

SYMPOSIUM INTRODUCTION: CHALLENGE AND HOPE

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INTRODUCTION

A. Frank's Story

I watched *An Inconvenient Truth* around 2008 because a friend suggested it. In our family room with my wife, I was terrified. Al Gore's sonorous voice reassured us that we could deal with global warming—we were healing the ozone layer, weren't we? But the problem seemed so large, so overwhelming, that I spent the next several years largely sticking my head in the sand. I focused on my work at the U.S. Environmental Protection Agency, persuading the U.S. military to cleanup Superfund sites. It seemed more manageable; it was something I knew how to do.

But how to ignore it? We watched our barometer needle fall past the bottom of the scale as Hurricane Sandy approached our home in New Jersey.¹ Three straight February days in the low seventies,² when it usually was forty or fifty degrees Fahrenheit; and the next year, two straight February days of seventy-two and seventy-seven degrees Fahrenheit³—was it climate change?

B. Kyle's Story

I never thought I would see a half-foot of snow in my little backyard in South Austin, Texas. But in February of 2021, Winter Storm Uri swept through Texas and dumped over six inches of snow in Austin, while delivering consecutive days of below-freezing temperatures across the state. Millions of Texans lost power and nearly half the state experienced water disruptions.⁴ The roads were mostly impassable, and supplies were hard to come by. My roommates and I were shoveling snow into big coolers to melt and then boil for drinking, cooking, and bathing. However, we felt extremely fortunate compared to many Texans because we never lost power or the ability to heat our home. Our house was on the same section of the power grid as St. David's

¹ Hurricane Sandy set a New Jersey state record for low barometric pressure. Dr. David A. Robinson, *Sandy Strikes, October 12 Report*, RUTGERS UNIV. (Nov. 7, 2012), <https://climate.rutgers.edu/stateclim/?section=menu&%20target=oct12> [<https://perma.cc/S26E-Z66B>].

² *Essington, PA Weather History, Monthly, Feb. 2017*, WEATHER UNDERGROUND, <https://www.wunderground.com/history/monthly/us/pa/essington/KPHL/date/2017-2> [<https://perma.cc/7ELW-UU2X>] (looking at February 23–25).

³ *Essington, PA Weather History, Monthly, Feb. 2018*, WEATHER UNDERGROUND, <https://www.wunderground.com/history/monthly/us/pa/essington/KPHL/date/2018-2> [<https://perma.cc/9UWY-6WW5>] (looking at February 20–21).

⁴ Texas Tribune Staff, *Texas Power Outages: Nearly Half the State Experiencing Water Disruptions as Power Grid Operator Says It's Making Progress*, TEX. TRIB., <https://www.texastribune.org/2021/02/18/texas-winter-storm-power-outage-ercot/> [<https://perma.cc/C8K V-4K3B>] (Feb. 18, 2021, 3:00 PM).

Hospital and a fire station. Officially, 246 people died across Texas because of the storm and power blackouts—although experts think the number is likely higher.⁵

It was safe to say that Winter Storm Uri had completely overwhelmed Texas’s power grid, which is “deregulated” and separate from the rest of the United States’ grid.⁶ But how exactly did this happen? Was this the “new normal” for Texas or an abnormal, once-in-a-lifetime weather event? Should the state regulators have ensured that natural gas wells and wind turbines were weatherized for this type of scenario? Should we have been more prepared for climate change?

C. *Climate Change is Here*

In 1988, Dr. Michael Oppenheimer, testifying before Congress during the hottest summer then on record, said the greenhouse effect “is here. It is happening. The warming has begun.”⁷ It is more obvious today, as U.S. National Climate Assessments, reports of the International Panel on Climate Change (“IPCC”), and the articles in this Symposium show. Many people can feel it in their daily lives. In our home state of Nevada, the Colorado River basin is in a twenty-three-year drought, with the federal government declaring the first ever water shortage at Lake Mead in 2021.⁸ The lake, our drinking water source, fell to a record low last year: 27 percent of capacity.⁹

In response, climate change science and law have grown at an astounding pace. Climate law is dynamic, rapidly changing, and growing. This Symposium gives an excellent sample of this vast field. Our authors show the daunting problems we face and the significant gaps in our laws and systems. More importantly, they show us ways forward, practically and theoretically. They summon hope. They envision a fairer, more just world. Out of the climate crisis, they hope to build utopias. Several of the articles envision worlds where peace reigns; military budgets are redirected to healthcare, education and other basic human services; traditionally downtrodden groups have

⁵ Patrick Svitek, *Texas Puts Final Estimate of Winter Storm Death Toll at 246*, TEX. TRIB., <https://www.texastribune.org/2022/01/02/texas-winter-storm-final-death-toll-246/> [<https://perma.cc/5RQY-JD5K>] (Jan. 3, 2022).

⁶ Darla Cameron et al., *How Texas’ Power Grid Works*, TEX. TRIB. (Feb. 25, 2021, 3:00 PM), <https://www.texastribune.org/2021/02/25/texas-power-grid-ercot-puc-greg-abbott/> [<https://perma.cc/YA5U-XACL>].

⁷ *Greenhouse Effect and Global Climate Change: Hearing Before the Comm. on Energy and Nat. Res.*, 100th Cong. 154 (1988) (statement of Dr. Michael Oppenheimer).

⁸ Samuel C. Yang, *A River Used to Run Through It: Protecting the Public Right to A Sustainable Water System*, 34 GEO. ENV’T. L. REV. 67, 85 (2021); see also *Reclamation Announces 2022 Operating Conditions for Lake Powell and Lake Mead*, BUREAU OF RECLAMATION (Aug. 16, 2021), <https://www.usbr.gov/newsroom/news-release/3950> [<https://perma.cc/4BZE-KAQH>].

⁹ *Lake Mead Keeps Dropping*, NASA EARTH OBSERVATORY, <https://earthobservatory.nasa.gov/images/150111/lake-mead-keeps-dropping> [<https://perma.cc/2ME8-EHUT>].

better, more equitable choices about where to live; and ecosystems thrive in areas damaged by climate change.

Part I of this Article briefly describes the evolution of the science of climate change, legal responses to it and themes that emerge from that evolution. Part II shows how the articles in this Symposium embody and advance the conversation on themes identified in Part I. In addition, we extract additional themes from the articles in this Symposium and show how the articles advance those conversations. The Article concludes that there is hope, but we must act quickly.

I. A SHORT HISTORY OF CLIMATE CHANGE SCIENCE AND LAW

A. *The Science*

1. *The Greenhouse Effect & Global Temperatures*

Climate change law begins with climate change science; that science began at least 200 years ago. In the 1820s, French mathematician and physicist Joseph Fourier calculated that Earth would be much colder if it had no atmosphere.¹⁰ He likened the atmosphere to a greenhouse,¹¹ which allows sunlight to enter and heat the surface but does not allow all the heat to escape back to space.¹² He did not identify the heat-trapping mechanism.¹³

In the mid-1800s, amateur U.S. scientist Eunice Foote discovered that different gases, including carbonic acid gas, warm to very different temperatures inside sunlit glass jars.¹⁴ Carbonic acid rapidly converts to CO₂ and water in the presence of water.¹⁵ Her 1856 paper¹⁶ was apparently the first to suggest that Earth's atmosphere might be warmer if it contained more CO₂.¹⁷

¹⁰ See generally JEAN-BAPTISTE JOSEPH FOURIER, *THEORIE ANALYTIQUE DE LA CHALEUR* (Firmen Didot 1822); DELIANG CHEN ET AL., *Framing, Context, and Methods*, in *CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS* (Valérie Masson-Delmonnte et al. eds., 2021); ROBERT HENSON, *THE THINKING PERSON'S GUIDE TO CLIMATE CHANGE* 29 (2d. ed. 2019); Spencer Weart, *The Discovery of Global Warming: Introduction and Summary*, AM. INST. PHYSICS, <https://history.aip.org/climate/summary.htm> [https://perma.cc/H7P9-CRWK] (Apr. 2024).

¹¹ CHEN ET AL., *supra* note 10, at 178.

¹² Spencer Weart, *The Discovery of Global Warming: The Carbon Dioxide Greenhouse Effect*, AM. INST. PHYSICS, <https://history.aip.org/climate/co2.htm> [https://perma.cc/9UQ8-2JQD] (Apr. 2024).

¹³ HENSON, *supra* note 10, at 29.

¹⁴ *Id.* at 32.

¹⁵ *Carbonic Acid*, WIKIPEDIA, https://en.wikipedia.org/wiki/Carbonic_acid [https://perma.cc/9WVH-WXGK].

¹⁶ Eunice Foote, *Circumstances Affecting the Heat of the Sun's Rays*, 22 AM. J. SCI. & ARTS 382–83 (1856).

¹⁷ HENSON, *supra* note 10, at 32.

The mid-1800s brought the discovery of prehistoric ice ages.¹⁸ John Tyndall, an Irish physicist and alpine climber familiar with glaciers, wondered about the cause of these profound changes in the Earth's climate: could it be gases in our atmosphere? Tyndall's laboratory work, published in 1861,¹⁹ showed that water vapor, CO₂, and methane, among others, strongly absorbed infrared radiation, i.e., heat.²⁰

Four decades later, Swedish chemist Svante Arrhenius, also intrigued by Earth's ice ages, wondered if a decrease in atmospheric CO₂ might cause an ice age.²¹ In 1896, his lengthy calculation showed that halving the amount of atmospheric CO₂ could cool Europe by four to five degrees Celsius (seven to nine degrees Fahrenheit).²² A colleague then asked what would happen if atmospheric CO₂ doubled.²³ He went back and calculated that doubling CO₂ would warm the planet about five degrees Celsius (about nine degrees Fahrenheit), remarkably close to the high end of recent estimates (1.5 to 4.5 degrees Celsius).²⁴ That sort of warming, he thought, would not occur until the year 4,000.²⁵ In any event, he thought warming might help Europe, which was just emerging from the Little Ice Age, which caused famines and disease.²⁶

In 1958, Charles Keeling began meticulously measuring atmospheric CO₂ at Hawaii's Mauna Loa Observatory.²⁷ Keeling's curve showed that average yearly CO₂ concentrations were rising steadily.²⁸ His data is one of the foundations of modern climate change science.

During the next few decades, scientists began building mathematical models of Earth's climate and atmosphere, and exploring feedback loops that could make the system "surprisingly sensitive."²⁹ They pioneered ways to retrieve past temperatures from ancient tree rings, pollen, corals, and fossils of plants and animals, including microscopic creatures.³⁰ In the 1970s, research accelerated, with state-of-the-art computers, international programs to

¹⁸ Weart, *supra* note 10.

¹⁹ John Tyndall, *The Bakerian Lecture – On the Absorption and Radiation of Heat by Gases and Vapours, and on the Physical Connexion of Radiation, Absorption, and Conduction*, 151 PHIL. TRANSACTIONS ROYAL SOC'Y LONDON 1 (1861).

²⁰ Weart, *supra* note 12.

²¹ *Id.*

²² *Id.*

²³ HENSON, *supra* note 10, at 40.

²⁴ Weart, *supra* note 12; HENSON, *supra* note 10, at 40.

²⁵ Henson, *supra* note 10, at 40.

²⁶ *Id.*; Dagomar Degroot, *Little Ice Age Lessons*, AEON (Nov. 11, 2019), <https://aeon.co/essays/the-little-ice-age-is-a-history-of-resilience-and-surprises> [<https://perma.cc/C4LK-39UD>].

²⁷ *Trends in Atmospheric Carbon Dioxide*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. EARTH SYS. RSCH. LAB. (NOAA/ESRL), <https://www.esrl.noaa.gov/gmd/ccgg/trends> [<https://perma.cc/JY5X-52UT>].

²⁸ HENSON, *supra* note 10, at 41.

²⁹ Weart, *supra* note 10.

³⁰ HENSON, *supra* note 10, at 278–79.

assemble weather data, and expeditions to gather information on past climates.³¹

The 1980s were a turning point in several ways. First, scientists were stunned to learn that concentrations of other greenhouse gases, like methane and chlorofluorocarbons, were rising rapidly and contributing as much warming as CO₂.³² That meant atmospheric warming would come twice as fast as previously predicted, perhaps within the lifetimes of people then alive.³³ Second, 1988 was hotter than any of the prior 130 years; that summer, the Environmental Defense Fund's Michael Oppenheimer told the U.S. Congress that the greenhouse effect "is here."³⁴ Third, scientists began to call on world governments to limit greenhouse gas emissions.³⁵ Finally, the United Nations ("U.N.") Environment Programme and the World Meteorological Association established the Intergovernmental Panel on Climate Change ("IPCC"), a U.N. body to provide policymakers with regular scientific assessments on climate change, its impacts and potential future risks.³⁶

The IPCC issued its first Assessment Report in 1990 and its sixth Assessment Report in 2023.³⁷ They are the most authoritative summaries of scientific knowledge about global climate change and its effects. The U.S. analogs, the National Climate Assessments, come from the Global Change Research Project, a federal interagency program established by Congress in 1990. The Fifth National Climate Assessment was released in November 2023.³⁸ It is the most authoritative summary of scientific knowledge about climate change and its effects in the United States.

