

ESSAY

NOW COMES THE HARD PART: ENVIRONMENTAL ADVOCACY IN THE AGE OF CLIMATE DISRUPTION

REMARKS BY
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I. THAT WAS THEN: THE HALCYON DAYS OF ENVIRONMENTAL LAW

The modern environmental movement was launched with great fanfare on Earth Day, April 22, 1970. Earth Day inspired 20 million Americans to take to the streets, parks, and auditoriums to demonstrate against scenes of environmental degradation being broadcast on nightly news programs: the Cuyahoga River bursting into flames; oil washing up on the beaches of Santa Barbara; massive fish kills in Florida's Lake Apopka; and smog blanketing Los Angeles, Denver, Pittsburg, and other major cities. Thousands of colleges and universities organized protests to highlight this widespread environmental degradation with massive coast-to-coast rallies in cities, towns, and communities.

Congress responded to public demand by enacting a plethora of environmental laws in quick succession: The National Environmental Policy Act (NEPA),¹ the Clean Air Act (CAA),² the Clean Water Act (CWA),³ the Safe Drinking Water Act,⁴ the Noise Control Act,⁵ The Toxic Substances Control Act,⁶ the Endangered Species Act (ESA),⁷ the Marine Mammal Protection Act,⁸ the Surface Mining and Reclamation Act,⁹ and others. President Nixon, not known as an environmental crusader, created the Environmental Protection Agency (EPA) by Executive Order and signed more environmental laws than any other president.¹⁰ The 1970s saw a dramatic expansion in the role of the federal government in protection of public health and conservation of natural resources within a top-down, command-and-control regulatory framework.

The passage of the Comprehensive Environmental Response and Recovery Act¹¹ (otherwise known as CERCLA or Superfund) in 1980 ushered in a decade of new federal laws aimed at the cleanup of contaminated sites and stricter regulation of hazardous waste under the

¹ 42 U.S.C. §§ 4321–4370m (2018).

² 42 U.S.C. §§ 7401–7671q (2018).

³ Federal Water Pollution Control Act, 33 U.S.C. §§ 1251–1388 (2018).

⁴ 42 U.S.C. §§ 300f–300j-27 (2018).

⁵ 42 U.S.C. §§ 4901–4918 (2018).

⁶ 15 U.S.C. §§ 2601–2692 (2018).

⁷ 16 U.S.C. §§ 1531–1544 (2018).

⁸ 16 U.S.C. §§ 1361–1423h (2018).

⁹ 30 U.S.C. §§ 1201–1328 (2018).

¹⁰ Reorganization Plan No. 3 of 1970, 3 C.F.R. 1970 Compilation of Title 3—The President; see, e.g., Robber, *Which Presidents are the Greenest in U.S. History?*, NATION SWELL, <https://perma.cc/U7GU-RPR2> (last visited Jan. 12, 2023) (citing Nixon as one of the “strongest environmental champions,” alongside President Ford). For a summarized history of Nixon's role in passing key environmental statutes, see Erin Blakemore, *How Nixon Became the Unlikely Champion of the Endangered Species Act*, HISTORY (Aug. 19, 2019), <https://perma.cc/AXH8-QF6X>.

¹¹ 42 U.S.C. §§ 9601–9675 (2018).

Resource Conservation and Recovery Act¹² and tougher standards to reduce toxic discharges under the Clean Water Act. The disastrous Exxon Valdez oil spill in Prince William Sound Alaska in 1989 led to the enactment of the Oil Pollution Act of 1990,¹³ with the creation of a special fund to speed cleanup and expand liability for natural resource damages, among other things.¹⁴

The year 1990 was a milestone for another reason. It marked the passage of amendments to the CAA that gave us comprehensive new programs using market-based mechanisms (emissions trading) to address acid rain and stratospheric ozone depletion, along with much stronger controls on hazardous air pollutants like mercury and benzene.¹⁵ Except for strengthening amendments to the Toxic Substances Control Act in 2016, the 1990 CAA amendments represent the last time Congress updated the nation's landmark environmental laws, despite the need for reforms to keep pace with scientific discoveries of new threats to public health and ecological integrity.

Of course, passing these laws was just the first step. They also had to be implemented on-time and vigorously enforced. Fortunately, Congress understood the value of public participation in this effort and included provisions requiring public notice of proposed actions, access to information, opportunities to comment on permits and other regulatory actions, and the right to petition agencies for stronger rules. Most importantly, Congress authorized citizen-suit provisions in most of the major laws, starting with the CAA.¹⁶ Citizen suits have proven to be vital to the success of these programs, ensuring that statutory deadlines are met, that federal agencies engage in transparent, rational decision-making, that polluters are not given a free pass, and that frontline communities—already overburdened with air and water pollution—are given a seat at the table when yet another polluting facility is proposed for their backyard.

Throughout the 70s and 80s, the federal courts played a key role in shaping the development of environmental law. As Judge J. Skelly Wright famously said in the seminal *Calvert Cliffs* decision: “Our duty, in short, is to see that important legislative purposes, heralded in the halls of Congress, are not lost or misdirected in the vast hallways of the federal bureaucracy.”¹⁷ The courts were, by and large, open to citizens seeking judicial review of questionable agency decisions and injunctive relief to compel compliance with statutory mandates and timelines. The famous Flannery Decree—which led to the adoption of the comprehensive

¹² 42 U.S.C. §§ 6901–6992k (2018) (amending Solid Waste Disposal Act, Pub. L. No. 89–272, 79 Stat. 992 (1965)).

¹³ 33 U.S.C. §§ 2701–2762 (2018).

¹⁴ Thomas A. Birkland, *In the Wake of the Exxon Valdez: How Environmental Disasters Influence Policy*, ENV'T: SCI. & POL'Y FOR SUSTAINABLE DEV., Sept. 1998, at 5–6.

¹⁵ CAA, 42 U.S.C. §§ 7651–7661f, 7671–7671q (2018).

¹⁶ *Id.* § 7604.

¹⁷ *Calvert Cliffs' Coordinating Comm. v. U.S. Atomic Energy Comm'n*, 449 F.2d 1109, 1111 (D.C. Cir. 1971).

program to regulate toxic discharges under the Clean Water Act—is a good example of federal courts using their equitable powers to enforce statutory requirements for protection of public health.¹⁸

Over time, the courts have become a less favorable forum for environmental litigants. Led by the late Justice Scalia, the Supreme Court has erected barriers to the courthouse through heightened standing requirements and at times has seemed to display outright hostility to environmental interests. Nowhere is this more apparent than in NEPA's 0 for 17 record in the High Court.¹⁹ The solid 6-3 conservative majority of today's Supreme Court as revealed in the recent decision in *West Virginia v. EPA*²⁰ (discussed below) portends less deference to agency authority that is not clearly spelled out in statutory text—a serious problem for dealing with emerging environmental threats that were not foreseen when these laws were first enacted fifty years ago and have not been updated since. The Ninth Circuit's dismissal of the *kid's* climate case—*Juliana v. United States*²¹—on the grounds that courts lack any ability to award meaningful relief—not even a declaratory judgment—for the acknowledged danger created by federal policies, dealt a serious blow to climate litigation in federal courts.²²

Still, looking back over the first fifty plus years of environmental law, one can see notable accomplishments. Water quality has improved through combined federal and state investments in sewage treatment and regulation of industrial point source pollution. Nonpoint source pollution—the runoff from agriculture, forestry, and other activities—which is not regulated by the Clean Water Act, is now the major contributor to water quality impairment.²³

CAA programs have lowered levels of six common pollutants—particulate matter, ozone, lead, carbon monoxide, nitrogen dioxide and sulfur dioxide—as well as numerous toxic pollutants.²⁴ Airborne lead

¹⁸ See Rosemary O'Leary, *The Courts and the EPA: The Amazing "Flannery Decision,"* NAT. RES. & ENV'T, 1990, at 19–20 (explaining the history of the case leading up to the Flannery Decree—the interpretation by Judge Flannery that the EPA “upon completion of the rulemaking procedures, may, in its discretion, decide not to issue a regulation for a specific pollutant or point source”).

¹⁹ Richard Lazarus, *Scholarship Highlight: NEPA's 0-17 Record at the Court*, SCOTUSBLOG (Oct. 2, 2012), <https://perma.cc/9U4M-7EWA> (noting that all NEPA cases have been won almost unanimously by the federal government).

²⁰ 142 S. Ct. 2587, 2616 (2022).

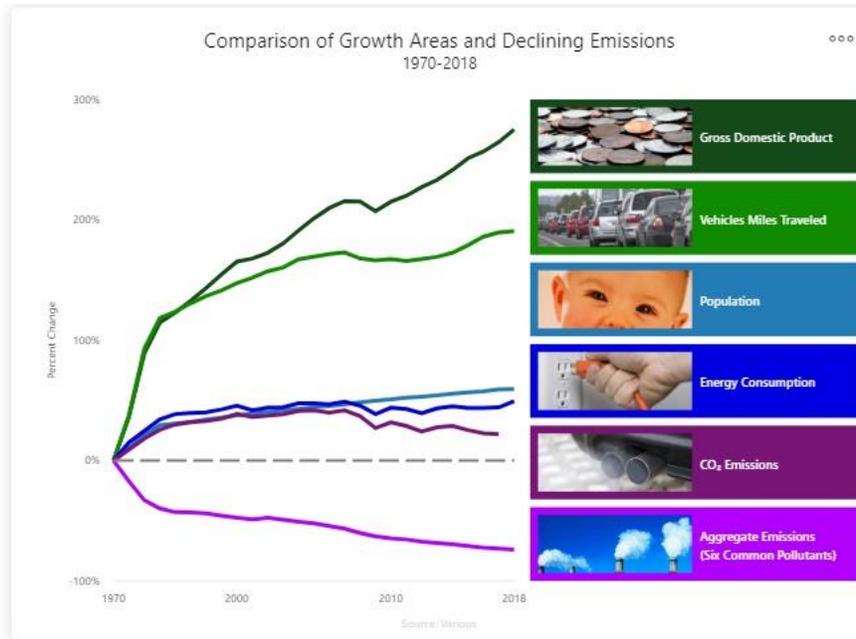
²¹ 947 F.3d 1159, 1175 (9th Cir. 2020) (dismissing the case on standing grounds).

²² See Mark Kaufman, *The Kid's Climate Lawsuit Just Got Thrown Out*, MASHABLE (Jan. 17, 2020), <https://perma.cc/YJC9-B7X4>.

²³ *Basic Information About Nonpoint Source (NPS) Pollution*, U.S. ENV'T PROT. AGENCY (Dec. 22, 2022), <https://perma.cc/5CJ2-YD7Z>; see also Kevin DeGood, *A Call to Action on Combating Nonpoint Source and Stormwater Pollution*, CTR. FOR AM. PROGRESS ACTION FUND (Oct. 27, 2020), <https://perma.cc/KQY7-UCDH> (claiming that the U.S. will not achieve water quality goals without addressing the impact from nonpoint source pollutants).

²⁴ *Air Pollutants: EPA Criteria Pollutants*, CTR. FOR DISEASE CONTROL & PREVENTION (Nov. 21, 2022), <https://perma.cc/Q6WJ-8KCH>; *Benefits and Costs of the Clean Air Act Amendments of 1990*, U.S. ENV'T PROT. AGENCY, <https://perma.cc/L4XM-ZSD8> (last visited Jan. 12, 2022) [hereinafter *Benefits and Costs of the Clean Air Act*].

pollution, a widespread health concern before EPA phased out lead in motor vehicle gasoline, now meets national air quality standards in most areas of the country.²⁵ The economic benefits of these improvements



greatly exceed their cost.²⁶ Indeed, as reported in an analysis by Resources for the Future, air quality across the United States has improved substantially, while the Gross Domestic Product has quadrupled since 1970.²⁷ The benefits of improved air quality have not been equitably shared, and more must be done to address disproportionate impacts on minority and low income “frontline” communities.²⁸

Figure 1: *Our Nation’s Air: Air Quality Improves as America Grows*, U.S. ENV’T PROT. AGENCY (2021), <https://perma.cc/2QYR-JWR4> (depicting the percent change of population and emissions from 1970 to 2020).

