people both within and outside of their territories.¹⁷¹ Thus, State responsibility for GHG emissions – and the corresponding duty to mitigate – should be understood in relation to the full scope of harm attributable to those emissions, including harm that occurs outside of the State’s territory. This is an important consideration when assessing a State’s “fair share” obligations.¹⁷²

¹⁶⁹ See, e.g., *Urgenda v. Netherlands*, *supra* note 134; *Neubauer v. Germany*, *supra* note 134. See also Held, *supra* note 156 (finding that the emissions attributable to the state of Montana contributed to climate change-related injuries incurred by plaintiffs, that the State had the authority to “alleviate and avoid climate impacts by limiting fossil fuel activities that occur in Montana”, *Conclusions of Law* ¶14, and thus the plaintiffs had standing to sue the State for prohibiting consideration of GHG emissions in state environmental reviews).

¹⁷⁰ IACtHR Advisory Opinion OC-23/17, § VIII.B.3 (“Obligation of Cooperation”). See also American Convention, Art. 26 (establishing the obligation of international cooperation with a view to the development and protection of economic, social, and cultural rights).

¹⁷¹ *Id.* at § VII.C.

¹⁷² See *infra* § III(A)(3).

2. States must achieve deep and rapid GHG reductions in the next decade to limit global warming to 1.5°C or “well below” 2°C

It is clear that the window of opportunity to limit global warming to 1.5°C or “well below” 2°C is rapidly closing.¹⁷³ Meeting these temperature targets will require “rapid and deep and in most cases immediate GHG emission reductions across all sectors.”¹⁷⁴ For example, based on emissions generated through 2019, IPCC AR6 found that emissions must peak before 2025 and then be reduced by roughly half by 2030 in order to have a >50% chance of limiting global warming to 1.5°C.¹⁷⁵ This may actually be an understatement of the ambition required to achieve the 1.5°C target, due to the fact that emissions have continued to grow since 2019. If these targets are exceeded, the impacts of climate change will be significantly worse, there will be an even greater need to rapidly reduce GHG emissions to protect human rights, some irretrievable tipping points will be crossed, and both mitigation and adaptation will become more costly.¹⁷⁶

These findings support the IACHR’s determination that States have an obligation to “adopt and implement policies aimed at reducing [GHG] emissions that reflect the *greatest possible ambition*”¹⁷⁷ – in other words, states must adopt policies and regulations aimed at reducing GHG emissions to net zero as quickly as possible, taking into account their respective capabilities and resources. This is consistent with the more general principle that states should guarantee human rights to the maximum extent possible,¹⁷⁸ as well as the precautionary principle, the “no harm” rule, the duty to prevent transboundary environmental harm, the duty to cooperate, and the CBDR principle.¹⁷⁹ Moreover, a principle of non-regression can be inferred from the obligation to pursue

¹⁷³ See *infra* § I(B)(C). See also INTERNATIONAL ENERGY AGENCY, NET ZERO ROADMAP: A GLOBAL PATHWAY TO KEEP THE 1.5 °C GOAL IN REACH, 2023 UPDATE (September 2023), <https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to-keep-the-15-0c-goal-in-reach>.

¹⁷⁴ IPCC AR6 WGIII at 24.

¹⁷⁵ IPCC AR6 SYR Summary for Policymakers at ¶ B.6.1, Table SPM.1.

¹⁷⁶ See, e.g., Benjamin M. Sanderson & Brian C. O’Neill, *Assessing the Costs of Historical Inaction on Climate Change*, 10 SCI. REP. 9173 (2020), <https://www.nature.com/articles/s41598-020-66275-4> (finding that each year of delay in GHG mitigation can substantially increase the costs of mitigation).

¹⁷⁷ IACHR Resolution 3/2021 at 11.

¹⁷⁸ See IACtHR Advisory Opinion OC-23/17 at ¶ 118 (recognizing that “the obligation to ensure rights” means that States must take “all appropriate steps to protect and preserve” those rights).

¹⁷⁹ Preventative action is particularly warranted when confronting a problem like climate change, where there is ample evidence of foreseeable harm despite scientific uncertainty about some aspects of future impacts

the “greatest possible ambition” in GHG mitigation – i.e., States should not weaken mitigation policies unless there are compelling humanitarian circumstances requiring such action.¹⁸⁰

As detailed below, scientific research also provides insights on how States can achieve GHG emission reductions at speed and scale, which is relevant when determining whether State policies reflect the greatest possible ambition with regards to climate change mitigation.

i. States must reduce emissions across all sectors and activities

To meet climate targets, States will need to reduce emissions across all sectors and sources, eventually achieving economy-wide net zero emissions. State mitigation obligations therefore encompass duties to reduce emissions from government activities, regulate emissions from private actors, and conserve and enhance carbon sinks and reservoirs, such as forests and coastal ecosystems.¹⁸¹ Fossil fuel combustion for energy, transportation, and industrial use is by far the largest source of GHG emissions and should be a focal point of mitigation policies. Other major sources of emissions include agriculture, livestock production, waste and wastewater treatment, deforestation and land use change, and industrial process emissions. There are many actions that States can undertake to address emissions from these source categories, e.g.:¹⁸²

- Adopting emission limits, performance-based standards, and/or price-based mitigation policies to control and reduce GHGs from fossil fuel-based energy and other sectors
- Ending fossil fuel subsidies, financing for fossil fuel projects, and other sources of public support for fossil fuel production, transportation, and consumption¹⁸³
- Investing in renewable energy, and accelerating approvals for renewable energy projects and associated electricity storage and transmission infrastructure

¹⁸⁰ *PSB v. Brazil*, *supra* note 134.

¹⁸¹ See, e.g., *Future Generations v. Ministry of Environment* (Colombia), *supra* note 134, at ¶ 11.3 (finding that the government of Colombia had violated fundamental rights by allowing deforestation in the Amazon and abrogating its NDC commitment to reduce deforestation in the Colombian Amazon to zero by 2020 to prevent 44 megatons of GHGs from entering the atmosphere). See also Paris Agreement Art. 5.

¹⁸² This list is based on recommendations from multiple legal and scientific sources, including the Deep Decarbonization Reports, *supra* note 131 (included as an attachment to this brief); LATIN AMERICAN ECONOMIC OUTLOOK 2022: TOWARDS A GREEN AND JUST TRANSITION (2022), <https://www.cepal.org/en/publications/48415-latin-american-economic-outlook-2022-towards-green-and-just-transition>; IMF, *Climate Change Challenges in Latin America and the Caribbean* (2021), <https://www.imf.org/-/media/Files/Publications/REO/WH/2021/English/CH3.ashx>; Ken Alex, *What If We Really Acted as if Climate Change is An Emergency?*, LegalPlanet (July 5, 2023), <https://legal-planet.org/2023/07/05/emergency/>.

¹⁸³ Currently, Venezuela, Ecuador, Bolivia, and Argentina net fossil fuel subsidies are equivalent to 85.6%, 29.2%, 23.5%, 15.4% respectively, of their health budgets. In total, the six countries spent USD 27.9 billion on fossil fuel subsidies in 2021. Hartinger et al. (2023), *supra* note 82, at 4.

