Our Children's Trust Submission to the United Nations Special Rapporteur on Cultural Rights and Climate Change

May 2020

Our Children's Trust

Our Children's Trust ("OCT") is a non-profit organization that provides strategic, campaign-based legal services to youth to secure their rights to a safe climate. OCT writes to draw the attention of the Special Rapporteur to the substantive obligations of states under international human rights law to refrain from conduct that harms cultural rights in the context of a warming climate. Children disproportionately suffer from the dangers and catastrophic impacts of global climate change. In light of children's particular vulnerabilities to climate change impacts, the substantive obligations necessary to preserve the human right to a stable climate, and thus all other underlying human rights, should be linked directly to the ***temperature and atmospheric greenhouse gas concentration standard as defined by the best available science.*** This standard would provide a clear benchmark to states for the protection of human rights in a climate change-affected world. According to the best available science, all State policies regarding atmospheric carbon dioxide ("CO_2") pollution and CO_2 sequestration should be aimed at reducing global CO_2 concentrations to ***below 1°C above pre-industrial temperatures and 350 parts per million ("ppm") by 2100*** to ensure that youth and future generations have access to a stable climate and can realize all human rights that a stable climate underpins, including the enjoyment of cultural rights.

This submission (1) contextualizes the cultural rights implications of climate change through the experiences of youth across the United States and Canada; (2) explicates the need for a scientific, as opposed to political, standard for human rights-compliant climate change mitigation; (3) sets out the State actions that are necessary to align concentrations of CO_2 with the 350 ppm standard and thereby prevent the adverse impacts of climate change on culture; and (4) provides overall recommendations for the Special Rapporteur in her report to the General Assembly.

I. States' Dangerous Greenhouse Gas Emissions Endanger Children and Violate Cultural Rights by Causing and Contributing to Climate Change

Climate change poses significant risks to the enjoyment of human rights recognized under international human rights law. A stable climate is essential to the preservation of human rights and all cultures on earth. Culture is fundamental to human dignity and identity[1] and therefore inseparable from human rights. State action and inaction has resulted in dangerous levels of greenhouse gas ("GHG") emissions, which have in turn caused and contributed to: (1) widespread food and water shortages; (2) more frequent and intense extreme weather events; (3) increased rates of disease; (4) loss of access to a safe and secure community structure; and (5) inability to participate in traditional cultural activities. Harms from climate change impact all aspects of a child's life, and children are especially and disproportionately vulnerable to many of these climate change impacts,[2] including culture and cultural rights.[3]

[1] Universal Declaration of Human Rights art. 27, Dec. 10, 1948, U.N. Doc. A/810 at 76.

[2] *See, e.g.,* World Health Organization, *Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s* (2014), https://www.who.int/globalchange/publications/quantitative-risk-assessment/en/.

A stable climate system is critical to the protection of cultural rights.[4] State parties to the ICESCR and other U.N. treaty bodies are violating cultural rights by continuing to cause and contribute to climate change and failing to adequately address the climate crisis.[5] Accordingly, State parties are also failing to ensure the special protection of cultural rights of particularly vulnerable groups, primarily children and youth.

The enjoyment of culture is threatened by climate change in numerous ways, particularly insofar as the culture is tied to the natural environment. The following stories (provided in **Appendix A**) from youth across the United States and Canada illustrate how extreme weather events, increased temperatures, ecosystem disruption, and the disappearance of snow or ice, negatively impact traditional practices and cultural heritage, and further demonstrate that the cultural rights of children, youth, and future generations are being impacted in specific and disproportionate ways.

The stories are from youth who are petitioners in ongoing climate litigation against their respective State governments.[6] The youth that OCT work with on these legal actions allege that the State causes, contributes to, and allows dangerous levels of GHG emissions and is thus

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[3] *See* International Covenant on Economic, Social and Cultural Rights ("ICESCR") art. 15, Dec. 16, 1966, 993 U.N.T.S. 3; Convention on the Rights of the Child ("CRC") arts. 30, 31, Sept. 2, 1990, 1577 U.N.T.S. 3; Declaration on Rights of Indigenous People ("UNDRIP"), arts. 11, 25, Oct. 2, 2007, U.N. Doc. A/RES/61/295. Specific rights implicated by climate change impacts include, *inter alia*, the rights to self-determination (International Covenant on Civil and Political Rights ("ICCPR") art. 1, Dec. 19, 1966, 999 U.N.T.S. 171; ICESCR art. 1); life (ICCPR art. 6; CRC art. 24); health (ICCPR art. 12; CRC art. 24); water (The Convention on the Elimination of All Forms of Discrimination against Women ("CEDAW") art. 14, Dec. 18, 1979, 1249 U.N.T.S. 13; CRC art. 24.); means of subsistence (ICESCR art. 1); adequate standard of living (ICESCR art. 12; CRC art. 27); adequate housing (ICESCR art. 12); property (Universal Declaration of Human Rights art. 17, Dec. 10, 1948, U.N. Doc. A/810 at 71); education (ICESCR art. 13; CRC art. 28); parental rights (CRC arts. 7, 9); and freedom from exploitation (CRC arts. 34, 36, 37).

[4] The meaning of the term "culture" in Article 15 of the ICESCR is defined broadly as "a way of life," and "a broad, inclusive concept encompassing all manifestations of human existence." Accordingly, culture:

> encompasses, inter alia, ways of life, language, oral and written literature, music and song, non-verbal communication, religion or belief systems, rites and ceremonies, sport and games, methods of production or technology, natural and man-made environments, food, clothing and shelter and the arts, customs and traditions through which individuals, groups of individuals and communities express their humanity and the meaning they give to their existence, and build their world view representing their encounter with the external forces affecting their lives.

See CESCR, *General Comment No 21: Right of everyone to take part in cultural life (art. 15, para. 1(a)), of the International Covenant on Economic, Social and Cultural Rights*, UN Doc E/C.12/GC/21, (2009).

[5] *See also* Five UN human rights treaty bodies issue a joint statement on human rights and climate change, Joint Statement on "Human Rights and Climate Change," OHCHR (September 16, 2019), https://www.ohchr.org/en/NewsEvents/Pages/DisplayNews.aspx?NewsID=24998&LangID=E ("Failure to take measures to prevent foreseeable human rights harm caused by climate change, or to regulate activities contributing to such harm, could constitute a violation of States' human rights obligations.") (internal citations omitted).

[6] OCT works with youth petitioners on several legal actions, which are currently pending in different jurisdictions in the United States and Canada. *See Juliana v. United States*, 217 F.Supp.3d 1224, 1233 (D. Or. 2016); *La Rose, et al. v Her Majesty the Queen, et al.*, (25 October 2019) Vancouver T-1750-19 (FC) (Statement of Claim). *See also* Our Children's Trust, *State Judicial Actions Now Pending*, https://www.ourchildrenstrust.org/pending-state-actions (last visited April 30, 2020).

responsible for the specific, individualized harms they are experiencing, which includes the infringement of their cultural rights. This includes State-caused-harm to: (a) religious practices; (b) hunting and traditional foods; and (c) access to natural environment. The youth have experienced cultural harms in the states of Washington, Alaska, Montana, Florida, and Arizona, as well as in the provinces of Ontario, Quebec, British Columbia and the Northwest Territories. Seventeen (17) youth included in this submission have experienced impacts to religious practices; 18 have experienced impacts to hunting and food sources; and all 19 have experienced loss and damage to their natural environment and heritage.

Religious Practices

Climate change has and continues to permanently damage and undermine traditional ways of life, such as religion, belief systems, and rites and ceremonies. Indigenous youth whose religious practices are closely tied to the seasons and natural environment are distinctly impacted. Youth have lost traditional lands and burial sites due to rising sea levels and coastal erosion; the availability of traditional medicines due to rising temperatures; the ability to participate in spiritual ceremonies, including sweat lodge ceremonies; and the loss of elder and historical knowledge, which further endangers the cultural integrity of communities.

Hunting and Traditional Foods

Climate change continues to threaten many youth's culturally significant food sources and diet, and threatens hunting, harvesting, and gathering practices. Wild game animals that communities rely on have become increasingly scarce and difficult to find due to rising temperatures and resulting changes in herd range and behavior; and drumming gatherings and story-telling is inhibited by decreasing deer populations, as traditional drums are made from hides.

Similarly, non-indigenous youth's hunting traditions are impacted by climate change. The heat, smoke, and drought conditions pose challenges for wildlife and alters their normal range, behavior, and populations, which makes hunting difficult; additionally, the warming and acidification of ocean waters harms the ecosystems and aquatic species that have traditionally sustained many of the youth's diets.

Access to Natural Environment

Climate change continues to alter the environment and landscape, which significantly impacts traditional sports and outdoor activities. These activities and practices are often integral parts of the youth's lifestyles and foundational to their family life. Increasing temperatures, wildfire smoke, and extreme weather events continue to impact the youth's ability to partake in this part of their heritage.

Furthermore, climate change continues to jeopardize the youth's ability to learn and engage in traditional and cultural practices and customs that have been passed down for generations. Thus, as temperatures increase, extreme weather becomes the norm, and the natural

environment erodes, the continued viability of culture is at risk and many traditions may be lost forever.

See **Appendix A** for detailed stories of the youth referenced in this submission.

II. States Must Abide by the Best-Available Science to Ensure a Stable Climate System, Which Upholds Human Rights and Cultural Rights

Given that "urgent, effective and ambitious action"[7] to ensure a stable climate system is essential to protecting an array of human rights threatened by the impacts of climate change, states have an obligation to pursue scientific rather than political targets for climate change mitigation. The best available climate science provides a prescription for climate recovery that requires states to collectively decrease CO_2 levels to below 350 ppm by 2100 and stabilize the long-term average global temperature increase at no higher than 1°C (*see also* **Appendix B,** Why 350?).[8] Adverse impacts on human rights are already occurring at 1°C of warming, and children and youth are already being harmed at this global temperature; every additional increase in temperature will only further undermine the realization of rights.[9] The Special Rapporteur, and all other U.N. treaty bodies and mandates, should utilize this clear scientific prescription as the standard that states must achieve in order to uphold their legal obligations under international human rights law.

In contrast, the emission reduction pledges ("Nationally Determined Contributions" or "NDCs") made by States as political decisions pursuant to the Paris Climate Agreement, if achieved, would result in GHG emissions increasing through 2030 and would cause catastrophic climate warming of between 2.7 ºC and 3.5 ºC.[10] Even the aspirational 1.5°C or "well below" 2°C benchmarks cited in Article 2 the Paris Agreement—which are commonly associated with atmospheric CO_2 concentrations of 425 ppm and 450 ppm, respectively—have not been nor are presently considered safe or scientifically-sound targets for present or future generations.[11] The

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[7] Zeid Ra'ad Al Hussein, *Burning Down the House*, OHCHR (December 3, 2015), https://www.ohchr.org/EN/NewsEvents/Pages/BurningDowntheHouse.aspx?utm_source=hootsuite ("Given the stakes, urgent, effective and ambitious action is certainly a moral imperative. But it is also a legal obligation.").

[8] Our Children's Trust, *Government Climate and Energy Actions, Plans, and Policies Must Be Based on a Maximum Target of 350 ppm Atmospheric CO2 and 1°C by 2100 to Protect Young People and Future Generations*, https://www.ourchildrenstrust.org/s/20190411OCTWhy350Final.pdf.

[9] Joint Statement on "Human Rights and Climate Change," *supra* note 5.

[10] Louise Jeffrey et al., *2.7°C is Not Enough—We Can Get Lower*, Climate Action Tracker Update (Dec. 8, 2015), http://climateactiontracker.org/news/253/Climate-pledges-will-bring-2.7C-of-warming-potential-for-more-action.html; Climate Interactive, *Climate Scoreboard: UN Climate Pledge Analysis*, https://www.climateinteractive.org/programs/scoreboard/ (last visited April 29, 2020).

[11] Roy, J., et al., *Sustainable Development, Poverty Eradication and Reducing Inequalities.* In *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* at 447 (2018) ("Warming of 1.5°C is not considered 'safe' for most nations, communities, ecosystems and sectors and poses significant risks to natural and human systems as compared to the current warming of 1°C (*high confidence*)."). IPCC, *Summary for policymakers* at 13-14, Climate Change 2014: Impacts, Adaptation, and Vulnerability (2014), http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/ar5_wgII_spm_en.pdf; UNFCCC, *Report on the structured expert dialogue on the 2013–2015*

2°C figure, for instance, was originally adopted in the political arena "from a set of heuristics" and has retained this predominantly political character ever since.[12] In light of the IPCC's findings in its 1.5°C Special Report, as well as the mounting evidence leading to publication that 2°C is catastrophic relative to lower, achievable levels of warming, the international community has all-but-abandoned 2°C as a credible policy goal.[13]

Additionally, state compliance with political targets such as those outlined in the Paris Agreement should not be deemed to constitute compliance with human rights obligations in the area of climate change. While states have some discretion in setting environmental standards for the protection of human rights, such standards should be "consistent with all relevant international environmental, health and safety standards," and "should take into account the best available science."[14] Although there is a wealth of case law applying international environmental, health and safety standards in the area of environmental human rights,[15] in none of these cases did the State's actions meet or exceed purported domestic and international environmental, health and/or safety standards. Rather, the State's actions either did not comply with international standards (resulting in the court finding a human rights violation), or the applicant failed to provide evidence of non-compliance.[16] Nor should the principle of systemic integration lead to equating compliance with the Paris Agreement with compliance with human rights obligations.[17] The principle of systemic integration is not universally applicable,[18] and is not appropriately-applied to the context of climate change. This is because parties to the

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review, 18 (2015), http://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf; Petra Tschakert, *1.5 °C or 2 °C: a conduit's view from the science policy interface at COP20 in Lima, Peru,* Climate Change Responses 8 (2015), http://www.climatechangeresponses.com/content/2/1/3; 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, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* (2018), https://www.ipcc.ch/sr15/.