2. *Current State of the Climate*

The IPCC's Sixth Assessment Report (2023) summarizes the current state of our global climate:

It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.³⁹

³¹ Weart, *supra* note 10.

³² Spencer Weart, *The Discovery of Global Warming: Other Greenhouse Gases*, AM. INST. PHYSICS (May 2023), <https://history.aip.org/climate/othergas.htm> [<https://perma.cc/2K4E-E8KQ>].

³³ *Id.*

³⁴ *Hearing on the Greenhouse Effect and Global Climate Change: Before the Comm. on Energy and Nat. Res.*, 100th Cong., 1st Sess., 39, 154 (1988).

³⁵ Weart, *supra* note 10.

³⁶ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), <https://www.ipcc.ch/> [<https://perma.cc/6NHL-HBRW>].

³⁷ *Reports*, IPCC, <https://www.ipcc.ch/reports/> [<https://perma.cc/UX85-K27K>].

³⁸ *National Climate Assessments*, U.S. GLOB. CHANGE RSCH. PROGRAM, <https://www.globalchange.gov/our-work/national-climate-assessment> [<https://perma.cc/FUU2-VC2Q>].

³⁹ *Summary for Policymakers*, in CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS, 3, 4 (Valérie Masson-Delmotte et al. eds., 2021), <https://www.ipcc.ch/report/ar6/wg1/chapter/s>

The scale of recent changes across the climate system as a whole – and the present state of many aspects of the climate system – are unprecedented over many centuries to many thousands of years.⁴⁰

Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since AR5 [IPCC's Fifth Assessment Report].⁴¹

According to the IPCC, “[h]uman influence has warmed the climate at a rate that is unprecedented in at least the last 2,000 years.”⁴² The concentration of CO₂ in our atmosphere is now outside the range when our civilization arose⁴³ 6,000 years ago.⁴⁴ As a result, “[e]ach of the last four decades has been successively warmer than any decade that preceded it since 1850,”⁴⁵ and the year 2023 was the warmest ever recorded.⁴⁶

3. *Environmental and Societal Impacts*

“Virtually every weekly issue of the peer-reviewed journals *Science* and *Nature*, and many more specialized scientific publications, report new studies showing the adverse effects of global climate change.”⁴⁷ Our Symposium authors document some of these effects, present and projected:

1. In the eastern U.S., 8.2 million people in seventeen states lost power, many for two weeks, after Hurricane Sandy in 2012;⁴⁸ abnormally warm sea surface temperatures, due partly to climate change, increased the storm's strength;⁴⁹ sea level rose over one foot since the mid-1800s near Sandy's

ummary-for-policymakers/ [https://perma.cc/W95X-QYBB] [hereinafter IPCC 2021 *Summary for Policymakers*].

⁴⁰ *Id.* at 8.

⁴¹ *Id.*

⁴² *Id.* at 6.

⁴³ MICHAEL E. MANN, OUR FRAGILE MOMENT: HOW LESSONS FROM EARTH'S PAST CAN HELP US SURVIVE THE CLIMATE CRISIS 3 (2023).

⁴⁴ *Id.* at 1.

⁴⁵ IPCC 2021 *Summary for Policymakers*, *supra* note 39, at 5.

⁴⁶ 2023 Was the World's Warmest Year on Record, *by Far*, NAT. OCEANIC & ATMOSPHERIC ADMIN. (Jan. 12, 2024), <https://www.noaa.gov/news/2023-was-worlds-warmest-year-on-record-by-far> [https://perma.cc/4PVR-WVVG].

⁴⁷ AM. BAR ASSOC., GLOBAL CLIMATE CHANGE AND U.S. LAW 15 (Michael B. Gerrard et al. eds., 3d ed. 2023) [hereinafter Gerrard].

⁴⁸ Kara Consalo, *Let the Sun Shine: Methods For Expansion Of Small-Scale Solar Electricity To Reduce Fossil Fuel Dependence, Ease Financial Energy Burdens, And Enhance Community Resiliency*, 24 NEV. L.J. 793, 810 (2024).

⁴⁹ Kevin Trenberth, *Hurricane Sandy Mixes Super-Storm Conditions with Climate Change*, CONVERSATION (Oct. 28, 2012, 8:30 PM), <https://theconversation.com/hurricane-sandy-mixes-super-storm-conditions-with-climate-change-10388> [https://perma.cc/3GN Y-NDZ4].

landfall, amplifying a damaging storm surge; the sea level rise was mostly (but not solely) due to climate change;⁵⁰

2. Climate disasters like floods, storms, and wildfires caused most of the displacements of 4.5 million people in North and South America in 2020;⁵¹

3. Rising sea levels, extreme weather, drought, and famine may cause 143 million climate refugees across the globe by 2050;⁵²

4. Communities are “already losing land to sea level rise, floods, heat, and wildfires” and even more land will be rendered uninhabitable or unaffordable by these and other climate-related changes, like invasive species and inadequate water resources;⁵³

5. “Blistering heat, stronger storms, droughts, floods, and fires are putting food production at risk. Nearly all crops grown and raised in the United States . . . are facing climatic stress and the impact of the climate crisis on grain crops, in particular, is extending beyond the nation’s borders”;⁵⁴ and

6. Disruptions in one part of an ecosystem may cascade or ripple through other systems (trophic cascade), decreasing resilience and biodiversity, which in turn can challenge the sustainability of local communities.⁵⁵

4. *Mitigation: Decarbonization and Sequestration*

In the late twentieth century, as scientists began to realize the severity of the threat posed by climate change, they focused on the obvious solution: put less greenhouse gas in the atmosphere. Reducing or eliminating greenhouse gas emissions, or “decarbonization,” lessens the severity of, or “mitigates,” climate change.

A leading strategy is changing the ways that we produce energy; energy production is one of the biggest sources of greenhouse gases. Renewable energy plays a pivotal role. In the United States, 13.1 percent of total energy consumed comes from renewable energy, with wind and solar accounting for just 6 percent.⁵⁶ States have been instrumental in driving climate mitigation,

⁵⁰ *Climate Change and Hurricane Sandy*, PHYSICAL SCIS. LAB’Y, NAT’L OCEANOGRAPHIC AND ATMOSPHERIC ADMIN., <https://psl.noaa.gov/repository/entry/show?entryid=98c8065f-d639-496a-a684-fe4762e1d1be> [<https://perma.cc/2CWL-AQPW>].

⁵¹ Jade A. Craig, *Struggle Against the Water: Connecting Fair Housing Law and Climate Justice*, 24 NEV. L.J. 737, 739 (2024).

⁵² Nadia B. Ahmad, *Military Climate Emissions*, 24 NEV. L.J. 845, 875 (2024) (citing Marcy Winograd, *The Pentagon Is Killing Us—and the Planet*, COMMON DREAMS (Aug. 5, 2021), <https://www.commondreams.org/views/2021/08/05/pentagon-killing-us-and-planet> [<https://perma.cc/7NX3-GM5J>]).

⁵³ Jonathan Rosenbloom, *Sacrifice Zones*, 24 NEV. L.J. 891, 892–93 (2024).

⁵⁴ Alexia Brunet Marks, *Transitioning to Regenerative Agriculture One French Fry at a Time*, 24 NEV. L.J. 1029, 1030 (2024).

⁵⁵ Rosenbloom, *supra* note 53, at 897.

⁵⁶ *U.S. Renewable Energy Factsheet*, UNIV. OF MICH. CTR. FOR SUSTAINABLE SYS. (July 2023), <https://css.umich.edu/publications/factsheets/energy/us-renewable-energy-factshe>

with ten states plus the District of Columbia and Puerto Rico adopting 100 percent clean energy policies and economy-wide greenhouse gas emission reduction targets.⁵⁷ As a result, solar energy is booming in the United States, accounting for 54 percent of all new generating capacity in the United States in 2023.⁵⁸

Another way to mitigate climate change is to remove or “sequester” greenhouse gases from the atmosphere for some period of time. Plants absorb CO₂ from the atmosphere during photosynthesis.⁵⁹ Oceans, soil and some rock formations also absorb CO₂.⁶⁰ These “carbon sinks” pull CO₂ and other greenhouse gases from the atmosphere like a sink pulls down water. Many entities are working on techniques that capture carbon and sequester it for long periods.

One technique is regenerative agriculture: a suite of sustainable land management approaches that promote soil health, water quality, erosion prevention, and overall resilience of agro-ecosystems.⁶¹ Because of rising food demands from global population growth, agriculture now accounts for 11 percent of global greenhouse gas emissions⁶² and 10 percent of U.S. emissions.⁶³ With rising interest from farmers, governments, and the private sector, carbon markets tailored to farming and agriculture have emerged. A form of regenerative agriculture is the practice of sequestering carbon and storing it underground in the soil, thereby earning farmers “carbon credits” to be bought and sold on a voluntary carbon market.⁶⁴ This practice is known as “carbon farming” and can be accomplished through sustainable soil, crops, livestock, and agroforestry practices. The firms who buy the carbon credits use them to offset their supply chain’s carbon footprint or shield them from liability related to their environmental, social, and governance (“ESG”) policies. The

et [<https://perma.cc/25LF-FU2G>].

⁵⁷ Sam Ricketts et al., *States are Laying a Roadmap for Climate Leadership*, AM. PROGRESS (Apr. 30, 2020), <https://www.americanprogress.org/article/states-laying-road-map-climate-leadership> [<https://perma.cc/QW9Q-5KAS>].

⁵⁸ *More than Half of New U.S. Electric-Generating Capacity in 2023 Will be Solar*, U.S. ENERGY INFO. ADMIN. (Feb. 6, 2023), <https://www.eia.gov/todayinenergy/detail.php?id=55419> [<https://perma.cc/Q83U-66FZ>].

⁵⁹ *DOE Explains...the Carbon Cycle*, U.S. DEPT. ENERGY, <https://www.energy.gov/science/doe-explains-the-carbon-cycle> [<https://perma.cc/826U-4HRY>].

⁶⁰ Alexia Brunet Marks, *(Carbon) Farming Our Way Out of Climate Change*, 97 DENV. L. REV. 497, 503 (2020); *5 Things to Know About Carbon Mineralization, A New Approach to Carbon Removal*, WORLD ECON. F. (July 3, 2023), <https://www.weforum.org/agenda/2023/07/carbon-mineralization-things-to-know> [<https://perma.cc/77LV-87B9>].

⁶¹ Marks, *supra* note 54, at 1033.

⁶² *Carbon Farming: Opportunities for Agriculture and Farmers to Gain from Decarbonization*, S&P GLOB. (Jul. 28, 2022), <https://www.spglobal.com/esg/insights/topics/carbon-farming-opportunities-for-agriculture-and-farmers-to-gain-from-decarbonization> [<https://perma.cc/EN3G-TW8N>].

⁶³ Marks, *supra* note 54, at 1031.

⁶⁴ *Id.* at 1036.

same regenerative agriculture practices that sequester carbon in the soil also provide co-benefits that improve soil health and boost resilience to climate-related impacts.⁶⁵

In Section II.A, we discuss Symposium articles that suggest new and better ways to mitigate climate change: Professor Kara Consalo's *Let the Sun Shine: Methods for Expansion of Small-Scale Solar Electricity to Reduce Fossil Fuel Dependence, Ease Financial Energy Burdens, and Enhance Community Resiliency*; Professor Alexia Brunet Marks's *Transitioning to Regenerative Agriculture One French Fry at a Time* (improving markets for carbon credits to ensure regenerative agriculture delivers on its promise to sequester carbon) and Professor Nadia B. Ahmad's *Military Climate Emissions* (reducing our military's enormous and largely uncounted greenhouse gas emissions).

5. *Decarbonization is Feasible and Affordable*

The Deep Decarbonization Pathways (“DDP”) project launched in 2013⁶⁶ to help governments across the globe find realistic paths to limit global warming to 2 degrees Celsius or less.⁶⁷ It began as a group of domestic research teams from sixteen countries.⁶⁸ The United States team published a report in 2014⁶⁹ demonstrating that drastically reducing U.S. greenhouse gas by 2050 is technically and economically feasible.⁷⁰ Specifically, the report found that the U.S. could reduce greenhouse emissions by 80 percent, compared to 1990 levels, by 2050 in multiple pathways⁷¹ using commercial or near-commercial technology.⁷² The reductions come from high levels of energy efficiency,

⁶⁵ U.S. Dept. of Agric., *Climate-Smart Agriculture: Soil Health & Carbon Farming*, https://www.climatehubs.usda.gov/sites/default/files/%20WLIC%20Fact%20Sheet%201_CarbonFarming.pdf [https://perma.cc/V584-VEJQ].