²⁵ *Progress Cleaning the Air and Improving People’s Health*, U.S. ENV’T PROT. AGENCY (Mar. 9, 2022), <https://perma.cc/8S4A-KXFC>.

²⁶ *Benefits and Costs of the Clean Air Act*, *supra* note 24.

²⁷ Joseph E. Aldy et al., *Looking Back at 50 Years of the Clean Air Act of 1970*, RES. FOR THE FUTURE (Jun. 15, 2020), <https://perma.cc/Z3HB-ZEXD>.

²⁸ For more information on environmental justice, see *Environmental Justice: Addressing the Burden of Air Pollution*, AM. LUNG ASS’N (Aug. 26, 2020), <https://perma.cc/PJK8-2S4M> (“[P]eople of color are 1.5 times more likely to live in an area with poor air quality than white people”) (internal citation omitted), and *Established Examples of Frontline Communities*, STATE OF VERMONT AGENCY OF ADMIN., <https://perma.cc/7EV4-BFSV> (last visited Jan. 12, 2023) (“Frontline communities are groups of people who are directly affected by . . . inequity in society at higher rates than people who have more power in society.”).

There have been many other success stories: recovery of iconic endangered species like the bald eagle and gray whale; rescue of the California condor and black-footed ferret from the brink of extinction and reintroduction of the gray wolf to the Yellowstone ecosystem; conservation of wetlands and barrier islands; designation of hundreds of millions of acres of wilderness, national monuments, and marine sanctuaries; cleanup of over 500 Superfund sites; reduction in toxic wastes, and much more.²⁹

There is also much unfinished business: plastics in the ocean; forever chemicals in water supplies; dead zones in lakes and coastal waters; depleted fish stocks; desertification of farmland; and invasive species everywhere. Yet as pressing as these problems are, they pale in comparison with the existential threat posed by global climate change, or more accurately, climate disruption. With each new report from the Intergovernmental Panel on Climate Change (IPCC), the warnings become more dire. In the first installment of its Sixth Assessment, *Climate Change 2021: The Physical Basis* concluded: “It is indisputable that human activities are causing climate change and human influence is making extreme climate events, including heat waves, heavy rainfall, and droughts, more frequent and severe.”³⁰

Time is fast running out to slash the greenhouse gas emissions that are cooking the planet with devastating effects including heat waves, melting ice sheets, sea-level rise, extreme droughts, catastrophic wildfires, ocean acidification, biodiversity loss, and much more. And it is not just an environmental disaster. It is a human health and safety disaster as well. The displacement of countless numbers of people forced to leave their homelands to escape the drought and the floods and the fires is, in military parlance, a threat multiplier that exacerbates conflicts and threatens national security.

II. THIS IS NOW: THE CLIMATE CRISIS

The Chinese phrase for crisis is *Wēijī*, which combines the elements of danger and opportunity. This captures the challenge facing humanity at this moment in time. To understand the nature of this crisis, one must

²⁹ 110 *Success Stories for Endangered Species Day 2012*, ESA SUCCESS, <https://perma.cc/K5CE-896N> (last visited Jan. 12, 2023); *Gray Whales in the Eastern North Pacific*, NAT'L OCEANIC ATMOSPHERIC ADMIN. FISHERIES (Oct. 7, 2023), <https://perma.cc/PE9K-PLUA> (highlighting how gray whales have recovered from near extinction just in the past few decades); see, e.g., *NOAA and Partners Build Coastal Resiliency with Natural Infrastructure in Louisiana*, NAT'L OCEANIC ATMOSPHERIC ADMIN. FISHERIES (May 18, 2018), <https://perma.cc/TV47-XZ79> (showing how the federal-state partnership has helped to restore wetlands in order to protect vulnerable communities); *Superfund History*, U.S. ENV'T PROT. AGENCY (Aug. 15, 2022), <https://perma.cc/89Y8-FBJF>.

³⁰ Hoesung Lee, chair, IPCC, Keynote Address by the IPCC Chair Hoesung Lee at the Opening of the First Technical Dialogue of the Global Stocktake (June 10, 2022), <https://perma.cc/3UFD-KEAT>. For the complete report, see INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS (Valérie Masson-Delmotte et al., 2021).

first confront and even embrace the danger it poses. There is a good deal of cognitive literature positing that fear does not motivate people.³¹ Doomsday messaging can turn people off or elicit a feeling that the situation is hopeless and there is nothing they can do about it, which is simply not true.

Scare tactics are obviously counter-productive, but a certain amount of rational fear is a necessary response that can activate people to see the danger and act decisively. A healthy fear of things that can kill us is a good thing. That is why taking a selfie with a bison in Yellowstone National Park or forgetting to hang your food high in a tree at a backcountry campsite in Grizzly country are risky behaviors best avoided.

Facts are stubborn things. It is a fact that CO₂ has reached its highest level in more than 4 million years.³² It is a fact that average global temperatures have increased by roughly 1.1°C (1.9°F) since the industrial revolution.³³ It is a fact that 90% of this extra heat is trapped in the oceans; global warming means ocean warming with multiple serious consequences as will be shown.³⁴ And it is a fact that more than 99.9% of peer-reviewed scientific papers agree that climate change is mainly caused by humans.³⁵ In short, the earth's energy balance—the balance between incoming energy from the sun and outgoing energy from the earth—is dangerously out-of-whack.

Let us consider four examples of the clear and present dangers that climate disruption poses right now, everywhere on earth, and then consider the even greater dangers that lie ahead should we fail to act decisively while there is still time—albeit limited—to avoid catastrophe. Following this somewhat bleak accounting, this Essay will take a positive turn towards the opportunities available to not only avoid worst-case outcomes of climate disruption, but to build a more just and sustainable global economy for all.

³¹ See, e.g., *Fear is Not the Best Motivator*, METHODS (Mar. 5, 2020), <https://perma.cc/XQC7-GFPZ>. (stating that fear creates burnout and lowers energy levels).

³² See Eric Roston, *CO₂ Reaches its Highest Level in More than 4 Million Years*, PHYS. ORG. (June 8, 2021), <https://perma.cc/F976-Y3SW> (noting that the accumulated global atmospheric level of 419 parts per million (ppm) “appears to be the highest in as long as 4.5 million years” and is substantially higher than the 316 ppm found in 1958, when measurements first began).

³³ *World of Change: Global Temperatures*, NASA: EARTH OBSERVATORY, <https://perma.cc/AD5Y-DVPT> (last visited Jan. 12, 2023) (stating that the global temperature has risen 1.1°C since 1880 and that the majority of the warming has occurred since 1975).

³⁴ *Ocean Warming*, NASA: GLOBAL CLIMATE CHANGE, <https://perma.cc/TR6U-3A8T> (last visited Jan. 13, 2023) (measuring global warming of oceans since 1955).

³⁵ Naomi Oreskes, *Beyond the Ivory Tower: The Scientific Consensus on Climate Change*, 306 SCIENCE 1686, 1686 (2004) (determining that 928 out of 928 peer-reviewed papers agreed with the Intergovernmental Panel on Climate Change's statement that the Earth's climate is being affected by human activities).

A. Extreme Heat

The most obvious effect of heat-trapping gases like carbon dioxide, methane, nitrous oxide and many others is rising temperatures across the globe. One need look no further than the heat dome that descended on Portland, Oregon last summer, when the thermostat hit 116°F on June 28, 2021, setting an all-time record.³⁶ Scientists studying this “freak” heat wave that killed hundreds of people across the Pacific Northwest have concluded that it would have been “virtually impossible” without climate change.³⁷



Figure 2: Screen capture of June 2021 weather broadcast, in Joseph Dames, *A recap to the historic June 2021 heatwave*, KOIN (June 29, 2021), <https://perma.cc/TJV4-CTRT>.

There is now a specialized field of climate science known as “attribution science” that analyzes and quantifies the contribution that anthropogenic climate change is having on extreme weather events.³⁸ For example, climate change is estimated to have increased by 20% the flooding caused by Hurricane Harvey in Houston, Texas in 2017.³⁹

Asking whether climate change caused a particular event is asking the wrong question. At this point, there is widespread agreement in the scientific community that *every* extreme weather event has a human

³⁶ Monica Samayoa, *Pacific Northwest Heat Wave Was a Freak, 10,000-year Event*, *Study Finds*, OR. PUB. BROAD. (Sept. 28, 2022), <https://perma.cc/7KRA-FS7J>.

³⁷ *Western North American Extreme Heat Virtually Impossible Without Human-Caused Climate Change*, WORLD WEATHER ATTRIBUTION (July 7, 2021), <https://perma.cc/PEG6-Z48X>.

³⁸ Renee Cho, *Attribution Science: Linking Climate Change to Extreme Weather*, COL. CLIMATE SCH.: STATE OF THE PLANET (Oct. 4, 2021), <https://perma.cc/3KVE-TCX2>.

³⁹ S-Y Simon Wang et al., *Quantitative Attribution of Climate Effects on Hurricane Harvey’s Extreme Rainfall in Texas*, ENV’T RSCH. LETTERS, Apr. 2018, at 8.

element in it.⁴⁰ Climate change amplifies these normal weather events creating “weather on steroids.”

Heat waves have been setting all-time record highs throughout the West this September. On September 7, more than 61 million people were under extreme heat advisories and warnings, according to the National Weather Service.⁴¹ Excessive heat warnings “were issued for much of California and parts of western Arizona and southern Nevada.”⁴² “Temperatures reached well into the triple digits . . . , with some areas exhibiting record-high nighttime lows” and relatively high humidity,⁴³ both of which contribute to the health effects of heat known as the “wet bulb” effect.⁴⁴ Wet bulb temperature is the lowest temperature to which an object can cool down when moisture evaporates from it.⁴⁵ The “highest wet-bulb temperature that humans can survive when exposed for at least six hours is about 95°F (35°C).”⁴⁶

Anecdotal evidence of last summer’s heat wave can even be found on Tik Tok.⁴⁷ A guy in Phoenix, Arizona posted a video of him cooking hamburgers, a steak, and a chocolate cake on the dashboard of his car on June 6, 2022.⁴⁸ The temperature inside his car hit a peak of 210°F, according to the thermometer he was using.⁴⁹

As bad as the heat was in the Western United States last summer, it was much worse in other parts of the globe. Southeast Asia, Europe, and Africa all saw record-breaking sustained heat waves.⁵⁰ The United Kingdom issued its first ever “red” warning for exceptional heat, urging citizens in London to reduce travel in July as the temperature surpassed a record-high of 105°F.⁵¹ “Thailand, Laos, and Cambodia recorded temperatures up to 112.4°F, beating all-time national highs.”⁵² In Mumbai, a punishing heat wave pushed temperatures past 120°F, killing

⁴⁰ See, e.g., Alan Buis, *Extreme Makeover: Human Activities Are Making Some Extreme Events More Frequent or Intense*, NASA: GLOB. CLIMATE CHANGE (Nov. 8, 2021), <https://perma.cc/SVA3-6MEM> (“[W]ith extreme events such as heat waves, wildfires, and intense perceptions, we’re seeing, in event after event, a very clear human fingerprint.”).