[12] Randalls, S., *History of the 2°C Temperature Target*. 1. WIREs Climate Change 598, 603 (2010); Jaeger, C. and J. Jaeger, *Three views of two degrees*. 11 (Suppl. 1) Regional Environmental Change S15 (2011).

[13] Roy, J., et al., *supra* note 11, at 447 ("Warming of 1.5°C is not considered 'safe' for most nations, communities, ecosystems and sectors and poses significant risks to natural and human systems as compared to the current warming of 1°C (*high confidence*)."). Notably, it is beyond the IPCC's mandate to endorse a particular threshold of warming as "safe," and "each major IPCC assessment has examined the impacts of [a] multiplicity of temperature changes but has left [it to the] political processes to make decisions on which thresholds may be appropriate." *See* IPCC*, Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report*, 125 (2014), http://report.mitigation2014.org/report/ipcc_wg3_ar5_chapter1.pdf.

[14] Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment, Jan. 24, 2018, U.N. Doc. A/HRC/37/59 at 14.

[15] *See, e.g*., *Fadeyeva v. Russia*, no. 55723/00 (ECHR 2005), ¶69; *Borysiewicz v. Poland*, no. 71146/01 (ECHR 2008), ¶¶52-53; *Arrêt Tătar c. Roumanie*, no. 67021/01 (ECHR 2009), ¶¶93-97; *Kámok Kásek Indigenous Community v. Paraguay,* No. 214 (IACHR 2010).

[16] *See, e.g., Borysiewicz v. Poland,* no. 71146/01 (ECHR 2008), ¶ 53.

[17] Cf. Annalisa Savaresi, *Climate Change and Human Rights*. In *Routledge Handbook of Human Rights and Climate Governance* (2018, Routledge) 31.

[18] *Id*. at 34.

UNFCCC rejected from the outset the idea that the UNFCCC would be systemically-integrated with or supersede more general, pre-existing international obligations.[19]

As a result, while State GHG emissions mitigation actions that fail to align with the State's NDC or Paris Agreement's temperature goals are irrefutably a violation of the right to a stable climate system, it does *not* follow—and the relevant jurisprudence does not suggest—that state actions that merely comply with these temperature goals are sufficient to protect the right to a stable climate system. As set out above, the best available ***science indicates that even 1.5°C of warming above pre-industrial temperatures for any significant amount of time jeopardizes the right to a safe climate for future generations.*** Consequently, more ambitious mitigation efforts are needed than those encompassed by the Paris Agreement to protect the human rights of children and youth.

III. State Action is Necessary to Reduce CO_2 levels to 350 ppm and Mitigate Adverse Effects of Climate Change on Cultural and Human Rights

There is a small window of opportunity for States to fulfill their legal obligations by taking the urgent science-based action needed to protect human rights and mitigate the catastrophic effects of climate change. The process to reduce CO_2 levels to 350 ppm by the end of the century is twofold. First, CO_2 emissions must be reduced as significantly and rapidly as possible. Carbon dioxide emission reductions of approximately 80% by 2030 and close to 100% by 2050 are necessary to keep long-term warming to 1°C and the atmospheric CO_2 concentration to 350 ppm. To achieve these reductions, States must *immediately* cease actions supporting industries that extract, process, transport and burn fossil fuels, such as oil, gas, and coal, and must implement comprehensive climate recovery plans, programs, and policies to rapidly reduce GHG emissions in line with this trajectory.[20] Emission reduction targets that seek to reduce CO_2 emissions by 80% by 2050 are consistent with long-term warming of 2°C and an atmospheric

[19] See Roda Verheyen, *Climate Change Damage and International Law* (2005, Martinus Nijhoff) 145 ("In sum, nothing in the negotiation history or the structure of the existing treaties [i.e. the UNFCCC and the Kyoto Protocol] indicates that the rules of the regime are *lex specialis* vis à vis other rules of international law. This applies both to the level of primary rules and the levels of legal consequences for breach (secondary rules)."); Patricia Birnie et al., *International Law & the Environment* (OUP, 2009) 371 fn. 187 ("The governments of Nauru, Tuvalu, Kiribati, Fiji, and Papua-New Guinea made declaration on signature or ratifications stating that the Convention [i.e. UNFCCC] did not constitute a renunciation of any rights under international law concerning state responsibility for adverse effects of climate change or a derogation from the principles of general international law.").

[20] James Hansen et al., *Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature*, 8(12) PLOS ONE 81648, 10 [hereinafter *Assessing "Dangerous Climate Change"*] ("Halting emissions in 2015 causes CO2 to decline to 350 ppm at century's end . . . . A 20 year [sic] delay in halting emissions has CO2 returning to 350 ppm at about 2300. With a 40 year [sic] delay, CO2 does not return to 350 ppm until after 3000."). For an outline of an approach for states to take to successfully reduce emissions, *see* Mark Jacobson et al., *100% Clean and Renewable Wind, Water, and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World*. 1 JOULE 108 (2017); Mark Jacobson et al., *Matching demand with supply at low cost in 139 countries among 20 world regions with 100% intermittent wind, water, and sunlight (WWS) for all purposes*, 123 Renewable Energy 236 (2018).

CO_2 concentration of 450 ppm, which would result in catastrophic and irreversible impacts for the climate system and oceans.

Second, these actions to reduce emissions on the prescribed trajectory must be coupled with programs to sequester or "drawdown" excess CO_2 already in the atmosphere through natural sequestration projects, such as reforestation and improved agricultural and forestry practices.[21] It is important to emphasize that the 350 ppm target cannot be accomplished without this significant drawdown of atmospheric carbon and that such a drawdown is distinct from reducing emissions. *Both* CO_2 emissions reductions *and* substantial CO_2 drawdown are required to restore climate stability.

Research in the United States suggests that this transformation is both technologically available and economically feasible. Recent research by Deep Decarbonization Pathways Project and Evolved Energy Research produced sophisticated modeling demonstrating the feasibility of a near-complete phase out of fossil fuels in the United States by 2050.[22] The authors describe six different technologically-feasible pathways to quickly and drastically cut reliance on fossil fuels and achieve the requisite level of emissions reductions in the United States while meeting forecasted energy needs.[23] All of the 350 ppm pathways rely on four pillars of action: (1) investment in energy efficiency; (2) electrification of everything that can be electrified; (3) shifting to very low-carbon and primarily renewable electricity generation; and (4) carbon dioxide capture as fossil fuels are rapidly phased out.[24] The six scenarios are used to evaluate the ability to achieve a 350 ppm-consistent transition even absent one key technology. Such a transition can and must be implemented in a way that respects, promotes, and upholds human rights.

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[21] *Assessing "Dangerous Climate Change," supra* note 21, at 10; World Agroforestry Centre, *Credits where credit's due: a guide to community-level carbon forestry project development* (2014); I. A. Janssens et al., *The Carbon Budget of Terrestrial Ecosystems at Country-Scale—a European Case Study*, 2 Biogeosciences 15, 23-25 (2005); Robert Lal, *Soil Carbon Sequestration Impacts on Global Climate Change and Food Security*, 304 Science 1623, 1623-1626 (2004); Rodale Institute, *Regenerative Organic Agriculture and Climate Change: A Down-to-Earth Solution to Global Warming,* http://rodaleinstitute.org/assets/WhitePaper.pdf (last visited April 26, 2020); Bronson Griscom et al., *Natural climate solutions*. 114(44) U.S. Proceedings Nat'l Acad. Sci. 11645, 11648.

[22] Ben Haley et al., *350 ppm pathways for the United States* (2019), https://www.ourchildrenstrust.org/350-ppm-pathways.

[23] Unlike some other modelling of low emissions pathways, the *350 ppm pathways for the United States* report assumes the same level of U.S. economic growth and increased consumption of "energy services" as the baseline projections provided by the U.S. Energy Information Administration, which project demand to increase out to 2050. *Id*. at 52. The choice of this assumption in the report should not be taken as an endorsement by the report's authors or Our Children's Trust of the desirability of increasing U.S. energy services demand in the context of a warming climate, particularly in light of the United States' disproportionate share of historical cumulative CO_2 emissions. Were U.S. energy services demand to decrease in the future, the level of emissions reductions modelled in the report could be achieved more easily and rapidly.

[24] The use of CO_2 capture in some of the modelled scenarios should be considered a function of the increasing energy services demand assumption described in footnote 42. It should be emphasized that CO_2 capture is deployed in the modelling in conjunction with an extremely rapid phase-out of fossil fuels and therefore is in no sense enabling continued fossil fuel use. *Id.* at 63.

The study also concludes that the cost of the energy system transition is affordable. The total cost of supplying and using energy in the United States in 2016 was about 5.6% of GDP.[25] A transition from fossil fuels to low carbon energy sources is expected to increase those costs by no more than an additional 2-3% of GDP. Even with this small and temporary added expense, the cost would still be well below the 9.5% of GDP spent on the U.S. energy system in 2009 and well below the harm to the economy caused by climate change.[26]

IV. Recommendations to the Special Rapporteur

In the report to the General Assembly, we respectfully urge the Special Rapporteur to address the substantive obligations related to the right to culture and other human rights in light of the particular circumstances and vulnerabilities of children, youth, and future generations. In particular, we call on the Special Rapporteur to recognize that:

1. The best available science is clear that a climate system beyond 1°C of warming above pre-industrial temperatures and 350 ppm CO_2 is not protective of individual human rights;

2. Marrying international political commitments to human rights standards risks depriving future generations of the stable climate system such standards are supposed to secure; and

3. State action to reduce harmful GHG emissions and sequester atmospheric carbon as rapidly as feasible is, therefore, the only way to ensure that young people and future generations have access to a stable climate system and can realize all the human rights that a stable climate underpins.

We are grateful for this opportunity for input in the Special Rapporteur's report.

[25] *Id.*, Figure 9.
[26] *Id*., Figure 9.

Appendix A

Religious Practices

Haana E.

Haana is 16 years old and resides in the village of Masset on Haida Gwaii, British Columbia. Haana is a member of the Tsitts Gitanee clan of the Haida Nation. Sea level rise threatens to wash away Haana's home and traditional lands where her people have lived since time immemorial. Haana's grandfather's village of Skedans – an ancient Haida village that is part of the Gwaii Haanas National Park Reserve and Haida Heritage Site, and is a registered National Historic Site of Canada – is experiencing increasing damage as a result of rising sea levels, extreme weather and erosion. Burial sites are being disturbed and unearthed and totem poles have been damaged. These impacts jeopardize the continued existence of this culturally and personally significant site.

Haana is learning to speak the Haida language, which is endangered, and spends much of her time engaging in Haida cultural practices. Haana's language, culture and mythology is deeply interconnected with the animals, plants, waters, natural resources, climate and ecology of Haida Gwaii. As part of her cultural practices, Haana fishes and harvests berries, roots, cedar bark and other plants from her local environment.

Harvested and hunted foods, particularly fish, form a large and culturally-significant part of Haana's diet on Haida Gwaii. Haana and her family regularly fish for salmon. Warm river temperatures and low rainfall and river levels in recent years have led to low salmon numbers on Haida Gwaii. Haana's experiences deeply contrast with the stories she has heard from her elders of the rivers being full with salmon, which causes a cultural rift.

In the spring, Haana and her family harvest large amounts of berries and seaweed as her ancestors have done for thousands of years. Within Haana's lifetime, drier temperatures and lower rainfall have affected the quality and quantity of the berries harvested. Haana and her family harvest cedar bark from the sacred yellow cedar (*Cupressus nootkatensis*). Higher temperatures and drier weather are contributing to die-off and range-shifts of this critically important species. Yellow cedar, which Haida culture particularly values for its use in blanket weaving and other utilitarian and artistic uses, is becoming increasingly-scarce on Haida Gwaii. The decline in yellow cedar makes it more difficult for her to learn her culture, as less cedar bark availability means fewer people using the bark, and therefore fewer opportunities to pass on these cultural practices to the next generation.

In 2019, Haana stayed at the Rediscovery culture camp located at T'aalan Stl'ang, a remote beach on the west coast of Haida Gwaii, where she increased her knowledge about the connection between forests, beaches and oceans and Haida culture, and participated in cultural learning with her siblings. Haana sees her commitment to the resurgence in Haida culture as imperiled because the natural world on which Haida language and culture are based are disappearing because of climate change.

Jaime B.