⁶⁶ *About Us*, DEEP DECARBONIZATION PATHWAYS INITIATIVE (DDP), <https://ddpinitiative.org/about/> [https://perma.cc/7SF8-NPTC] [hereinafter DDP].

⁶⁷ Verena Rauchenwald, *The US Deep Decarbonization Pathways Project—Transforming the US Energy System*, SUSTAINABLE SOLS. DEV. NETWORK (Aug. 1, 2019), <https://www.unsd.org/news/2019/08/01/the-us-deep-decarbonization-pathways-project-transforming-the-us-energy-system> [https://perma.cc/4THW-JBBS].

⁶⁸ DDP, *supra* note 66.

⁶⁹ JAMES H. WILLIAMS ET AL., PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES: U.S. 2050 REPORT (2014), https://ddpinitiative.org/wp-content/pdf/DDPP_USA.pdf [https://perma.cc/DFT5-6P6W] [hereinafter 2014 US DDPP Report]; *see also* JAMES H. WILLIAMS ET AL., POLICY IMPLICATIONS OF DEEP DECARBONIZATION IN THE UNITED STATES: US 2050 VOL. 2 POLICY REPORT (2015), <https://irp.cdn-website.com/be6d1d56/files/uploaded/2015-report-on-policy-implications.pdf> [https://perma.cc/G8RW-HB8G].

⁷⁰ 2014 US DDPP Report, *supra* note 69, at xi.

⁷¹ The study examined a high renewable energy case, a high nuclear energy case, a high carbon capture and sequestration case, and a mixture of the three cases. *Id.* at 16.

⁷² *Id.* at xi.

decarbonizing electricity generation, electrifying most end uses (*e.g.*, heating, transportation), and switching the remaining end uses to lower carbon fuels.⁷³

The study estimated a surprisingly reasonable cost for this transformation: an incremental cost to the energy system equivalent to less than 1 percent of gross domestic product (“GDP”) in the base case.⁷⁴ Although the study envisioned significant changes to the U.S. energy system over thirty-five years, the changes did not necessarily entail major changes in lifestyle.⁷⁵ The pathways were designed to support the same level of energy services and economic growth then estimated by U.S. Department of Energy’s Annual Energy Outlook.⁷⁶ If work began in 2014, infrastructure could be replaced at natural replacement rates, reducing cost, easing demand on manufacturing, and allowing gradual consumer adoption.⁷⁷

Subsequent studies have confirmed and refined these findings. In 2020, the Sustainable Solutions Development Network modeled six different scenarios and found that achieving net-zero U.S. greenhouse gas emissions by 2050 was feasible and, again, surprisingly affordable.⁷⁸ “[T]he overall incremental costs of the transition will be just 0.4 percent GDP in 2050, a small fraction of America’s annual energy spending.”⁷⁹

In 2021, Princeton University’s Net-Zero America modeled five different technologically and economically plausible energy-system pathways for the U.S. to reach net-zero emissions by 2050.⁸⁰ Each pathway results in a net increase in energy-sector employment and significant reductions in air pollution, which produce public health benefits starting in the first decade of the transition.⁸¹ The study concluded that a successful transition would entail annual energy spending comparable or lower, as a percentage of GDP, to what the nation spends today.⁸² The transition requires, however, immediate, large-scale capital, policy and societal commitments.⁸³ At least \$2.5 trillion in additional capital investment would be needed in energy supply, industry,

⁷³ *Id.*

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ SUSTAINABLE DEV. SOLUTIONS NETWORK, AMERICA’S ZERO CARBON ACTION PLAN 1, 3 (2020), <https://irp-cdn.multiscreensite.com/6f2c9f57/files/uploaded/zero-carbon-action-plan-exec-summary.pdf> [<https://perma.cc/SPG9-NYLN>].

⁷⁹ *Id.* at 1.

⁸⁰ Eric Larson et al., *Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final Report Summary*, PRINCETON UNIV. (Oct. 29, 2021), [https://netzeroamerica.princeton.edu/img/Princeton%20NZA%20FINAL%20REPORT%20SUMMARY%20\(29Oct2021\).pdf](https://netzeroamerica.princeton.edu/img/Princeton%20NZA%20FINAL%20REPORT%20SUMMARY%20(29Oct2021).pdf) [<https://perma.cc/2B8V-N9DN>].

⁸¹ *Id.*

⁸² *Id.*

⁸³ *Id.*

buildings, and vehicles in the next decade.⁸⁴ Consumers would pay back the upfront investment over decades; total annualized U.S. energy expenditures would increase less than 3 percent between 2021 and 2030.⁸⁵

6. *Adaptation and Resilience*

As the effects of climate change became more and more evident in daily life, attention began to focus on how to adapt to climate change effects that are already here or that we cannot avoid. The global warming we will experience between now and 2040 is inevitable; it cannot be avoided.⁸⁶ Reducing greenhouse gas emissions (mitigation) occupied eighty-four pages in the IPCC's First Assessment Report on response strategies in 1990.⁸⁷ Adapting to the effects of climate change occupied slightly fewer pages (seventy-eight) in the same report.⁸⁸ By 2022, the IPCC report on impacts, adaptation and vulnerability had expanded to 3,056 pages,⁸⁹ over 1,000 pages longer than the report on mitigation of climate change.⁹⁰

Climate adaptation takes many different forms depending on geography, local customs, political structures, funding, existing inequities, the particular risks faced by a community, and many more factors.⁹¹ Generally speaking, climate adaptation entails adjusting behaviors, actions, and decisions within social and biological systems to respond to climatic changes.⁹² Those adjustments can respond to events that have already occurred or anticipate future events or conditions.⁹³ Resilience complements adaptation and refers to “the capacity to prepare for, respond to, and recover from the impacts of hazardous climatic events while incurring minimal damage to societal wellbeing, the economy and the environment.”⁹⁴ Building a community's climate resilience requires a holistic approach to enhance the capacity to manage climate crises

⁸⁴ *Id.*

⁸⁵ *Id.*

⁸⁶ Gerrard, *supra* note 47, at 16.

⁸⁷ *See generally* IPCC, CLIMATE CHANGE: THE IPCC RESPONSE STRATEGIES (1990), <https://www.ipcc.ch/report/ar1/wg3/> [<https://perma.cc/X6KW-AV2K>].

⁸⁸ *See generally id.*

⁸⁹ IPCC, CLIMATE CHANGE 2022: IMPACTS, ADAPTATION, AND VULNERABILITY (2022), <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/> [<https://perma.cc/9T52-WL7K>].

⁹⁰ IPCC, CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE (2022), <https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/> [<https://perma.cc/GZ6G-3VF9>].

⁹¹ Gigi Owen, *What Makes Climate Change Adaptation Effective? A Systematic Review of the Literature*, 62 GLOB. ENV'T CHANGE 1, 1 (2020).

⁹² *Id.* at 2.

⁹³ *Id.* at 2.

⁹⁴ Sara Mehryar, *What is the Difference Between Climate Change Adaptation and Resilience?*, GRANTHAM RSCH. INST. ON CLIMATE CHANGE & THE ENV'T (Sept. 12, 2022), <https://www.lse.ac.uk/granthaminstitute/explainers/what-is-the-difference-between-climate-change-adaptation-and-resilience/> [<https://perma.cc/U3G5-6S4B>].

and encompasses: (1) shock absorbing and/or coping, (2) adapting, and (3) transforming.⁹⁵ Thus, while adaptation and resilience are separate concepts, they frequently overlap and affect each other.

Every article in this Symposium touches on adaptation and resilience, as we discuss in Section II.B. Professor Jonathan Rosenbloom's, *Sacrifice Zones* develops innovative zoning tools to help communities adapt and increase resilience. Professor Jade A. Craig's *Struggle Against the Water: Connecting Fair Housing Law and Climate Justice* urges us to incorporate Fair Housing Act principles in climate retreat policies. Professor Benoit Mayer's *Climate Reparations* outlines a new strategy for seeking reparations under international law to fund, among other things, developing countries' adaptation efforts. Professor Consalo argues that on-site solar and microgrids will increase resilience, especially in low-income communities. Professor Ahmad suggests redirecting part of our enormous military budget to national and international adaptation efforts, and Professor Marks shows how regenerative agriculture, and properly functioning markets for associated carbon credits, can build resilient agricultural systems.

B. The Law

The growing body of science in the late twentieth century prompted policy and law makers at international, national, state, and local levels to develop climate policies, agreements, and laws.⁹⁶

1. International Agreements

a. UNFCCC

In this Symposium, Professor Benoit Mayer gives an excellent summary of the critical international agreements on climate change,⁹⁷ all of which build on the U.N. Framework Convention on Climate Change ("UNFCCC"). The UNFCCC entered into force in 1994; virtually every country is a party to it.⁹⁸ Its ultimate objective is to "achieve . . . stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."⁹⁹ Further, that stable level

⁹⁵ Christophe Béné et al., *Review Article: Resilience, Poverty and Development*, 26 J. INT'L DEV. 598, 600–01 (2014).

⁹⁶ The following summary is heavily indebted to Michael B. Gerrard, Jody Freeman and Michael Burger's excellent treatise. Gerrard, *supra* note 47.

⁹⁷ Benoit Mayer, *Climate Reparations*, 24 NEV. L.J. 963, 973–74 (2024).

⁹⁸ *Id.* at 973; *What is the United Nations Framework Convention on Climate Change?*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/what-is-the-united-nations-framework-convention-on-climate-change> [<https://perma.cc/L54M-WM2C>] (198 countries have ratified the UNFCCC).

⁹⁹ United Nations Framework Convention on Climate Change, art. 2, May 9, 1992, S. Treaty Doc No. 102-38, 1771 U.N.T.S. 107 [hereinafter UNFCCC].

“should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”¹⁰⁰ The UNFCCC established a Conference of the Parties (“COP”), which meets annually to review and make decisions about implementing the convention.¹⁰¹

b. Kyoto Protocol

Years of negotiations among the parties led to the Kyoto Protocol (“Protocol”) in 1997.¹⁰² In theory, the Protocol bound developed countries to reduce their overall greenhouse gas emissions by specific amounts by 2008 to 2012.¹⁰³ The U.S., for example, was to reduce its emissions by 7 percent from 1990 levels.¹⁰⁴ Developing countries did not have to reduce emissions.¹⁰⁵ 192 countries have ratified the Kyoto Protocol;¹⁰⁶ the U.S. is one of the few that has not.

c. Copenhagen Accord

Greenhouse gas emissions continued to rise after 1997;¹⁰⁷ it became clear that a new agreement was necessary. The COP gathered in Copenhagen in 2009 and reached the Copenhagen Accord, which invited all nations to submit non-binding, unenforceable pledges to reduce greenhouse gas emissions.¹⁰⁸ President Barack Obama pledged the U.S. to reduce greenhouse gas emissions by 17 percent from 2005 levels by 2020.¹⁰⁹

The Copenhagen Accord recognized the scientific consensus that the increase in average global temperature should be kept below two degrees Celsius.¹¹⁰ By 2100, the U.N. projected that pledges under the Copenhagen Accord could limit global warming to 2.5 degrees Celsius to 5 degrees Celsius.¹¹¹

¹⁰⁰ *Id.*

¹⁰¹ *Id.* art. 7.

¹⁰² Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 2303 U.N.T.S. 162 [hereinafter *Kyoto Protocol*].

¹⁰³ *Id.* art. 3, para. 1.

¹⁰⁴ *Id.* at Annex B.

¹⁰⁵ Anita M. Halvorssen, *The Kyoto Protocol and Developing Countries—the Clean Development Mechanism*, 16 COLO. J. INT’L ENV’T. L. & POL’Y 353, 361 (2005).

¹⁰⁶ *What is the Kyoto Protocol?*, U.N. CLIMATE CHANGE, https://unfccc.int/kyoto_protocol [<https://perma.cc/G5PG-X22W>].

¹⁰⁷ Gerrard, *supra* note 47, at 21.

¹⁰⁸ *Id.*; Mayer, *supra* note 97, at 974.

¹⁰⁹ Gerrard, *supra* note 47, at 46–48, 96.

¹¹⁰ Copenhagen Accord, appended to UNFCCC Dec. 2/CP.15, FCCC/CP/2009/11/Add.1, para. 1 (Dec. 18, 2009).