- Adopting regulatory standards for or investing in energy efficiency
- Increasing access to low-carbon transportation options
- Ending deforestation and restoring and conserving habitats that serve as carbon sinks
- Establishing GHG control standards for agricultural and livestock practices
- Waste reduction and diversion strategies

State mitigation policies should be comprehensive, addressing all major emission sources within the country, based on the best available source attribution data (including data on carbon sinks and land use emissions). State mitigation policies should also be designed to achieve the maximum level of emission reduction (i.e., the greatest level of ambition), to the extent feasible and consistent with the CBDR principle, taking into account the best available research on the efficacy, feasibility, and cost of different mitigation technologies and policy pathways available to the State.

ii. States should reduce non-CO₂ emissions in order to limit near-term warming

Although CO₂ is the dominant cause of global warming, other GHG emissions have a more immediate and potent warming effect on a per ton basis. Methane, for example, has a global warming potential (GWP) of 82.5 over 20 years, meaning that one ton of methane causes 82.5 more warming than a ton of CO₂ in the 20 years after it is emitted.¹⁸⁴ Nitrous oxide (N₂O), hydrofluorocarbons (HFCs), and chlorofluorocarbons (CFCs) are also highly potent GHGs.¹⁸⁵

Especially given that there is a very real prospect of overshooting the 1.5°C target, states should aim to achieve reductions in these non-CO₂ pollutants in order to limit near-term warming to the maximum extent possible. Methane, in particular, plays a major role in short-term warming because methane emissions are so abundant.¹⁸⁶ Researchers have identified many different actions that states can undertake to reduce these more potent non-CO₂ emissions across sectors, including energy, agriculture, industry, and waste management.¹⁸⁷ Some of the most effective ways to reduce

¹⁸⁴ IPCC AR6 WGI at 1017, Table 7.15

¹⁸⁵ The 20-year GWPs for these pollutants are: N₂O (273), HFC-32 (2693), HFC (4144), CFC-11 (8231), PFC-14 (5301). IPCC AR6 WGI at 1017, Table 7.15 (note that these are average estimates).

¹⁸⁶ See IPCC AR6 WGIII at 23 (recognizing the potential to reduce peak warming through methane reductions).

¹⁸⁷ See, e.g., Richard Ferris, Gabrielle Dreyfus, & Durwood Zaelke, *A Primer on Cutting Methane: The Best Strategy for Slowing Warming in the Decade to 2030* (Institute for Governance & Sustainable Development 2023), https://www.igsd.org/wp-content/uploads/2022/09/IGSD-Methane-Primer_2022.pdf (identifying technologies that can be used to achieve substantial reductions in methane emissions from the energy production, waste, and agriculture sectors).

methane emissions include: (i) phasing out fossil fuel production and consumption; (ii) requiring the use of technologies and operational practices to limit methane emissions from fossil fuel production and transportation systems; (iii) establishing standards for and/or making public investments in practices and technologies to reduce methane from livestock and agriculture (e.g., using anaerobic digestion to control methane from manure, daily spreading of manure and reducing long-term storage of manure), and reducing demand for livestock products; (iv) establishing standards for and/or making investments in practices and technologies to reduce methane from landfills and wastewater treatment facilities, and reducing waste production; and (v) implementing conservation and nature-based strategies to limit the release of biogenic methane from wetlands and other ecosystems.¹⁸⁸

iii. States should pursue mitigation approaches that deliver co-benefits to marginalized and vulnerable populations

The Petition includes a question about what “differentiated measures” should be taken to minimize the impact of climate damages on “populations in situations of vulnerability,” taking into account intersectional considerations.¹⁸⁹ As discussed below, adaptation approaches will be needed to minimize the effects of climate change on vulnerable populations, but States can also pursue GHG mitigation measures that have important co-benefits for vulnerable groups, in some cases even offsetting harmful impacts associated with climate change. For example, research on mitigation pathways indicates that the following measures would yield substantial co-benefits for vulnerable populations:

- Reducing fossil-fuel based road travel would help reduce mortality and illness associated with air pollution exposure, which disproportionately affects poor and marginalized communities in urban areas (e.g., it would help avert the over 10,100 deaths that were attributable to PM2.5 exposure from the transport sector in South America in 2020).¹⁹⁰
- Providing access to clean cooking, heating, and household energy technologies, and reducing the use of traditional cookstoves that use charcoal, firewood, and other biomass would also help reduce mortality and illness associated with air pollution exposure that disproportionately affects people living in rural areas without access to electricity and/or

¹⁸⁸ See Ferris et al. (2023), *supra* note 174; E.G. Nisbet et al., *Methane Mitigation: Methods to Reduce Emissions, on the Path to the Paris Agreement*, 58(1) REV. GEOPHYS. e2019RG000675 (2020), <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019RG000675>.

¹⁸⁹ Request for Advisory Opinion at § IV(A)(2).

¹⁹⁰ Hartinger et al. (2023), *supra* note 82, at 4.

modern appliances. Public health data indicates that household air pollution from these polluting technologies was responsible for nearly 59,000 deaths in Latin America and the Caribbean in 2019 alone.¹⁹¹

- Nature- and ecosystem-based measures can enhance GHG sequestration while also providing environmental and adaptation benefits. For example, the protection of carbon sequestering ecosystems, such as forests, mangroves, and coastal wetlands, often improves resiliency to climate change-related hazards (e.g., tropical forests provide cooling benefits, mangroves and coastal wetlands reduce storm-related damages).¹⁹² Planting trees and adding green surfaces to urban areas also sequesters carbon while mitigating the effects of extreme heat, storms, and floods, and providing air quality benefits.
3. States' differentiated obligations should be interpreted in light of climate attribution research and carbon budget analyses

Climate science also provides insights on States' "differentiated" responsibilities with respect to GHG mitigation. In particular, source attribution data and other areas of attribution research can be used to evaluate States' historical and present contributions to climate change and corresponding damages. This, in turn, can inform decisions about the equitable allocation of carbon budgets and what qualifies as a State's "fair share" of global mitigation efforts. We recognize that the Court has not been asked to characterize specific GHG reduction obligations for individual states, but the Request does seek clarification on the nature of State duties to prevent climate change and "what principles should inspire mitigation, adaptation and response actions to the losses and damages generated by the climate emergency."¹⁹³ It would therefore make sense for the Court to provide some generalized guidance on the nature of States' differentiated responsibilities with regards to GHG emissions and how scientific research may inform those responsibilities.

In prior rights-based litigation, courts and litigants have used attribution data to establish a causal connection between a state's GHG emissions, climate change, and adverse effects on

¹⁹¹ Astrid Schilmann et al., *Just and fair household energy transition in rural Latin American households: are we moving forward?* 16(10) ENVIRO. RES. LETT. 105012 (2021), <https://iopscience.iop.org/article/10.1088/1748-9326/ac28b2>.

¹⁹² See P. Menéndez et al., *The Global Flood Protection Benefits of Mangroves*, 10 SCI. REP. 4404 (2020), <https://www.nature.com/articles/s41598-020-61136-6>; Frances Seymour et al., *Not Just Carbon: Capturing All the Benefits of Forests for Stabilizing the Climate from Local to Global Scales* (WRI 2022), <https://www.wri.org/research/not-just-carbon-capturing-benefits-forests-climate>; US National Ocean Service, *Coastal Blue Carbon*, <https://oceanservice.noaa.gov/ecosystems/coastal-blue-carbon/>.

¹⁹³ Request for Advisory Opinion, §§ IV(A)(1), IV(A)(2.B), IV(B)(1)(ii).

specific human rights.¹⁹⁴ However, courts have primarily relied on political documents, such as UNFCCC decisions, EU climate targets, and government-derived carbon budgets, when evaluating the sufficiency of GHG reduction targets and mitigation policies adopted by a State.¹⁹⁵ Courts have also referred to UNFCCC decisions and treaty commitments when evaluating the reasonableness of specific elements of State climate policies (e.g., policies related to the prevention of deforestation) and State obligations to implement existing policies..¹⁹⁶

We recognize that the Court is not assessing the responsibility of any particular State with regards to GHG mitigation, but it is possible to articulate some general principles for assessing a State's differentiated responsibilities in this context. Based on a review of both scientific evidence and past litigation, we recommend the following general principles.