Jaime is 18 years old and is a Diné (Navajo) person of Window Rock, Arizona. Jaime is of the Tangle People Clan, born for the Bitterwater Clan, maternal grandfathers are the Redhouse Clan,

and paternal grandfathers are the Toweringhouse Clan. She grew up in Cameron, Arizona on the Navajo Nation Reservation. In 2011, due to extreme heat, extended drought, and a scarcity of potable water, Jamie's cultural homeland became uninhabitable. Jaime and her family were forced to flee and resettle to the urban center of Flagstaff. Their home had no running water, and to find drinking water for her family, as well as the goats and sheep, Jaime and her family traveled to a distant spring and filled 50-gallon drums. Jaime and her extended family on the Reservation recall times when there was enough water on the Reservation for agriculture and farm animals, but now the springs they once depended on year-round are drying up. Jaime and her mother were no longer able to live sustainably in Cameron because of the high financial cost of hauling water into Cameron for their use and for their farm animals.

As a member of the Navajo nation, Jaime has a profound cultural and spiritual connection to the land on which she was raised, and that on which her ancestors have lived for generations. Jaime is concerned that her extended family, who still live on the Reservation, will also be displaced from their traditional lands, which would erode her culture and entire way of life.

While on the Reservation, Jaime and her family were forced to stop farming. Although they had dryland farmed and used drought resistant corn, which relied solely on the water from winter snowmelt, the dry topsoil was too deep to find damp earth, up to 12 inches in most areas. Jaime does not know of anyone who farms anymore on the Reservation. Jaime and her family engaged in subsistence farming, and they used to raise livestock, grow corn, tomatoes, and squashes in Cameron. They did not have to buy food from the grocery store; however, now, everything they eat is from the grocery store and most of the food is processed or canned.

There are many wild horses on the Reservation. The wild horses are culturally-significant animals to Jaime. Due to severe drought, many of the wild horses are starving and dying. High numbers of wild animals are dying on the Reservation, and Jaime's community is not equipped to deal with the carcasses of the wild animals. The rotting carcasses are contaminating natural resources due to the decaying matter and bacterial growth. This is extremely disturbing to Jaime because she cares deeply about the wild animals, which are a part of the land that is a part of Jaime's identity and cultural heritage.

According to Jaime, "climate impacts […] are already harming my ability, as well as the ability of my family and my tribe, to participate in traditional ceremonies,"[1] and therefore threaten the survival of indigenous cultural practices. Jaime has expressed fear for her future and for the future of her family, and their traditions, dignity, and way of life.

Participating in sacred Navajo ceremonies on the Reservation is an integral part of Jaime's life, and climate impacts endanger Jaime's ability to participate in traditional ceremonies. Ceremonies are governed by phases of the moon and seasons. The extreme drought and lack of water affect her ability to offer livestock, food, and water for ceremonies. Ceremonies often require objects secured in nature that were once plentiful, like medicinal plants, hides, and feathers. These natural resources are no longer plentiful, and the scarcity of these objects forces Jaime and her community to purchase these resources, including medicinal plants, because they can no longer harvest these sacred resources from the natural environment.

[1] Declaration of Jaime B. in Support of Plaintiffs' Opposition to Defendants' Motion for Summary Judgment, *Juliana v. United States*, No. 18-36802 (9th Cir. 2018), Doc. 115 at pp. 139-140 (¶¶ 2-4).

Jaime's cultural rights have been increasingly harmed as the climate crisis worsens. Compounding those losses is the increased vulnerability of Jaime's community and culture to other threats that are exacerbated by the climate crisis. The COVID-19 public health pandemic is another example of harm and hardship exacerbated by climate crisis. The lack of access to potable water on the Navajo Reservation, due to drought conditions, forces member of the Navajo nation to drive long distances and wait hours in line to retrieve water at utility water points. Laundromats are over-capacity as lines form outside, and families move quickly in and out of tightly packed spaces. The reduced ability to grow food and raise livestock, due to drought and heat, makes grocery stores the only access for food supply. However, there are only thirteen (13) grocery stores in a geographical area of twenty-seven thousand square miles. As COVID-19 positive numbers continue to climb, more families and clans face the loss of family members, mostly elders, who hold the enduring cultural knowledge of their people. The loss of historical knowledge further endangers the cultural integrity of the largest sovereign tribal nation within the United States, and Jaime's interests specifically.

Sophia S.

Sophia is 18 years old and resides in Gatineau, Quebec. Sophia is of Mi'kmaq descent and a member of the Metepenagiag First Nation. In the summer months, Sophia regularly visits and stays with her community on the Metepenagiag First Nation Reserve along the New Brunswick northeastern shore.

Sophia's community fish for and rely upon salmon and eel for their cultural and spiritual fulfillment and physical sustenance. Salmon are a central part of her Mi'kmaq cultural heritage and are also a critical food staple for Sophia and her community. Climate change has impacted Sophia's ability to partake in this cultural and spiritual activity. She has been unable to learn how to fish or participate in this central part of her culture because, within the last two to three years, the time frame to find salmon in the river has significantly decreased due to the warming water and, as a consequence, she has not had the opportunity to be taught to fish by her family.

Sophia's community hunts wild game in the area, and moose is a primary and culturally-significant food source for Sophia as a member of the Mi'kmaq community. Sophia's family and other Mi'kmaq families use moose meat caught over the fall season for the entire year. This activity also strengthens the bonds within the community as moose are so large that the meat is divided and shared.

Over the past decade, and particularly in recent years, the moose population in or around the reserve has severely declined due to climate change-induced heat and habitat loss due to flooding and deforestation. As a result, moose have become increasingly scarce. The change in the abundance of moose has impacted Sophia's family's ability to hunt for their food supply, and infringed upon a culturally significant practice that has sustained her community for thousands of years. Moose hides are traditionally used to make drums and drum sticks for ceremonies, and are draped over tee-pees, but moose hides are increasingly harder to prepare as the population declines. If the moose population continues to decline, Sophia's community will no longer be able to make and use drums and drum sticks as it traditionally has, which is central to Sophia's cultural and spiritual practices.

Collecting a variety of plants that can be used for medicinal purposes is an important practice that Sophia and other members of her community engage in. Sophia's uncle collects chaga, a fungus that grows on the side of birch trees, to make tea that has been used for centuries for medicine and sacred purposes. However, chaga has been increasingly difficult to find because it is sensitive to the rising temperatures and changing environment. This has negatively impacted Sophia's community's ability to collect and use chaga. Chaga is also traditionally used to treat cancer. Sophia has seen an increase in cancer rates within her community, and thus worries about the decline in the availability of chaga. She is also increasingly concerned that, as the availability of chaga and other traditional medicines declines, her generation and future generations will lose this knowledge held by her elders that is essential to her spiritual beliefs.

Sophia and her community have also traditionally gathered sweetgrass, a central medicine for her people. Sophia is no longer able to gather sweetgrass on her reserve and community members must now travel long distances to engage in this culturally important gathering activity. However, the sweetgrass in New Brunswick and Nova Scotia has been increasingly difficult to find and gather due to increased flooding, heavy rainfall and sea level rise impacts caused by climate change.

Cedar is a central component of Sophia's traditional cultural and spiritual practices, in particular it is used in ceremonies and traditional medicines for cleansing and energizing. Many elders in Sophia's community have described a significant decline in the number and health of cedar trees around the reserve, which is largely due to climate change. The rising temperatures have caused drought and made it too hot for cedar trees to survive, and many are being lost in neighboring wildfires or extreme heat spells. Cedar is used in many traditional ceremonies. For example, it is used to line the floor of sweat lodges, for smudging ceremonies, as well as in healing and fasting ceremonies, and as gifts from community members. The loss of cedar has had a substantial negative impact on Sophia's ability to participate in these traditional cultural activities.

The extreme heat in the summer and rising temperatures have also made it difficult, at times impossible, for Sophia and her community to participate in sweat lodge ceremonies during the summer, as doing so would be dangerous in the severe heat. Sweat lodges are traditionally held during every season, but this practice has been unavailable to Sophia and other community members during recent periods of extreme heat. The extreme heat has harmed Sophia's ability to participate in this culturally-significant practice, which is Sophia's connection to the spirit world and her ancestors.

Due to the increase in temperature and periods of drought, there have been a number of fire bans issued in the New Brunswick area. Sophia's community uses sacred fires in a number of traditional activities, such as sweat lodges, fasts, traditional feasts, death feasts and Powwows. Because of fire bans, many of these ceremonies have had to be cancelled.

Sophia is a jingle dress dancer and often travels to dance at different Powwows along the East Coast. Sophia has been a jingle dress dancer for approximately three years. The extreme heat prevents her from dancing for longer periods of time and limits her ability to dance. Jingle dress dancing is a healing ceremony that impacts Sophia's entire community. When Sophia is unable to focus on the healing and spiritual aspects of the dance, and is only able to focus on her stamina and health under extreme heat and stress, her spirituality and individual dignity are impacted.

Rising sea levels and substantial flooding around New Brunswick, Nova Scotia and Prince Edward Island have impacted Sophia's ability to retrieve red ochre with her uncle. Sophia's

uncle uses the red ochre to mix into a paste, which is then used as traditional face paint for the Mi'kmaq community. Because of its increasing inaccessibility due to sea level rise, red ochre is less commonly used in Sophia's traditional ceremonies and many people on her reserve are unable to experience the same traditions and practices as once existed.

Sophia is distressed at the thought of her community losing its culture again, at the same time as her people are working to regain such practices and restore their community.

Sariel S.

Sariel is 17 years-old and lives on the Flathead Indian Reservation, which is located in the State of Montana in the United States. Sariel is a member of the Confederated Salish and Kootenai Tribes. Sariel's family and community have a deep connection to the natural world, and have a body of knowledge about the environment closely tied to the seasons, locations, and environment. This body of knowledge is passed on by elders and family to Sariel so that her generation and younger generations can continue her community's spiritual familial traditions and ways of life.

Climate change is threatening Sariel's culture, which is already in constant jeopardy and at risk of being lost. The environment is one of the remaining connections Sariel and her community have to their culture; Sariel fears that her and her community's activities, practices, and beliefs will be entirely lost if the climate crisis is not promptly addressed. The threat of losing her community's important connection to the environment and losing her culture because of climate change is extremely stressful on Sariel.

The lack of winter snowpack in recent years, due to climate disruption, has harmed Sariel and her community on the Flathead Reservation. The Flathead Lake depends on the runoff from the snow but the lack of snow creates low water levels, which impacts her community's ability to fish for bull trout and rainbow trout. Snow is also a necessary component of certain traditional ceremonies, like Coyote Stories and Creation Stories. Sariel's elders are only able to share these stories when there is snow on the ground, but this winter season, and in recent winters, the snow has melted too quickly and this oral history thus cannot be shared with Sariel and the community. Climate change is impacting Sariel's ability to partake in cultural and spiritual activities, central to her individual dignity and being.

Sariel's family members hunt wild game on the Flathead Reservation, including bison. Sariel and her family rely on this food source for the rest of the year. Bison in particular, are a central part of her Salish and Kootenai cultural heritage and also a critical food source for Sariel and her community. Sariel and her family pick huckleberries, which they dry, freeze, and make into jam, syrup, and other foods, such as cheesecake for Sariel's birthday. However, Sariel has to travel farther and farther to pick huckleberries and the huckleberry picking season has been pushed later into the year because the berries are not ripe due to fluctuating and extreme temperatures. Sariel is concerned that as the climate crisis worsens, traditional food sources and cultural practices may be lost with the declining access to bison, berries, and other foods.

Climate disruption has made it difficult for Sariel to learn and engage in traditional and cultural practices and customs that have been passed down for generations. The passing on of cultural knowledge is incredibly important to Sariel, and she is increasingly worried that the impacts of climate change are threatening her opportunity and right to learn these practices so that she might

carry them on. The climate crisis has a profound emotional and psychological impact on Sariel, who stresses about the impacts her community is facing and will face in the near future. Sariel is distraught when thinking about her future and if she will even have one.

Ruby D. and Lilian D.

Ruby D. is 11 years old, and Lilian D. is 9 years old. Ruby and Lilian reside in Bozeman, Montana, and are of Crow descent and a member of the Crow Tribe of Montana. Many of Ruby and Lilian's family members live on the Crow Reservation, where they visit during the summer and for special occasions and celebrations.

Each year in August, Ruby, Lilian, and their family travel to Crow, Montana for Crow Fair, during which they engage in a number of traditional cultural and spiritual activities and practices, including Pow Wows, toymaking, horse-riding, dancing, story-telling, playing games, sleeping in a tipi, and eating traditional foods. Ruby is a jingle dress dancer and often dances at Crow Fair, and travels to jingle dress dance at different Pow Wows in the region. Lilian is a fancy shawl dancer and dances at Crow Fair and competes at different Pow Wows in the region. The past two Fairs have been abnormally wet, cold, and muddy, which makes it difficult to complete the dances and other events as planned—events and cultural practices that are central to their spirituality and individual dignity.

Ruby and Lilian pick wild chokecherries, and use the berries to make syrup. They also pick wild huckleberries, raspberries, Oregon grapes, and other wild fruits. They pick the berries before Crow Fair; however, recently they have experienced abnormal weather conditions and the berries and other fruits are not ripe. The increase in wildfires in Montana has restricted access to certain areas where they used to pick berries, infringing upon a cultural and family tradition.