⁴¹ Sarah E. Pratt, *A Long-lasting Western Heatwave*, NASA EARTH OBSERVATORY (Sept. 6, 2022), <https://perma.cc/M9G5-7UTX>.

⁴² *Id.*

⁴³ *Id.*

⁴⁴ Alan Buis, *Too Hot to Handle: How Climate Change May Make Some Places Too Hot to Live*, NASA: ASK NASA CLIMATE (Mar. 9, 2022), <https://perma.cc/E8F5-5H89>.

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ Now This News, *TikToker Cooks Full Meals in His Car from Arizona Heat*, YOUTUBE (June 6, 2022), <https://perma.cc/BF5V-BJKS>.

⁴⁸ *Id.* at 0:28–0:33, 1:50–1:57, 3:10–3:20.

⁴⁹ *Id.* at 1:57.

⁵⁰ Sara E. Pratt, *Heatwaves and Fire Scorch Europe, Africa, and Asia*, NASA EARTH OBSERVATORY (Jul. 13, 2022), <https://perma.cc/5ZEE-6ZK5>.

⁵¹ Zhang Changyue, *China, European Countries Engulfed in Record Extreme Heat*, GLOB. TIMES (July 17, 2022), <https://perma.cc/WU6E-Q65T>.

⁵² Nathan A. Thompson, *Killer Heatwave Havoc in Southeast Asia*, CNN (May 12, 2016), <https://perma.cc/L75L-5QJ6>.

hundreds of people from heatstroke, closing schools, and rendering work outdoors on farms and construction sites unbearable.⁵³

India will be particularly hard hit by the wet bulb effect as the warming continues. Delhi currently experiences sixty-three wet bulb days per year.⁵⁴ Under a business-as-usual scenario, that number could rise to 100 by 2050. Even under a stringent emissions reduction scenario—holding temperatures below 2°C—Delhi will see eighty-one days of deadly wet bulb temperatures every year.

These kinds of extreme heat waves are baked into the climate system. The only response is adaptation. But the capacity to adapt in places like India, Southeast Asia, and Africa is limited. Adaptation on the scale required to protect billions of people in developing countries requires financial and institutional capacity that simply does not exist. It requires building cooling centers and providing households with air conditioning. The problem with that approach is that the refrigerants contain hydrofluorocarbons (HFCs) that are thousands of times more potent than CO₂.⁵⁵ This results in what is called maladaptation, where the adaptive strategy worsens the global warming problem. Under the Kigali Amendment to the Montreal Protocol, which was recently ratified by the U.S. Senate in a rare bi-partisan vote, nations have committed to reducing the production and use of these gases by 85% by 2050.⁵⁶

B. Extreme Drought

A huge swath of the Western landscape has suffered a mega-drought condition this summer. Scientists say the current drought in the West is the region's driest twenty-two year stretch in more than 1,200 years.⁵⁷ California is ground zero for drought in the West. The last three water years from October 1 to September 30 have been the driest in California's history.⁵⁸ A new study in *Nature Climate Change* shows that climate change has made the western drought about 40% more severe, making it the region's driest stretch since A.D. 800—and there is no end in sight.⁵⁹

⁵³ Lauren Frayer, *Climate Scientists Say South Asia's Heat Wave (120F!) is a Sign of What's to Come*, NAT'L PUB. RADIO (May 3, 2022), <https://perma.cc/8EUN-P59F>.

⁵⁴ Soumay Pillai, 'Wet-bulb Temperatures': Soaring Mercury, Humidity Make Outdoors Dangerous, HINDUSTAN TIMES (Jul. 7, 2021), <https://perma.cc/7X9U-Z387>.

⁵⁵ *Contribution of HFCs to the Greenhouse Effect*, NAT'L INST. FOR PUB. HEALTH & ENV'T (Nov. 2, 2018), <https://perma.cc/86XE-UUMR>.

⁵⁶ Phil McKenna, *Senate Votes to Ratify the Kigali Amendment, Joining 137 Nations in an Effort to Curb Global Warming*, INSIDE CLIMATE NEWS (Sept. 24, 2022), <https://perma.cc/4CU4-LJ7D>.

⁵⁷ Ian James, *Western Megadrought is Worst in 1,200 Years, Intensified by Climate Change, Study Finds*, L.A. TIMES (Feb. 14, 2022), <https://perma.cc/7KFK-2TFA>.

⁵⁸ Hayley Smith, *California Suffering Through Driest Three Years Ever Recorded, With No Relief in Sight*, L.A. TIMES (Oct. 3, 2022), <https://perma.cc/29HK-XYCH>.

⁵⁹ A. Park Williams et al., *Rapid Intensification of the Emerging Southwestern North American Megadrought in 2020–2021*, NATURE CLIMATE CHANGE (2022), <https://perma.cc/GE4A-9RUB>.

The drought is not confined to the West. In Oklahoma, 100% of the state saw severe or exceptional drought this year.⁶⁰ In Nebraska, over 98% of the state experienced at least moderate drought conditions.⁶¹ According to the U.S. Drought Monitor, nearly 82% of the country faced at least abnormally dry conditions—the highest percentage since the drought monitor launched in 2000.⁶² Even in the wet islands of Hawai‘i, nearly 90% of the state has seen abnormally dry conditions.⁶³



Figure 3: Lake Powell Falls to Lowest Level on Record Threatening Hydroelectric Power Production, Justin Sullivan/Getty Images No. 1388099088 (March 2022).

The consequences of these drought conditions are visible from space. Lakes Powell and Mead, the two giant reservoirs that supply water to 40 million people in the Colorado River Basin, are at 27% of capacity.⁶⁴ In June 2022, the U.S. Bureau of Reclamation issued an emergency request to the seven Upper and Lower Basin states to reduce water usage by 2 million to 4 million acre-feet over the next eighteen months.⁶⁵ Failure to comply could result in federally mandated rationing.

⁶⁰ Zach Rosenthal, *More Than 80 Percent of the U.S. is Facing Troubling Dry Conditions*, WASH. POST (Oct. 14, 2022), <https://perma.cc/6HT5-8BFH>.

⁶¹ *Id.*

⁶² *Id.*

⁶³ *Id.*

⁶⁴ Michael Carlowicz, *Lake Mead Keeps Dropping*, NASA: EARTH OBSERVATORY (Jul. 21, 2022), <https://perma.cc/CRJ6-8VWS>.

⁶⁵ *Western Drought: Hearing Before the Senate Committee on Energy and Nat. Resources*, 117th Cong. 01:06:05–34 (2022) (statement of Camille Touton, Comm’r, Bureau of Reclamation), <https://perma.cc/HB3L-F226>.

An acre foot is exactly what that sounds like, an acre of land with a foot deep of water and . . . that’s enough water roughly 325,000 gallons for a family of four for an entire year . . . when you look at Lake Powell and when you look at Lake Mead, this is just for critical elevations . . . we’re looking at two million to four million acre feet starting in 2023 that we need to conserve.

The once Great Salt Lake (GSL) is disappearing in response to less precipitation, evaporation, and increased diversions of snowmelt to offset loss of water supply to cities and agriculture. According to data from the U.S. Geological Survey, the lake has lost nearly half of its surface area from the historical average, exposing around 800 square miles of lakebed—an area slightly larger than Maui.⁶⁶ The biologically rich GSL—an ecosystem of regional, national, and global importance for migratory birds—is unraveling with significant economic impacts on Utah’s tourism, mineral extraction, and brine shrimp industry, valued at between \$1.5 to about \$2 billion annually.⁶⁷ As Republican Utah State Senator Timothy D. Hawkes has said of the Lake vanishing: “It’s not just fear-mongering[; i]t can actually happen.”⁶⁸

Worse still, the exposed lakebed is loaded with naturally occurring arsenic and other hazardous substances which are becoming airborne and threatening to poison the air surrounding Salt Lake City, putting its 1.2 million residents at risk.⁶⁹ The consequences for the lake and its surroundings are “absolutely, insanely bad,” said Kevin Perry, a professor of atmospheric sciences at the University of Utah.⁷⁰ This is a clear example of the cascading effects of climate change.

Drought is having even worse impacts in other poorer parts of the world, such as the Horn of Africa, which has endured four consecutive years of a failed rainy season.⁷¹ The World Meteorological Organization forecasts a fifth consecutive failed rainy season because of drier than average conditions expected for October to December 2022, worsening the crisis that affects millions of people.⁷² According to the World Food Program, 22 million people are at risk of starvation in the region.⁷³ Somalia is among the worst-affected countries in the Horn of Africa. A thirty-year civil war and political instability, combined with one of the worst droughts on record and food price shocks, are pushing Somalia toward famine.⁷⁴

⁶⁶ Nathan Frandino, *Utah’s Great Salt Lake is Drying Out, Threatening Ecological, Economic Disaster*, REUTERS (Jul. 14, 2022), <https://perma.cc/S83M-5CQY>.

⁶⁷ Victoria Masterson, *The Great Salt Lake is Getting a Little Less Great - Here’s Why*, WORLD, ECON. F. (Aug. 31, 2022), <https://perma.cc/4NUA-HMRM>.

⁶⁸ Christopher Flavelle, *As the Great Salt Lake Dries Up, Utah Faces an ‘Environmental Nuclear Bomb’*, N.Y. TIMES (Sept. 22, 2022), <https://perma.cc/3SUU-4QCX>.

⁶⁹ Rachel Frazin, *DRIED UP: In Utah, Drying Great Salt Lake Leads to Air Pollution*, THE HILL (Sept. 13, 2022), <https://perma.cc/63PT-47CV>.

⁷⁰ Flavelle, *supra* note 68.

⁷¹ *Horn of Africa Misses 5th Consecutive Rainy Season*, AFRICA NEWS (Aug. 26, 2022), <https://perma.cc/PW67-Y7BF>.

⁷² *Id.*

⁷³ *Id.*

⁷⁴ Belinda Luscombe, *Hardly Anybody Has Noticed Somalia Is Having Its Worst Drought Ever. Here’s Why*, TIME (Oct. 13, 2022), <https://perma.cc/SCB7-E4E9> (discussing how the drought has only exacerbated famine and instability from civil unrest).

The United Nations is appealing for \$42 million to provide urgent assistance to Ethiopia, Somalia, and Kenya.⁷⁵ This is a climate justice issue. These countries are not responsible for the extreme drought threatening their people. They lack the money and resources to deal with this calamity. The impacts are not confined to these countries. Extreme drought is driving more people from their homelands, turning them into “climate refugees” even though they do not qualify as refugees under international law, and creating political conflicts in European nations struggling to absorb the migrants.

Climate-driven droughts have been implicated in the uprisings that led to the ten-year-old war in Syria and to the steady stream of immigrants from Central America seeking refuge in the United States.⁷⁶ Forced migration from Central America is driven by violence, corruption, lack of opportunity, and—increasingly—climate change. El Salvador, Guatemala, and Honduras—the Northern Triangle—face increasing food insecurity. Drought has caused repeated crop failure in the Dry Corridor of Central America, where people rely on agriculture for food and livelihoods.⁷⁷ Additionally, this region is highly susceptible to hurricanes.

According to the World Bank’s Groundswell report, climate impacts could force 216 million people in some of the most climate-vulnerable regions to move within their countries by 2050.⁷⁸ Globally, it is estimated that over 1 billion people are at risk of being driven from their homes for climate-related reasons.⁷⁹ Population displacement of this large scale leads to resource pressure on the towns, countries, and communities receiving migrants and can exacerbate existing instability.