- i. *State responsibility for climate change should be predicated on a holistic assessment of GHG emissions attributable to the State*

There are a number of different ways to attribute GHG emissions to a State. State responsibility for climate change is typically measured in reference to the State's territorial emissions (i.e., emissions from sources within the state). This has been the approach taken within the UNFCCC framework, and it has also underpinned various legal decisions on state responsibility for GHG mitigation.¹⁹⁷ However, different GHG accounting approaches provide valuable insights on the nature of State contributions to climate change, and the sufficiency or reasonableness of State mitigation measures. For example, data on consumption-based emissions provide insights on whether States are outsourcing carbon intensive products,¹⁹⁸ and data on fossil fuel production and extraction-based emissions provide insights on whether States are pursuing policies and development pathways that accord with the scientific consensus on the need to rapidly phase out

¹⁹⁴ See, e.g., *Urgenda v. Netherlands*, *supra* note 134; *Neubauer v. Germany*, *supra* note 134; *VZW Klimaatzaak v. Belgium*, *supra* note 134; *Held v. Montana*, *supra* note 156.

¹⁹⁵ *Id.*

¹⁹⁶ See, e.g., *Future Generations v. Ministry of Environment* (Colombia); *supra* note 134; *PSB v. Brazil*, *supra* note 134.

¹⁹⁷ See UNFCCC Reporting Requirements, <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/reporting-requirements>.

¹⁹⁸ See, e.g., Zhan-Ming Chen et al., *Consumption-Based Greenhouse Gas Emissions Accounting with Capital Sock Highlights Dynamics of Fast-Developing Countries*, 9 NAT. COMMUN. 3581 (2018), <https://www.nature.com/articles/s41467-018-05905-y>; Michael Jakob & Robert Marschinski, *Interpreting Trade-Related CO₂ Emission Transfers*, 3 NAT. CLIM. CHANGE 19 (2013).

fossil fuels and leave most remaining reserves in the ground.¹⁹⁹ It is also informative to look at estimates of per capita emissions when assessing State mitigation obligations, since this metric accounts for differences in population among States and is relevant when considering what qualifies as an “equitable” distribution of emissions and mitigation effort. Granted, there are contexts where one accounting approach must prevail (e.g., when setting numeric GHG targets), but outside of those contexts, using multiple accounting methods provides more holistic insights on State responsibility for climate change.

State responsibility should also be assessed in light of the State’s cumulative emissions (which can be measured in reference to territorial and/or per capita emissions), as this provides the best estimate of a State’s total contribution to climate change and associated threats to human rights. States with larger emission contributions bear greater responsibility for climate injuries, and therefore have a greater obligation to control and reduce GHG emissions as quickly as possible, consistent with the CBDR principle.²⁰⁰ This notion underpins much of the legal and technical discourse on whether States are doing their “fair share” to mitigate GHG emissions – although there is not a uniform definition of “fair share”, it is clear that this concept refers to what “each country *should* be doing to reduce and reverse” its contribution to climate change, drawing on notions of equity and climate justice, and a State’s cumulative emissions are clearly relevant to this analysis.²⁰¹ Granted, as discussed below, cumulative emissions are not the *only* factor that is relevant when framing fair share obligations (e.g., wealth and development status are also relevant). Moreover, States may be viewed as having greater responsibility with regards to recent and future emissions due to factors such as the foreseeability of harm from newer emissions, the ability of States to control current and future emissions, and the fact that more recent emissions may cause greater damage as they are less likely to be absorbed by ocean and terrestrial systems, and may cause the climate system to reach certain thresholds and tipping points.

¹⁹⁹ See, e.g., *Held v. Montana*, Findings of Fact, ¶¶ 210-237 (estimating emissions attributable to fossil fuel extraction, processing, and transportation in Montana, and finding that these emissions were substantial enough to support State responsibility for plaintiff’s climate-related injuries). See also Erickson & Lazarus (2013), *supra* note 98.

²⁰⁰ See Paris Agreement Art. 4(4) (recognizing that “[d]eveloping country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets”).

²⁰¹ Maria Antonia Tigre, *The ‘Fair Share’ of Climate Mitigation: Can Litigation Increase National Ambition for Brazil*, JOURNAL OF HUMAN RIGHTS PRACTICE (September 6, 2023), <https://academic.oup.com/jhrp/advance-article-abstract/doi/10.1093/jhuman/huad032/7261647>. See also *infra* § III.A.3.iii.

ii. State obligations are constantly evolving

States’ “fair share” obligations are constantly evolving due to continued human interference with the climate system, the increasing urgency of GHG emission reductions, and new scientific information about the scope of harmful impacts attributable to climate change. In particular, as noted in Part I, it is possible that we will hit critical warming thresholds even faster than previously anticipated (e.g., exceeding the 1.5°C target within the next few years). Impacts may also be more harmful than anticipated, particularly if the world surpasses tipping points that result in cascading and compounding impacts, such as the melting of ice sheets. This means that GHG reduction targets need to be periodically re-assessed in light of new data about cumulative GHG emissions and the impacts attributable to those emissions.

For example, based on current emissions trajectories and scientific research on climate impacts, it is clear that emission reduction targets in UNFCCC documents and NDCs are not sufficiently protective of human rights.²⁰² These should therefore be viewed as a “floor” for state obligations – i.e., States must, at minimum, comply with NDC commitments and GHG reduction targets articulated in UNFCCC documents. Some States, particularly those that have made larger contributions to climate change, will need to pursue more ambitious GHG reduction targets in order to fulfill their human rights obligations. Of course, the adequacy of NDC commitments will vary depending on the level of ambition and the unique circumstances of the State.

iii. Carbon budget and “fair share” research can be used to assess the adequacy of state ambition

In light of the above considerations, courts may need to look beyond NDCs, UNFCCC documents, and other political agreements when assessing the adequacy of State ambition with regards to GHG reductions. As noted in Part I, there is a growing body of research on the equitable allocation of the global carbon budget that courts can refer to in order to determine whether a State is doing its fair share to reduce GHG emissions.²⁰³ The research generally recognizes that historical responsibility (as measured by cumulative emissions), current levels of per capita emissions, and

²⁰² See UNEP, EMISSIONS GAP REPORT 2022, <https://www.unep.org/resources/emissions-gap-report-2022>.

²⁰³ See, e.g., Rajamani et al. (2021), *supra* note 129; Hickel et al. (2020), *supra* note 129; Maria Antonia Tigre (2023), *supra* note 201; *Fair Shares: A Civil Society Equity Review of NDCs* (Civil Society Review 2015), <https://policy-practice.oxfam.org/resources/fair-shares-a-civil-society-equity-review-of-indcs-579848/>; Climate Action Tracker, *Fair Share*, <https://climateactiontracker.org/methodology/cat-rating-methodology/fair-share/>.

development status are all relevant when evaluating fair share obligations. State obligations should also be assessed in light of the overarching goal of harm prevention, i.e., they should reflect emission reduction pathways that have a reasonable chance of limiting global warming to 1.5°C or well below 2.0°C.

There is tension between the goals of harm prevention and international equity. The CBDR principle addresses this by acknowledging that States have a “common” obligation to reduce GHG emissions as rapidly as possible in order to mitigate the human rights consequences of climate change, but they also have “differentiated” obligations with regards to GHG reduction due to varying levels of responsibility for climate change as well as differences in wealth and development status. Courts will need to account for both types of considerations when evaluating fair share obligations for specific States.

Rajamani et al. (2021) demonstrate how fair share obligations can be assessed using the principles of international environmental law, including the principles of harm prevention, precaution, sustainable development, special circumstances, equity (inter- and intra-generational), CBDR, public participation, international cooperation and good faith.²⁰⁴ The authors evaluate nationally determined contributions (NDCs) to the Paris Agreement in light of these principles, and find that NDCs are often predicated on a combination of indicators that both are and are not supported by the equitable principles of international environmental law (see Box III.A.3, next page). The authors also present a framework for quantifying fair-share contributions based on their assessment of legal principles and NDC indicators, and in accordance with a global emissions pathway that have a reasonable prospect of limiting warming to well below 2°C.

Importantly, even where a court lacks jurisdiction to establish numeric GHG reduction targets for a State, it can use carbon budget and fair share research to evaluate the sufficiency of existing targets and policies, and to determine whether more ambitious measures are needed to protect human rights.²⁰⁵ For example, the framework articulated by Rajamani et al. could be used in qualitative assessments of NDC commitments and GHG reduction targets.