Increasingly frequent and destructive wildfires have also diminished Lilian and Ruby's ability to recreate in and enjoy Montana's forests. Seeing dead and degraded forests, both due to wildfires and pine beetles, is distressing to Ruby. Wildfires also making it more difficult to engage in cultural practices, including building the tipis that are an integral part of Ruby and Lilian's experience at Crow Fair. The tipis can only be built out of lodgepole pine. However, once lodgepole pine trees have been exposed to heat from a wildfire it is no longer possible to peel the bark off the tree, which is necessary for constructing the tipi and to avoid damaging the tipi. As wildfires are increasingly common in Montana, it is becoming difficult to find lodgepole to build tipis and for Ruby and Lilian to engage in this cultural practice.

Hunting and Traditional Foods

Hiroki M.

Hiroki is 19 years old and resides in Fort Good Hope, Northwest Territories, on the banks of the Mackenzie River. Hiroki is of Fort Good Hope Dené / K'asho Got'ine descent. Hiroki's family, including at certain times Hiroki themself, hunts in the area around Fort Good Hope, and game is a primary and culturally-significant food source for their family and the entire Fort Good Hope community. Wild game animals that Hiroki's family and community rely on – including barren-ground, boreal and porcupine caribou, as well as moose – have become increasingly scarce and

difficult to find due to rising temperatures and resulting changes in herd range and behavior. For example, the Bluenose–West herd of barren-ground Caribou's range used to extend to the outskirts of Fort Good Hope on the Mackenzie River, but now can only be found hundreds of kilometers from their community.

These changes to game availability have meant that Hiroki's family must spend several hours on winter roads, or charter a helicopter at other times, in order to hunt for food that for thousands of years traditionally had sustained their community. Hunting trips that used to take only a day now take a week or more. Their family has also noticed changes in the quality of the meat they hunt, discarding meat they believe may be contaminated.

Rising temperatures in Fort Good Hope are also impacting the Mackenzie River. Hiroki and their community rely on being able to travel over the frozen Mackenzie River in the winter via snowmobile to transport goods. However, warmer winter temperatures mean the Mackenzie River does not freeze over completely and contains non-frozen patches that are hazardous to travel over, increasing the isolation of the community and the risks associated with winter travel.

Customary fishing practices in the Mackenzie River are also being impacted. Burbot, a traditional delicacy in the Northwest Territories Hiroki's family eats, has been found to contain increased mercury levels in the proximity of Fort Good Hope, due to the higher rates of mercury methylation that occur in organisms when there is a longer ice-free season and warmer river temperatures.

Fort Good Hope is largely situated on permafrost. Rising temperatures and a warming climate in the Northwest Territories are contributing to increasingly rapid permafrost melt, which is adversely affecting the foundations of homes and infrastructure. As a result of permafrost melt, the joints holding the walls, floors and ceilings of Hiroki's home together are expanding and contracting as the ground underneath shifts in centimeters. Hiroki has seen cracks, gaps and sinks in the walls and floors of his home due to the ground shifting. These impacts are imposing increasing economic costs on Hiroki and their family as they try to repair the damage to their home and adapt to the increasingly unstable permafrost terrain. Permafrost melt and riverbank erosion from heavy precipitation events cause even more severe impacts. For example, as a result of a landslide, the foundations of Hiroki's parents' previous cabin on the Mackenzie River shifted in such a way that it cannot be rebuilt. Hiroki fears further shifts will occur, including to his home in Fort Good Hope.

Hiroki is a youth advisor to the K'ahsho Got'ine Self-Government Negotiations Secretariat and is increasingly aware of and concerned about impacts from warming temperatures and other climate change-related changes in Fort Good Hope. Hiroki hears from his family and elders that their world is changing, and they feel that as a young person they now need to take extra steps to address and adapt to these unprecedented changes. The costs of these adaptations, some of which may not even be possible given the severity of the impacts, also concern and frustrate them.

Daniel M.

Daniel M. is 14 years old and a member of the Quinault Indian Nation, who lives on the Quinault Indian Reservation at the confluence of the Quinault River and Lake Quinault on the Pacific coast of Washington state in the United States. The Quinault River was once largely fed by the

meltwater of the Anderson Glacier, which no longer exists because it melted during Daniel's lifetime due to climate change.

There have been devastating cultural consequences associated with the loss of Anderson Glacier. Decreased stream flows and increased temperature in the Quinault River means that Daniel is unable to fish for Blueback, a species of salmon that is found only in the Quinault River and is of extreme cultural importance to the Quinault Nation. Unless flows are restored to levels that they once were, Blueback salmon could disappear forever, eliminating an important cultural connection for Daniel, with incalculable consequences.

Daniel's ancestors negotiated treaties with the U.S. government to ensure that future generations could fish at usual and accustomed places as they have done since time immemorial. Tragically, ocean acidification and other climate change impacts are rapidly limiting Daniel's ability to consume mussels and razor clams, which have provided sustenance to members of the Quinault Nation for thousands of years.

Summer S.

Summer is 18 years old and is an Inupiaq resident of the Unalakleet, located in the Alaska region in the United States. The Inupiaq culture of Summer's village is tied intimately to the land local ecology, both of which are increasingly endangered by climate change. Summer's ancestors have inhabited the area for over 2,200 years. Climate change is already harming, and will dangerously threaten, Summer's village, her subsistence lifestyle, and her cultural traditions and heritage.

Summer is psychologically harmed by losing the native plants and landmarks of her people and her heritage. Learning the subsistence lifestyle and other aspects of Unalakleet's native culture is important for Summer and important for her to pass the traditions and culture along to future generations. As climate change increasingly impacts her village and the environment on which it depends, Summer worries about the harms to her cultural heritage and the village's ability to transmit that culture to her generation and later generations.

Unalakleet sits between the ocean and an arm of the Unalakleet River, leaving it vulnerable to flooding events that can trap the village's residents. Sea ice in the region is forming later and thinner and breaking up earlier and faster. Permafrost is thawing, leaving Unalakleet vulnerable to a combination of higher seas and increasing storm events that flood the village and wash away the coast more and more frequently, especially during the fall months. Increased river flooding also occurs because of the increased rain that Unalakleet receives as a result of climate change. Unalakleet placed a wall of boulders along its coastline and mouth of the river to buffer against erosion, storm surges, and higher ocean levels, but each flooding event pushes the boulders out into the ocean or the river mouth and more land is washed away. Many Unalakleet residents have to be evacuated from their homes to higher elevation during these climate-induced storms and flood events. Summer's house is less than one mile from the ocean, and is threatened by these climate-change induced threats. Permafrost around Summer's house has already thawed leaving one part of her house higher than the rest.

Summer relies upon the lands and waters of Alaska for subsistence. She picks blueberries, salmonberries, cranberries, and blackberries. She fishes salmon and trout, hunts for ugruk (bearded seal), beaver, moose, and geese, and collects seagull and duck eggs. Summer's ability to engage in these seasonal subsistence activities is already harmed by climate change. She loves to fish in the North River near Unalakleet, but hotter and drier summer seasons have made the river shallower and some of its streams are now often even dry. Snow comes later and later to Unalakleet each year, melts earlier, and increasingly falls as rain instead of snow. Lack of snow makes travel and hunting during the winter difficult for Summer and her family.

Loss of sea ice and thinner sea ice makes hunting for seals and jigging for crab increasingly difficult and dangerous as well. One of Summer's teachers fell through the ice one year, but thankfully was saved. Summer's family used to use an ice cellar to preserve berries and fish in the summer months, but they cannot use it now because the land is not frozen anymore and it is not cold enough to preserve the food. Summer's traditional subsistence practices are already negatively affected by climate change, and these impacts will only worsen without meaningful action to address GHG emissions and climate change.

Summer is afraid of the increasing impacts of fires on wildlife and habitat in the areas surrounding Unalakleet, the loss of the things that are vital to her life and identity, and the increasing temperatures that threaten the very landscape and ice on which she and her people have survived for millennia.

Kailani S.

Kailani S. is 15 years old and a member of the Confederated Tribes of the Colville Reservation, located in the North-Central part of Washington state in the United States. The Icicle River, which is of traditional cultural importance to Kailani's Wenatchi people, has seen extremely low flow and high temperatures because of climate change. This harms Kailani's ability to exercise her traditional cultural and spiritual practices and harvest culturally important food sources such as salmon. The increased severity and frequency of wildfires on the Colville Reservation have been devastating for her community, destroying homes and large tracts of fish, wildlife, and subsistence harvest habitat.

Linnea L.

Linnea is 16 years old and his lived in Gustavus, Alaska all her life. Linnea's identity and community are built on the rugged beauty and rich ecosystem surrounding her, which is increasingly endangered by climate change.

Linnea relies upon the wild flora and fauna of Southeast Alaska for subsistence. Approximately 60 percent of Linnea's family's diet comes from hunting, fishing, and their garden. Among the numerous species that make up her family's subsistence diet are deer, moose, coho and sockeye salmon, halibut, black cod, berries, and many others. The warming and acidification of ocean waters harms the ecosystems and aquatic species Linnea relies on. Warming oceans and freshwaters result in changes to salmon migration patterns and timing. Changing precipitation patterns, increased rain, and increased glacial and snowmelt also endanger salmon with increased

stream turbidity and runoff. The warming oceans also increases harmful algal blooms, which contaminate shellfish, among many other negative ecosystem impacts.

Climate change also threatens the game species that Linnea relies on by increasing risk of exposure to parasites and vector borne diseases and through changes in vegetation, affecting the availability of the game's food, resulting in changing habitat range. Absent science-based action to address climate change, Linnea could lose access to, and availability of, the species that sustain her diet.

Whales are particularly important to Linnea and she enjoys spending time in the boat observing Humpback whales, which are becoming increasingly difficult to find. Warming waters impact whales' migration patterns, timing, habitat ranges, and food sources. As climate change has progressed, whales have increasingly been found in abnormal locations, or hard to find at all in Linnea's region.

Linnea also enjoys recreating in the outdoors and visits nearby Glacier Bay National Park each year. The glaciated area used to extend all the way into Icy Strait, but glaciers now only occur in the northern reaches of the park and nearly all of the glaciers are retreating. In the last few years, one of the nearby tidewater glaciers, which Linnea enjoyed, which used to calve into the ocean, has retreated so far that it is no longer a tidewater glacier. Linnea enjoys boating close to these tidewater glaciers and walking on the icepack, and hopes to continue to do so throughout her life and with her own family one day. However, these cultural and familial traditions that make up Linnea's identity and way of life may not be possible in the future, and she will not be able to have the same experiences at this significant site as she does today. Absent science-based action, the glaciers may disappear entirely.

Lander B. and Badge B.

Lander B. and Badge B. are 15 and 12 years old, respectively, and live in Kalispell, Montana. Hunting and fishing are an integral part of Lander and Badge's cultural heritage and community, as well as an important food source – Lander, Badge, and their family depend on the food they hunt and fish for as their source of meat and protein. Their access to an important food source, and a cultural and familial tradition, is inhibited due to the climate crisis.

Lander and Badge are also avid fishermen and catch cutthroat trout, rainbow trout, bull trout, and other fish in Montana. Their ability to fish is adversely impacted as the climate crisis causes abnormally low instream water levels and high water temperatures, which harm fish and decrease their population. Climate disruption has also caused the closure of certain fisheries; Lander and Badge recall closures on the Flathead River and Blackfoot River, among others, which have prohibited them from fishing.

Hunting is an important part of Lander and Badge's family life, identity, and culture. Lander hunts for antelope, deer, birds, and other small and large wild game animals. However, the increasing heat, as well as the dry and smoke-filled air in the summer and fall, as a result of climate disruption, have diminished his opportunities to hunt in Montana. The extreme temperatures and smoke make hunting unbearable for Lander. The heat and drought conditions pose challenges for wildlife and alters their normal range, behavior, and populations, which makes hunting even more challenging. Badge hunts for upland birds, which are a food source for

him and his family. However, as climate disruption increases the frequency of extreme weather events and drought conditions, the birds are experiencing increased mortality rates, which limits Badge's ability to hunt and cuts off a natural food source.

Badge is named after Badger-Two Medicine, an area where he frequently recreates and fishes, and feels strongly connected to. Severe wildfires in Badger-Two Medicine destroyed ancient White Pines and degraded areas significant to Badge and where he likes to visit and recreate. The devastation of Badger-Two Medicine, Badge's namesake, was particularly distressing and had a profound emotional impact on Badge.

Lander cares deeply about protecting Montana's environment, which is an integral part of his family traditions, culture, and identity. Witnessing the current impacts of the climate crisis in Montana and in other parts of the world is traumatic for Lander. Badge is anxious when he thinks about the future that he, and his potential children, will inherit.

Montay B.

Montay is 12 years old and resides in Smithers, British Columbia. His mother is Wet'suwet'en and his father is Tahltan. Montay spends much of his time participating in traditional Wet'suwet'en and Tahltan cultural practices, such as drumming, fishing, traditional plant harvesting and basket making. Game meat, harvested fish and berries form a large proportion of his family's food supply. Montay's grandfather hunts and provides meat for Montay's family, particularly elk, moose and bear.

Montay has been told by his grandfather that hunting is becoming more difficult due to changes in the range and abundance of these animals. In years when his grandfather is less successful at hunting, Montay and his family must rely on pigs they raise or otherwise must purchase meat from the grocery store, which adversely impacts their food security, as well as their connection to their culture.