C. Catastrophic Wildfires

The term “fire season” is now a misnomer in California and increasingly throughout the West. Fifteen of the twenty biggest fires in the state’s history have occurred since the year 2000, and large wildfires—covering more than 25,000 acres—could become 50% more frequent by the year 2100.⁸⁰ Since the 1980s, researchers say, climate

⁷⁵ Stefan Ellerbeck, *The Horn of Africa is Facing an Unprecedented Drought. What Is the World Doing to Help Solve It?*, WORLD ECON. F. (Jul. 21, 2022), <https://perma.cc/7MP3-EV7Q>.

⁷⁶ John Podesta, *The Climate Crisis, Migration, and Refugees*, BROOKINGS (Jul. 25, 2019), <https://perma.cc/SZ24-LFSA>.

⁷⁷ Abrahm Lustgarten, *The Great Climate Migration*, N.Y. TIMES MAG. (Jul. 23, 2020), <https://perma.cc/QDW5-5T6R>.

⁷⁸ WORLD BANK, GROUNDSWELL PART 2: ACTING ON INTERNAL CLIMATE MIGRATION, at xxii (2021). The six regions examined in this study were Sub-Saharan Africa, East Asia and the Pacific, South Asia, North Africa, Latin America, and Eastern Europe and Central Asia. *Id.*

⁷⁹ Tetsuji Ida, *Climate Refugees—the World’s Forgotten Victims*, WORLD ECON. F. (Jun. 18, 2021), <https://perma.cc/K263-7FUM>.

⁸⁰ Jeremy Berke & Dana Varinsky, *California’s Devastating Wildfires are Part of an Alarming Trend—Here’s Why They’ve Gotten So Much Worse*, BUS. INSIDER (Nov. 9, 2018), <https://perma.cc/42P7-DLP4>.

change has roughly doubled the area of wildfires in the western United States.⁸¹

Wildfire season has become longer and more dangerous because winter snows are melting earlier, and rain is coming later in the fall. What was once a four-month fire season now lasts six to eight months. Fires in recent years have burned well-outside of the typical fire season throughout California, Arizona, New Mexico, Tennessee, and New Jersey. Fires in the winter months are becoming part of the new abnormal.

Other factors contributing to longer fire seasons include extended drought, tree mortality from pine beetle infestations—another consequence of warmer winters that reduce beetle mortality—and invasive species such as cheat grass that allow fire to ignite easily and spread rapidly.⁸² Government policies that encouraged aggressive fire suppression for more than a century have had the effect of allowing fuels to accumulate, stoking hotter and larger fires.⁸³

The behavior of these wildfires has changed. They burn hot enough to destroy thousand-year-old giant sequoias. The National Park Service reports that between 2015 and 2021, more than 85% of giant sequoia groves throughout the Sierra Nevada has burned in wildfires, compared to only one quarter in the last 100 years.⁸⁴ These supercharged fires move so fast that firefighters warn residents that by the time they see the flames, it may be too late to escape.⁸⁵ Wildfires can create their own weather systems, sometimes powerful enough to spark a new set of fires. The Bootleg Fire in Southern Oregon in 2021 burned so hot it created pyrocumulus clouds—a fire tornado—from the intense heat and smoke.⁸⁶

⁸¹ *Climate Change Has Doubled Western U.S. Forest Fires, Says Study*, COLUM. CLIMATE SCH.: EARTH INST. (Oct. 10, 2016), <https://perma.cc/3FTL-H2H4>.

⁸² Benji Jones, *Beetles, Drought, and Fires are a Ticking Time Bomb in the West*, VOX (Jul. 29, 2021), <https://perma.cc/2FGH-QHN4>.

⁸³ *Id.*

⁸⁴ *Wildfires Kill Unprecedented Number of Large Sequoia Trees*, NAT'L PARK SERV. (Feb. 25, 2022), <https://perma.cc/QMY6-P8L3>.

⁸⁵ Sammy Roth, *'Going House to House Knocking on Doors, Telling People to Get Out': Alert System No Match for Fast-Moving Fire*, DESERT SUN (Nov. 15, 2017), <https://perma.cc/N22Z-A253>.

⁸⁶ Joe Sutton et al., *The Bootleg Fire in Oregon Is So Large, It's Creating Its Own Weather*, CNN (Jul. 20, 2021), <https://perma.cc/2RFD-3DT3>.

These clouds essentially become their own thunderstorms, triggering lightning strikes that ignite still more fires.



Figure 4: Oregon Office of State Fire Marshall (July 2021) (a pyrocumulus cloud appears over the Bootleg Fire in southern Oregon).

Adapting to these virtually uncontrollable fires is a daunting challenge. Nearly 90% of wildfires are human caused, so public education is important—controlling off-road vehicles for example. Land-use controls at the urban-wildlands interface is important. Building codes requiring use of fire-resistant materials is important. Family evacuation plans should be part of living in the wildland-urban interface.

Globally, wildfires have been increasing. A wildfire that incinerated part of the town of Lytton, British Columbia in June 2021 was in part caused by three days of record-breaking heat that reached 121°F, temperatures that climate researchers say would not be possible without human-caused global warming.⁸⁷ “The Black Summer forest fires of 2019–2020 in Australia burned more than 24 million hectares, directly causing thirty-three deaths and almost 450 more from smoke inhalation.”⁸⁸ The boreal forests of Siberia resting on permafrost would not seem to be especially vulnerable to wildfires, yet in 2021, gigantic wildfires scorched 7,258 square miles, an area the size of Greece and larger than all the fires around the world combined.⁸⁹

Climate change and land-use changes are projected to make wildfires even more frequent and intense, with a global increase of extreme fires of 14% by 2030, 33% by the end of 2050, and 52% by the end of the century

⁸⁷ Vjosa Isai, *Heat Wave Spread Fire That ‘Erased’ Canadian Town*, N.Y. TIMES (Jul. 10, 2021), <https://perma.cc/FH9D-T8UT>.

⁸⁸ Garry Cook et al., *Australia’s Black Summer of Fire Was Not Normal—and We Can Prove It*, THE CONVERSATION (Nov. 26, 2021), <https://perma.cc/PAK4-RARL>.

⁸⁹ Benjamin Seidman, *Siberian Wildfires Doubly Dangerous to Distracted Russia*, ENV’T NEWS SERV. (May 20, 2022), <https://perma.cc/MCN8-UJGN>.

under the lowest emissions scenario, according to a U.N. Environmental Programme report.⁹⁰

The extreme wildfires sweeping across parts of North America, Europe, and Siberia this year are not only wreaking local damage and sending choking smoke downwind, they are also affecting the climate itself with long-term consequences. Wildfires emit carbon dioxide and other greenhouse gases that will continue to warm the planet well into the future. They kill trees that would otherwise remove CO₂ from the air. And they inject soot and other aerosols into the atmosphere, with complex effects on warming and cooling. Scientists estimate that the annual contribution of fires to global greenhouse gas emissions is 2.1 PgCO₂, or 6% of global fossil fuel CO₂ emissions in 2014.⁹¹

Then there is the smoke. In September 2022, ninety-three large fires were burning across seven western states.⁹² Alerts for hazardous air quality were in effect in parts of Oregon, Washington state, Idaho, Wyoming, and Montana.⁹³ Hazy smoke drifted thousands of miles and was visible from my home in Vermont.

Researchers with the Scripps Institution of Oceanography at the University of California, San Diego say that the tiny particles (PM_{2.5}) released in wildfire smoke are up to ten times more harmful to humans than car exhaust.⁹⁴ Fine particles from wildfire smoke led to 10% more respiratory hospitalizations than there would be without the smoke, according to a study published in *Nature*.⁹⁵

When communities burn, the smoke can be especially hazardous. “The 2018 fire in Paradise, California that killed 85 people and torched 14,000 houses also generated a thick plume, blanketing portions of Northern California for weeks.”⁹⁶ Smoke from burning houses and buildings contains more toxic plastics and other manufactured materials, as well as chemicals stored in garages.

⁹⁰ SPREADING LIKE WILDFIRE: THE RISING THREAT OF EXTRAORDINARY LANDSCAPE FIRES, U.N. ENV'T PROGRAMME 10 (2022), <https://perma.cc/9G4A-JRK9>.

⁹¹ Guido R. van der Werf et al., *Global Fire Emissions Estimates During 1997–2016*, 9 EARTH SYS. SCI. DATA 697, 711 (2017).

⁹² Zach Rosenthal, *Smoke from Western Fires Fuels Dangerous Air Quality*, WASH. POST (Sept. 13, 2022), <https://perma.cc/GQ7D-SGQ6>.

⁹³ *Id.*

⁹⁴ Robert Monroe, *Fine Particulate Matter from Wildfire Smoke More Harmful Than Pollution from Other Sources*, UC SAN DIEGO: SCRIPPS INST. OF OCEANOGRAPHY (Mar. 5, 2021), <https://perma.cc/8N8E-GYTA>.

⁹⁵ Rosana Aguilera et al., *Wildfire Smoke Impacts Respiratory Health More Than Fine Particles from Other Sources: Observational Evidence from Southern California*, 12 NATURE COMM'NS, Mar. 5, 2021, at 1, 3.

⁹⁶ *As Wildfire Smoke Spreads, Research Points to Potential Long-term Health Damages*, KTLA (Jul. 22, 2021), <https://perma.cc/YB9Q-YRQX>.

D. Biblical Floods

Figure 5: Indus River Pakistan. *New Report Links Pakistan Flooding to Climate Change*, AM. RED CROSS (Sept. 16, 2022), <https://perma.cc/MUM8-PL8S>.

Pakistan is especially vulnerable to floods, but none worse than the torrential monsoon rains that struck between June and September this year. Flood waters covered over a third of the country and affected all four of the country's provinces and approximately 15% of its population.⁹⁷ Flooding killed thousands, washed away entire villages, and left almost 10 million children in need of immediate, lifesaving support.⁹⁸ Malaria, dengue fever, and waterborne diseases are rampant. Food is scarce and the government cut off power to prevent electrocutions. United Nations officials say it could take six months for floodwaters to recede in the hardest-hit areas.⁹⁹

The ongoing human rights tragedy of Pakistan has led to increased calls for payment of reparations—"loss and damage" in the parlance of the United Nations Framework Convention on Climate Change (UNFCCC) process¹⁰⁰—from the wealthy nations that are primarily responsible for these climate-driven disasters. Loss and damage will be a central focus of the upcoming COP 27 meeting in Sharm El Sheikh, Egypt. The United States has opposed the idea of establishing legal liability for such damage and prefers to emphasize payments for

⁹⁷ Pumza Fihlani & Frances Mao, *Pakistan Floods: Monsoons Bring Misery to Millions in Pakistan*, BBC (Aug. 26, 2022), <https://perma.cc/NL7H-WXHP>.

⁹⁸ *As Floodwaters Recede, Grave Risks for Children in Pakistan*, FORBES (Jan. 13, 2023), <https://perma.cc/5X6A-BGK3>.

⁹⁹ *Pakistan Floods: Six Month Wait for Water to Recede, Warn Relief Agencies*, U.N. NEWS (Sept. 20, 2022), <https://perma.cc/J867-5YS4>.

¹⁰⁰ *Topics: Introduction to Loss and Damage*, UNFCC, <https://perma.cc/PXM8-G7HX> (last visited Jan. 11, 2023).

mitigation and adaptation.¹⁰¹ But the idea that rich nations should compensate poorer ones for irreversible damages from intensifying perils is gaining traction. That kind of funding is distinct from money for reducing emissions or adapting to future conditions.