¹¹¹ UNEP, *THE EMISSIONS GAP REPORT: ARE THE COPENHAGEN ACCORD PLEDGES SUFFICIENT TO LIMIT GLOBAL WARMING TO 2°C OR 1.5°C?* 15, 47 (2010).

d. Paris Climate Agreement

The UNFCCC Parties met in Paris in 2015 and hammered out the Paris Agreement; it was adopted by 196 parties.¹¹² Paris sought to strengthen the global response to climate change, limit warming to “well below 2°C above pre-industrial levels” and “pursu[e] efforts to limit the temperature increase to 1.5°C above pre-industrial levels.”¹¹³ The parties aimed to “reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties.”¹¹⁴ Each party was to communicate and maintain “nationally determined contributions” (“NDCs”)¹¹⁵ to the global response to climate change. Every five years, each party communicates new, more ambitious NDCs.¹¹⁶

The Parties invited the IPCC to report in 2018 on the impacts of global warming of 1.5 degrees Celsius above pre-industrial levels.¹¹⁷ That report predicted catastrophic results at two degrees Celsius.¹¹⁸ As of 2019, however, nations’ unconditional NDCs, if fully implemented, would limit global warming to 3.2 degrees Celsius by 2100.¹¹⁹

e. Glasgow Conference of the Parties (COP26)

Around the time of the Glasgow COP in November 2021, several countries strengthened their NDCs.¹²⁰ By the end of 2022, however, the U.N. Environment Programme found that “the international community is falling far short of the Paris goals, with no credible pathway to 1.5°C in place.”¹²¹ Policies then in place indicated a 2.8 degrees Celsius rise by 2100; conditional and unconditional pledges at that time would only reduce this to 2.4 to 2.6 degrees Celsius by 2100, respectively.¹²²

¹¹² *The Paris Agreement: What is the Paris Agreement?*, U.N. CLIMATE CHANGE, <https://unfccc.int/process-and-meetings/the-paris-agreement> [<https://perma.cc/SUN6-RGFP>].

¹¹³ Paris Agreement to the United Nations Framework Convention on Climate Change, art. 2, Dec. 12, 2015, T.I.A.S. No. 16-1104 [hereinafter Paris Agreement].

¹¹⁴ *Id.* art. 4(1)

¹¹⁵ Paris Agreement art. 4(2).

¹¹⁶ Paris Agreement art. 4(9).

¹¹⁷ Paris Conference, UNFCCC FCCC/CP/2015/10/Add.1, para. 21 (Jan. 29, 2016).

¹¹⁸ Gerrard, *supra* note 47, at 21.

¹¹⁹ UNEP, EMISSIONS GAP REPORT 2019: EXECUTIVE SUMMARY IX (2019), <https://wedocs.unep.org/bitstream/handle/20.500.11822/30798/EGR19ESEN.pdf?sequence=1&isAllowed=y> [<https://perma.cc/RGB2-PVDJ>].

¹²⁰ Gerrard, *supra* note 47, at 21.

¹²¹ UNEP, EMISSIONS GAP REPORT 2022: THE CLOSING WINDOW, CLIMATE CRISIS CALLS FOR RAPID TRANSFORMATION OF SOCIETIES (2022), <https://www.unep.org/resources/emissions-gap-report-2022> [<https://perma.cc/2YHV-LRFM>].

¹²² *Id.*

f. Dubai Conference of the Parties (COP28)

The Conference of the Parties met in Dubai, United Arab Emirates, at the end of 2023.¹²³ The Parties formally reviewed, for the first time, progress since the Paris Agreement, under a “Global Stocktake.”¹²⁴

COP28 was at once heartening and disheartening, encouraging and disappointing. It recognized the world’s significant progress toward the Paris Agreement goals: collective action has reduced expected global temperature increase from 4 degrees Celsius (estimate at the time of Paris) to 2.1 to 2.8 degrees Celsius above pre-industrial levels (estimate in 2023).¹²⁵ Yet it underlined that the world is not on track to limit warming to 2 degrees Celsius, let alone 1.5 degrees Celsius.¹²⁶ The parties resolved, once again, to “pursue efforts” to limit warming to 1.5 degrees Celsius¹²⁷ but recognized that global greenhouse gas emissions must be cut 43 percent by 2030, compared to 2019 levels, to achieve that goal. That is daunting because current NDCs would reduce emissions only 2 percent by 2030 compared to 2019 levels.¹²⁸

For the first time, a COP document mentioned “fossil fuels.” It called on the parties to “contribute to . . . global efforts” to “[t]ransitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner . . . to achieve net zero by 2050.”¹²⁹ In another first, the parties “operationalised” a fund to help vulnerable countries repair loss and damage caused by climate change¹³⁰ and pledged almost \$800 million in funding.¹³¹

The text provoked a wide range of reactions. One commentator said, “this result would have been unheard of two years ago, especially at a Cop meeting in a petrostate.”¹³² The lead negotiator for the Alliance of Small Island States, however, criticized it as a “litany of loopholes” and declared, “[w]e have made an incremental advancement over business as usual when what we really needed is an exponential step change in our actions and support.”¹³³ She

¹²³ *COP28: What was Achieved and What Happens Next?*, UNFCCC (Jan. 12, 2024, 5:00 PM), <https://unfccc.int/cop28> [<https://perma.cc/37MD-Z6FH>].

¹²⁴ *Bringing The World Together*, COP28 UAE, <https://www.cop28.com/en/cop28-presidency> [<https://perma.cc/MV22-8C7P>].

¹²⁵ UNFCCC, First Global Stocktake, Revised Advance Version, para. 18, FCCC/PA/CMA/2023/L.17 (Dec. 13, 2023) [hereinafter First Global Stocktake].

¹²⁶ *Id.* para. 2.

¹²⁷ *Id.* para. 4.

¹²⁸ *Id.* para. 21.

¹²⁹ *Id.* paras. 28 & 28(d).

¹³⁰ Adam Morton et al., *Cop28 Landmark Deal Agreed to ‘Transition Away’ from Fossil Fuels*, GUARDIAN (Dec. 13, 2023, 11:48 AM), <https://www.theguardian.com/environment/2023/dec/13/cop28-landmark-deal-agreed-to-transition-away-from-fossil-fuels> [<https://perma.cc/6BCP-LUJQ>].

¹³¹ First Global Stocktake, *supra* note 125, para. 87.

¹³² Morton et al., *supra* note 130.

¹³³ *Id.*

received a standing ovation.¹³⁴ A representative of Saudi Arabia reportedly stated that the COP28 agreements “do not affect our exports, do not affect our ability to sell.”¹³⁵

2. U.S. Policy

U.S. climate policy has swung back and forth wildly, especially in the last three decades. Lyndon Johnson’s Science Advisory Committee was apparently the first federal body to warn, in 1965, of the risks of climate change.¹³⁶

a. George H. W. Bush Through Joseph Biden

George H. W. Bush was the first U.S. president to acknowledge the impacts of climate change and the need to act.¹³⁷ He supported the 1990 Clean Air Act amendments, which included a new requirement to monitor and report CO₂ emissions from air pollution sources, and signed the Global Change Research Act in 1990,¹³⁸ which started the U.S. National Climate Assessments. His Chief of Staff John Sununu, however, strongly opposed an international agreement on climate change.¹³⁹ Sununu reluctantly went along with plans for the UNFCCC, but picked the U.S.’s chief negotiator, a trade expert who opposed binding emission targets, and directed him: “no targets, no money.”¹⁴⁰ The administration worked to ensure the UNFCCC was toothless.¹⁴¹ Under the first President Bush, the U.S. adopted no federal greenhouse gas emission standards.¹⁴²

The Clinton administration changed course. It negotiated and signed the Kyoto Protocol in 1992, including the U.S. commitment to reduce its

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ ENV’T POLLUTION PANEL PRESIDENT’S SCI. ADV. COMM., RESTORING THE QUALITY OF OUR ENVIRONMENT 126–27 (1965), <https://ozonedepletiontheory.info/Papers/Revelle1965AtmosphericCarbonDioxide.pdf> [<https://perma.cc/CXU5-YUJ8>] (“By the year 2000 the increase in atmospheric CO₂ will be close to 25%. This may be sufficient to produce measurable and perhaps marked changes in climate, and will almost certainly cause significant changes in the temperature and other properties of the stratosphere.”). Gerrard, *supra* note 47, at 76.

¹³⁷ Barack Obama, President of the U.S., Remarks by the President on the Impacts of Climate Change (Apr. 22, 2015), <https://obamawhitehouse.archives.gov/the-press-office/2015/04/22/remarks-president-impacts-climate-change> [<https://perma.cc/U2DV-55NE>].

¹³⁸ Jody Freeman, *The Environmental Protection Agency’s Role in U.S. Climate Policy—A Fifty Year Appraisal*, 31 DUKE ENV’T L. & POL’Y F.1, 21–22 (2020).

¹³⁹ *Id.* at 23.

¹⁴⁰ *Id.* at 24.

¹⁴¹ *Id.* at 26.

¹⁴² Gerrard, *supra* note 47, at 322.

greenhouse gas emissions by 7 percent from 1990 levels.¹⁴³ The U.S. Senate, however, never ratified it.¹⁴⁴

President George W. Bush repudiated Kyoto in 2001 “because it exempts 80 percent of the world, including major population centers such as China and India, from compliance, and would cause serious harm to the U.S. economy.”¹⁴⁵ Under his administration, the U.S. adopted programs to inventory greenhouse gas emissions (as required by the UNFCCC) and to research climate change and technologies to control it.¹⁴⁶ Congress, with his support, passed tax incentives for renewable energy and energy efficiency, but for fossil energy, too.¹⁴⁷ His administration refused to use the Clean Air Act to regulate greenhouse gases, even though the Supreme Court said it could.¹⁴⁸

When President Obama arrived in 2009, he directed the EPA to use existing statutory authority to regulate greenhouse gases.¹⁴⁹ He asked Congress to pass a law setting a market-based cap on carbon emissions.¹⁵⁰ In 2009, the House barely passed the Waxman-Markey Bill, which would have established an economy-side cap-and-trade program for carbon emissions.¹⁵¹ It died in the Senate.¹⁵² In 2013, President Obama announced a Climate Action Plan that did not require legislation.¹⁵³ In 2015, the EPA issued new regulations, known as the Clean Power Plan, for new and existing coal-fired power plants, but the regulations were stayed by the U.S. Supreme Court.¹⁵⁴ Under Obama, the U.S. NDC for the 2015 Conference of the Parties in Paris pledged to reduce greenhouse gas emissions by 26–28 percent from 2005 levels by 2025.¹⁵⁵ The U.S. formally joined the Paris Agreement in 2016 through executive action.¹⁵⁶

¹⁴³ *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ Letter from George W. Bush, President of the U.S., to Senators Hagel, Helms, Craig, and Roberts (Mar. 13, 2001), <https://georgewbush-whitehouse.archives.gov/news/releases/2001/03/20010314.html> [<https://perma.cc/P86Z-5GTZ/>]

¹⁴⁶ Gerrard, *supra* note 47, at 22.

¹⁴⁷ *Id.*

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ *Id.* at 22–23.

¹⁵⁴ *Id.* at 23; *West Virginia v. EPA*, 597 U.S. 697, 697–98 (2022).

¹⁵⁵ Gerrard, *supra* note 47, at 23; Press Release, White House, Fact Sheet: U.S. Reports its 2025 Emissions Target to the UNFCCC (Mar. 31, 2015), <https://obamawhitehouse.archives.gov/the-press-office/2015/03/31/fact-sheet-us-reports-its-2025-emissions-target-unfccc/> [<https://perma.cc/T7WX-JBYZ>].

¹⁵⁶ Tanya Somanader, *President Obama: The United States Formally Enters the Paris Agreement* (Sept. 3, 2016, 10:41 AM), <https://obamawhitehouse.archives.gov/blog/2016/09/03/president-obama-united-states-formally-enters-paris-agreement> [<https://perma.cc/9HCF-J49T>].

President Trump took office in 2017. He quickly withdrew the Clean Power Plan, revoked virtually all Obama administration regulations and executive orders on climate change, and withdrew the U.S. from the Paris Agreement.¹⁵⁷ He generally favored fossil fuels over renewable energy and appointed officials who did not believe in climate change to lead EPA and other federal agencies.¹⁵⁸ The Trump administration often ignored climate science and took steps to silence or dismiss climate scientists.¹⁵⁹

When President Biden took office in 2021, he immediately rejoined the Paris Agreement¹⁶⁰ and restored many executive orders on climate change that President Trump revoked.¹⁶¹ President Biden affirmed his administration's commitment to "listen to the science," reduce greenhouse gas emissions, bolster resilience to the impacts of climate change, and pursue environmental justice.¹⁶² The Biden administration strengthened greenhouse gas emission standards for motor vehicles,¹⁶³ removed obstacles to increasing energy efficiency of appliances,¹⁶⁴ and encouraged development of renewable energy.¹⁶⁵ In April 2021, the administration submitted a new NDC, setting a U.S. economy-wide target to reduce net greenhouse gas emissions by 50–52 percent below 2005 levels in 2030.¹⁶⁶

President Biden's signature accomplishment on climate change is the Inflation Reduction Act of 2022 ("IRA").¹⁶⁷ The IRA is the most significant U.S.

¹⁵⁷ Gerrard, *supra* note 47, at 23.

¹⁵⁸ *Id.*

¹⁵⁹ *Id.*; see also *Silencing Science Tracker*, SABIN CTR. FOR CLIMATE CHANGE L., <https://climate.law.columbia.edu/Silencing-Science-Tracker> [<https://perma.cc/W3W4-XPZ6>].