Montay and his family fish for sockeye salmon, pink or humpback salmon, and steelhead trout, which fishermen gather from the Bulkley River in the Witset Canyon. In recent years, rising temperatures, reduced rainfall and snowpack, and consequential reduced river flow have caused sharp declines in fish numbers in the canyon. As a result, permitted fish catch quotas for Montay and his family have been reduced. 2019 was the first year since 2011 that Montay and his family were unable to get any fish.

Montay and his family also regularly forage for berries, including huckleberries, blueberries and saskatoon berries. Climate change, particularly changes to the length of the seasons in northern British Columbia, has resulted in decreased productivity and size of huckleberries around Smithers. Increased competition from plants that thrive in warmer territories and northward migrating invasive species have also reduced the availability of berries. Montay and his family also harvest stinging nettle and devil's club for medicinal uses, harvest birch bark for basket making, and plan to use western red cedar bark for weaving traditional headwear. But the abundance of devil's club and western red cedar near Montay's home is being adversely affected by rising temperatures and changes to the length of the seasons.

Montay participates in local drumming gatherings of Wet'suwet'en and other First Nations one to two times per month, and in larger gatherings of different groups approximately five times per year. These larger gatherings involve singing, drumming, dancing, story-telling, eating traditional foods and participating in other cultural activities. Traditional Wet'suwet'en drums are made from deer hide, but decreasing deer populations near Smithers make it impractical to hunt for the hide needed to make drums. Instead, Montay and his family must purchase drum kits commercially in order to participate in traditional practices.

Changes to the environment and to the availability of plants and animals traditionally used in these ceremonies make it more difficult for Montay to learn about and practice his culture and for elders to pass on knowledge about these resources to him. Wet'suwet'en traditions have always involved large amounts of storytelling, but the disappearance or decreased abundance of plant and animal species like wild rice and deer mean that Montay is less familiar with what his elders describe to him, which threatens Montay's cultural well-being.

Access to Natural Environment

Zoe W.

Zoe is 13 years old and resides in Vancouver, British Columbia. Zoe and her family regularly spend time at their family cabin in Hopkins Landing, British Columbia, a small coastal community near the town of Gibsons. From the time she was an infant, Zoe has spent two months every summer in Hopkins Landing.

In recent years, historically unprecedented smoke from summer wildfires in British Columbia has affected Zoe's ability to live healthfully in Vancouver and Hopkins Landing. She has felt the wildfire smoke irritate her lungs and cause her nasal congestion, throat and eye irritation, and headaches. Because of the wildfire smoke, she has felt fear and sadness about the destabilizing of local and global ecosystems. At times, the wildfire smoke has been so thick that Zoe and her family have been forced to stay inside and/or limit outdoor activities for days at a time, in compliance with advice of local health and government officials. Zoe understands that breathing in wildfire smoke is especially harmful to children's developing lungs.

Culture and the right to culture encompasses a person's way of life, including sports and games, natural environments, and the customs and ways in which a person expresses their humanity and the meaning they give to their existence. Because of the wildfire smoke, Zoe has been unable to participate in a number of activities that are important for her health, well-being and way of life, including running, swimming, and enjoying outdoor games, events and activities. The wildfires have made her feel afraid for her own well-being and the well-being of her family members who live and keep animals in Kamloops, British Columbia, an area particularly vulnerable to wildfires.

Western red cedars are vital to the local ecology that Zoe has grown up with. In recent years, Zoe has witnessed large scale die-off, and subsequent removal, of hundreds of western red cedars within one kilometre of her home. She is witnessing firsthand the negative impacts this is having on her community and local ecology.

Sea level rise, storm surges, and coastal erosion also affects Zoe's community in both Vancouver and Hopkins Landing. In Hopkins Landing, the community has suffered significant shoreline erosion, which threatens to destroy a 50-foot stretch of community property that links the

community – the Hopkins Landing heritage path. This stretch of waterfront land is a site where many community events take place and is critical to the enjoyment and culture of Zoe's family and community in Hopkins Landing. Zoe is afraid that due to climate change the path will no longer exist, thereby breaking community bonds and irrevocably changing the character and identity of her community there.

James D.

James D. is 19 years old and is a member of the Quinault Indian Nation who lives in Taholah, the Nation's lower village that is adjacent to the Pacific Ocean. James and his community in Taholah will be displaced, as the entire community must be relocated due to rapid sea level rise and the increasing severity of storms triggered by climate change. While the Quinault Indian Nation has plans to relocate the village site, the community does not have the financial resources as relocation comes at extraordinary economic expense. This critical loss of James' place-based heritage, a heritage that dates back to time immemorial, is irreplaceable and permanent. As James' culture and ways of life are deeply tied to the land and natural environment, the loss of his home is an infringement of his cultural heritage, dignity, and identity.

Valholly F.

Valholly F. is 16 years old, and her father is a member of the Panther Clan of the Seminole Tribe of Florida, located in the United States. Valholly was raised on the Big Cypress Indian Reservation near the Florida Everglades, and she continues to spend significant amounts of time at this culturally significant place. Valholly's tribal heritage and personal identify is closely linked the natural environment and her community believes that if the land dies, so will the Tribe.

Like her ancestors before her, Valholly was raised in the Florida Everglades and has been surrounded by its unique ecosystem her entire life. She has witnessed how sea level rise is inundating the Everglades so that the "River of Grass" may be fully underwater within her lifetime. The disappearance of the Everglades would have immeasurable cultural consequences that could never be rectified because it would destroy the cultural touchstone of the Seminole Tribe.

Georgi F.

Georgi is 17 years old and lives in Bozeman, Montana. Georgi is a competitive Nordic skier and she trains 11 months of the year and practices 15 hours each week, 7 days a week.

Culture encompasses all ways of life, including sports and games. Georgi's ability to compete and participate in Nordic skiing has been directly impacted by climate disruption. With less snowfall in the winter, and the snow melting at rapid rates, Georgi's training season is curtailed and has overall shortened in length. In recent years there has not been enough snow to groom trails or create tracks in the snow to Nordic ski race until January, although historically tracks were created in November. The lack of snow has inhibited Georgi's ability to complete all her necessary and appropriate training and hinders her ability to continue to compete at a high level, which adversely impacts her health and mental well-being.

In the summer, when Georgi trains for Nordic skiing and winter competition, the wildfire smoke limits her ability to train outdoors, which is important for the sport. Practices in the summer have been cancelled or curtailed due to smoke from wildfires in Montana. The smoke makes it so Georgi cannot fully breathe or train at a high intensity level; she is increasingly worried about the long-term effects that the exposure to heavy smoke while training has on her health and respiratory system. In or around August 2017, while training in Canmore, Alberta, Canada, Georgi had to wear a mask to protect herself from the ash that fell from the sky.

Georgi also enjoys paddleboarding, backpacking, hiking, and other activities in the outdoors. She has noticed that there is less flow in the local rivers, in particular the Smith, Flathead, and Missouri Rivers, and at times these rivers have been closed due to low water levels, which inhibits her access and restricts activities important to her health and foundational to her family life. Additionally, due to less water flows, the season for recreating on the river is shortened, impacting important familial and traditional activities.

Lucas P.

Lucas is 15 years old and resides in Ottawa, Ontario. He was born in Inuvik, Northwest Territories, where he lived until he was six years old. Lucas is of Gwich'in descent from Fort McPherson, Northwest Territories. A number of his family members continue to reside in Fort McPherson and Inuvik. His family members participate in traditional hunting practices around Inuvik and Fort McPherson. Lucas knows that game meat forms a large part of his family's diet in the Northwest Territories, and that rising temperatures are making it increasingly difficult for his family to hunt on the land. Changing caribou and moose migration patterns mean that the number of caribou and moose around these communities is declining, resulting in a decreased availability of affordable and traditional food. As a result, many of his family members are now moving away from these communities.

Rising temperatures and increasingly frequent heatwaves are having a major impact on Lucas, who is sensitive to extreme heat, and susceptible to heat stress, heat stroke and heat-triggered anxiety. Lucas visited two doctors and spoke with a therapist in 2018 to treat his increased anxiety associated with extreme heat.

Lucas started playing baseball in 2015, and has become an avid baseball player. Heat was not an issue for Lucas when he first played baseball, but he has felt that each summer in recent years has been hotter than the last. Particularly extreme heat during the 2018 and 2019 baseball season caused Lucas to experience symptoms of heat stress and heatstroke while playing baseball. On several occasions, these symptoms resulted in panic attacks and forced Lucas to withdraw from games because of heat-related difficulties and illness. On these occasions he felt fearful and light-headed and had stomach aches and difficulty breathing.

Lucas's concerns about the changes he is experiencing due to rising temperatures and increasingly extreme weather events have led to frustration about the unfairness of the burden placed on him as a young person.

Appendix B

Government Climate and Energy Actions, Plans, and Policies Must Be Based on a Maximum Target of 350 ppm Atmospheric CO_2 and 1°C by 2100 to Protect Young People and Future Generations

INTRODUCTION

Human laws can adapt to nature's laws, but the laws of nature will not bend for human laws. Government climate and energy policies **must** be based on the best available climate science to protect our climate system and vital natural resources on which human survival and welfare depend, and to ensure that young people's and future generations' fundamental and inalienable human rights are protected.

Because carbon dioxide (CO_2) is the primary driver of climate destabilization and ocean warming and acidification, all government policies regarding CO_2 pollution and CO_2 sequestration should be aimed at reducing global CO_2 concentrations **below 350 parts per million (ppm) by 2100**. Global atmospheric CO_2 levels, as of 2019, are approximately 407 ppm and rising.[1] An emission reductions and sequestration pathway back to 350 ppm could limit peak warming to approximately 1.3°C this century and stabilize long-term heating at 1°C above pre-industrial temperatures.

As explained in more detail below, there are numerous scientific bases and lines of evidence supporting setting 350 ppm and 1°C by 2100 as the uppermost safe limit for atmospheric CO_2 concentrations and global warming. Beyond 2100, atmospheric CO_2 may need to return to below 300 ppm to prevent the complete melting of Earth's ice sheets and protect coastal cities from sea level rise. Fortunately, it is still not only technically and economically feasible to return to those levels, but transitioning to renewable energy sources will provide significant economic and public health benefits and improve quality-of-life.

WHY 350 PPM AND 1°C LONG-TERM WARMING?

Three lines of robust and conclusive scientific evidence, based on the paleo-climate record and real-world observations show that above an atmospheric CO_2 concentration of 350 ppm there is: 1) significant global energy imbalance; 2) massive ice sheet destabilization and sea level rise; and 3) ocean warming and acidification resulting in the bleaching death of coral reefs and other marine life.

[1] Ed Dlugokencky & Pieter Tans, NOAA/ESRL, www.esrl.noaa.gov/gmd/ccgg/trends/.

1) Energy Balance

Earth's energy flow is out of balance. Because of a buildup of CO_2 in our atmosphere, due to human activities, primarily the burning of fossil fuels and deforestation,[2] more solar energy is retained in our atmosphere and less energy is released back into space.[3] The energy imbalance of the Earth is roughly equivalent to 2500 Camp Creek[4] fires **per day** burning around the world.[5] Returning CO_2 concentrations to below 350 ppm would restore the energy balance of Earth by allowing as much heat to escape into space as Earth retains, an important historic balance that has kept our planet in the sweet spot for the past 10,000 years, supporting stable sea levels, enabling productive agriculture, and allowing humans and other species to thrive.[6] The paleo-climate record shows that CO_2 levels, temperature, and sea level all move together (see Figure 1). Humans have caused CO_2 levels to shoot off the chart (circled in red), rising to levels unprecedented over the past 3 million years, and causing the energy imbalance.[7]

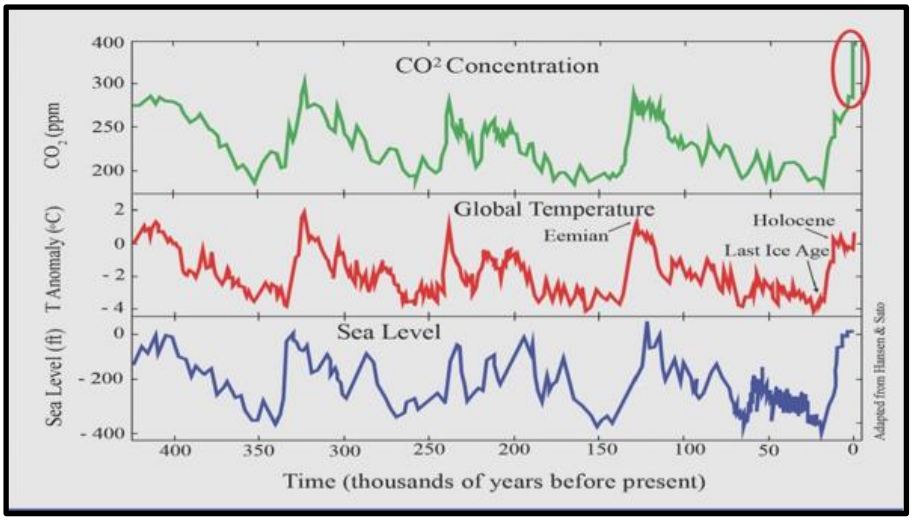

Figure 1: Evidence from the paleo-climate record showing the relationship between CO_2 concentration, global temperature, and sea level.