Floods are becoming more frequent and devastating here in the United States as well. In July, a series of massive thunderstorms dumped sixteen inches of rain on Eastern Kentucky and Central Appalachia, causing deadly flash-flooding of roadways that led to about forty deaths and devastating river flooding.¹⁰² Entire homes and parts of some communities were swept away by flood waters.¹⁰³ Over 600 helicopter rescues and countless swift-water rescues by boat were needed to evacuate people who were trapped by the fast-rising flood waters.¹⁰⁴

Kentucky was not alone. In June, historic floods closed most of Yellowstone National Park.¹⁰⁵ On the morning of July 26, St. Louis awoke to historic flooding in the city.¹⁰⁶ A staggering 7.87 inches of rain fell in six hours during the morning commute, inundating vehicles and prompting hundreds of water rescues.¹⁰⁷ In August, parts of the Dallas-Fort Worth metroplex awoke to torrential downpours that dropped ten to sixteen inches, bringing calamitous impacts, and once again prompting widespread water rescues.¹⁰⁸ Not even Death Valley escaped. On August 5, heavy storms dumped over 1.46 inches of rain on Death Valley, California.¹⁰⁹ That does not sound like much, but it is just 0.01 inches shy of the all-time daily record.¹¹⁰

What all of these floods have in common is that they are regarded as once in a thousand-year events meaning that they had only a 0.1% chance of happening in any given year. Yet we saw five such once-in-a-thousand-year flooding events this year. All five events stemmed from stationary

¹⁰¹ Jean Chemnick, *Fearing Liability, U.S. Resists U.N. Fund for Climate Damages*, SCI. AM. (Nov. 19, 2021), <https://perma.cc/Z9ZN-LNAC>.

¹⁰² Ryan Van Velzer, *Heavy Rain, Steep Slopes and Climate Change Contributed to Catastrophic Eastern Kentucky Floods*, WKU PUB. RADIO (Aug. 26, 2022), <https://perma.cc/XQL4-PZ4Q>.

¹⁰³ *Id.*

¹⁰⁴ *Historic July 26th-July 30th, 2022 Eastern Kentucky Flooding*, NAT'L WEATHER SERV., <https://perma.cc/R2WF-SGYY> (last visited Jan. 12, 2023).

¹⁰⁵ Elizabeth Wolfe et al., *Dozens Evacuated as Unprecedented Flooding Yellowstone National Park to Close All Entrances*, CNN (Jun. 15, 2022), <https://perma.cc/2EE9-4MV3>.

¹⁰⁶ *July 26th, 2022 Historic Flash Flooding in the St. Louis Metro Area*, NAT'L WEATHER SERV., <https://perma.cc/TD67-AK64> (last visited Jan. 12, 2023).

¹⁰⁷ Renee Duff, *Hundreds Rescued After Deadly Flash Flooding Swamps St. Louis Metro Area*, ACCUWEATHER (Jul. 26, 2022), perma.cc/C4Y3-GLSS.

¹⁰⁸ *See Heavy Rain Floods Streets Across the Dallas-Fort Worth Area*, NAT'L PUB. RADIO (Aug. 22, 2022), <https://perma.cc/83RW-9TFQ> (describing how fast and hard the rain fell in the area).

¹⁰⁹ News Release, Nat'l Parks Serv., August 5, 2022 Recognized as Rainiest Day in Death Valley's History (Sept. 1, 2022), <https://perma.cc/JE7E-RV72>.

¹¹⁰ *U.S. Sweltered Through Third-Hottest Summer on Record – August 2022 Saw Remarkable Heat, Historic Flash Floods*, SIERRA SUN TIMES (Sept. 10, 2022), <https://perma.cc/A6GP-Z557>.

fronts and anomalously humid air masses, bearing the unmistakable fingerprints of anthropogenic climate change.

E. The Climate Cliff

All these catastrophes are just the beginning. Looming ahead but not yet visible are much greater threats to life on earth. What scientists call climate tipping points are a source of growing concern. A tipping point “is the point at which small changes become significant enough to cause a larger, more critical change that can be abrupt, irreversible, and lead to cascading effects.”¹¹¹ Scientists sometimes describe this as the climate system going on auto-pilot. Once triggered, these tipping points lead to significant impacts, including substantial sea-level rise from collapsing ice sheets, dieback of ecologically critical ecosystems such as the Amazon rainforest or warm-water corals, and carbon release from thawing permafrost. In the past, scientists believed it would take extreme heating of 5°C to trigger these tipping points, but latest evidence suggests that this could happen between 1° and 2°C.¹¹²

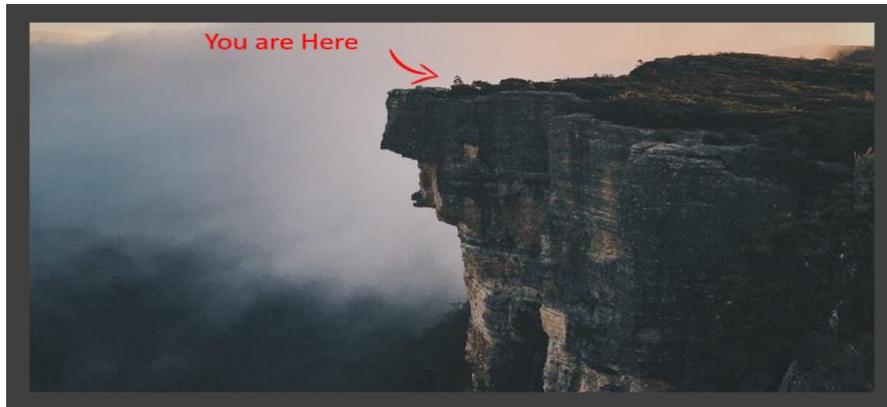


Figure 6: Billy Pasco, Kanangra Walls Lookout, Australia, Unsplash (Oct. 27, 2017), <https://perma.cc/C5GW-8WZY> (adding in “You are Here”).

The disintegration of the West Antarctic Ice Sheet (WAIS) illustrates the risks and consequences of one of these tipping points. WAIS rests on an underwater bedrock. Warmer water underneath the sheet, melting it from below, reduces the contact area and friction between the WAIS and the bedrock, speeding up the outward flow of the WAIS.¹¹³ A video of the Thwaites Glacier—dubbed the Doomsday Glacier—explains how this

¹¹¹ Renee Cho, *How Close Are We to Climate Tipping Points?*, COLUM. CLIMATE SCH.: STATE OF THE PLANET (Nov. 11, 2021), <https://perma.cc/UER3-2L8T>.

¹¹² David I. Armstrong McKay et al., *Exceeding 1.5°C Global Warming Could Trigger Multiple Climate Tipping Points*, 377 SCI., Sep. 9, 2022, at 4, <https://perma.cc/N7XD-64SC>.

¹¹³ Juan Siliezar, *Antarctic Ice Sheet Melting to Lift Sea Level Higher than Thought, Study Says*, HARV. GAZETTE (Apr. 30, 2021), <https://perma.cc/KRY9-K7W2>.

process is threatening the integrity of the WAIS.¹¹⁴ It would take centuries for the WAIS to melt completely, but the consequences for the world's most populous areas—many of which lie within a foot of sea levels—would be catastrophic long before then.

According to a recent National Oceanic and Atmospheric Administration (NOAA) report, the East Coast could see as much as fourteen inches of sea-level rise by 2050, and the Gulf Coast as much as eighteen inches, with regional variabilities primarily attributed to topography.¹¹⁵ The rising seas and storm surges from more intense storms also pose a critical risk to infrastructure such as roads, water supplies, power plants, oil and gas wells, sewage treatment systems, and nearly everything that we use, eat, and wear that comes through the supply chain and arrives through coastal ports.

One of the most disruptive tipping points involves something called the Atlantic Meridional Overturning Current (AMOC), the great conveyor belt that constantly moves water, heat, salt, carbon, and nutrients on a north-south axis within and between the ocean basins around the globe.¹¹⁶ In the Atlantic Ocean, warm and salty water in the upper ocean is transported from the South Atlantic northwards towards Greenland, England, and Northern Canada, where, after losing its heat to the atmosphere and mixing with ambient water masses, it sinks and forms deep water that flows south all the way down toward Antarctica.

Recent evidence indicates that the AMOC is slowing.¹¹⁷ Melting of the Greenland and Antarctic ice sheets is dumping huge volumes of freshwater into the ocean, making water more buoyant and reducing the sinking of dense water at high latitudes. A complete shutdown of the circulation could bring extreme cold to Europe and parts of North America, raise sea levels along the U.S. East Coast, and disrupt seasonal monsoons that provide water to much of the world and accelerate the drying of the Amazon.¹¹⁸ Though such a worst-case scenario is a low probability, it cannot be ruled out because it has occurred in Earth's history, and the consequences for humans and the marine ecosystem are too profound to risk.

¹¹⁴ Carlo Cadenas, *Thwaites Glacier Animation for Vox*, VIMEO (2021), <https://perma.cc/B5UF-HN2X>.

¹¹⁵ NAT'L OCEANIC AND ATMOSPHERIC ADMIN., GLOBAL AND REGIONAL SEA LEVEL RISE SCENARIOS FOR THE UNITED STATES 60 (Feb. 2022), <https://perma.cc/A68E-G27F> ("Specifically, [relative sea level] along the contiguous U.S. . . . coastline is expected to rise, on average as much over the next 30 years (0.25–0.30 m over 2020–2050) as it has over the last 100 years (1920–2020).").

¹¹⁶ See, e.g., *What is the Atlantic Meridional Overturning Circulation (AMOC)*, NAT'L OCEAN SERV., <https://perma.cc/S4NA-F4TS> (last visited Jan. 13, 2023) (giving an overview of the AMOC and how it circulates water).

¹¹⁷ See, e.g., Chelsea Harvey, *A Major Ocean Current Is at Its Weakest Point in 1,000 Years*, SCI. AM. (Apr. 27, 2022), <https://perma.cc/7TH2-JXC8> (explaining how the AMOC is slowing down and the role that climate changes plays in this phenomena).

¹¹⁸ *Id.*; Sarah Kaplan, *A Critical Ocean System May be Heading for Collapse Due to Climate Change, Study Finds*, WASH. POST (Aug. 5, 2021), <https://perma.cc/Y7K8-FJ9Q>.

III. NOW FOR SOME GOOD NEWS

There is still time to avoid the worst consequences of climate disruption if the nations of the world—led by the wealthiest and largest emitters in the G7—can get their collective act together. But the clock is ticking. In its press release announcing publication of the Sixth Assessment Report (AR6), the IPCC said: “Without immediate and deep emissions reductions across all sectors, limiting global warming to 1.5°C is beyond reach.”¹¹⁹ To hit this target will require global greenhouse gas emissions to peak before 2025 at the latest and be reduced by 43% by 2030, and methane must be reduced by about a third.¹²⁰ Even with this, there is a good chance global temperatures will “temporarily exceed” 1.5°C and require deployment of new “direct air capture” technologies, such as the Orca plant in Iceland, to suck carbon from the atmosphere.¹²¹ Limiting warming to around 2°C still requires global greenhouse gas emissions to peak before 2025 at the latest and be reduced by a quarter by 2030.