¹⁶⁰ Press Release, White House, President Joseph R. Biden Jr., Paris Climate Agreement (Jan. 20, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/20/paris-climate-agreement/> [<https://perma.cc/AEE6-9JU5>].

¹⁶¹ See Exec. Order No. 13990, 86 Fed. Reg. 7037, 7037 (Jan. 25, 2021).

¹⁶² *Id.*

¹⁶³ See Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 Fed. Reg. 74434, 74434 (Dec. 30, 2021) (codified at 40 C.F.R. pts. 86 & 600).

¹⁶⁴ See Energy Conservation Program for Appliance Standards: Procedures, Interpretations, and Policies for Consideration in New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Commercial/Industrial Equipment, 86 Fed. Reg. 70892, 70892 (Dec. 13, 2021) (codified at 10 C.F.R. pt. 430).

¹⁶⁵ See, e.g., White House, *Fact Sheet: Biden-Harris Administration Races to Deploy Clean Energy that Creates Jobs and Lowers Costs* (Jan. 12, 2022), <https://www.whitehouse.gov/briefing-room/statements-releases/2022/01/12/fact-sheet-biden-harris-administration-races-to-deploy-clean-energy-that-creates-jobs-and-lowers-costs/> [<https://perma.cc/5VHL-TM9D>].

¹⁶⁶ THE UNITED STATES OF AMERICA NATIONALLY DETERMINED CONTRIBUTION, REDUCING GREENHOUSE GASES IN THE UNITED STATES: A 2030 EMISSIONS TARGET 1 (2021), <https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf> [<https://perma.cc/B7QP-67C8>].

¹⁶⁷ Inflation Reduction Act of 2022, Pub. L. No. 117–169, 136 Stat. 1818 .

climate legislation so far¹⁶⁸ and the largest investment in U.S. history to combat the climate crisis.¹⁶⁹ The IRA dedicates \$369 billion¹⁷⁰ to lower energy costs for Americans, increase energy security, focus investment on disadvantaged communities, and support resilient rural communities.¹⁷¹ The IRA, along with the Infrastructure Investment and Jobs Act of 2021 (“IIJA”),¹⁷² is expected to cut U.S. greenhouse gas emissions to 37–42 percent below 2005 levels by 2030.¹⁷³ These laws take a substantial step toward meeting the U.S.’s NDC of 50–52 percent below 2005 levels by 2030, but additional cuts are needed to meet that commitment.

b. Using Existing Laws for Climate Change

A recurring theme in U.S. climate policy is using existing laws to address climate change, even though the laws were not originally intended for that purpose. The Clean Air Act is the prime example. Enacted in 1970, it aimed to control common or “criteria” air pollutants (particulate matter, ground-level ozone, carbon monoxide, lead, nitrogen oxides and sulfur oxides) and toxic air pollutants (which cause cancer and other serious health effects).¹⁷⁴ The law, however, allows EPA to regulate new air pollutants that meet certain requirements.¹⁷⁵ In *Massachusetts v. EPA*,¹⁷⁶ the Supreme Court ruled that the EPA had authority to regulate greenhouse gases under the Clean Air Act because they were “air pollutants.” Under the Clean Air Act, EPA has

¹⁶⁸ Gerrard, *supra* note 47, at 96. The IRA also aims to reduce inflation by lowering prescription drug and health insurance costs. See Joseph R. Biden, President of the U.S., Statement by President Biden on Senate Passage of the Inflation Reduction Act (Aug. 7, 2022), <https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/07/statement-by-president-biden-on-senate-passage-of-the-inflation-reduction-act/> [<https://perma.cc/GN9R-8ZKQ>].

¹⁶⁹ Statement by President Biden, *supra* note 168.

¹⁷⁰ Press Release, U.S. Dept of Treasury, Treasury Announces Guidance on Inflation Reduction Act’s Strong Labor Protections (Nov. 29, 2022), <https://home.treasury.gov/news/press-releases/jy1128> [<https://perma.cc/5TR5-5ALH>].

¹⁷¹ SENATE DEMOCRATS, SUMMARY OF THE ENERGY SECURITY AND CLIMATE CHANGE INVESTMENTS IN THE INFLATION REDUCTION ACT OF 2022 1 (2022), https://www.democrats.senate.gov/imo/media/doc/summary_of_the_energy_security_and_climate_change_investments_in_the_inflation_reduction_act_of_2022.pdf [<https://perma.cc/B44W-X6XD>].

¹⁷² Infrastructure Investment and Jobs Act, Pub. L. 117–58, 135 Stat. 429 (2021).

¹⁷³ Jesse D. Jenkins et al., *Climate Progress and the 117th Congress: The Impacts of the Inflation Reduction Act and the Infrastructure Investment and Jobs Act*, REPEAT PROJECT 7 (2013), https://repeatproject.org/docs/REPEAT_Climate_Progress_and_the_117th_Congress.pdf [<https://perma.cc/4MUH-2TBT>].

¹⁷⁴ U.S. ENV’T PROT. AGENCY (EPA), THE PLAIN ENGLISH GUIDE TO THE CLEAN AIR ACT 4-5 (2007).

¹⁷⁵ See, e.g., 42 U.S.C. § 7521(a) (provision the EPA used to regulate CO₂ and five other greenhouse gases emitted by motor vehicles); Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66496, 66500 (Dec. 15, 2009) (codified at 40 C.F.R. ch. I).

¹⁷⁶ *Massachusetts v. EPA*, 549 U.S. 497, 532 (2007).

regulated: (i) greenhouse gas emissions from motor vehicles;¹⁷⁷ and (ii) stationary sources of air pollution that emit 100 or 250 tons of criteria pollutants (like sulfur dioxide) plus CO₂.¹⁷⁸

Securities and financial disclosure laws now play an important role in climate law. In 2010, the Securities and Exchange Commission issued guidance interpreting existing disclosure laws as they applied to climate change.¹⁷⁹ The agency noted that governments, businesses, investors and the public had become increasingly interested in climate change, and that some companies were beginning to recognize the effects of climate change and mitigation efforts on their businesses.¹⁸⁰ Money increasingly flowed to companies and funds that promised better environmental, social and governance (“ESG”) policies.¹⁸¹ The SEC’s guidance noted that many companies were providing information to their peers and the public about their carbon footprints and their efforts to reduce them.¹⁸²

The SEC found that climate change-related information could be material and must be disclosed in some situations.¹⁸³ Unfortunately, the guidance did not specify those situations. Companies disclosed climate information in very different ways, which were often difficult to compare. There was disagreement about how and what to measure. Suspicions of greenwashing—making a business, business practice, or product appear more climate-friendly and sustainable than it really is—grew. In 2015, the international Financial Stability Board (“FSB”) formed a Task Force on Climate-Related Financial Disclosure (“TCFD”). In March 2022, after years of work by companies, investors, and others, and an executive order from President Biden, the SEC issued climate-specific disclosure regulations (Regulations S-K and S-X) in March 2022. In this Symposium, Professor Marks argues, for example, that the SEC

¹⁷⁷ Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25324, 25324 (May 7, 2010) (codified at 40 C.F.R. pts. 85, 86, 600); 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62624, 62624 (Oct. 15, 2012) (codified at 40 C.F.R. pts. 85, 86, 600); The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, 85 Fed. Reg. 24174, 24175 (Apr. 30, 2020) (codified at 40 C.F.R. pts. 86, 600); Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 Fed. Reg. 74434, 74434 (Dec. 30, 2021) (codified at 40 C.F.R. pts. 86 & 600).

¹⁷⁸ Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31514, 31514 (June 3, 2010) (codified at 40 C.F.R. pts. 51, 52, 70, 71); *Util. Air Regul. Grp. v. EPA*, 573 U.S. 302, 333–34 (2014) (upholding EPA regulation of greenhouse gas emissions from stationary sources that emit 100 or 250 tons of criteria pollutants (like sulfur dioxide) plus carbon dioxide).

¹⁷⁹ Commission Guidance Regarding Disclosure Related to Climate Change, 75 Fed. Reg. 6290, 6295 (Feb. 8, 2010) (codified at 17 C.F.R. pts. 211, 231, 241).

¹⁸⁰ *Id.* at 6290.

¹⁸¹ Gerrard, *supra* note 47, at 263.

¹⁸² Commission Guidance Regarding Disclosure Related to Climate Change, 75 Fed. Reg. 6290, 6290 (Feb. 8, 2010) (codified at 17 C.F.R. pts. 211, 231, 241).

¹⁸³ *Id.* at 6290, 6295.

should require public companies to disclose the role of carbon offsets in their business strategy.¹⁸⁴

Annual National Defense Authorization Acts, which fund the Department of Defense (“DOD”), have been vehicles to advance federal climate policy. During the Trump administration, the National Defense Authorization Act for Fiscal Year 2018 expressed the “[s]ense of Congress” that “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.”¹⁸⁵ It required the DOD to report within a year on “vulnerabilities to military installations and combatant commander requirements resulting from climate change over the next 20 years.”¹⁸⁶ The National Defense Authorization Act for Fiscal Year 2022, during the Biden administration, directed the DOD to “fully consider and make needed adjustments to account for current and emerging climate and environmental challenges” in its core processes.¹⁸⁷ It also required the Secretary of Defense to “improve military installation efficiency, performance, and management by ensuring that at least 10 percent of major military installations achieve energy net-zero and water or waste net-zero by fiscal year 2035.”¹⁸⁸ In this Symposium, Professor Ahmad suggests fundamentally rethinking National Defense Authorization Acts to decrease military spending, reduce military climate emissions, and redirect funds to climate mitigation and adaptation in the U.S. and abroad.¹⁸⁹ The political swings of U.S. federal climate policy have affected action under these laws. For example, from 2001 to 2008, the Bush administration refused to control greenhouse gas emissions using the Clean Air Act, even after *Massachusetts v. EPA*.¹⁹⁰ Shortly after President Obama took office in 2009, the EPA found, under Clean Air Act Section 202(a), that six greenhouse gases endanger the public health and welfare of current and future generations.¹⁹¹ In 2010 and 2012, the EPA and U.S. Department of Transportation issued regulations limiting greenhouse gas emissions from new motor vehicles.¹⁹² The Trump

¹⁸⁴ Marks, *supra* note 54, at 1064.

¹⁸⁵ National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115–91, § 335(b), 131 Stat. 1283, 1358 (2017).

¹⁸⁶ *Id.* § 335(c)(1).

¹⁸⁷ National Defense Authorization Act for Fiscal Year 2022, Pub. L. No. 117–81, § 334(a), 135 Stat. 1541, 1639 (2021).

¹⁸⁸ *Id.* at 1633, § 319(a).

¹⁸⁹ Ahmad, *supra* note 52.

¹⁹⁰ Gerrard, *supra* note 47, at 22.

¹⁹¹ Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66496, 66496 (Dec. 15, 2009) (codified at 40 C.F.R. ch. I).

¹⁹² Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25324, 25327 (May 7, 2010) (codified at 40 C.F.R. pts. 85, 86, 600); 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62624, 62624

administration weakened those standards in 2020.¹⁹³ The Biden administration strengthened them again in 2021.¹⁹⁴

3. State and Regional Initiatives

As U.S. federal climate policy has swung back and forth, states, regions and cities have stepped in to make progress using their own laws and policies. Frustrated by the first Bush administration's inaction on climate,¹⁹⁵ the governors of New Jersey (a Republican) and Connecticut (a Democrat) acted early, in 1989¹⁹⁶ and 1990.¹⁹⁷

Many more states began to act after the second Bush administration rejected the Kyoto Protocol and denied a petition by several states to regulate greenhouse gases under the Clean Air Act.¹⁹⁸ From 2000 to 2008, twenty-one states and Washington, D.C. adopted "renewable portfolio standards" ("RPSs"): laws that require utilities to gradually increase, over many years, the percentage of electricity generated from renewable resources like sun and wind.¹⁹⁹ Thirteen states established appliance efficiency standards or enhanced existing standards.²⁰⁰ In the mid-2000s, eight groups of states were discussing ways to cooperatively reduce greenhouse gas emissions in multiple regions of the U.S.²⁰¹ Only the Regional Greenhouse Gas Initiative in the Eastern U.S. continues to this day.²⁰²

(Oct. 15, 2012) (codified at 40 C.F.R. pts. 85, 86, 600); The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, 85 Fed. Reg. 24174, 24174 (Apr. 30, 2020) (codified at 40 C.F.R. pts. 86 & 600); Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 Fed. Reg. 74434, 74434 (Dec. 30, 2021) (codified at 40 C.F.R. pts. 86 & 600).

¹⁹³ See The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, 85 Fed. Reg. 24174, 24174 (Apr. 30, 2020) (codified at 40 C.F.R. pts. 86 & 600).

¹⁹⁴ See Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 Fed. Reg. 74434, 74434 (Dec. 30, 2021) (codified at 40 C.F.R. pts. 86 & 600).

¹⁹⁵ Gerrard, *supra* note 47, at 322.