2) Ice Sheets and Sea Level Rise

The last time the ice sheets appeared stable in the modern era was in the 1980s when the atmospheric CO_2 concentration was below 350 ppm. The consequences of > 350 ppm and 1°C of warming are already visible, significant, and dangerous for humanity. With just 1°C of warming, glaciers in all regions of the world are shrinking, and the rate at which they are melting is accelerating.[8] Large parts of the Greenland and Antarctic ice sheets, which required millennia to grow, are teetering on the edge

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[2] Intergovernmental Panel on Climate Change, *Summary for Policymakers, Climate Change 2014: Impacts, Adaptation, and Vulnerability* 5 (2014).

[3] James Hansen et al., *Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature*, PLOS ONE 8:12 (2013) [hereinafter Assessing "*Dangerous Climate Change*"].

[4] The Camp Creek fire was the 2018 California fire, the deadliest and most destructive in the state's history, that burned over 150,000 acres (almost 240 square miles).

[5] Steven W. Running, *Declaration in Support of Plaintiffs, Juliana v. United States*, No. 18-36082, Doc. 21-12 (9th Cir. Feb. 7, 2019).

[6] James Hansen, Storms of My Grandchildren 166 (2009).

[7] Willeit et al., *Mid-Pleistocene transition in glacial cycles explained by declining CO2 and regolith removal*. Science Advances (2019).

[8] Zemp et al., *Global glacier mass changes and their contributions to sea-level rise from 1961-2016.* Nature (2019); B. Menounos, *Heterogeneous Changes in Western North American Glaciers Linked to Decadal Variability in Zonal Wind Strength*, Geophysical Research Letters (2018).

of irreversible disintegration, a point that if reached, would lock-in major ice sheet mass loss, sea level rise of many meters, and worldwide loss of coastal cities – a consequence that would be irreversible on any timescale relevant to humanity (see Figure 2).[9] Greenland's ice sheet melt is currently occurring faster than anytime during the last three and a half centuries, with a 33% increase alone since the 20th century.[10] The paleo-climate record shows the last time atmospheric CO_2 levels were over 400 ppm, the seas were **70 feet higher** than they are today and that heating consistent with CO_2 concentrations as low as 450 ppm may have been enough to melt almost all of Antarctica.[11] While many experts are predicting multi-meter sea level rise this century, even NOAA's modest estimate of 3-6 feet by 2100 would impact between 4 and 13 million Americans (see Figure 3).[12]

Figure 2: Antarctic melt water from the Nansen ice shelf.

Most climate models represent sea level rise as a gradual linear response to melting ice sheets, but the historic climate record shows something very different. In reality, seas do not rise slowly and predictably but rather in quick pulses as ice sheets destabilize.[13] Scientists believe we have a chance to preserve the large ice sheets of Greenland and Antarctica and most of our shorelines and ecosystems if we limit long-term warming by the end of the century to no more than 1°C above pre-industrial levels (short-term warming will inevitably exceed 1°C but must not exceed 1°C for more than a short amount of time).

[9] Hansen, Assessing "Dangerous *Climate Change*," at 13; *see also* James Hansen et al., *Ice Melt, Sea Level Rise and Superstorms; Evidence from Paleoclimate Data, Climate Modeling, and Modern Observations that 2 °C Global Warming Could be Dangerous*, Atmos. Chem. & Phys. 16, 3761 (2016) [hereinafter *Ice Melt, Sea Level Rise and Superstorms*].
[10] Trusel, L. D., et al., *Nonlinear rise in Greenland runoff in response to post-industrial Arctic warming*, Nature (2018).
[11] Dec. of Dr. James E. Hansen, *Juliana et al., v. United States et al*., No. 6:15-cv-01517-TC, 14 (D. Or. Aug. 12, 2015); Intergovernmental Panel on Climate Change: 2007 Working Group I: The Physical Science Basis, Chapter 6.3.2, What Does the Record of the Mid-Pliocene Show?; Dowsett & Cronin, *High eustatic sea level during the middle Pliocene: Evidence from the southeastern U.S. Atlantic Coastal Plain*, Geology (1990); Shackleton et al., *Pliocene stable isotope stratigraphy of ODP Site 846*, Proceedings of the Ocean Drilling Program, Scientific Results (1995).
[12] NOAA, Examining Sea Level Rise Exposure for Future Populations, https://coast.noaa.gov/digitalcoast/stories/population-risk.
[13] Wanless, H.R., et al., *Dynamics and Historical Evolution of the Mangrove/Marsh Fringe Belt of Southwest Florida, in Response to Sea-level History, Biogenic Processes, Storm Influences and Climatic Fluctuations*. Semi-annual Research Report (June 1993 to February 1994); Hansen, *Ice Melt, Sea Level Rise and Superstorms*, at 3761; Hansen, *Assessing "Dangerous Climate Change,"* at 20.

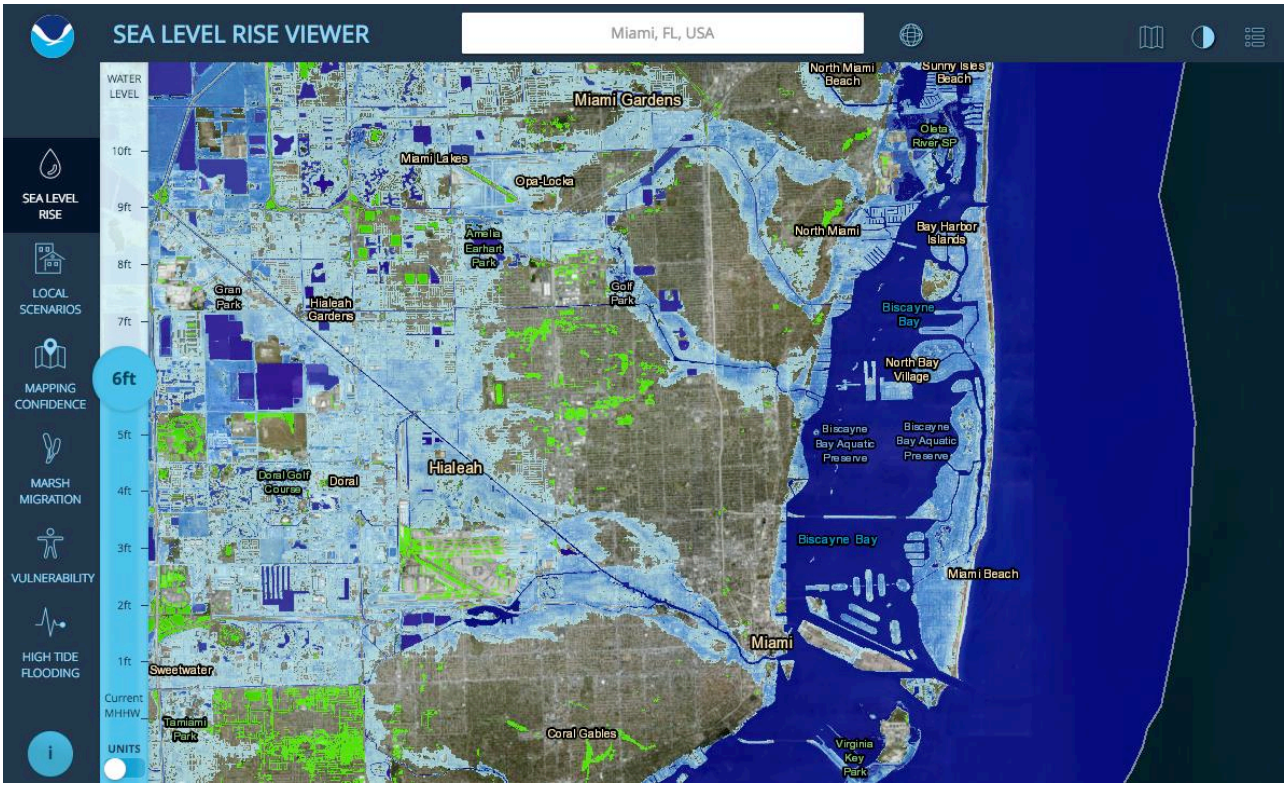

Figure 3: South Florida, including Miami, will face significant inundation with 6 feet of sea level rise.

3) Ocean Warming and Acidification

Our oceans have absorbed 93% of the excess heat in the atmosphere trapped by greenhouse gases (see Figure 4) as well as approximately 30% of CO_2 emitted into the atmosphere, causing ocean temperatures to surge and the ocean to become more acidic.[14] Indeed, our oceans are warming much more rapidly than previously-thought.[15] Many marine ecosystems, and particularly coral reef ecosystems, cannot tolerate the increased warning and acidity of ocean waters that result from increased CO_2 levels.[16] At today's CO_2 concentration, around 407 ppm,[17] critically important ocean ecosystems, such as coral reefs, are rapidly declining and will be irreversibly damaged from high ocean temperatures and repeated mass bleaching events if we do not quickly curtail emissions (see Figures 5 and 6).[18] According to the Intergovernmental Panel on Climate Change, bleaching events are occurring more frequently than the IPCC previously projected and 70-90% of the world's coral

[14] Hansen, *Assessing "Dangerous Climate Change*," at 1; *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2013); Cheng et al., *How fast are the oceans warming?* 363 Science 128 (2019); National Oceanic and Atmospheric Administration, *What is Ocean Acidification?,* https://oceanservice.noaa.gov/facts/acidification.html.

[15] Cheng, L. et al., How fast are the oceans warming?, 363 *Science* 128 (2019).

[16] Hughes et al., *Global warming impairs stock-recruitment dynamics of corals*, Nature (2019).

[17] Ed Dlugokencky and Pieter Tans, NOAA/ESRL, www.esrl.noaa.gov/gmd/ccgg/trends/.

[18] Frieler, K. et al., *Limiting global warming to 2 degrees C is unlikely to save most coral reefs*. Nature Climate Change 3:165-170. (2013); Veron, J., et al; *The coral reef crisis: The critical importance of< 350ppm CO2*. Marine Pollution Bulletin 58:1428-1436 (2009); Hughes, T. et al., *Spatial and temporal patterns of mass bleaching of corals in the Anthropocene*, Science 359: 80–83 (2018); Hughes, T. et al. *Global warming impairs stock–recruitment dynamics of corals*, Nature (2019).

reefs could disappear as soon as 2030 (the IPCC also predicts 99% of coral reefs will die with 2°C warming).[19] Even the recent National Climate Assessment acknowledged that coral reefs in Florida, Hawaii, Puerto Rico, and the U.S. Virgin Islands have been harmed by mass bleaching and coral diseases and could disappear by mid-century as a result of warming waters.[20] Scientists believe we can protect marine life and prevent massive bleaching and die-off of coral reefs only by rapidly returning CO_2 levels to below 350 ppm.[21]

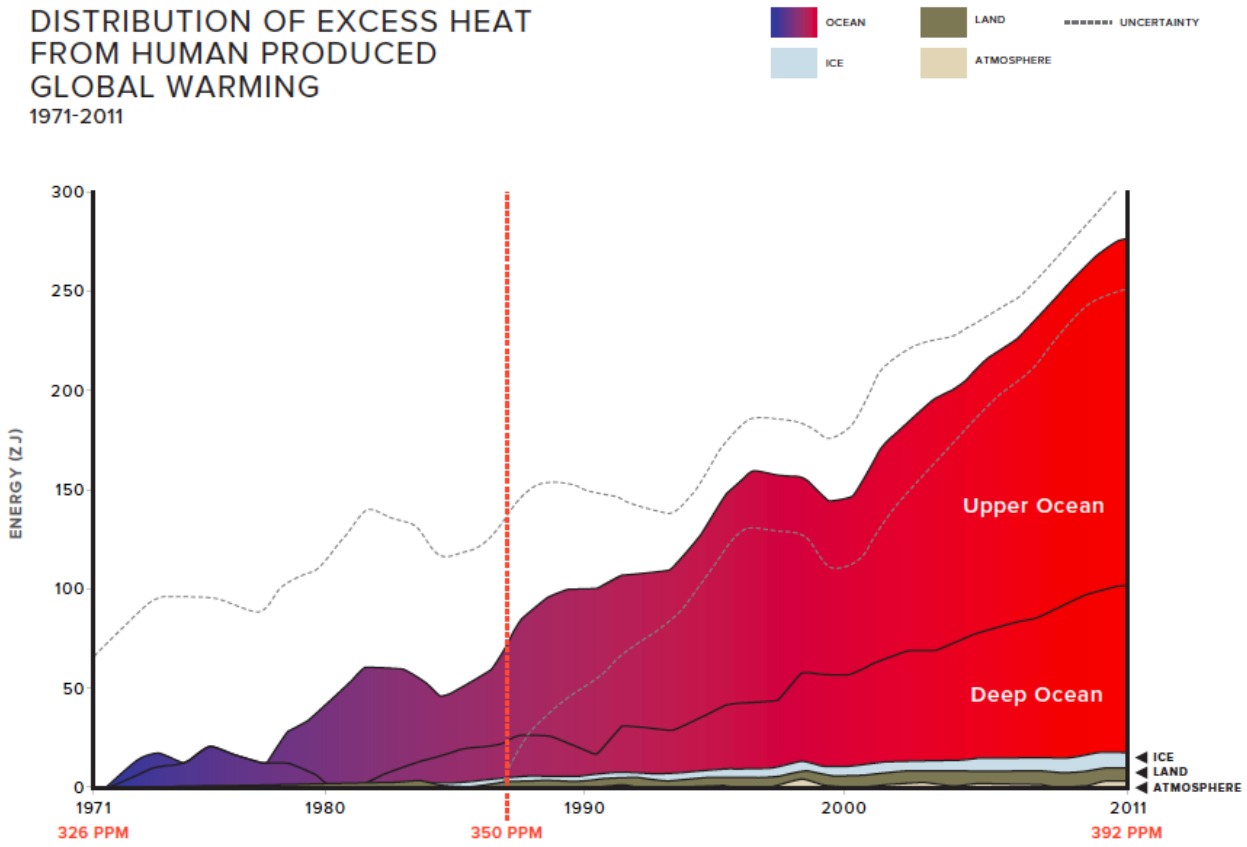

Figure 4: Over 90% of the excess energy from human caused climate change has been absorbed by the oceans, adding energy to storms and harming coral reefs around the globe.