A daunting challenge to be sure. But we already have the technologies to cut emissions in half by 2030.¹²² Energy efficiency, cleaner electricity, and rapid electrification are central strategies for near- and long-term emissions reduction. Development and commercial scale deployment of the technologies needed to get to net zero by 2050 are underway and must be accelerated. The costs of clean energy resources like wind and solar energy and battery storage have dropped dramatically over the last decade, even as their performance has improved. For example, the price of solar energy has fallen 85% since 2010, while wind power is half as expensive.¹²³

Few areas in the world of clean energy are as dynamic as the electric car market. Sales of electric vehicles (EVs) doubled in 2021 from the previous year to a new record of 6.6 million.¹²⁴ “Back in 2012, just 120,000 electric cars were sold worldwide.”¹²⁵ In 2021, many more than that are sold each week. “Nearly 10% of global car sales were electric in 2021, four times the market share in 2019. Global sales of electric cars have kept

¹¹⁹ Press Release, IPCC, *The Evidence is Clear: The Time for Action is Now. We Can Halve Emissions by 2030* (Apr. 4, 2022), <https://perma.cc/9BXL-GVEK>.

¹²⁰ *Id.*

¹²¹ *Id.*; Ben Panko, *World’s Largest Carbon Capture Plant Opens in Iceland*, SMITHSONIAN (Sept. 9, 2021), <https://perma.cc/39GP-9TFH>.

¹²² John Bistline et. al., *Actions for Reducing U.S. Emissions at Least 50% by 2030*, 376 SCIENCE 922, 923–24 (2022) (describing how some industry sectors, such as electricity, already have the existing technology needed to reach 2030 goals).

¹²³ John Timmer, *U.S. Installs Record Solar Capacity as Prices Keep Falling*, ARS TECHNICA (Sept. 21, 2022), <https://perma.cc/77FM-6GCE>.

¹²⁴ Press Release, International Energy Agency, *Global Electric Car Sales Have Continued Their Strong Growth in 2022 After Breaking Records Last Year* (May 23, 2022), <https://perma.cc/6THK-RRHP>.

¹²⁵ INT’L ENERGY AGENCY, *GLOBAL EV OUTLOOK 2022 4* (2022), <https://perma.cc/ND29-JU3P>.

rising strongly in 2022, with 2 million sold in the first quarter, up 75% from the same period in 2021.”¹²⁶

The biggest hurdles to rapid acceleration of clean energy are in the process and governance structures of utilities, grid operators, and regulators in deploying clean energy resources and connecting them to the grid, overcoming challenges with siting and permitting, providing access to clean energy to low and moderate-income families in all communities, and focusing on approaches that support both utility-scale and local-scale distributed energy.

Heat pumps are another key tool. “If implemented worldwide, using heat pumps instead of traditional boilers and furnaces could cut global CO2 emissions by three gigatons per year.”¹²⁷ According to McKinsey & Co’s analysis: “heat pumps could constitute approximately 90 percent of new heating unit sales by 2050, compared with 35 percent today.”¹²⁸ The list of green tech goes on.

To quote the philosopher Pogo, “We are confronted with insurmountable opportunities.”¹²⁹

¹²⁶ *Id.*

¹²⁷ *Building Decarbonization: How Electric Heat Pumps Could Help Reduce Emissions Today and Going Forward*, MCKINSEY & CO. (July 25, 2022), <https://perma.cc/FPD9-GX7Z>.

¹²⁸ *Id.*

¹²⁹ Burton Cole, *Pogo Possum and His Friends Speak Words of Wisdom*, THE VINDICATOR: BURT’S EYE VIEW (NOV. 3, 2019), <https://perma.cc/2BG6-JJHF>.

A. The Inflation Reduction Act: America's New Climate Law

Figure 7: President Biden Hands the Inflation Reduction Act Signing Pen to Senator Joe Manchin. Kent Nishimura, *President Biden Signs Tax, Climate and Healthcare Package*, Getty Image (Aug. 16, 2022), <https://perma.cc/E374-6YP>.

Just in the nick of time and to the great surprise of many, Congress has passed, and President Biden has signed, the Inflation Reduction Act of 2022 (IRA),¹³⁰ representing the largest climate investment in the nation's history.¹³¹ It calls for roughly \$370 billion over ten years.¹³² Model projections by Princeton and others show the bill could reduce U.S. greenhouse gas emissions as much as 42% below 2005 levels by 2030, close to President Biden's goal of cutting them in half by 2030, which is also the pledge made in the form of "nationally determined contributions" or NDCs by the United States under the Paris Agreement.¹³³ Passage of the IRA restores some of the credibility lost when former President Trump pulled the United States out of Paris and provides some leverage in the upcoming COP 27 meeting in Sharm El Sheikh in November. It could also help reduce the cost of various clean energy technologies, potentially making it easier for other countries to transition away from fossil fuels.

Unlike the carrot and stick approach that characterizes much of environmental law, the IRA is almost exclusively carrots. The one big exception is the hefty charge on methane emissions from regulated

¹³⁰ Pub. L. No. 117-169, 136 Stat. 1818 (2022).

¹³¹ SENATE DEMOCRATS, SUMMARY: THE INFLATION REDUCTION ACT (July 27, 2022), <https://perma.cc/Y29P-MQR9>.

¹³² *Id.*

¹³³ Jesse D. Jenkins et al., *Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022*, PRINCETON UNIV. REPEAT PROJECT: ZERO LAB 7 (Aug. 2022), <https://perma.cc/YH7M-QYU3>.

sources under the CAA (\$900 per metric ton of methane, increasing to \$1,500 after two years).¹³⁴ Scientists emphasize the critical importance of reducing methane because it has eighty-four times the global warming potential as CO₂ over a twenty-year period.¹³⁵ The IRA allows for an exemption from this charge if EPA determines that a company is in compliance with rules that are currently under development.¹³⁶

Among the larger carrots in the IRA are these:

- More than \$135 billion for clean energy tax credits to ramp up solar and wind power. This could save households \$500 a year in energy costs.
- Tax incentives to help jumpstart adoption of electric vehicles including \$7,500 for purchase of new and \$4,000 for purchase of used EV's.
- \$60 billion for environmental justice to assist communities that have long borne the brunt of environmental pollution.
- \$21 billion to help U.S. farmers and rural communities cut emissions and make food production more resilient to climate impacts we cannot avoid.
- \$27 billion for EPA to establish the Greenhouse Gas Reduction Fund (Green Bank), designed to provide capital, leverage private capital, and provide other forms of financial assistance for the rapid deployment of low- and zero-emissions products, technologies, and services with 40% earmarked for low-income and disadvantaged communities.
- \$2.6 billion to make coastal regions more resilient in the face of sea-level rise and storm surge.¹³⁷

Unlike the bi-partisan infrastructure law, which contained more than \$1.2 billion in FY 2022 for a new Carbon Reduction Program specifically to reduce transportation-related emissions, the IRA passed without the support of a single Republican in the Senate and House. It would not have passed at all without the support of Senator Joe Manchin (D. W. Va.) and Kyrsten Sinema (D. Az.). As such, it contains several concessions to the fossil fuel industry. It mandates that up to 60 million acres of public waters and up to 2 million acres of public lands be offered up for sale each year to the oil and gas industry before the federal government can approve any new wind or solar projects.¹³⁸ It includes tax

¹³⁴ *Inflation Reduction Act 2022: Sec. 6011 and Sec. 50263 on Methane Emissions Reductions*, INT'L ENERGY AGENCY (Nov. 8, 2022), <https://perma.cc/P3RY-2PXH>.

¹³⁵ Inger Andersen, U.N. Env't Programme, *Methane Action: Tackling a Warming Planet* (Nov. 5, 2021), <https://perma.cc/63GG-XBK7>.

¹³⁶ JONATHAN L. RAMSEUR, CONG. RSCH. SERV., R47206, *INFLATION REDUCTION ACT METHANE EMISSIONS CHARGE: IN BRIEF 10* (2022).

¹³⁷ *The Inflation Reduction Act: A Breakthrough for Lower Energy Costs and Climate Progress*, ENV'T DEF. FUND (Aug. 1, 2022), <https://perma.cc/G6G7-T8FP>.

¹³⁸ Press Release, Ctr. For Biological Diversity, *Manchin Poison Pills Buried in Inflation Reduction Act Will Destroy Livable Climate* (Jul. 28, 2022), <https://perma.cc/H3Z5-WWSG>.

credits for carbon capture and sequestration (CCS) that could extend the life of dirty coal plants with impacts on frontline communities.¹³⁹ It requires that the critical minerals for renewables and EV's must be mined in the United States or imported from our trading partners, which do not include China and Russia where most of these minerals originate.¹⁴⁰

Senator Manchin got two other commitments in a backroom deal struck with Majority Leader Chuck Schumer. One involves fast track approval for the Mountain Valley Pipeline (MVP).¹⁴¹ MVP would transport fracked gas in a pipeline bigger than the controversial Keystone XL pipeline through properties in West Virginia and Virginia as well as in North Carolina. The pipeline would traverse more than 500 local rivers, streams, and wetlands, down dangerously steep slopes, and across active seismic zones. MVP is also slated to cut through the public lands of Jefferson National Forest and the Appalachian Trail. MVP has been tied up in litigation before the Fourth Circuit, which has issued four opinions finding violations of NEPA, the Endangered Species Act, and the Clean Water Act.¹⁴²

Manchin also got a commitment from Senator Schumer to push a



Figure 8: The Threatened Candy Darter is One of the Things Holding Up the MVP. FWS, T. Travis Brown.

“permit reform” bill (which had not been drafted at that point) through Congress as a rider to a “must-pass” Continuing Resolution to fund the

¹³⁹ *Carbon Capture Provisions in the Inflation Reduction Act of 2022*, CLEAN AIR TASK FORCE, <https://perma.cc/S7QU-NPWZ> (last visited Jan. 12, 2023).

¹⁴⁰ David E. Bond, *New US Climate Bill Seeks to Bolster Domestic Critical Minerals Supply Chain*, WHITE & CASE (Aug. 2, 2022), <https://perma.cc/LX4K-3EM9>.

¹⁴¹ Nina Lakhani, *Schumer and Manchin’s ‘Dirty side Deal’ to Fast-Track Pipelines Faces Backlash*, GUARDIAN (Sept. 22, 2022), <https://perma.cc/69MB-B2SE>.

¹⁴² *Wild Virginia v. U.S. Forest Serv.*, 24 F.4th 915, 927–28 (4th Cir. 2022) (finding a violation of NEPA where the Bureau of Land Management and Forest Service inadequately considered the pipeline’s sediment and erosion impacts); *Appalachian Voices v. U.S. Dep’t of Interior*, 25 F.4th 259, 263–64 (4th Cir. 2022) (vacating a biological opinion and incidental take permit under the ESA that failed to adequately consider the effects of the pipeline on two species of endangered fish); *Sierra Club v. U.S. Army Corps of Eng’rs*, 981 F.3d 251, 261–62, 265 (4th Cir. 2020) (granting a motion to stay because petitioners were likely to succeed on the merits of their claims under the Clean Water Act); *Mountain Valley Pipeline, LLC v. North Carolina Dep’t of Env’t Quality*, 990 F.3d 818, 821 (4th Cir. 2021) (holding that the North Carolina Department of Environmental Quality denial of the pipeline’s certification was consistent with the Clean Water Act).

federal government.¹⁴³ That tactic failed in the face of stiff opposition from progressive Democrats in the House. But the issue is sure to be revived in the next Congress.