¹⁹⁶ N.J. Exec. Order No. 219 (Oct. 23, 1989), <https://nj.gov/infobank/circular/eok219.htm> [<https://perma.cc/2U8H-QGXE>].

¹⁹⁷ *Connecticut's Climate Action Contribution*, WE ARE STILL IN, <https://www.wearestillin.com/organization/connecticut> [<https://perma.cc/59E2-BCJW>].

¹⁹⁸ Freeman, *supra* note 138, at 41–43.

¹⁹⁹ *State Renewable Portfolio Standards and Goals*, NAT'L CONF. OF STATE LEGISLATURES, <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx#ia> [<https://perma.cc/3N5A-GSRT>] (Aug. 31, 2021).

²⁰⁰ *Appliance Standards Summary*, AM. COUNCIL FOR AN ENERGY EFFICIENT ECON., <https://database.aceee.org/state/appliance-standards-summary> [<https://perma.cc/4NB6-VWTM>].

²⁰¹ Gerrard, *supra* note 47, at 323.

²⁰² *Program Design Archive: A Brief History of RGGI*, REG'L GREENHOUSE GAS INITIATIVE, <https://www.rggi.org/program-overview-and-design/design-archive> [<https://perma.cc/YQH4-3ACU>].

State climate efforts generally fall into several categories:²⁰³

(i) *Laws specifically aimed at greenhouse gases*, e.g., greenhouse gas inventories and reporting; non-binding targets and plans, and binding commitments, to reduce GHG emissions by given dates; greenhouse gas cap-and-trade programs; incorporating the social cost of carbon into utility decisions; requirements for other greenhouse gases, like methane and hydrofluorocarbons (“HFCs”);

(ii) *Laws on electricity generation*, e.g., renewable portfolio standards, community solar;

(iii) *Energy efficiency legislation*, e.g., appliance energy efficiency standards, building codes, building performance standards;

(iv) *Litigation*, e.g., petitioning EPA to regulate greenhouse gases under the Clean Air Act; challenging Trump administration efforts to roll back climate regulations and policies; suing fossil fuel companies for deceptive marketing and misinformation about climate risks; and

(v) *“Soft diplomacy,”*²⁰⁴ e.g., governors and state officials attending U.N. COP gatherings; states working with Canada on energy and greenhouse gas issues.

State laws figure prominently in Professor Marks’s *Transitioning to Regenerative Agriculture One French Fry at a Time*, Professor Consalo’s *Let the Sun Shine*, and Professor Craig’s *Struggle Against the Water: Connecting Fair Housing Law and Climate Justice*.

4. Local Law

Cities now contain about 50 percent of the world’s population, consume about 67 percent of global energy and produce more than 70 percent of carbon emissions.²⁰⁵ These numbers are likely to grow. City population is expected to grow to over 70 percent of world population by 2050.²⁰⁶

Climate action at the municipal level, like action at the state level, has ramped up as action at the international and federal levels has stalled. A pioneering group of local and regional governments²⁰⁷ founded the International Council for Local Environmental Initiatives (“ICLEI”) in 1990.²⁰⁸ Only

²⁰³ Gerrard, *supra* note 47, at 339–41.

²⁰⁴ *Id.* at 341.

²⁰⁵ INT’L ENERGY AGENCY, EMPOWERING CITIES FOR A NET ZERO FUTURE: UNLOCKING RESILIENT, SMART, SUSTAINABLE URBAN ENERGY SYSTEMS 3 (2021), <https://iea.blob.core.windows.net/assets/4d5c939d-9c37-490b-bb53-2c0d23f2cf3d/G20EmpoweringCitiesforaNetZeroFuture.pdf> [<https://perma.cc/4WBT-9KED>].

²⁰⁶ *Id.*

²⁰⁷ *About Us*, ICLEI – LOC. GOV’TS FOR SUSTAINABILITY, https://iclei.org/about_iclei_2/ [<https://perma.cc/E49Y-R6QX>].

²⁰⁸ ICLEI – LOC. GOV’TS FOR SUSTAINABILITY, at Charter 4 (2021), https://iclei.org/wp-content/uploads/2023/08/Charter_APPROVED_202104.pdf [<https://perma.cc/E2SW-3HSG>].

fourteen cities in the U.S., Canada, Europe and Turkey joined the ICLEI's Urban CO₂ Reduction Project in 1991.²⁰⁹ ICLEI's second effort, the Cities for Climate Protection program, however, quickly grew to hundreds of cities.²¹⁰ By 2009, over 200 mayors met at the Copenhagen Climate Summit for Mayors, held in parallel with COP15. They declared that over 1,000 mayors had signed up to meet or beat the targets of the Kyoto Protocol and almost 900 European cities had committed to targets that went beyond the European Union's policy for 2020.²¹¹ The mayors contrasted starkly with 114 national representatives at COP15, who failed to reach agreement.²¹²

Cities and local governments have jurisdiction over many significant sources of greenhouse gases, including sewage and water treatment plants, solid waste facilities, power plants, large motor vehicle fleets (police, fire, garbage, maintenance vehicles) and municipal buildings, including schools, offices and social service centers.²¹³ Cities may have the potential to make up a significant part of the gap between current NDCs and greenhouse gas emission reductions necessary to limit global warming to 1.5 degrees Celsius.²¹⁴

Local laws cover a range of topics, some of them unique to municipalities. For this Symposium, the most important categories are:

(i) Zoning and development restrictions, including permit conditions, buffer zones and overlay zones;²¹⁵

(ii) Renewable energy community power, including community solar laws; and

(iii) Distributed energy and microgrids.²¹⁶

Thirty-nine states and the District of Columbia have adopted community solar laws. Twenty-two states have adopted laws that facilitate community solar. Distributed energy and microgrids are especially important because

²⁰⁹ ICLEI – LOC. GOV'TS FOR SUSTAINABILITY, CITIES FOR CLIMATE PROTECTION 1–2 (1993), https://iclei.org/wp-content/uploads/2022/05/ICLEI_TheBirthofCCP_1993.pdf [https://perma.cc/BKZ2-RY5W].

²¹⁰ See generally Michele Acuto & Benjamin Leffel, *Understanding the Global Ecosystem of City Networks*, 58 URB. STUD. 1758 (2020).

²¹¹ CITIES ACT, THE COPENHAGEN CLIMATE COMMUNIQUÉ 2 (2009) https://www.nyc.gov/html/planyc2030/downloads/pdf/cities_act_copenhagen_communique.pdf [https://perma.cc/4UMH-YFF8].

²¹² Gerrard, *supra* note 47, at 361.

²¹³ *Id.* at 362.

²¹⁴ Angel Hsu et al., *Beyond States: Harnessing Sub-National Actors for the Deep Decarbonisation of Cities, Regions, and Businesses*, 70 ENERGY RSCH. & SOC. SCI. 101738, 101738 (2020); Don Grant et al., *Can Transnational Municipal Networks Mitigate the Carbon Pollution of the World's Power Plants?: An Empirical Analysis*, 2 NPJ CLIMATE ACTION, 2023, at 2.

²¹⁵ See Gerrard, *supra* note 47, at 378–80. Zoning law is central to Jonathan Rosenbloom's *Sacrifice Zones*. Rosenbloom, *supra* note 53.

²¹⁶ Renewable energy, distributed solar, community solar, and microgrids are the centerpiece of Kara Consalo's *Let the Sun Shine*. Consalo, *supra* note 48.

two-thirds of the fuel that generates electrical power is lost at the point of generation or in transmission.²¹⁷

5. *Litigation*

a. *Overview*

Faced with increasingly severe consequences of climate change and inadequate responses, a wide range of actors—children, Indigenous groups, non-governmental organizations, corporations, national and sub-national governments—have resorted to litigation.²¹⁸

Few cases addressed climate change before 2000.²¹⁹ Since then, climate litigation has increased steadily, from 884 cases in twenty-four jurisdictions in 2017 to 2,180 cases in sixty-five jurisdictions in 2022.²²⁰ Many of these cases are based on legal frameworks—treaties, laws, and regulations—that governments have built over the last three decades.²²¹

In the United States, states, local governments, and private citizens have sued governments, fossil fuel companies, and other companies under a wide range of theories, including federal and state public trust doctrines,²²² rights of nature (including laws passed by ballot initiative),²²³ state consumer protection statutes,²²⁴ public and private nuisance under federal and state

²¹⁷ Gerrard, *supra* note 47, at 375.

²¹⁸ MICHAEL BURGER & JUSTIN GUNDLACH, THE STATUS OF CLIMATE CHANGE LITIGATION: A GLOBAL REVIEW 4–5 (2017) [hereinafter 2017 STATUS REVIEW].

²¹⁹ See *U.S. Climate Change Litigation*, SABIN CTR. FOR CLIMATE CHANGE L., https://climatecasechart.com/search/?fwp_sort=filing_year_asc [<https://perma.cc/DN2S-RCQW>] (filtered and sorted by date); see also Meredith Wilensky, *Climate Change in the Courts: An Assessment of Non-U.S. Climate Litigation*, 26 DUKE ENV'T. L. & POL'Y F. 131, 133, 135, 142, 149 (2015).

²²⁰ MICHAEL BURGER & MARIA ANTONIA TIGRE, GLOBAL CLIMATE LITIGATION REPORT: 2023 STATUS REVIEW 12 (2023) [hereinafter 2023 STATUS REVIEW].

²²¹ 2017 STATUS REVIEW, *supra* note 218, at 4–5.

²²² Gerrard, *supra* note 47, at 291–94.

²²³ *Id.* at 294–95 (providing examples of lawsuits based on rights of nature—including the 2021 lawsuit brought by the White Earth Band of Ojibwe in Minnesota on behalf of wild rice—and explaining that while these suits have so far been unsuccessful, they demonstrate the ways environmental advocates are using ballot initiatives and tribal courts to create new substantive rights for the environment); see also 2023 STATUS REVIEW, *supra* note 220, at 36, 38.

²²⁴ Gerrard, *supra* note 47, at 296 (explaining how cities and states like Minnesota, Massachusetts, New York City, and Baltimore are asserting consumer protection claims against companies based on deceiving statements and misleading practices in marketing their products, such as fossil fuels); see also 2023 STATUS REVIEW, *supra* note 220, at 50, 57, 59.

common law,²²⁵ negligence,²²⁶ trespass,²²⁷ products liability,²²⁸ and more. They have alleged investor fraud and violations of securities laws;²²⁹ and that companies were negligent and liable for trespass and takings because they failed to adapt to climate change.²³⁰ They have sought both damages and injunctive relief.

Outside the U.S., plaintiffs have also sued governments, fossil fuel companies, and other companies on a variety of theories—including human rights claims,²³¹ environmental rights claims,²³² claims based on international

²²⁵ See, e.g., *Am. Elec. Power Co. v. Connecticut*, 564 U.S. 410, 418–19, 424 (2011) (federal common law of public nuisance displaced by Clean Air Act and EPA regulatory actions; Plaintiffs alleged electric utilities created a public nuisance by burning fossil fuels, emitting greenhouse gases and contributing to global warming); Complaint at 204–08, *Delaware v. BP Am., Inc.*, No. N20C-09-097 (Del. Super. Ct. Sept. 10, 2020) (fossil fuel companies allegedly created a public nuisance); *Comer v. Murphy Oil USA*, 585 F.3d 855, 859–60 (5th Cir. 2009), *reh'g en banc granted*, 598 F.3d 208 (5th Cir. 2010), *appeal dismissed*, 607 F.3d 1049 (5th Cir. 2010) (plaintiffs alleged oil and other energy companies created private nuisance by emitting greenhouse gases which exacerbated Hurricane Katrina's damage; appeals court en banc dismissed appeal as non-justiciable).

²²⁶ See, e.g., *City of Hoboken v. Chevron Corp.*, 45 F.4th 699 (3d Cir. 2022), *cert. denied sub nom.* *Chevron Corp. v. City of Hoboken, N.J.*, 143 S. Ct. 2483 (2023).

²²⁷ See, e.g., *City of New York v. Chevron Corp.*, 993 F.3d 81, 89 (2d Cir. 2021).

²²⁸ Gerard, *supra* note 47, at 296 (explaining how the City of Charleston, South Carolina—which is battling the damaging impacts of sea level rise—sued several fossil fuel companies on strict liability theories for failure to warn consumers of the inevitable climate effects from intended and foreseeable misuse of fossil fuel products).

²²⁹ *Id.* at 270–72 (examining various types of securities fraud claims related to climate change, including shareholder claims brought under SEC Rule 10b-5 against companies for material misrepresentations and omissions in climate-related disclosures). See e.g., *Ramirez v. Exxon Mobil Corp.*, 334 F. Supp. 3d 832 (N.D. Tex. 2018).

²³⁰ *Graves v. Arkema Inc.*, No. 4:17-CV-3068, 2018 WL 10158337, at *3 (S.D. Tex. Mar. 7, 2018). See generally *Petition and Application for Permanent Injunction, Harris Cnty. v. Arkema, Inc.*, No. 2017-76961 (Tex. Dist. Ct. Nov. 16, 2017).