²⁰⁴ Rajamani et al. (2021), *supra* note 129.

²⁰⁵ See, e.g., Brussels Court of First Instance, *VZW Klimaatzaak v. Kingdom of Belgium & Others*.

Box III.A.3. Evaluation of NDC Indicators and Consistency with International Environmental Law in Rajamani et al. (2021)	
Indicators supported by principles of international environmental law:	
<ul style="list-style-type: none"> • Emissions per capita (73) • Classification as small island developing states (SIDS) or least developed countries (LDCs) (61) • Small share of global emissions, to the extent this overlaps with special circumstances (ie., LDCs and/or SIDS) (59) • Historic responsibility (37) • GDP per capita (27) 	
Indicators not supported by principles of international environmental law:	
<ul style="list-style-type: none"> • Small share of global emissions for countries that are not LDCs or SIDS (52) • Progression of own effort (55) • In line with own targets (26) • Emissions per GDP (24) • Peak year (10) • Least cost pathways (8) 	
Notes:	
<ul style="list-style-type: none"> • The (##) next to each indicator refer to the number of NDCs that contained each indicator (specifically, NDCs submitted through December 31, 2020). • These indicators are based on the text of NDCs. The authors identify a number of other indicators that would also be consistent with the principles of international environmental law, including cumulative GHG emissions, current and projected harm, and GDP per capita adjusted for development. 	

iv. GHG reduction targets are not the only way to characterize State obligations with regards to GHG emissions

It is important to recognize that State obligations with regards to GHG emissions do not need to be exclusively framed in reference to numeric GHG reduction targets. The adequacy of a state's GHG reduction measures can also be assessed by evaluating the nature of state climate policies in light of the state's resources, development status, capacity constraints, and other considerations. For example, a court could evaluate whether a State is making its best efforts to transition its energy system away from fossil fuels and to reduce emissions from other key sectors, such as agriculture and land use. This would be generally consistent with how courts approach many legal disputes involving human rights – assessments of whether States are fulfilling their human rights obligations are often predicated on a more qualitative analysis of State measures and whether they reflect, e.g., “the greatest possible ambition,” taking into account the respective capabilities of the

State.²⁰⁶ Research on the efficacy, cost, and availability of mitigation technologies and policies would be relevant to such an analysis, as would source attribution research on GHG emissions from different sectors and activities under the State’s jurisdiction or effective control.

A more qualitative or functional analysis of State action may also be necessary when courts are tasked with assessing the legality of policies and government decisions that contribute to climate change in ways that are not reflected in territorial emission budgets, e.g., decisions about fossil fuel extraction and export, land use decisions with difficult-to-quantify emissions impacts, or policies that may affect consumption-based emissions. In that context, courts can refer to available emissions data to understand the magnitude of the impact on climate change, but the legality of the action would ultimately need to be assessed in reference to something other than a territorial emissions budget (e.g., whether the State is taking reasonable measures or making “best efforts” to transition away from dependency on fossil fuel exports, mitigate emissions from deforestation or other land use decisions, prevent carbon leakage, etc.).

B. Adaptation Obligations

The Request also raises questions about the scope of state duties with regards to adaptation measures, minimizing the harms caused by climate change, and protecting vulnerable populations, such as children, from the impacts of climate change.²⁰⁷ Human rights law recognizes an obligation on the part of States to take reasonable measures to protect and guarantee human rights in the face of foreseeable environmental risks and natural hazards, even where the State did not cause such hazards through its own actions.²⁰⁸ Accordingly, States must prepare for and respond to the effects

²⁰⁶ See, e.g., *Future Generations v. Colombia*, *supra* note 134; *PSB v. Brazil*, *supra* note 134.

²⁰⁷ Request §§ IV(A)(2); IV(B)(1)(ii)-(iii); IV(C)(1).

²⁰⁸ For example, there are several decisions from the European Court of Human Rights (ECtHR) that provide insights on the nature of a state’s positive obligation to protect the right to life in the context of natural disasters. In *Budayeva and Others v. Russia*, the ECtHR determined that Russian authorities had violated the right to life when those authorities knew that there was a risk of a mudslide but did not implement land planning and emergency relief policies or adequately inform the public about the risk, and eight citizens died as a result of the mudslide. *Budayeva and Others v. Russia*, App. Nos. 15339/02, 21155/02, 20058/02, 11673/02 and 1543/02, Eur. Ct. H.R. (March 20, 2008). Similarly, in *Kolyadenko v. Russia*, the ECtHR determined that Russian authorities violated the rights to life, respect for private and family life, and protection of property when they released a large amount of water from a reservoir during an exceptionally heavy rain event, thus causing a flash flood immediately downstream of the reservoir. *Kolyadenko and Others v. Russia*, Eur. Ct. H.R. (Judgment, February 28, 2012). Notably, the court did not find that authorities were negligent in their operation of the dam at the time of the flood – rather, the problem was that the government authorities (i) knew for many years that such an event was foreseeable and failed to take action to mitigate the risk, (ii) failed to adopt planning restrictions and take other necessary steps to protect people living downstream

of climate change, particularly those that pose a foreseeable threat to human rights, and this “duty of adaptation” is independent from State responsibility for GHG emissions and the duty of mitigation. Attribution research and climate projections provide insights on foreseeable hazards and risks associated with climate change and are therefore relevant when assessing State obligations to adapt.

1. Greater ambition in adaptation will be needed to protect human rights from the harmful impacts of climate change

The findings from IPCC AR6 and other scientific authorities indicate that ambitious adaptation measures will be needed to protect human rights from foreseeable threats associated with climate change, even if warming is limited to 1.5 or 2°C, and adaptation requirements will increase with each additional increment of warming. IPCC AR6 and other authorities have also found that current investments in adaptation are insufficient and “adaptation gaps” will continue to grow under current policies.²⁰⁹ States will therefore need to enhance their ambition with regards to adaptation to protect people and ecosystems from climate change-related hazards that pose an imminent risk to life, health, environmental health, and other fundamental rights.

To date, court decisions involving human rights and climate change have focused on mitigation obligations for states, but courts are beginning to weigh in on the scope of state obligations with regards to climate change adaptation.²¹⁰ For example, courts in Colombia and Pakistan have

of the reservoir, and (iii) did not take all possible measures to alert residents of the risks prior to or during the storm. There are also a number of human rights decisions affirming that governments have a positive obligation to protect citizens from other environmental hazards that threaten human rights, including wholly man-made hazards. For example, in *Öneryildiz v. Turkey*, the ECtHR found that the government of Turkey had violated the rights to life and property arising from a methane explosion at a landfill when governmental authorities knew of the risk of explosion but failed to issue any regulations or take measures to mitigate that risk. *Öneryildiz v. Turkey*, Eur. Ct. H.R. (Judgment, 2004) at 1. See also *The Environment & Human Rights*, Advisory Opinion OC-23/17, Inter-Am. Ct. H.R. (ser. A), No. 23 (holding that governments have a positive obligation to prevent foreseeable harms arising from their conduct).

²⁰⁹ See IPCC AR6 SYR at ¶ A.3 (“Despite progress, adaptation gaps exist, and will continue to grow at current rates of implementation. ... Current global financial flows for adaptation are insufficient for, and constrain implementation of, adaptation options, especially in developing countries (*high confidence*).”). See also UNEP, ADAPTATION GAP REPORT 2022 (Nov. 1, 2022).