No scientific institution, including the IPCC, has ever concluded that 2°C warming or 450 ppm would be safe for ocean life. According to Dr. Ove Hoegh-Guldberg, one of the world's leading experts on ocean warming and acidification, and a Coordinating Lead Author on the "Oceans" chapter of the IPCC's Fifth Assessment Report and on the "Impacts of 1.5ºC global warming on natural and human systems" of the IPCC's Special Report on 1.5°C:

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[19] Hoegh-Guldberg, Ove, et al., *Impacts of 1.5ºC Global Warming on Natural and Human Systems*. In *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* at pp. 225-226 (2018); IPCC, *Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C Approved by Governments* (2018).

[20] Pershing, A. J., et al., *Oceans and Marine Resources*. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*, USGCRP (2018);

[21] Veron, J., et al., *The coral reef crisis: The critical importance of <350 ppm CO2*, 58 *Marine Pollution* Bulletin 1428 (2009).

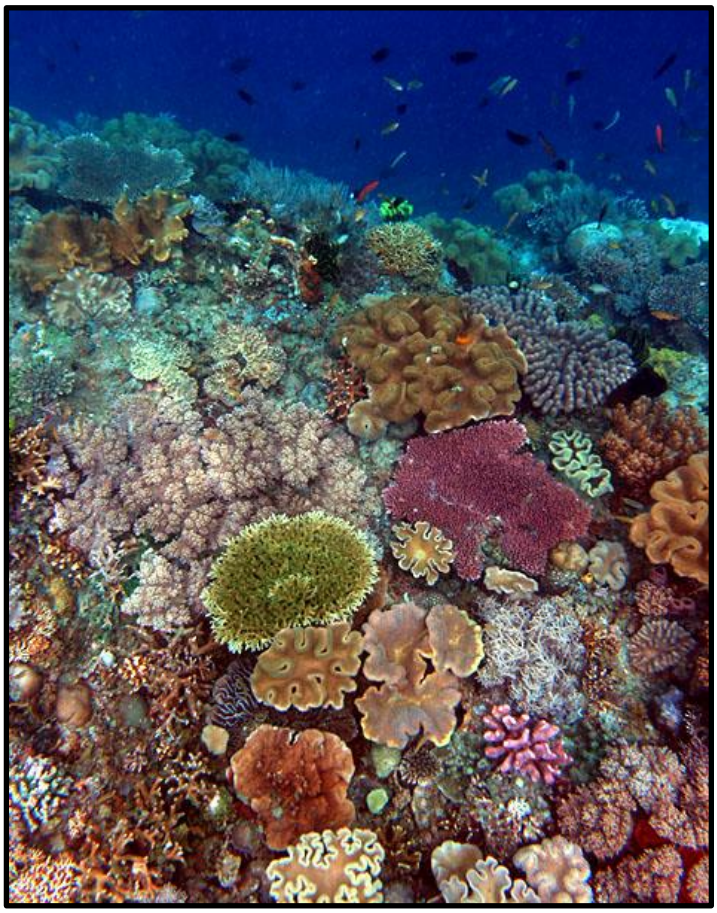

Figure 5: Healthy coral like this are already gravely threatened and will likely die with warming of 1.5°C.

"Allowing a temperature rise of up to 2°C would seriously jeopardize ocean life, and the income and livelihoods of those who depend on healthy marine ecosystems. Indeed, the best science available suggests that coral dominated reefs will completely disappear if carbon dioxide concentrations exceed much more than today's concentrations. Failing to restrict further increases in atmospheric carbon dioxide will eliminate coral reefs as we know them and will deny future generations of children from enjoying these wonderful ecosystems."[22]

Figure 6: Bleached coral from warmer ocean temperatures.

ADDITIONAL OBSERVATIONS ILLUSTRATE THE DANGERS OF INCREASED WARMING

In addition to the evidence discussed above which illustrates the necessity of ensuring that the atmospheric CO_2 concentration returns to no more than 350 ppm, based on present day observations about climate impacts occurring **now**, it is clear that the present level of 1°C is already causing significant climate impacts and additional warming will exacerbate these already dangerous impacts. Climate impacts that are already being experienced today include:

- Declining snowpack and rising temperatures are increasing the length and severity of drought conditions, especially in the western United States and Southwest, causing problems for agriculture users, forcing some people to relocate, and leading to water restrictions.[23]
- In the western United States, the wildfire season is now almost three months longer (87 days) than it was in the 1980s.[24]

[22] *Id*.
[23] Steven W. Running, *Declaration in Support of Plaintiffs, Juliana v. United States*, No. 18-36082, Doc. 21-12 (9th Cir. Feb. 7, 2019).
[24] Steven W. Running, *Declaration in Support of Plaintiffs, Juliana v. United States*, No. 18-36082, Doc. 21-12 (9th Cir.

- Extreme weather events, such as intense rainfall events that cause flooding, are increasing in frequency and severity because a warmer atmosphere holds more moisture.[25] What are supposedly 1-in-1000-year rainfall events are now occurring with alarming frequency – in 2018 there were at least five such events.[26]
- Tropical storms and hurricanes are increasing in intensity, both in terms of rainfall and windspeed, as warmer oceans provide more energy for the storms (we saw this with Hurricanes Harvey, Irma, and Maria in 2017) (Figure 7).[27]
- Terrestrial ecosystems are experiencing compositional and structural changes, with major adverse consequences for ecosystem services.[28]
- Terrestrial, freshwater, and marine species are experiencing a significant decrease in population size and geographic range, with some going extinct and others are facing the very real prospect of extinction – the rapid rate of extinctions has been called the 6th mass extinction.[29]

Figure 7: Flooding in Port Arthur, Texas on August 13, 2018 after Hurricane Harvey.

- Human health and well-being are already being affected by heat waves, floods, droughts, and extreme events; infectious diseases; quality of air, food, and water.[30] Doctors and leading medical institutions are calling climate change a "health emergency."[31] Children are being uniquely impacted by climate change.[32]
- In addition to physical harm, climate change is causing mental health impacts, ranging from stress to suicide, due to exposure to climate impacts, displacement, loss of income, chronic stress, and other impacts of climate change.[33]

Feb. 7, 2019).

[25] Kevin E. Trenberth, *Declaration in Support of Plaintiffs, Juliana v. United States*, No. 18-36082, Doc. 21-3 (9th Cir. Feb. 7, 2019).

[26] Belles, F., *America's 'One-in-1,000-Year' Rainfall Events in 2018*, The Weather Channel (Sept. 27, 2018).

[27] Kevin E. Trenberth, *Declaration in Support of Plaintiffs, Juliana v. United States*, No. 18-36082, Doc. 21-3 (9th Cir. Feb. 7, 2019).

[28] Nolan et al., *Past and future global transformation of terrestrial ecosystems under climate change*, Science (2018).

[29] G. Ceballos, et al., *Accelerated modern human–induced species losses: Entering the sixth mass extinction*, Science Advances (2015); Steven W. Running, *Expert Report, Juliana v. United States*, No. 6:15-cv-01517-TC, Doc. 264-1 (D. Or. June 28, 2018).

[30] Ebi, K. L., et al., *Human Health.* In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*, USGCRP (2018).

[31] Solomon, C. G. & LaRocque R. C., *Climate Change – A Health Emergency*, N. Engl. J. Med. 380:3 (2019).

[32] May, C., et al., *Northwest.* In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*, USGCRP (2018); Watts, N., et al., *The 2018 report of the* Lancet *Countdown on health and climate change: shaping the health of nations for centuries to come*, Lancet, Vol. 392 at 2482 (2018); *Brief of Amici Curiae Public Health Experts, Public Health Organizations, and Doctors in Support of Plaintiffs*, No. 18-36082, Doc. 47 (9th Cir. Mar. 1, 2019).

[33] Lise Van Susteren, *Expert Report, Juliana v. United States*, No. 6:15-cv-01517-TC, Doc. 271-1 (D. Or. June 28, 2018).

Figure 8: Offutt Air Force Base was impacted by flood waters during flooding in Nebraska during spring 2019.

- As Congress has recognized, "climate change is a direct threat to the national security of the United States and is impacting stability in areas of the world both where the United States Armed Forces are operating today, and where strategic implications for future conflict exist."[34] Senior military leaders have called climate change "*the* most serious national security threat facing our Nation today,"[35] a conclusion similarly recognized by our Nation's intelligence community.[36] Climate change is increasing food and water shortages, pandemic disease, conflicts over refugees and resources, and destruction to homes, land, infrastructure, and military assets, directly threatening our military personnel and the "Department of Defense's ability to defend the Nation" (see Figure 8).[37]
- Climate change is already causing vast economic harm in the United States. Since 1980 the United States has experienced 246 climate and weather disasters that each caused damages in excess of $1 billion, for a total cost of $1.6 trillion.[38] In 2018 alone, Congress appropriated more than $130 billion for weather and climate related disasters.[39]

These already serious impacts will grow in severity and will impact increasingly large numbers of people and parts of the world if CO_2 concentrations continue to rise. If we want our children and grandchildren to have a safe planet to live on, full of health and biodiversity rather than chaos and conflict, we must follow the best scientific prescription to restore Earth's energy balance and avoid the destruction of our planet's atmosphere, climate, and oceans.

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[34] *National Defense Authorization Act for Fiscal Year 2018*, Pub. L. No. 115-91, 131 Stat. 1358.

[35] Vice Admiral Lee Gunn, USN (Ret.), *Declaration in Support of Plaintiffs, Juliana v. United States*, No. 18-36082, Doc. 21-17 (9th Cir. Feb. 7, 2019) (emphasis in original); *see also* CNA Military Advisory Board, *National Security and the Accelerating Risks of Climate Change* (2014), https://www.cna.org/cna_files/pdf/MAB_5-8-14.pdf.

[36] National Intelligence Council, *Implications for US National Security of Anticipated Climate Change* (Sept. 2016), https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/Implications_for_US_National_Security_of_Anticipated_Climate_Change.pdf.

[37] U.S. Dep't of Defense, *2014 Climate Change Adaptation Roadmap* (2014), https://www.acq.osd.mil/eie/downloads/CCARprint_wForward_e.pdf.

[38] NOAA, *Billion Dollar U.S. Weather/Climate Disasters 1980-2019* (2019), http://www.ncdc.noaa.gov/billions/events.pdf.

[39] U.S. House of Representatives Committee on the Budget, *The Budgetary Impact of Climate Change* 2 (Nov. 27, 2018).

INTERNATIONAL POLITICAL TARGETS OF 1.5°C OR 2°C ARE NOT SCIENCE-BASED AND ARE NOT SAFE

International, politically-recognized targets like 1.5°C or "well below" 2°C – which are commonly-associated with long-term atmospheric CO_2 concentrations of 425 and 450 ppm, respectively – have not been and are not presently considered safe or scientifically-sound targets for present or future generations.