²³¹ Gerrard, *supra* note 47, at 305 (Explaining how lawsuits have proceeded in international courts based on human rights violations to varying results, including a 2005 lawsuit where the “Inuit Circumpolar Conference filed a petition with the Inter-American Commission on Human Rights, seeking a ruling that the United States was ‘internationally responsible for violations of rights’ due to climate change,” which the Inter-American Commission on Human Rights could not process. (quoting *Petition to the Inter American Commission on Human Rights Seeking Relief from Violations Resulting from Global Warming Caused by Acts and Omissions of the United States*, at 7, <https://earthjustice.org/wp-content/uploads/petition-to-the-inter-american-commission-on-human-rights-on-behalf-of-the-inuit-circumpolar-conference.pdf> [<https://perma.cc/5V4K-BNJ> P])).

²³² See, e.g., *Hoge Raad der Nederlanden [HR] [Supreme Court of Netherlands] Dec. 20, 2019 (De Staat Der Nederlanden / Stichting Urgenda) (Urgenda v. Netherlands) (Neth.)*.

treaties,²³³ and rights of nature,²³⁴—in a variety of forums, including national, regional, international, and other adjudicatory bodies.²³⁵

Cases in national courts have often failed, as Mayer points out, on threshold issues of standing and political questions. Many courts have found that plaintiffs lacked standing because they failed to allege: (i) a concrete and particularized injury in fact;²³⁶ (ii) that the injury was “fairly traceable” to defendants’ conduct;²³⁷ or (iii) that the injury was redressable by a favorable court decision.²³⁸ They have found that the relief requested by plaintiffs is the province of political branches of government, requiring “complex policy decisions” that courts are not equipped to make or implement.²³⁹

Some plaintiffs, nevertheless, have succeeded. In 2017, the Inter-American Court of Human Rights, responding to a request from Colombia, issued an advisory opinion finding that the right to a healthy environment is one of the human rights protected by the American Convention on Human Rights.²⁴⁰ The court recognized that “the adverse effects of climate change have a negative impact on the enjoyment of human rights”²⁴¹ and concluded that a state must ensure that activities in its territory do not significantly damage the environment outside its territory.²⁴² In 2021, the Inter-American Commission of Human Rights (“IACHR”) and the Office of the Special Rapporteur on Economic, Social, Cultural, and Environmental Rights relied on this advisory opinion to adopt resolution No. 3/2021, *Climate Emergency:*

²³³ Gerrard, *supra* note 47, at 305–06 (explaining how the Kyoto Protocol to the UNFCCC provides for noncompliance proceedings; lawsuits in the Netherlands, Germany and Nepal have succeeded in compelling countries to enact stronger climate policies to comply with the Paris Agreement).

²³⁴ *Id.* at 306 (Ecuador amended its Constitution in 2008 to recognize rights of nature. Lawsuits under the provision recognizing those rights and the right of citizens to demand recognition of those rights have so far had mixed success).

²³⁵ 2023 STATUS REVIEW, *supra* note 220, at 13.

²³⁶ See, e.g., *Citizens’ Committee on the Kobe Coal-Fired Power Plant v. Japan*, CLIMATE CHANGE LITIG. DATABASE, <https://climatecasechart.com/non-us-case/citizens-committee-on-the-kobe-coal-fired-power-plant-v-japan/> [<https://perma.cc/8AKF-LFSZ>] (a lawsuit that went to the Supreme Court of Japan regarding a request for injunction against constructing and operating of two new units at a coal-fired plant; Petitioners argued the project was inconsistent with Japan’s 2030 and 2050 climate targets; court found plaintiffs’ human rights claims were general rather than individual and therefore lacked standing).

²³⁷ *Native Vill. of Kivalina v. Exxon Mobil Corp.*, 663 F. Supp. 2d 863, 877, 880 (N.D. Cal. 2009).

²³⁸ See, e.g., *Juliana v. United States*, 947 F.3d 1159, 1170 (9th Cir. 2020).

²³⁹ *Id.* at 1171–72.

²⁴⁰ A Request for an Advisory Opinion from the Inter-American Court of Human Rights Concerning the Interpretation of Article 1(1), 4(1) and 5(1) of the American Convention on Human Rights, Advisory Opinion OC-23/17, Inter-Am. Ct. H.R. 25 (Nov. 15, 2017).

²⁴¹ *Id.* at 22.

²⁴² *Id.* at 44.

*Scope of Inter-American Human Rights Obligations.*²⁴³ The resolution declares that human rights must be central to climate policy;²⁴⁴ states have a special, “reinforced” obligation to protect the rights of those who are particularly vulnerable to the adverse impacts of climate change;²⁴⁵ companies must align their behavior and operations to the human rights regime²⁴⁶ and adopt plans to reduce greenhouse emissions from their products, services, subsidiaries, and suppliers.²⁴⁷

In light of these and other successes, the IPCC concluded in 2023 that climate litigation has, in some cases, “influenced the outcome and ambition of climate governance”²⁴⁸ and is an important tool for influencing climate policy outside formal climate policy processes.²⁴⁹

b. Reparations Under International Law

In *Climate Reparations*, Professor Benoit Mayer focuses on claims seeking reparations under international law for climate harms.²⁵⁰ Those harms could include, for example, the slow inundation and destruction of island states like Tuvalu and the Marshall Islands as sea levels rise.²⁵¹ Under international law, classical reparations include restitution, compensation, and satisfaction.²⁵²

According to Mayer, most efforts at climate reparations—whether in international agreements or litigation—have failed because they sought to make industrial states pay damages for all climate impacts resulting from their greenhouse gas emissions.²⁵³ These efforts appeared to assume that every greenhouse emission is wrongful or that wrongfulness is irrelevant to reparation claims. Mayer makes a new, narrower, and more persuasive argument, calling for climate reparations for climate wrongs. He focuses on the breach of a state’s international law obligations to mitigate climate change and the harmful consequences of a breach, instead of the consequences of all

²⁴³ IACHR Res. 3/2021, CLIMATE EMERGENCY: SCOPE OF INTER-AMERICAN HUMAN RIGHTS OBLIGATIONS 5 (Dec. 31, 2021).

²⁴⁴ *Id.* at 8.

²⁴⁵ *Id.* at 15.

²⁴⁶ *Id.* at 21.

²⁴⁷ *Id.* at 22.

²⁴⁸ Jim Skea et al., *Summary for Policy Makers*, in CLIMATE CHANGE 2022 MITIGATION OF CLIMATE CHANGE 3, 46 (Priyadarshi R. Shukla et al., eds., 2022).

²⁴⁹ Navroz K. Dubash et al., *National and Sub-National Policies and Institutions*, in CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE 1355, 1375 (P.R. Shukla et al. eds., 2022).

²⁵⁰ Mayer, *supra* note 97, at 963.

²⁵¹ Kees van der Geest et al., *Climate Change, Ecosystem Services and Migration in the Marshall Islands: Are They Related?*, 161 CLIMATIC CHANGE 109, 110 (2020); Celia McMichael et al., *Rising Seas, Immobilities, and Translocality in Small Island States: Case Studies from Fiji and Tuvalu*, 43 POPULATION & ENV’T 82, 88 (2021).

²⁵² Mayer, *supra* note 97, at 1009.

²⁵³ *Id.* at 968.

greenhouse emissions. He builds on well-established rules about state responsibility for breaching obligations under international law and avoids many of the common obstacles in climate litigation.²⁵⁴

Mayer examines existing cases, piecing together elements of successful claims, to map a new and ingenious path. First, seek advisory opinions in international tribunals, rather than traditional judgments in national courts, to avoid standing and political question problems. Second, allege breach of a state's international law obligation to mitigate climate change; do not allege that emitting greenhouse gas, by itself, is a compensable wrong. Third, use the resulting decrees to increase pressure on national governments and spur international negotiations on adequate reparations. Fourth, seek innovative forms of reparations, like insurance, a global tax, and transitional justice remedies. "Transitional justice refers to how societies respond to the legacies of massive and serious human rights violations."²⁵⁵ Transitional justice remedies could involve truth commissions, reparations commissions or other ways to address climate harms, including compensatory and non-compensatory forms of repair.

II. THEMES OF THIS SYMPOSIUM

A. *Decarbonization & Mitigation*

It took nearly a decade for the Kit Carson Electric Cooperative—a member-owned electricity distribution cooperative in Northern New Mexico that serves more than 30,000 members—to transition away from fossil fuels and end its long, contractual relationship with Tri-State Generation and Transmission, a coal-based energy supplier serving Colorado, Nebraska, Wyoming, and New Mexico.²⁵⁶ There are 832 rural energy distribution co-ops nationwide and, in general, they rely more on coal and have been slower to decarbonize than large investor-owned utilities.²⁵⁷ In 2012, a group of Taosños members of the Kit Carson co-op formed a nonprofit organization called Renewable Taos with the goal of achieving 100 percent renewable energy for the Kit Carson service area.²⁵⁸ In 2022, they achieved their goal. Today, renewable energy provides 100 percent of the year-round daytime electricity of Kit Carson's members.²⁵⁹ Kit Carson and Renewable Taos achieved this incredible milestone by visiting co-op members in their communities and

²⁵⁴ *Id.* at 963.

²⁵⁵ *What Is Transitional Justice?*, INT'L CTR. FOR TRANSNAT'L JUST., <https://www.ictj.org/wh-at-transitional-justice> [<https://perma.cc/SAD8-JU2E>].

²⁵⁶ Mary Catherine O'Connor, *The New Mexico Co-op Breaking Up with Fossil Fuels*, HIGH COUNTRY NEWS (Jan. 1, 2024), <https://www.hcn.org/issues/56.1/energy-industry-the-new-mexico-co-op-breaking-up-with-fossil-fuels> [<https://perma.cc/Q9P6-QUBY>].

²⁵⁷ *Id.*

²⁵⁸ *Id.*

²⁵⁹ *Id.*

discussing the benefits of renewable energy and the downsides of continuing down the path of coal.²⁶⁰ Aided by the falling price of solar, which reached price parity with coal in the mid-2010s, every community in the Kit Carson service area—including its more skeptical conservative members—signed onto Renewable Taos’s clean energy resolution.²⁶¹ After securing a renewable energy-supplier, Kit Carson broke its \$37 million contract with Tri-State.²⁶² Now, other co-ops in Western Colorado are following Kit Carson’s lead in pursuit of decarbonization and clean energy.²⁶³

The authors in this Symposium recognize the importance of continuing to aggressively reduce carbon emissions—even as we are forced to adapt to a changing climate—because of the disastrous consequences of each additional degree of warming. They take aim at some of the most carbon-intensive industries, like the fossil fuels, industrial agriculture, and military-industrial complex, and offer fresh perspectives on the future of climate change mitigation.

1. *The Blueprint for Expanding Small-Scale Solar Electricity*

Much of the climate scholarship on solar energy explores large-scale solar development and its role in the renewable energy transition. In the *Let the Sun Shine: Methods for Expansion of Small-Scale Solar Electricity to Reduce Fossil Fuel Dependence, Ease Financial Energy Burdens, and Enhance Community Resiliency*, Professor Kara Consalo refocuses the solar discussion on the benefits of microgrids and on-site photovoltaic (“PV”) panels.²⁶⁴ Adding to the growing body of scholarship that seeks to advance on-site solar energy as a renewable electricity source in the United States, the article specifically targets financially-affordable and user-friendly PV panels for small residential and office buildings.

Using Hawaii, California, and Illinois as case studies, Consalo evaluates successful political strategies, financial incentives, and legal structures that will lead to exponential growth in the deployment of small-scale PV systems in the communities that most need cheap and reliable energy. Through a mix of RPS policies and layered financial incentives that target a variety of stakeholders, California and Hawaii have rapidly increased the use of on-site solar PV systems. Illinois’ impressive “Solar for All” program prioritizes “energy equity” by making PV systems more affordable for low-income homeowners and tenants. The program incentivizes property owners, tenants, nonprofits, and contractors to collaborate to make solar accessible to subscribers at various socioeconomic levels. Through the lens of these three states, Consalo

²⁶⁰ *Id.*

²⁶¹ *Id.*

²⁶² *Id.*

²⁶³ *Id.*

²⁶⁴ Consalo, *supra* note 48, at Introduction and Part I.

provides a blueprint for like-minded governments and policymakers to unleash the potential for on-site PV solar in their communities and begin enjoying the myriad benefits of resilient and clean energy.