²¹⁰ See, e.g., *Billy et al. v. Australia*, *supra* note 134; *Leghari v. Pakistan*, *supra* note 134. There are also a number of pending cases and petitions involving adaptation-oriented claims. For example, the US tribal petition to the UN Special Rapporteurs alleges that the US government and the state governments of Louisiana and Alaska violated the collective and individual rights of Indigenous tribes by (i) undertaking maladaptive activities that contributed to coastal erosion, land loss, and flooding along the coastlines where the tribes reside, thus exacerbating the effects of sea level rise and extreme storms; and (ii) failing to take affirmative measures to protect the tribes from sea level rise, extreme storms,

generally found that governments have an obligation to undertake adaptation measures in order to protect fundamental rights, such as the rights to life and environmental health.²¹¹ The UN Human Rights Committee’s decision in *Billy et al. v. Australia* is perhaps the strongest decision to date on State adaptation obligations under human rights law. The Committee specifically found that Australia had violated the Torres Strait Islanders’ rights to indigenous culture and family, home, and private life because it “fail[ed] to discharge its positive obligation to implement adequate adaptation measures” to protect the authors and their communities.²¹² Based on this holding, the Committee found that the State had obligations to, *inter alia*, “take measures necessary to secure the communities’ continued safe existence on their respective islands,” “provide adequate compensation, to the authors for the harm they have suffered,” and “take steps to prevent similar violations in the future.”²¹³

Because petitioners do not need to prove that the government defendant caused or contributed to climate change in a failure-to-adapt case, the factual analysis is different from that in failure-to-mitigate cases. Petitioners need not grapple with questions about source attribution or related defenses. Instead, the focus is on the reasonableness of the government’s response to climate change (or lack thereof), which is based, at least in part, on the nature of climate change impacts and whether they are (or were) foreseeable.

and land loss and, in particular, failing to implement a “relocation governance framework” for these tribes. See Rights of Indigenous Peoples in Addressing Forced Displacement, *supra* note 152.

²¹¹ *Future Generations v. Ministry of Environment & Others* (Colombia), *supra* note 134; *Leghari v. Pakistan*, *supra* note 134.

²¹² The implications of the Committee’s decisions for state mitigation obligations are unclear. Although the decision specifically referred to *adaptation* measures in the two paragraphs finding a violation of those rights, it did not explicitly reject the Islanders’ claims with respect to mitigation, and some of the state obligations identified later in the decision could be interpreted as requiring both GHG mitigation and adaptation (e.g., the duty to prevent future harm). One committee member published an independent opinion expressing the view that the HRC should have linked the State obligation more clearly to mitigation measures, because adaptation will eventually become impossible for the islands in the absence of effective mitigation. (Annex II: Individual Opinion by Committee Member Gentian Zyberi (concurring), para 6). The committee member also noted that a “higher standard of due diligence applies in respect to those States with significant total emissions or very high per capita emissions (whether these are past or current emissions), given the greater burden that those emissions place on the global climate system, as well as to States with higher capacities to take high ambitious mitigation action.” (id. at para 5).

²¹³ *Billy et al. v. Australia*, *supra* note 134, ¶ 11.

2. Climate science provides actionable information on foreseeable climate hazards

Attribution research and climate projections provide insights on the effects of climate change that are already underway, likely future effects under different warming scenarios, and the extent to which specific climate change-related risks are foreseeable and should therefore be taken into account by decision-makers. Although attribution research is most often invoked in legal discussions about responsibility for climate change, its ultimate aim is to “further scientific understanding of causal links between elements of the Earth system and society” and thus the research also supports “management of climate-related risks through improved understanding of drivers of relevant hazards, or more widely, vulnerability and exposure.”²¹⁴

For example, the research shows that certain natural hazards, which might be characterized as “unlikely” or “unforeseeable” in a world without climate change, are becoming much more prevalent, thus posing foreseeable risks that should be accounted for in government planning and decision-making processes.²¹⁵ The research also provides insights on the prominent climate change-related hazards in Latin America and the Caribbean, and suggests that adaptation measures are needed to: (i) mitigate the adverse effect of climate change on agricultural systems, food security, and water security; (ii) reduce exposure and vulnerability to extreme heat, storms, flooding, and landslides; (iii) conserve and restore key ecosystems, such as forests, mangroves, and coastal wetlands, in order to reduce ecological damage and preserve ecosystem services; (iv) expand health services and protective measures to address the increased prevalence of communicable diseases; and (v) address the effects of sea level rise and other coastal hazards on small islands and low-lying coastlines.

The IPCC reports are a useful starting point for identifying foreseeable climate impacts and appropriate adaptation measures, but it will typically be necessary to consult other scientific resources, such as regional climate impact and vulnerability assessments, for more granular data on the effects of climate change on specific communities, locations, sectors, and activities.²¹⁶

²¹⁴ Rachel A. James et al., *Attribution: How is it Relevant for Loss and Damage Policy and Practice?*, CLIMATE RISK MANAGEMENT, POLICY AND GOVERNANCE (2018), https://link.springer.com/chapter/10.1007/978-3-319-72026-5_5.

²¹⁵ For example, the “recurrence interval” for climate-related extremes is increasing in many regions, such that events which were previously viewed as very rare (e.g., 1-in-500 year storms) are now occurring much more frequently.

²¹⁶ See *supra* § I(A)(3). For examples of national climate impact and vulnerability assessments, see: Uruguay Ministerio de Ambiente, *Cambio Climático*, <https://www.gub.uy/ministerio-ambiente/cambio-climatico>; Chile,

3. Adaptation should be “mainstreamed” in government planning processes

Government decision-makers should account for climate change-related hazards and adaptation options across a wide array of decisions related to natural resource management, ecosystem and biodiversity protection, urban and rural planning, food and water security, public health, and much more. States and sub-state actors should therefore seek to integrate or “mainstream” adaptation planning into existing planning processes across these different areas of decision-making. For example, the legal frameworks for environmental impact assessments should be updated, where needed, to ensure that decision-makers are accounting for climate impacts and opportunities to mitigate risks or environmental hazards associated with climate change.²¹⁷

C. International Cooperation and Climate Finance

The Request seeks clarification on the scope of state duties to prevent, minimize, and respond to the effects of climate change in the context of human rights law.²¹⁸ These duties encompass obligations related to international cooperation and the provision of climate finance. The IACHR and other legal authorities have recognized that States with greater financial capacity and greater responsibility for climate change have obligations to provide greater technical and logistical assistance for mitigation and adaptation activities in States that are most affected by climate change and have fewer resources to respond to it.²¹⁹ This obligation is predicated on the principles of

Ministerio del Medio Ambiente, *Publicaciones Destacadas*, <https://cambioclimatico.mma.gob.cl/publicaciones-destacadas/>. For other examples of regional and local climate impact studies, see José A. Marengo & Carlos Souza Jr., *Mudanças Climáticas: impactos e cenários para a Amazônia* (2018), https://www.oamanhachoje.com.br/assets/pdf/Relatorio_Mudancas_Climaticas-Amazonia.pdf (evaluating the effects of climate change on biodiversity in the Amazon rainforest); Vanesa Londoño Arteaga & Carlos Henrique Ribeiro Lima, *Impacto das mudanças climáticas em índices de monção da América do Sul*, Brazilian Association of Water Resources, Presented at the XIII Brazilian Symposium on Water Resources (2019), <https://files.abrhidro.org.br/Eventos/Trabalhos/107/XXIII-SBRH0668-1-20190808-101233.pdf> (finding that climate change will likely affect circulation patterns over Brazil in ways that will cause intensification of wind and precipitation patterns, particularly during summer months); Giovanna Klautau Leite Costa et al., *Impacto das mudanças climáticas nas vazões mínimas de referência de pequenas bacias hidrográficas na Amazônia Legal e dentro do arco do desflorestamento*, (20) REVISTA DE GESTÃO DE ÁGUA DA AMÉRICA LATINA (2023), <https://www.abrh.org.br/OJS/index.php/REGA/article/view/790/117> (finding that climate change may cause a drastic reduction in minimum reference flows of two small catchments located in the Amazon (Cerrado biome) and the Arch of Deforestation).

²¹⁷ See *infra* § III(E).

²¹⁸ Request for Advisory Opinion, §§ (IV)(A), (IV)(B).