Frankly, there is a need to speed-up permitting for siting of all the solar and wind projects that will be needed—as well as new transmission and distribution lines—to get the clean electricity to the load centers. “The proposed wind, solar and battery projects seeking interconnection to U.S. transmission grids today are enough to bring the country to 80% carbon-free electricity by 2030.”¹⁴⁴ But without major policy reforms and grid upgrades, much of the 1.4-terawatts of solar, wind and battery projects stuck in the interconnection queues across the United States may never get built, according to a report by Lawrence Berkeley National Laboratory.¹⁴⁵ With increased demands for clean electricity to power EVs and to replace oil and gas for home heating, as well as to produce “green hydrogen” alternative fuels for airlines and industrial sources like iron and steel manufacturing, there is a need for the kinds of permit reform that gets things built without sacrificing public health or environmental quality.¹⁴⁶

Despite these compromises and unfinished business, on balance, the IRA is a truly historic piece of legislation. Though much more will be needed, it does create a path to achieving climate stabilization goals. Whether it becomes the “game changer” that some are hoping for remains to be seen. The Treasury Department is writing the rules that will determine how \$369 billion in clean energy tax credits are parceled out.¹⁴⁷ The stakes are enormous. The department’s guidance will effectively determine who gets paid and how. It is also the first step to unleashing what the Biden administration hopes will be a wave of private-sector clean energy investment.

The November midterm elections will determine which party controls the House and Senate, and that will have a lot to say about whether the funding commitments in the IRA are honored or re-directed towards continued reliance of fossil fuels.

¹⁴³ *Manchin Releases Comprehensive Permitting Reform Text to Be Included in Continuing Resolution*, DEMOCRATIC NEWS (Sept. 21, 2022), <https://perma.cc/N8ZH-MWD5>; Maxine Joselow & Vanessa Montalbano, *Manchin Eyes Changes to Clean Water Act in Permitting Bill*, WASH. POST: THE CLIMATE 202, (Sept. 27, 2022), <https://perma.cc/U9C8-PTZB>; Stephen Lee & Kellie Lunney, *Common Ground Elusive as Manchin Permitting Bill Awaits Action*, BLOOMBERG L.: ENV’T & ENERGY, (October 20, 2022), <https://perma.cc/HME7-CQNT>.

¹⁴⁴ Jeff St. John, *The U.S. Has More Clean Energy Projects Planned than the Grid Can Handle*, CANARY MEDIA (Apr 20, 2022), <https://perma.cc/RF6G-9BUM>.

¹⁴⁵ *Record Amounts of Zero-Carbon Electricity Generation and Storage Now Seeking Grid Interconnection*, NEWS FROM BERKELEY LAB (Apr. 13, 2022), <https://perma.cc/4E4V-KY23>.

¹⁴⁶ *Green Hydrogen: An Alternative That Reduces Emissions and Cares for Our Planet*, IBERDROLA, <https://perma.cc/A5QW-8NRT> (last visited Jan. 15, 2023).

¹⁴⁷ The Department is currently seeking public comments on how to do just that. See Press Release, Treasury Seeks Public Input on Additional Clean Energy Tax Provisions of the Inflation Reduction Act, U.S. Dep’t of Treasury (Nov. 3, 2022), <https://perma.cc/D8MW-2F2P>.

B. Regulatory Approaches in the Shadow of the Supreme Court

Even if the IRA survives the midterm elections intact and is implemented with all deliberate speed, more will be required to reach President Biden's goal of a 50% reduction in emissions by 2030 and to make good on our commitments to the global community. That means using existing authorities under the CAA and other statutes to regulate sources of greenhouse gases and facilitate the expansion of renewable energy through, for example, Federal Energy Regulatory Commission (FERC). FERC holds extensive authority for regulating the nation's electricity and gas industries. The Federal Power Act¹⁴⁸ requires that electricity rates and practices be "just and reasonable," and not "unduly discriminatory" or "preferential."¹⁴⁹ On the gas side, the Natural Gas Act¹⁵⁰ says that FERC must determine whether a new interstate pipeline is required by the "public convenience and necessity" or whether a new liquefied natural gas (LNG) terminal is "consistent with the public interest."¹⁵¹ FERC's interpretation of these broad terms can frustrate or facilitate clean energy development, and courts rarely second-guess FERC's decisions.

How far the Biden administration will be able to go using statutes that have not been updated in decades to take account of climate change is an open question. In the wake of the Supreme Court's problematic decision in *West Virginia v. EPA*—in which the conservative majority went out of its way to strike down the "generation shifting" opinions in EPA's Clean Power Plan (CPP), even though it had never taken effect due to a stay imposed by an earlier Supreme Court order—EPA cannot count on getting any deference on close questions of statutory authority that have major economic and political consequences in the view of the current majority.¹⁵² The Court's formal adoption of the "major questions doctrine" has established a new regime to limit the power of administrative agencies (not just EPA). The conservative justices have summed up their approach in a single, deceptively benign sentence: we "expect Congress to speak clearly if it wishes to assign to an agency decisions of vast economic and political significance."¹⁵³ The problem with this highly subjective and activist approach to statutory interpretation is that most federal environmental laws do not speak the way the current Court prefers; instead, they speak in broad terms, authorizing agencies to address risks that Congress may not have foreseen or fully understood when it enacted the laws.

A full critique of the major questions doctrine is beyond the scope of this Essay. Instead, I commend the writings of two colleagues with deep

¹⁴⁸ 16 U.S.C. §§ 791–828c (2018).

¹⁴⁹ *Id.* § 824k.

¹⁵⁰ 15 U.S.C. §§ 717–717z (2018).

¹⁵¹ *Id.* §§ 717f(c), 717b(a).

¹⁵² *West Virginia*, 142 S. Ct. 2587, 2615–16 (2022).

¹⁵³ *Id.* at 2605 (quoting *Util. Air Regul. Grp. v. U.S. Env't Prot. Agency*, 573 U.S. 302, 324 (2014)).

expertise in administrative law and Supreme Court practice: Harvard Professor Richard Lazarus's opinion piece, *The Supreme Court Just Upended Environmental Law at the Worst Possible Moment*, and Georgetown Professor Lisa Heinzerling's article, *How Government Ends*.¹⁵⁴

A slim silver lining in the *West Virginia* decision is that it does not completely strip EPA of authority to regulate greenhouse gas (GHG) emissions under section 111 of the CAA, which is the main source of authority for regulating new and existing powerplants, both coal and gas. The Court rejected petitioners' argument that EPA's authority was limited to "within the fence line" regulations at individual plants which would severely limit the options.¹⁵⁵ As noted in Chief Justice Roberts' opinion: "We have no occasion to decide whether the statutory phrase 'system of emission reduction' refers *exclusively* to measures that improve the pollution performance of individual sources, such that all other actions are ineligible to qualify as the [best system of emission reduction]." ¹⁵⁶ Beyond-the-fence line options could include, for example, setting a standard based on the operation of a technology but allowing sources to trade with other sources to demonstrate compliance. The opinion also states that a rule could be acceptable even if it "may end up causing an incidental loss of coal's market share" as it distinguishes that scenario from "simply announcing what the market share of coal, natural gas, wind, and solar must be, and then requiring plants to reduce operations or subsidize their competitors to get there."¹⁵⁷

EPA is currently developing a rule to replace the CPP and regulate GHG emissions for powerplants under section 111. "In December 2021, EPA finalized revised national GHG emissions standards for passenger cars and light trucks for Model Years 2023–2026."¹⁵⁸ This rule requires passenger vehicles to meet a fifty-five miles per gallon of gasoline standard by 2026, up from just under thirty-eight miles per gallon today.¹⁵⁹ That would prevent the release of 3.1 billion tons of CO₂ through 2050, leading to a 15% annual reduction in the nation's gasoline consumption by 2050 and saving consumers about \$1,080 in fuel costs over the lifetime of more efficient vehicles.¹⁶⁰

EPA has also proposed rules to control methane emissions from new and existing oil and gas operations. The proposed methane rule "would

¹⁵⁴ Richard Lazarus, *Opinion, The Supreme Court Just Upended Environmental Law at the Worst Possible Moment*, WASH. POST (June 30, 2022), <https://perma.cc/7G9U-LSYV>; Lisa Heinzerling, *How Government Ends*, BOSTON REV. (Sept. 28, 2022), <https://perma.cc/X5RV-RBGW>.

¹⁵⁵ Reply Brief for Petitioners at 12, *West Virginia v. EPA*, 142 S. Ct. 2587 (2022).

¹⁵⁶ *West Virginia*, 142 S. Ct. at 2615 (emphasis in original).

¹⁵⁷ *Id.* at 2614, n.4.

¹⁵⁸ *Regulations for Greenhouse Gas Emissions from Passenger Cars and Trucks*, U.S. ENV'T PROT. AGENCY (Mar. 9, 2022), <https://perma.cc/53DV-AC92>.

¹⁵⁹ Andrew J. Hawkins, *U.S. Unveils Stricter Tailpipe Emissions Standards for New Vehicles*, THE VERGE (Apr. 1, 2022), <https://perma.cc/9J9M-KRQ7>.

¹⁶⁰ *Id.* (explaining that the new rule would save people "\$140 billion in fuel savings for new vehicles sold by 2030 and \$470 billion by midcentury.").

reduce 41 million tons of methane emissions from 2023 to 2035, the equivalent of 920 million metric tons of carbon dioxide. That's more than the amount of carbon dioxide emitted from all U.S. passenger cars and commercial aircraft in 2019.”¹⁶¹

The IRA provides additional support for EPA's rulemaking authority. It amends the CAA to define several greenhouse gases as air pollutants. This reinforces the Supreme Court's seminal decision in *Massachusetts v. EPA*.¹⁶² However, as I have written elsewhere, the IRA does not overrule *West Virginia* or give EPA any additional substantive power under the CAA.¹⁶³ It does strengthen the argument that Congress has now formally recognized EPA's authority to regulate all six greenhouse gases under various provisions of the Act and has funded enhanced efforts to reduce emissions.

C. Sustainable Finance and Private Governance

Even with the substantial public investment of the IRA and with maximum use of regulatory authority, the goal of net zero emissions by 2050 cannot be met without an unprecedented shift of private capital away from fossil fuels and towards sustainable energy, transportation, housing, food production, and other sectors of the global economy. McKinsey and Co., one of the world's leading management consulting firms, reports that the transformation of the global economy needed to achieve net-zero emissions by 2050 would require “\$9.2 trillion in annual average spending on physical assets, \$3.5 trillion more than today.”¹⁶⁴ To put it in context, that increase is equivalent to half of global corporate profits and one-quarter of total tax revenue in 2020.

The financial risks of climate change are real and gaining increased attention from the financial markets. The risks fall into four main categories: (1) the physical risks of the extreme weather events, discussed above, that threaten the assets and supply chains of major corporations and state-run enterprises; (2) the transition risks that follow societal and economic shifts toward a low-carbon and more climate-friendly future;¹⁶⁵ (3) reputational risks in an economy where 70% to 80% of market value comes from hard-to-assess intangible assets such as brand equity, intellectual capital, and goodwill, and thus organizations are especially

¹⁶¹ News Release, U.S. Env't Prot. Agency, U.S. to Sharply Cut Methane Pollution that Threatens the Climate and Public Health (Nov. 2, 2021), <https://perma.cc/42Y4-CZYB>.

¹⁶² 549 U.S. 497, 529 (2007).

¹⁶³ Patrick Parenteau, *The Inflation Reduction Act Doesn't Get Around the Supreme Court's Climate Ruling in West Virginia v. EPA, but it Does Strengthen EPA's Future Abilities*, THE CONVERSATION (Aug. 24, 2022), <https://perma.cc/DRB9-TFEE>.

¹⁶⁴ *The Net-Zero Transition: What it Would Cost, What it Could Bring*, MCKINSEY & CO., <https://perma.cc/EKE6-VSBB> (last visited Jan. 13, 2023).