Importantly, the Intergovernmental Panel on Climate Change ("IPCC") has never established nor endorsed a target of 1.5°C or 2°C warming as a limit below which the climate system will be stable.[40] It is beyond the IPCC's declared mandate to endorse a particular threshold of warming as "safe" or "dangerous." As the IPCC makes clear, "each major IPCC assessment has examined the impacts of [a] multiplicity of temperature changes but has left [it to the] political processes to make decisions on which thresholds may be appropriate."[41]

Neither 1.5°C nor 2°C warming above pre-industrial levels has ever been considered "safe" from either a political or scientific point of view. The 2°C figure was originally adopted in the political arena "from a set of heuristics," and it has retained predominantly political character ever since.[42] It has recently been all-but-abandoned as a credible policy goal, in light of the findings in IPCC's 1.5°C Special Report, and the mounting evidence leading up to its publication, that 2°C would be catastrophic relative to lower, still-achievable levels of warming.[43]

On the other hand, the idea of a 1.5°C target was first raised by the Association of Small Island States (AOSIS) in the negotiations leading up to the ill-fated 2009 UNFCCC Conference of Parties in Copenhagen.[44] AOSIS, however, was explicitly advocating a *well below* 1.5°C and *well below* 1°C target, on the basis of the research of Dr. James Hansen and his colleagues.[45] Political compromise on this science-based target then led to the adoption of a goal of "pursuing efforts to limit the

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[40] Dec. of Dr. James E. Hansen, *Juliana et al., v. United States et al*., No. 6:15-cv-01517-TC, 5 (D. Or. Aug. 12, 2015).
[41] IPCC, *Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report*, 125 (2014), http://report.mitigation2014.org/report/ipcc_wg3_ar5_chapter1.pdf.
[42] Randalls, S. *History of the 2°C Temperature Target*. 1. WIREs Climate Change 598, 603 (2010); Jaeger, C. and J. Jaeger, *Three views of two degrees*. 11(Suppl 1) Regional Environmental Change S15 (2011).
[43] IPCC, *Summary for policymakers* at 13-14, Climate Change 2014: Impacts, Adaptation, and Vulnerability (2014), http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/ar5_wgII_spm_en.pdf; UNFCCC, *Report on the structured expert dialogue on the 2013–2015 review*, 18 (2015), http://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf; Petra Tschakert, *1.5 °C or 2 °C: a conduit's view from the science-policy interface at COP20 in Lima, Peru*, Climate Change Responses 8 (2015), http://www.climatechangeresponses.com/content/2/1/3; 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, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* (2018), https://www.ipcc.ch/sr15/.
[44] See Webster, R. *A brief history of the 1.5C target*. Climate Change News (December 10, 2015), http://www.climatechangenews.com/2015/12/10/a-brief-history-of-the-1-5c-target/; *Submission from Grenada on behalf of AOISIS to the Ad Hoc Working Group on Further Commitments for Annex I Parties Under the Kyoto Protocol*, U.N. Doc. FCCC/KP/AWG/2009/MISC.1/Add.1 (25 March 2009), https://unfccc.int/sites/default/files/resource/docs/2009/awg7/eng/misc01a01.pdf.
[45] *Submission from Grenada on behalf of AOISIS to the Ad Hoc Working Group on Further Commitments for Annex I Parties Under the Kyoto Protocol*, U.N. Doc. FCCC/KP/AWG/2009/MISC.1/Add.1 (25 March 2009), https://unfccc.int/sites/default/files/resource/docs/2009/awg7/eng/misc01a01.pdf, citing Hansen, J. et al. *Target Atmospheric CO_2: Where Should Humanity Aim?* 2 The Open Atmospheric Science Journal 217 (2008).

temperature increase to 1.5°C above pre-industrial levels" in Article 2 of the Paris Agreement. Yet the 2018 IPCC Special Report on 1.5°C has made clear that allowing a temperature rise of 1.5°C:

> is **not considered 'safe'** for most nations, communities, ecosystems, and sectors and poses significant risks to natural and human systems as compared to current warming of 1°C (*high confidence*) . . . .[46]

Dr. James Hansen warns that "distinctions between pathways aimed at 1°C and 2°C warming are much greater and more fundamental than the numbers 1°C and 2°C themselves might suggest. These fundamental distinctions make scenarios with 2°C or more global warming far more dangerous; so dangerous, we [James Hansen et al.] suggest, that aiming for the 2°C pathway would be foolhardy."[47] This target is at best the equivalent of "flip[ping] a coin in the hopes that future generations are not left with few choices beyond mere survival. This is not risk management, it is recklessness and we must do better."[48]

Tellingly, more than 45 eminent scientists from over 40 different institutions have published in peer-reviewed journals finding that the maximum level of atmospheric CO_2 consistent with protecting humanity and other species is 350 ppm, and no one, including the IPCC, has published any scientific evidence to counter that 350 is the maximum safe concentration of CO_2.[49]

A 1.5° OR 2°C TARGET RISKS LOCKING-IN DANGEROUS FEEDBACKS

The longer the length of time atmospheric CO_2 concentrations remain at dangerous levels (i.e., above 350 ppm) and there is an energy imbalance in the atmosphere, the risk of triggering, and locking-in, dangerous warming-driven feedback loops increases. The 1.5°C or 2°C target reduces the likelihood that the biosphere will be able to sequester CO_2 due to carbon cycle feedbacks and shifting climate zones.[50] As temperatures warm, forests burn and soils warm, releasing their carbon. These natural carbon "sinks" become carbon "sources" and a portion of the natural carbon sequestration necessary to drawdown excess CO_2 simply disappear. Another dangerous feedback includes the release of methane, a potent greenhouse gas, as the global tundra thaws.[51] These feedbacks might show little change in the short-term, but can hit a point of no return, even at a 1.5°C or 2°C temperature increase, which will trigger accelerated heating and sudden *and irreversible* catastrophic impacts. Moreover,

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[46] Roy, J., et al., *Sustainable Development, Poverty Eradication and Reducing Inequalities.* In *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* at 447 (2018) (emphasis added).
[47] *Id*. at 15.
[48] Matt Vespa, *Why 350? Climate Policy Must Aim to Stabilize Greenhouse Gases at the Level Necessary to Minimize the Risk of Catastrophic Outcomes*, 36 Ecology Law Currents 185, 186 (2009), http://www.biologicaldiversity.org/publications/papers/Why_350.pdf.
[49] James Hansen, et al., *Target Atmospheric CO_2: Where Should Humanity Aim?* (2008); James Hansen, et al., *Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature* (2013); James Hansen, et al., *Ice Melt, Sea Level Rise and Superstorms: Evidence From Paleoclimate Data, Climate Modeling, and Modern Observations That 2ºC Global Warming Could Be Dangerous* (2016); James Hansen, et al., *Young People's Burden: Requirement of Negative CO_2* Emissions (2017); Veron, J., et al., *The Coral Reef Crisis: The Critical Importance of <350 ppm CO_2* (2009); Frieler, K., et al., *Limiting global warming to 2 ◦C is unlikely to save most coral reefs* (2012).
[50] *Id*. at 15, 20.
[51] *Id*.

an emission reduction target aimed at 2°C would "yield a larger eventual warming because of slow feedbacks, probably at least 3°C."[52] Once a temperature increase of 2°C is reached, there will already be "additional climate change 'in the pipeline' even without further change of atmospheric composition."[53]

IT IS TECHNOLOGICALLY AND ECONOMICALLY FEASIBLE TO REDUCE CO_2 LEVELS TO 350 PPM BY 2100

There are two steps to reducing CO_2 levels to 350 ppm by the end of the century: 1) reducing CO_2 emissions; and 2) sequestering excess CO_2 already in the atmosphere. Carbon dioxide emission reductions of approximately 80% by 2030 and close to 100% by 2050 (in addition to the requisite CO_2 sequestration) are necessary to keep long-term warming to 1°C and the atmospheric CO_2 concentration to 350 ppm. Emission reduction targets that seek to reduce CO_2 emissions by 80% by 2050 are consistent with long-term warming of 2°C and an atmospheric CO_2 concentration of 450 ppm, which, as described above, would result in catastrophic and irreversible impacts for the climate system and oceans. Importantly, it is economically and technologically feasible to transition the entire U.S. energy system to a zero-CO_2 energy system by 2050 and to drawdown the excess CO_2 in the atmosphere through reforestation and carbon sequestration in soils.[54]

Deep Decarbonization Pathways Project and Evolved Energy Research recently completed research and very sophisticated modeling describing a nearly complete phase out of fossil fuels in the U.S. by 2050.[55] They describe six different technologically feasible pathways to drastically, and quickly, cut our reliance on fossil fuels and achieve the requisite level of emissions reductions in the U.S. while meeting our nation's forecasted energy needs. All of the 350 ppm pathways rely on four pillars of action: a) investment in energy efficiency; b) electrification of everything that can be electrified; c) shifting to very low-carbon and primarily renewable electricity generation; and d) carbon dioxide capture as fossil fuels are phased out. The six scenarios are used to evaluate the ability to meet the targets even absent one key technology. For example, one scenario describes a route to 350 absent construction of new nuclear facilities; another illustrates getting to 350 with extremely limited biomass technology; still another describes a way to 350 without any carbon capture and storage. Even absent a key technology, each of these six routes are viable and cost effective.

The study also concludes that the cost of the energy system transition is affordable. The total cost of supplying and using energy in the U.S. in 2016 was about 5.6% of GDP (see Figure 9).[56] A transition from fossil fuels to low carbon energy sources is expected to increase those costs by no more than an additional two to three percent of GDP. Even with this small and temporary added expense, the cost would still be well below the 9.5% of GDP spent on the energy system in 2009 (not to mention well below the harm to the economy caused by climate change). Once the transition is complete, the cost

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[52] Hansen, Assessing "Dangerous *Climate Change*," at 15.
[53] *Id*. at 19.
[54] *See* Mark Z. Jacobson et al., *100% Clean and Renewable Wind, Water, and Sunlight (WWS) All-Sector Energy Roadmaps for the 50 United States,* 8 Energy & Envtl. Sci. 2093 (2015) (for plans on how the United States and over 100 other countries can transition to a 100% renewable energy economy see www.thesolutionsproject.org); *see also* Arjun Makhijani, Carbon-Free, Nuclear-Free: A Roadmap for U.S. Energy Policy (2007); B. Haley et al., *350 ppm pathways for the United States* (2019).
[55] B. Haley et al., *350 ppm pathways for the United States* (2019).
[56] B. Haley et al., *350 ppm pathways for the United States* (2019).

of energy will remain low and stable because we will no longer be dependent on volatile global fossil fuel markets for our energy supplies. As Nobel Laureate Economist Dr. Joseph Stiglitz has stated: "[t]he benefits of making choices today that limit the economic costs of climate change far outweigh any economic costs associated with limiting our use of fossil fuels."[57]

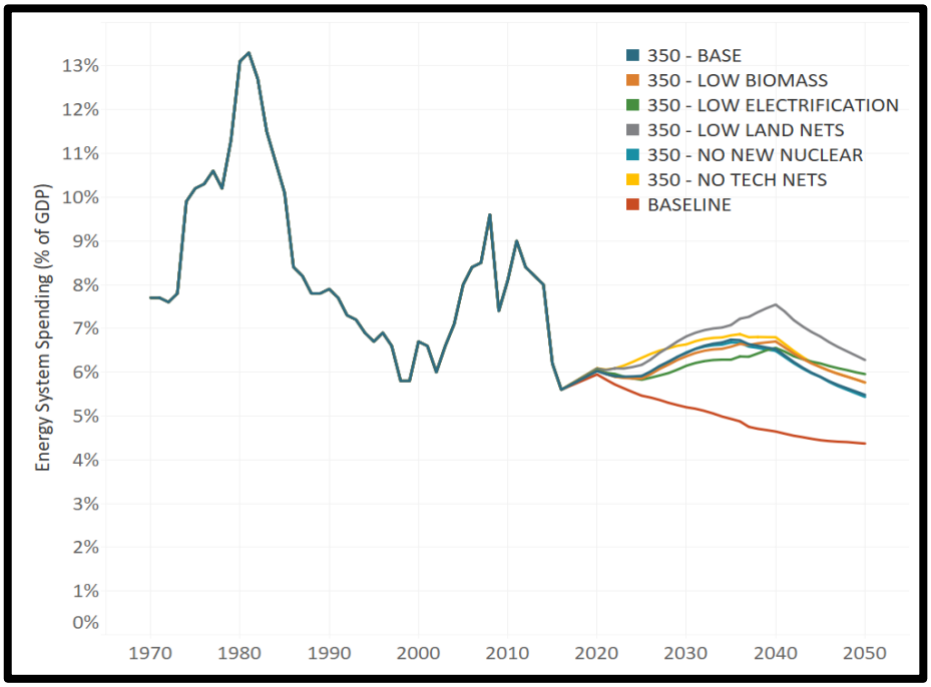

Figure 9: Historic and Projected Costs of Energy in the U.S.

Other experts have already prepared plans for all 50 U.S. states as well as for over 139 countries that demonstrate the technological and economic feasibility of transitioning off of fossil fuels toward 100% of energy, for all energy sectors, from clean and renewable energy sources: wind, water, and sunlight by 2050 (with 80% reductions in fossil fuels by 2030).[58]

Products already exist that enable new construction or retrofits that result in zero greenhouse gas buildings. We have the technology to meet all electricity needs with zero-emission electric generation. We know how to achieve zero-emission transportation, including aviation. These actions result in other benefits, such as improved health, job creation, and savings on energy costs.

The amount of natural carbon sequestration required is also proven to be feasible. Researchers have evaluated the potential to drawdown excess carbon dioxide in the atmosphere by increasing the carbon stored in forests, soils, and wetlands, and have found significant potential for these natural systems to support a return to 350 ppm by the end of the century.[59] We know the agricultural, rangeland, wetland, and forest management practices that decrease greenhouse gas emissions and increase sequestration.

There is no scientific, technological, or economic reason to *not* adopt a 350 ppm and 1°C by 2100 target. There are abundant reasons for doing so, not the least of which is to do our best through human laws to respect the laws of nature and create a safe and healthy world for children and future generations who will walk this Earth.

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[57] Joseph E. Stiglitz, Ph.D., *Declaration in Support of Plaintiffs, Juliana v. United States*, No. 18-36082, Doc. 21-14 (9th Cir. Feb. 7, 2019).

[58] Mark Z. Jacobson et al., *100% Clean and Renewable Wind, Water, and Sunlight (WWS) All-Sector Energy Roadmaps for the 50 United States,* 8 Energy & Envtl. Sci. 2093 (2015). For a graphic depicting the overview of the plan for the United States see: https://thesolutionsproject.org/why-clean-energy/#/map/countries/location/USA.

[59] Benson W. Griscom et al., *Natural Climate Solutions,* Proceedings of the National Academies of Sciences (2017); Joseph E. Fargione et al., *Natural Climate Solutions for the United States,* Science Advances (2018).




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