²¹⁹ See IACHR Resolution 3/2021, Section C.II, para 10 (“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

CDBR, international cooperation, and international solidarity.²²⁰ It is also related to State obligations to mitigate environmental harm arising from activities under their effective control, insofar as financial assistance for adaptation can serve as a form of mitigation for damages attributable to a State's GHG emissions.²²¹ In other words, there is considerable overlap between State obligations related to climate finance and State obligations related to loss and damage.

Climate finance obligations should therefore be assessed in light of both the State's contributions to climate damages and the State's capacity to provide assistance. As discussed above, climate science, particularly detection and attribution research, provides critical insights on the first issue (State contributions to climate change) and can therefore inform assessments of whether State commitments to climate finance reflect an adequate level of ambition – e.g., finance commitments could be compared to estimates of economic damages attributable to the State. The scientific research also provides insights on where financial resources should be directed in order to achieve the greatest level of harm reduction and the greatest benefit to human rights – e.g., source attribution data can be used to determine where financial investments in GHG mitigation will deliver the largest GHG reductions at the lowest cost, and impact attribution data can be used to determine whether adaptation investments will yield the greatest benefits.

D. Compensation for Loss and Damage

The Petition raises questions about State obligations to address the losses and damages generated by climate change, particularly in relation to their individual and collective obligations to “guarantee the right to reparations for damages generated by their actions or omissions in the face of the climate emergency.”²²² This Court has acknowledged that States have an obligation to

exercise of rights. This involves exchanging resources, technology, knowledge and capacities to build societies that operate in a low-emission environment, move towards a clean and just energy transition, and protect people's rights. States that are in a position to do so should contribute to covering the costs of mitigation and adaptation of States prevented from doing so, in accordance with the principle of common but differentiated responsibilities. In general, the fundamental principles of climate justice should serve as a guide for international cooperation.”) *See also id. at* Section C.1, para 7; UNHRC, Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment, A/74/161 (2019), ¶¶ 26 and 68 (recognizing that “wealthy States must contribute their fair share towards the costs of mitigation and adaptation in low income countries,” through grants and not loans, given that basic principles of justice are violated when poor countries are forced to pay for “the costs of responding to climate change when wealthy countries caused the problem.”).

²²⁰ See Table III, *supra* page 38.

²²¹ See IACtHR Advisory Opinion OC-23/17 at ¶¶ 145, 172-173.

²²² Request for Advisory Opinion, §IV(F)(2).

mitigate environmental damage from activities under their control or jurisdiction, that this responsibility extends to extraterritorial harms and transboundary environmental damage,²²³ and that violations of environmental and human rights “may result in sanctions as well as compensation for their negative consequences.”²²⁴ Accordingly, the Court has found that there are circumstances in which a State may be required to pay reparations to cover the costs of environmental damages and restitution.²²⁵ However, we recognize that there are open questions about the nature of State obligations to provide compensation for loss and damage caused by insufficient action on climate and insufficient regulation of GHG emissions, as there are very few legal decisions on this topic.²²⁶

As noted above, the UN Human Rights Committee did recently issue a decision in which it recognized that the government of Australia had an obligation to pay damages to indigenous Torres Strait islanders due to the State’s failure to protect the islanders from harmful effects of climate change, but this was premised on Australia’s failure to adapt, rather than loss and damage deriving from Australia’s contribution to climate change.²²⁷ If a State’s failure to adapt can give rise to a

²²³ IACtHR Advisory Opinion OC-23/17 at § C. *See also id.* at paras 145, 172-173.

²²⁴ *Id.* at para 127.

²²⁵ *See Lhaka Honhat (Our Land) Association v. Argentina*, Inter-Am. Ct. H.R. (ser. C.) No. 400 (Feb. 6, 2020), https://www.corteidh.or.cr/docs/casos/articulos/seriec_400_ing.pdf; Maria Antonia Tigre, *International Recognition of the Right to a Healthy Environment: What is the Added Value for Latin America and the Caribbean?* 117 AJIL UNBOUND 184 (2023), <https://www.cambridge.org/core/journals/american-journal-of-international-law/article/international-recognition-of-the-right-to-a-healthy-environment-what-is-the-added-value-for-latin-america-and-the-caribbean/1DAC082B9E909B45E3FEADC89E4126D9>.

²²⁶ At this time, the question of state obligations to provide compensation for climate change-related loss and damage is primarily being addressed through political channels, particularly negotiations under the UNFCCC. In 2022, the UNFCCC COP established a loss and damage fund, providing further legitimacy to the notion that States with greater responsibility for climate change should compensate other States for climate change-related losses and damages. States may also have a legal obligation to provide compensation for climate change-related loss and damage based on principles of human rights law and international environmental law, particularly the obligation to provide restitution for environmental harm caused to another country. *See* Audrey Chapman & A. Karim Ahmend, *Climate Justice, Human Rights, and the Case for Reparations*, 23(2) HEALTH HUM. RIGHTS 81 (2021), <https://pubmed.ncbi.nlm.nih.gov/34966227/>; Margaretha Wewerinke-Singh, *Remedies for Human Rights Violations Caused by Climate Change*, 9 CLIM. LAW 224 (2019), https://brill.com/view/journals/clla/9/3/article-p224_224.xml.

²²⁷ *Daniel Billy and others v. Australia*, *supra* note 134 (finding that Australia had violated the rights of indigenous Torres Strait Islanders by failing to take timely and adequate measures to protect them from climate change-related harms, and asking Australia to compensate the islanders for harm suffered and to take measures to secure their safe existence in the future). There are a number of other climate cases where plaintiffs are seeking restitution for losses and damages, but most of these cases involve non-state defendants (e.g., fossil fuel companies). *See, e.g., Lliuya v. RWE*, Az. 2 O 285/15 Essen Regional Court [2015], <https://climatecasechart.com/non-us-case/liuya-v-rwe-ag/>; *Asmania et al., v. Holcim* (Switzerland 2022), <https://climatecasechart.com/non-us-case/four-islanders-of-pari-v-holcim/>.

duty to compensate injured parties, then presumably a State’s contribution to climate change can also give rise to such a duty.

Loss and damage claims deal specifically with impacts and injuries that have already occurred as a result of climate change, and so attribution science is most relevant to such claims, as it can be used to calculate and attribute certain types of damages to specific sources. Some of the top-level findings from IPCC AR6 with regards to losses and damages are that: (i) human-induced climate change is already causing losses and damages to nature and people across the planet, (ii) losses and damages are unequally distributed across different countries, (iii) losses and damages will escalate with each increment of warming, (iv) losses and damages will continue to increase even with adaptation.²²⁸ AR6 thus provides general support for the establishment of legal structures to address loss and damage.

As discussed in Part I, researchers have developed techniques for estimating losses and damages at different scales and for attributing those damages to specific States. For example, Callahan & Mankin (2022) provide estimates of each country’s responsibility for temperature-driven income changes in all other countries. This type of data could be used to assess loss and damage claims between States. However, it is more difficult to estimate State contributions to climate damages incurred by individual rights-holders and communities. Generally speaking, confidence in attribution tends to be higher when evaluating changes and impacts at larger geographic and temporal scales, and there are additional complexities involved in “downscaling” attribution analyses to the level of an individual or community. At that scale, “there are multiple factors that contribute to a specific loss or damage, and the signal from climate change is more difficult to detect relative to the many other potential influences on hazard occurrence, exposure, and vulnerability.”²²⁹ Thus, although it is clear that State-level emissions contribute to local losses and damages from climate change, it may not be possible to assign a monetary value to all or most elements of that contribution, due to uncertainty about the influence of climate change at that scale, and the fact that many types of losses that cannot be readily be translated to a damage value.

Perhaps due to these challenges, the plaintiffs and petitioners in climate damage cases have sought compensation to help cover adaptation costs, in lieu of calculating actual damages

²²⁸ IPCC AR6 SYN SPM.