¹⁶⁵ See, e.g., Karen Piñeros, *Let's Talk About Climate Change Transition Risks...*, IDB IMPROVING LIVES (Nov. 10, 2022), <https://perma.cc/B859-C9Q9> (discussing how low-carbon measures and technology can help to change “from business-as-usual to more sustainable models.”).

vulnerable to anything that damages their reputations; and (4) liability risk from the rising tide of climate litigation worldwide now numbering over 2,000 cases.¹⁶⁶

Professor Michael P. Vandenburgh has written extensively on the concept of private governance.¹⁶⁷ His research has revealed several important insights: that a corporation's toxics use is regulated more by private supply chain contract requirements than by federal regulations; that more money is spent on private environmental inspections than by EPA's entire enforcement program; and that 14% of the world's temperate forests and 7% of the fisheries are in the hands of private certification systems like the Forest Stewardship Council.¹⁶⁸ His research provides new insights about collective action problems like climate change and suggests how the more enlightened corporate actors can be engaged to address the most pressing environmental problems. As Professor Vandenburgh puts it: "Private climate governance is not a sideshow but one way to bypass government gridlock and achieve major emissions reductions over the next decade."¹⁶⁹

The fossil fuel divestment movement, inspired by author Bill McKibben and the 350.org group he founded, has changed the conversation around fossil fuel finance. According to the Global Fossil Fuel Divestment Database, over 1,500 institutions have divested over \$40 trillion.¹⁷⁰ "Even for oil and gas, a study across thirty-three nations indicates that increased divestment pledges are associated with decreased debt and equity capital flows to fossil fuel firms."¹⁷¹

Of course, divestment alone cannot accomplish the goal of building a more sustainable and equitable economy. Reinvestment in the "regenerative economy" is what is needed. That is where the rapidly expanding ESG movement comes in. ESG stands for Environmental, Social, and Governance. Environmental criteria consider how a company safeguards the environment, including corporate policies addressing climate change, for example. Social criteria examine how it manages relationships with employees, suppliers, customers, and the communities

¹⁶⁶ See *Climate Change Litigation Databases*, SABIN CTR. FOR CLIMATE CHANGE LAW, <https://perma.cc/86KA-F4KN> (last visited Jan. 10, 2023) (providing databases of all climate change litigation, of which there are currently 1,546 cases in the United States and 683 cases internationally).

¹⁶⁷ Michael P. Vandenburgh, *Private Environmental Governance*, 99 CORNELL L. REV. 129, 133 (2013).

¹⁶⁸ *Id.* at 136, 147, 191.

¹⁶⁹ Michael Vandenburgh & Jonathan Gilligan, *Why Private 'Actors' Are Taking Center Stage on Climate Change*, GREENBIZ (Dec. 9, 2017), <https://perma.cc/Z32Z-ZHZU>.

¹⁷⁰ *The Database of Fossil Fuel Divestment Commitments Made by Institutions Worldwide*, GLOB. FOSSIL FUEL DIVESTMENT COMMITMENTS DATABASE, <https://perma.cc/KC3J-HDNS> (last visited Jan. 13, 2023).

¹⁷¹ David Carlin, *The Case for Fossil Fuel Divestment*, FORBES (Feb. 20, 2021), <https://perma.cc/6HUZ-MBJ7>.

where it operates. Governance deals with a company's leadership, executive pay, audits, internal controls, and shareholder rights.

ESG investing is used to screen investments based on corporate policies and to encourage companies to act responsibly. Interest in ESG has been steadily rising over time. The amount of capital allocated to ESG funds is estimated to reach \$41 trillion by the end of 2022.¹⁷²



Figure 9: Photograph of a Green Earth with ESG, in *Insight: Changing landscape accelerates demand for ESG solutions*, ENV'T ANALYST (Oct. 5, 2021), <https://perma.cc/924S-7ZLU>.

With the explosion of ESG investing, greenwashing has become a serious problem. In general, greenwashing is a term used to describe false, misleading, or exaggerated claims made by an organization about the positive impact that a company, product, or service has on the environment. A recent investigation of statements and advertising by BP, Chevron, Exxon, and Shell concluded that claims of a commitment to decarbonization and a clean energy transition were not matched by any significant change in the business models, or investments in further exploitation of fossil fuel resources.¹⁷³ Several states have sued Exxon and other oil companies and their trade associations for violations of state consumer protection and securities fraud laws.¹⁷⁴

Companies engage in greenwashing for a variety of reasons—most obviously to improve corporate image and brand identity. But there are other, less obvious reasons. A major factor is the lack of standardized criteria to measure and compare ESG claims. The European Union (E.U.)

¹⁷² Press Announcement, Bloomberg, ESG May Surpass \$41 Trillion Assets in 2022, But Not Without Challenges, Finds Bloomberg Intelligence (Jan. 24, 2022), <https://perma.cc/3H3X-SZ8Z>.

¹⁷³ Mei Li et al., *The Clean Energy Claims of BP, Chevron, ExxonMobil and Shell: A Mismatch Between Discourse, Actions and Investments*, PLOS ONE, Feb. 2022, at 1.

¹⁷⁴ See, e.g., *Rhode Island v. Shell Oil Prods.*, 35 F.4th 44, 45 (1st Cir. 2022) (arguing that Shell, Chevron, ExxonMobil, and other oil companies are liable for “public nuisance, products liability, trespass, impairment of public trust resources, and violation of Rhode Island’s Environmental Rights Act”); *Massachusetts v. Exxon Mobil Corp.*, 462 F.Supp.3d 31 (D. Mass. 2020); *Connecticut v. Exxon Mobil Corp.*, 2021 WL 2389739, at *2 (D. Conn. June 2, 2021); *Minnesota v. Am. Petroleum Inst.*, No. 20-1636, 2021 WL 1215656, at *1 (D. Minn. Mar. 31, 2021).

has been out-in-front on these issues for some time. “The E.U. taxonomy regulation describes a framework to classify ‘green’ or ‘sustainable’ economic activities executed in the EU.”¹⁷⁵ Previously, there was “no clear definition of green, sustainable, or environmentally friendly economic activity. The EU taxonomy regulation creates a clear framework for the concept of sustainability, exactly defining when a company or enterprise is operating sustainably.”¹⁷⁶ The regulation establishes six environmental objectives, including climate mitigation and adaptation.¹⁷⁷ The taxonomy defines environmentally sustainable activities as economic activities that make a substantial contribution to at least one of the E.U.’s environmental objectives, while at the same time, not significantly harming any of these objectives and meeting minimum social safeguards.¹⁷⁸ All financial market participants are covered by the rule. The taxonomy currently provides technical screening criteria for seventy climate change mitigation and sixty-eight climate change adaptation activities.

Here in the United States, there are two agencies with responsibility for policing greenwashing. The Federal Trade Commission has issued a series of Green Guides starting in 1992. The current version of the Guides was issued in 2012.¹⁷⁹ The guidance includes: (1) general principles that apply to all environmental marketing claims; (2) how consumers are likely to interpret particular claims; (3) how marketers can substantiate these claims; and (4) how marketers can qualify their claims to avoid deceiving consumers.¹⁸⁰ Among other modifications, the Guides caution marketers not to make broad, unqualified claims that a product is “environmentally friendly” or “eco-friendly” because consumer perception surveys confirm that such claims are likely to overstate the product’s environmental benefits.¹⁸¹

The Securities and Exchange Commission (SEC) proposed a more substantial and controversial rule on climate and ESG disclosures on March 21, 2022.¹⁸² The proposed rule, titled “The Enhancement and Standardization of Climate-Related Disclosures for Investors,” would require companies to include certain climate-related disclosures in their registration statements and periodic reports, including information about climate-related risks that are reasonably likely to have a material impact

¹⁷⁵ *EU Taxonomy Overview*, EU TAXONOMY INFO, <https://perma.cc/5L9P-996W> (last visited Jan. 12, 2023).

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

¹⁷⁸ *Id.*

¹⁷⁹ *FTC Issues Revised “Green Guides,”* FED. TRADE COMM’N (Oct. 1, 2012), <https://perma.cc/P2YC-W9SA>.

¹⁸⁰ *Guides for the Use of Environmental Marketing Claims*, 77 Fed. Reg. 62,124, 62,125 (Oct. 11, 2012) (codified at 16 C.F.R. § 260).

¹⁸¹ *Id.* at 63,552.

¹⁸² *The Enhancement and Standardization of Climate-Related Disclosures for Investors*, 87 Fed. Reg. 21,334, 21,473 (Apr. 11, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, and 249).

on their business, results of operations, or financial condition.¹⁸³ The required information about climate-related risks also would include disclosure of a registrant's greenhouse gas emissions, which have become a commonly used metric to assess a registrant's exposure to such risks.

The proposed rules also would require a company to disclose information about its direct GHG emissions (Scope 1) and indirect emissions from purchased electricity or other forms of energy (Scope 2).¹⁸⁴ In addition, a registrant would be required to disclose GHG emissions from upstream and downstream activities in its value chain (Scope 3) if material or if the registrant has set a GHG emissions target or goal that includes Scope 3 emissions.¹⁸⁵ A phase-in period is included with the compliance date dependent on the registrant's filer status, and an additional phase-in period for Scope 3 emissions disclosure.¹⁸⁶

There have been two rounds of public comments and a final rule is expected before the end of the year. Litigants are already lining up to challenge the final rule and opponents are sure to raise the major questions doctrine, including many of the same "red state" Attorneys General who brought the *West Virginia* case at the heart of the challenges.¹⁸⁷

IV. PREPARING FOR THE LONG ROAD AHEAD: WAYS TO AVOID CLIMATE BURNOUT

It has taken more than a century to create the climate crisis and it will take the rest of this century and beyond to deal with it effectively. There are only three options: mitigate, adapt, or suffer. At this point, some combination of all three is in store. The priority must be rapid decarbonization but done in a way that leaves no one behind—the "just transition," as it is called. This is not a short-term project. It will be a lifetime of work—a marathon, not a sprint. Systemic changes are needed that will take time. Meanwhile, every ton of carbon and every fraction of a degree matters.

Here are some closing words of advice to avoid climate fatigue and burnout.

- Pace yourself.
- Stay healthy in mind and body.
- Get lots of exercise. Keep those endorphins flowing.
- Get outdoors and stay connected to nature. Savor the beauty and wonder out there.

¹⁸³ *Id.* at 21,334.

¹⁸⁴ *Id.* at 21,346, 21,374–75.

¹⁸⁵ *Id.* at 21,344.

¹⁸⁶ *Id.* at 21,346, 21,444, 21,448.

¹⁸⁷ See Andrew Ramonas & Amanda Iacone, *SEC Climate Rules Pushed Back Amid Bureaucratic, Legal Woes*, BLOOMBERG L. (Oct. 19, 2022), <https://perma.cc/9T8W-HLA6> (discussing the upcoming final rules and how Republicans expect to sue the SEC under *West Virginia* and the major questions doctrine).

- Face your fears and strengthen your own resilience.
- Diversify your work and reading. Don't make it about climate 24/7.
- Focus on things you can do in your own life and your community.
- Celebrate every accomplishment, no matter how small.
- Connect with your fellow climate warriors.

Finally, consider running for office. As my friend and mentor Gus Speth says, “Honestly, right now we don’t need more studies or more policy ideas. We need more politicians, good ones, and we need them urgently and at all levels—federal, state, and local. There is no substitute for this.”¹⁸⁸

Good luck and “Don’t stop believin’!”¹⁸⁹

¹⁸⁸ Gus Speth, *Can Transformative Change Come to America?*, RESILIENCE (Aug. 17, 2022), <https://perma.cc/UW9H-ZFBR>.

¹⁸⁹ *Journey – Don't Stop Believin' (Lyrics)*, YOUTUBE, at 03:23, <https://perma.cc/2APY-48RU> (last visited Jan. 15, 2023).