²²⁹ James et al. (2018), *supra* note 214, at 115.

attributable to climate change. This has been the approach in lawsuits filed against private companies, primarily fossil fuel companies, seeking to establish liability based on the companies' contributions to climate change.²³⁰ Such lawsuits can be characterized as “loss and damage” claims insofar as they seek compensation from emitters for climate-related injuries (adaptation costs) on the basis of the emitter’s contribution to climate change.²³¹ The advantage of this approach is that adaptation costs can be more readily calculated based on planned or implemented adaptation measures. As discussed above, State obligations with regards to climate finance, including adaptation finance, are partially rooted in State responsibility for GHG emissions, and thus the provision of funding or resources for adaptation can be viewed as a form of restitution for GHG emissions and the losses and damages attributable to those emissions.

E. Government Procedure, Access to Information, Public Participation, and Access to Justice

The Petition asks the Court for clarification on how climate change should be addressed when interpreting state obligations to ensure access to information, public participation, and access to justice, consistent with duties under the Escazú Agreement and other human rights instruments.²³² There are also a number of questions that implicate government procedure, for example, questions about state obligations related to regulation, monitoring, impact assessment, and contingency planning in the context of climate change.²³³ Generally speaking, obligations related to government planning and procedure should be characterized in a way that will promote both public participation and science-based decision-making across policy, administrative, and judicial

²³⁰ See, e.g., *Lliuya v. RWE*, *supra* note 228; *Asmania et al., v. Holcim*, *supra* note 228.

²³¹ Some UN documents define “loss and damage” as the residual losses from climate change that are not avoided through mitigation and adaptation. See, e.g., *Non-economic Losses in the Context of the Work Programme on Loss and Damage*, Technical Paper FCCC/TP/2013/2 (Oct. 9, 2013), <https://unfccc.int/resource/docs/2013/tp/02.pdf>. Even under this framing, the costs of adaptation would still qualify as loss and damage, since these are residual economic damages that cannot be avoided through mitigation and adaptation. See also Maria Antonia Tigre & Margaretha Wewerinke-Singh, *Beyond the North-South Divide: Litigation’s Role in Resolving Climate Change Loss and Damage Claims*, REVIEW OF EUROPEAN, COMPARATIVE & INTERNATIONAL ENVIRONMENTAL LAW (2023) (recognizing that the requested remedies in such cases may include compensation for adaptation costs).

²³² Request for Advisory Opinion at § IV(A)(2.A). See also Regional Agreement on Access to Information, Public Participation and Access to Justice in Environmental Matters in Latin America and the Caribbean (Escazú Agreement) (2018), <https://www.cepal.org/en/escazuagreement>; Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) (1998), <https://unece.org/DAM/env/pp/documents/cep43e.pdf>.

²³³ Request for Advisory Opinion at § IV(A)(2.A).

contexts. The Court should also recognize State obligations to periodically reassess and revise responses to climate change in light of new scientific evidence.

1. Adaptive Management and Government Decision-making

Climate change and scientific knowledge of climate change are constantly evolving. Thus, in order to effectively respond to climate change-related risks, government decision-makers and planners will need to frequently re-evaluate many different types of planning and regulatory decisions and adjust course in light of new information. The Court should therefore recognize an obligation on the part of States to incorporate adaptive management procedures into government decision-making. In particular, adaptive management procedures should ensure that government decision-making is an iterative process that incorporates: (i) periodic monitoring and review of climate actions as well as planning decisions that may be affected by climate change; (ii) specific mechanisms for assessing the results and efficacy of government decisions in light of new scientific data; and (iii) mechanisms for adjusting course based on such assessments.²³⁴

Recognizing State obligations to pursue adaptive management in the context of climate change would be consistent with existing legal authorities, including UNFCCC and Paris Agreement provisions related to stocktaking (which recognize State obligations to periodically re-assess and revise GHG mitigation commitments), as well as more general legal obligations related to monitoring, environmental assessment, and contingency planning.²³⁵

2. Access to Information and Public Participation

The Escazú Agreement provides that each State party “shall ensure the public’s right of access to environmental information in its possession... in accordance with the principle of maximum disclosure” and “facilitate access to environmental information for persons or groups in vulnerable situations.”²³⁶ States also have an obligation to ensure that competent authorities “generate, collect, publicize, and disseminate environmental information relevant to their functions in a systematic,

²³⁴ For example, in the context of river basin management, a government plan could specify thresholds for conservation measures based on monitored flow levels.

²³⁵ See IACtHR Advisory Opinion OC-23/17 at § B.1.c (recognizing state obligations to regulate, supervise and monitor, require and approve environmental impact assessments, and prepare contingency plans, as part of broader obligations to prevent environmental harm).

²³⁶ Escazú Agreement Art. 5.

proactive, timely, regular, accessible, and comprehensive manner.”²³⁷ The public also has a right to participate in environmental-decision-making processes, and States must take measures to facilitate public participation, particularly for vulnerable groups and individuals.²³⁸ As this Court and other legal authorities have recognized, these requirements are closely related to and part of the State duties to mitigate environmental harm and prevent transboundary harm.²³⁹

There are several types of information related to climate change that State authorities should be compiling and disclosing in public documents. These include:

- **GHG Emissions Data:** Consistent with the requirements of the Escazú Agreement, other human rights instruments, and UNFCCC instruments, States should prepare and periodically update GHG emissions inventories that provide a detailed account of GHG sources under their jurisdiction. States should also disclose GHG emissions attributable to specific State actions, such as new policies or administrative approvals, and should provide the public with an opportunity to provide feedback on how and whether to proceed with those actions in light of climate change. For example, GHGs should be routinely disclosed as part of existing environmental impact assessment (EIA) procedures. In addition to data on territorial emissions, States should also provide data on extraction-based emissions (i.e., emissions from fossil fuel production, transportation, and processing, even for fuels that are exported to other jurisdictions).²⁴⁰ To the extent possible, States should also endeavor to provide information on carbon leakage and consumption-based emissions.
- **GHG Mitigation Measures:** States should carefully track their progress on GHG mitigation and periodically publish reports with detailed information about the nature and scope of GHG reduction measures and the effect that those measures are having on actual emissions. Such reports can be coordinated with the UNFCCC stocktaking process for NDCs. The public should also be given an opportunity to review and provide feedback on the efficacy and adequacy of the State’s mitigation measures, and that feedback should also be made available to the public along with information about how government decision-makers have incorporated the feedback into climate policies.
- **Climate impact assessments:** States should conduct periodic assessments of climate impacts, exposure, and vulnerability within their territory in order to help inform adaptation planning as well as discussions related to climate finance and loss and damage. Such assessments should be conducted in close coordination with scientists and affected communities, with ample opportunities for public input.

²³⁷ *Id.* Art. 6.

²³⁸ *Id.* Arts 2(a), 4(b)

²³⁹ See IACtHR Advisory Opinion OC-23/17 at § B.1.c ILC Draft articles on Prevention of Transboundary Harm from Hazardous Activities (2001), Arts. 3-18.

²⁴⁰ See *Held v. Montana*, *supra* note 156 (holding that a state law prohibiting analysis and disclosure of GHG emissions from fossil fuel extraction and other activities violated plaintiffs’ right to a clean and healthful environment).

- **Adaptation measures:** States should track their progress on adaptation planning and periodically publish reports with detailed information about the actions that they have undertaken to protect people and ecosystems from the harmful effects of climate change. Again, there should be an opportunity for public review and feedback, and the State should be transparent regarding how it has responded to public feedback.

States should provide ample opportunities for public participation when conducting these activities and in other aspects of decision-making on climate change. Public participation can improve the quality of decision-making because decision-makers have more complete information – e.g., citizens can share local environmental and scientific knowledge to help inform climate impact assessments and adaptation decisions.²⁴¹ Public participation mechanisms can also be structured to enhance accountability – e.g., by requiring decision-makers to justify decisions in light of public feedback. Participatory mechanisms thus play an important role in science-based decision-making.

3. Access to Justice

As this Court has recognized, States have an obligation to guarantee access to justice in relation to their environmental protection obligations, including opportunities to contest any provision, act, or omission of public authorities that violates or could violate obligations under environmental and human rights law.²⁴² Thus, States must ensure that individuals and communities can use judicial procedures to challenge decisions related to climate policy.

However, in climate litigation, prospective plaintiffs are sometimes denied access to judicial procedures and remedies on the grounds that they lack standing to pursue claims based on climate change-related injuries. For example, courts may determine that plaintiffs cannot establish a particularized injury on the basis of climate change,²⁴³ or that plaintiffs cannot establish a sufficient

²⁴¹ See Victoria Reyes-García, *Local Indicators of Climate Change: The Potential Contribution of Local Knowledge to Climate Research*, 7(1) WILEY INTERDISCIP. REV. CLIM. CHANGE 109 (2016), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5023048/>.

²⁴² IACtHR Advisory Opinion OC-23/17 at ¶ 237.

²⁴³ See, e.g., *Verein KlimaSeniorinnen Schweiz v. Bundesrat*, No. A-2992/2017, <https://climatecasechart.com/non-us-case/union-of-swiss-senior-women-for-climate-protection-v-swiss-federal-parliament/>; *Armando Ferrão Carvalho and Others v. The European Parliament and the Council*, No. T-330/18, <https://climatecasechart.com/non-us-case/armando-ferrao-carvalho-and-others-v-the-european-parliament-and-the-council/>; *Citizens' Committee on the Kobe Coal-Fired Power Plant v. Japan* (2018), <https://climatecasechart.com/non-us-case/citizens-committee-on-the-kobe-coal-fired-power-plant-v-kobe-steel-ltd-et-al/>.

causal nexus between emissions and specific climate change-related injuries.²⁴⁴ Such dismissals often occur before a full trial or investigation of facts.

In order to guarantee access to justice in the context of climate change, States should ensure that judicial procedures allow plaintiffs adequate opportunities to present scientific evidence in support of standing claims. Some jurisdictions recognize that organizations and groups may file lawsuits on behalf of the public interest, in which case standing can be established based on public harm or endangerment.²⁴⁵ In other cases, plaintiffs may need to demonstrate that they have experienced a particularized injury (or risk of injury) due to the defendant's conduct or inaction in order to have standing to sue.²⁴⁶ In such cases, questions of injury and causation are closely intertwined with the merits of the case, such that it may be prudent for courts to evaluate both issues in the same factual investigation. The UN Human Rights Committee recently recognized this very point when it affirmed the admissibility of the Torres Strait islanders' claims in *Daniel Billy et al. v. Australia*, where it noted that "whether the authors' Covenant rights were breached cannot be dissociated from the merits of the case".²⁴⁷ There are also a number of domestic cases in which courts have found that plaintiffs have standing to enforce individual rights claims on the basis of their unique climate change-related injuries.²⁴⁸ These decisions can be contrasted to a recent judgment from the European Court of Justice (ECJ) holding that individuals lack standing

²⁴⁴ See, e.g., *Washington Environmental Council v. Bellon*, 732 F.3d 1131 (9th Cir. 2013), <https://climatecasechart.com/case/washington-environmental-council-v-bellon/>; *Native Village of Kivalina v. ExxonMobil Corp.*, 663 F.Supp.2d 863 (N.D. Cal. 2009), <https://climatecasechart.com/case/native-village-of-kivalina-v-exxonmobil-corp/>.

²⁴⁵ See, e.g., *Urgenda v. Netherlands*, *supra* note 134 (recognizing that non-governmental organizations have standing to sue on behalf of the public interest). See also *Nuestros Derechos al Futuro y Medio Ambiente Sano et al. v. Mexico*, Amparo No. 204/2021 (First Circuit Collegiate Tribunal, April 7, 2021), <https://climatecasechart.com/non-us-case/nuestros-derechos-al-futuro-y-medio-ambiente-sano-et-al-v-mexico-unconstitutionality-of-the-reform-to-the-electric-industry-law/> (recognizing that non-governmental organizations have legal standing to file amparo lawsuits (constitutional challenges) to defend the right to a healthy environment). Cf. *Julia Habana et al. v. Mexico* (Unconstitutionality of the reform to the Electricity Industry Law), Amparo No. 210/2021 (Supreme Court of Mexico Dec. 7, 2022), <https://climatecasechart.com/non-us-case/julia-habana-et-al-v-mexico-unconstitutionality-of-the-reform-to-the-electricity-industry-law/> (to have standing, individual plaintiffs must show that they have a personal, qualified, current, real and legally relevant interest in the case); *Jóvenes v. Gobierno de México*, Amparo No. 1854/2019 (District Court on Administrative Matters, May 20, 2021), <https://climatecasechart.com/non-us-case/youth-v-government-of-mexico/> (to have standing, individual plaintiffs must establish that they are in a situation that differentiates them from the rest of society).

²⁴⁶ See, e.g., *Jóvenes v. Gobierno de México*, *supra* note 246; *Julia Habana et al. v. Mexico*, *supra* note 246.

²⁴⁷ *Daniel Billy et al. v. Others*, *supra* note X, at para 7.3

²⁴⁸ See, e.g., *Held v. Montana*, *supra* note 156; *Future Generations v. Ministry of Environment* (Colombia), *supra* note 134.

to challenge European Union climate policies of general application on the basis of climate-related injuries because climate change affects all individuals in one manner or another.²⁴⁹ If the ECJ's reasoning were extended to other legal systems and rights-based claims, it would preclude essentially all individuals from enforcing fundamental rights in the context of climate change. Thus, the approach taken by the UN Human Rights Committee and other courts is more consistent with human rights law and State obligations to ensure access to justice.

Conclusion

As detailed above, the scientific evidence shows that climate change poses a real and pervasive threat to a broad array of human rights, and that States must undertake ambitious mitigation and adaptation measures in order to prevent and mitigate harm to people and ecosystems. Scientific research can also be used to assess the relative responsibility of different States for climate change and attributable harms, thus informing legal determinations on States' differentiated responsibilities with respect to climate change mitigation, climate finance, and loss and damage. Climate science thus provides evidentiary support for recognizing and characterizing a wide array of State obligations related to the protection of human rights in the context of climate change.

²⁴⁹ *Armando Ferrão Carvalho and Others v. The European Parliament and the Council*, *supra* note 244.

Appendix: List of Attachments

- Attachment 1: KATELYN HORNE, MARIA ANTONIA TIGRE, & MICHAEL GERRARD, STATUS REPORT ON PRINCIPLES OF INTERNATIONAL AND HUMAN RIGHTS LAW RELEVANT TO CLIMATE CHANGE (Sabin Center for Climate Change Law, 2023)
- Attachment 2: MICHAEL BURGER & MARIA ANTONIA TIGRE, GLOBAL CLIMATE LITIGATION REPORT: 2023 STATUS REVIEW (Sabin Center for Climate Change Law, Columbia Law School & United Nations Environment Programme, 2023)
- Attachment 3: Michael Burger, Jessica Wentz, & Radley Horton, *The Law and Science of Climate Change Attribution*, 45(1) COLUM. J. ENVTL. L. 57 (2020)
- Attachment 4: WORLD METEOROLOGICAL ORGANIZATION (WMO), STATE OF THE CLIMATE IN LATIN AMERICA AND THE CARIBBEAN 2021 (2022)
- Attachment 5: Stella M. Hartinger et al., *The 2022 South America Report of the Lancet Countdown on Health and Climate Change*, 20 LANCET REGIONAL HEALTH – AMERICAS (2023)
- Attachment 6: Christopher Bataille et al., *Net-zero Deep Decarbonization Pathways in Latin America: Challenges and Opportunities* (Inter-American Development Bank Sept. 2020)
- Attachment 7: Christopher Bataille et al., *Policy Lessons from the Deep Decarbonization Pathways in Latin America and the Caribbean Project: Overall Synthesis and Country Team Perspectives* (2020).