2. *Carbon Farming for the Future*

In *Transitioning to Regenerative Agriculture One French Fry at a Time*, Professor Alexia Brunet Marks seeks to fill the gap in food law and environmental governance literature addressing carbon farming and its role in regenerative agriculture.²⁶⁵ Regenerative agriculture uses plants to store CO₂, in contrast to conventional farming which releases CO₂ into the atmosphere. It aims to increase a crop's photosynthetic intake to trap carbon, and then encourages the trapped carbon to move into the soil where it will remain indefinitely. Companies then use the carbon credits created by regenerative agriculture as offsets,²⁶⁶ insets,²⁶⁷ and in strategic alliances.²⁶⁸ Marks explains that while selling carbon credits from regenerative agriculture has become "big business" in voluntary markets, asymmetries in information sharing and uncertainty in price setting have so far undermined trust in the market and limited regenerative agriculture's potential. She suggests several regulatory changes to shore up the carbon-market system to ensure accurate measurements in carbon sequestration projects and facilitate more transparency among market participants. She is the first scholar to analyze the carbon markets using real-world food market participants, like McDonalds, General Mills, and Nespresso. Her article offers promising solutions that, if adopted, would encourage more firms to rely on carbon offsets to meet their emission-reduction targets and more farmers to invest long-term in regenerative agriculture.

3. *Coming Clean About the United States' Military Emissions*

With a budget hitting \$877 billion in 2022,²⁶⁹ the United States military consumes more petroleum than any other institution in the world, making it

²⁶⁵ Marks, *supra* note 54, at 1037.

²⁶⁶ *Id.* at 1044 (Explaining that offsets "are credits representing the removal of one ton of carbon dioxide equivalent (tCO₂e) from the atmosphere" that are used by companies to comply with government regulations and cap-and-trade programs, while others use offsets to meet voluntary emission reductions goals.).

²⁶⁷ *Id.* at 1049 (explaining that insets aim to reduce carbon emissions within one's own supply chain with nature-based solutions like regenerative agriculture and renewable energy).

²⁶⁸ *Id.* at 1051 (Defining strategic alliances as "[r]elationships between buyers and suppliers to make the supply chain greener.").

²⁶⁹ Lorraine Mallinder, *'Elephant in the Room': The US Military's Devastating Carbon Footprint*, AL JAZEERA (Dec. 12, 2023), <https://www.aljazeera.com/news/2023/12/12/elephant-in-the-room-the-us-militarys-devastating-carbon-footprint> [<https://perma.cc/FYT2-S486>].

a natural candidate for decarbonization.²⁷⁰ By one estimate, it produces more emissions than the industrialized nations of Sweden, Portugal, and Denmark.²⁷¹ Yet, as Professor Nadia B. Ahmad points out in *Military Climate Emissions*, U.S. military greenhouse gas emissions have consistently been omitted from official reports by U.S. federal agencies and are seldom discussed in global climate summits.²⁷² While the United States faces real adversaries around the world, climate change is arguably a more certain and immediate threat than any human adversary,²⁷³ and Ahmad argues it is high time to treat it accordingly.

Ahmad's article is radical, provocative and confrontational, on emotional, intellectual and policy levels. She brings Gen-Z and Black Lives Matter energy and thinking to military spending and its implications for climate change and social justice. Ahmad begins by estimating U.S. military greenhouse gas emissions from energy consumption, infrastructure, and the military-industrial complex, and demonstrates the military's broad environmental impact. She then develops a new analytic framework, "transmodern coloniality," which combines and extends Marc Luyckx Ghisi's theory of transmodern development of civilization with the concept of coloniality.²⁷⁴ In this framework, she connects U.S. military spending and global presence to persistent and urgent social, economic, and ethical challenges, such as climate justice and safeguarding human civilization.

Ahmad argues that demilitarization and disarmament could not only greatly reduce military greenhouse gas emissions, but also reduce global conflicts, promote economic development, and build international cohesion. She analyzes defense expenditures and the redistribution of resources, focusing on the emerging activist movements, including Veterans for Peace, which are actively promoting the need for accountability in military emissions and proposing significant policy changes. She critiques the idea that the military advances climate adaptation, arguing that this fails to acknowledge the military's substantial greenhouse gas emissions. She concludes by suggesting that the U.S.: (1) redirect military research and development to clean energy technologies that can help accelerate the transition to renewable energy sources and contribute to global decarbonization; (2) enter disarmament agreements to reduce military stockpiles and the potential for armed conflict; (3) reallocate budget and resources to stimulate economic growth (*e.g.*, in healthcare

²⁷⁰ Ahmad, *supra* note 52, at 855, 883.

²⁷¹ NETA C. CRAWFORD, *THE PENTAGON, CLIMATE CHANGE, AND WAR: CHARTING THE RISE AND FALL OF U.S. MILITARY EMISSIONS* 6 (2022).

²⁷² Ahmad, *supra* note 52, at 847, 856–57.

²⁷³ *Id.* at 858.

²⁷⁴ "Coloniality . . . refers to long-standing patterns of power that emerged as a result of colonialism, but that define culture, labor, intersubjective relations, and knowledge production well beyond the strict limits of colonial administrations. Thus, coloniality survives colonialism." Nelson Maldonado-Torres, *On the Coloniality of Being*, 21 *CULTURAL STUD.* 240, 241, 243 (2007) (footnote omitted).

and education) and encourage sustainable resource management; and (4) re-allocate resources from Special Operations Forces to climate adaptation. Ahmad argues that this kind of demilitarization will lead to a more peaceful, stable, and sustainable world.

B. *Adaptation & Resilience*

In response to unpredictable rain patterns and extreme weather that have fragmented traditional rangelands, Masaai pastoralists in Tanzania are diversifying their livelihoods with agriculture and wage labor to create more climate-resilient households.²⁷⁵ Meanwhile, Pacific Island communities are achieving greater resilience to sea-level rise and drought by combining traditional tribal practices with cutting-edge science.²⁷⁶ They are experimenting with salt and drought-resistant crops, revegetating coastline with endemic native plants,²⁷⁷ restoring traditional wells,²⁷⁸ and implementing climate-smart development plans.²⁷⁹

Climate change policy has, roughly speaking, evolved from early emphasis on reducing emissions and mitigating climate change to increasing emphasis on adapting to changes in climate that we cannot avoid. Adaptation becomes more and more important as we miss targets to limit warming to 1.5 or 2 degrees Celsius. This Symposium reflects that trend. The authors offer adaptation solutions that will build resilient communities. They envision a greater role for local and state governments as key decision-makers in land-use and energy policy. At the same time, they recognize that the federal

²⁷⁵ Edwige Marty et al., *Adapting to Climate Change Among Transitioning Maasai Pastoralists in Southern Kenya: An Intersectional Analysis of Differentiated Abilities to Benefit from Diversification Processes*, 50 J. PEASANT STUD. 136, 136–37 (2022).

²⁷⁶ Elizabeth Mcleod et al., *Lessons from the Pacific Islands—Adapting to Climate Change by Supporting Social and Ecological Resilience*, 6 FRONTIERS MARINE SCI. 1, 2 (2019).

²⁷⁷ Elizabeth Mcleod et al., *Raising the Voices of Pacific Island Women to Inform Climate Adaptation Policies*, 93 MARINE POL'Y 178, 182 (2018) (Explaining that “women in Palau, in partnership with the Palau Community College Cooperative Research and Extension, are experimenting with salt-tolerant varieties of taro (a traditional food crop) in response to coastal flooding and saltwater intrusion, and are moving taro patches inland to less vulnerable areas.”).

²⁷⁸ Mcleod et al., *supra* note 276, at 2 (“To improve water security and reduce impacts in the coastal environment, Oneisomw residents have rehabilitated traditional water wells by cleaning them, planting vegetation buffer strips around wells and streams to stabilize degraded banks and reduce sedimentation and installing concrete covers over the wells to reduce trash and other pollutants from entering the wells. They also developed agreements with landowners who had wells to allow others to access water during drought.”).

²⁷⁹ *Id.* at 4. (“In response to climate impacts and projections of future impacts, Palau developed a national climate change policy which identifies the need for building ecosystem and community resilience. Additionally, the Melekeok community developed a climate-smart guidance document due to their high dependence on their terrestrial and marine ecosystems in partnership with the Melekeok State government and conservation NGOs (e.g., the Nature Conservancy, Micronesia Conservation Trust).” (internal citations omitted)).

government's largesse on climate change remains essential because, without it, state and local governments will struggle to implement their climate adaptation plans. Our authors explore this dynamic and offer new perspectives on how zoning, fair housing, and energy policies can help us adapt to a changing climate.

1. *Sacrifice Zones as Adaptive Legal Tools*

Traditionally, the term “sacrifice zone” in environmental literature described fence line communities that live in proximity to big polluting industries, like Cancer Alley in Louisiana. Not unlike environmental justice communities, sacrifice zones suffer from environmental damage and economic disinvestment as residents are effectively “sacrificed” for the economic gains and prosperity of others. Professor Jonathan Rosenbloom, in *Sacrifice Zones*, redefines the term as an adaptive zoning mechanism for local governments to minimize environmental and social risks to humans, while restoring and enhancing over-strained ecosystems.²⁸⁰ A sacrifice zone designation may trigger moratoria on building, relocation of existing residents, and regenerative tools to limit dangerous and expensive development. A few cities across the United States have begun creating de facto sacrifice zones through policies that prohibit housing development in areas susceptible to wildfire, drought, and flooding—indicating that Rosenbloom’s concept is quickly becoming a reality.²⁸¹ By revisiting our outdated zoning laws and identifying areas where new and existing human development will exacerbate climatic risks, state and local governments can protect humans and natural systems from climate catastrophe.

2. *Adapting to a World of Flooding*

Professor Jade A. Craig’s *Struggle Against the Water: Connecting Fair Housing Law and Climate Justice* considers the long-standing problem of Black and Latinx communities being forced to live in flood zones and the need to move communities to higher land as floods become more frequent and destructive.²⁸² Craig describes the legacy of housing discrimination and redline zoning that led to predominantly Black communities residing in flood zones and floodplains, like the town of Princeville, North Carolina.²⁸³ He advocates for application of Fair Housing Act principles when creating managed-retreat

²⁸⁰ Rosenbloom, *supra* note 53, at 891.

²⁸¹ Lauren Sommer et al., *3 Cities Face a Climate Dilemma: To Build or not to Build Homes in Risky Places*, NPR (Nov. 6, 2023, 5:00 AM), <https://www.npr.org/2023/11/06/1204923950/arizona-california-new-jersey-climate-flood-wildfire-drought-building-homes> [<https://perma.cc/TJ4G-BB68>].

²⁸² Craig, *supra* note 51, at 737–38, 740–43.

²⁸³ *Id.* at 741.

policies with the goal of disrupting segregated living patterns and promoting residential integration.²⁸⁴

Two of the most important components of an equitable managed-retreat policy are the meaningful inclusion of residents in the decision-making process and sufficient resources for those residents, should they choose to relocate. Craig provides land reclamation and repatriation in South Africa as a cautionary tale, where South Africans were dispossessed of their land, denied consultation under the apartheid regime, and stripped of their dignity as a result. Craig explains that restricting Black and Latinx communities to the least desirable land in the United States facilitated a type of dignity taking and “radical othering.” Without careful planning, moving people away from their communities in floodplains risks taking their dignity all over again. Craig’s article shows us that managed-retreat for individuals residing in floodplains and flood zones—if done correctly—can promote resilience in the face of climate change *and* right historic wrongs.

3. *Building Resilient Communities with Microgrid Solar*

Small-scale solar provides many resilience benefits for local communities by reducing monthly electric bills, generating revenue from selling surplus electricity, providing reliable access to electricity during grid disruptions, and reducing local air pollution from burning fossil fuels.²⁸⁵ Low-income communities stand to benefit the most from the rise of small-scale solar because they are disproportionately burdened by frequent and prolonged power outages.²⁸⁶ Professor Consalo in the *Let the Sun Shine* suggests that we follow the lead of Hawaii, California, and Illinois with their success in making single-family homes and small businesses more resilient with microgrid solar.²⁸⁷ The sooner we can implement affordable, micro-grid solar, the sooner we can move forward with the renewable energy transition in the United States and decrease our reliance on aging electricity grids that are increasingly vulnerable to extreme weather.

4. *Improving Carbon Credit Markets to Increase Agricultural Resilience*

Marks describes the alluring promise of regenerative agriculture: it can remove significant amounts of CO₂ from the atmosphere and sequester it in soil. It could be a powerful weapon in the fight against climate change. Just

²⁸⁴ *Id.*

²⁸⁵ Consalo, *supra* note 48, at 794.

²⁸⁶ June Kim, *Increasing Power Outages Don’t Hit Everyone Equally*, SCI. AM. (July 26, 2023), <https://www.scientificamerican.com/article/increasing-power-outages-dont-hit-everyone-equally1> [<https://perma.cc/KQT5-2XTX>].

²⁸⁷ Consalo, *supra* note 48, at 817.

as attractive and important, however, is its potential to build resilience in agricultural systems.²⁸⁸ Regenerative agriculture can increase soil health and resilience, reduce agricultural inputs, retain more water, and improve water quality. All of these would increase farming sustainability and strengthen global supply chains.

Marks focuses on the carbon credits that farmers can earn by sequestering CO₂ in soil with regenerative agriculture. She notes significant problems and failures in those markets. Her prescriptions ensure that the markets function as intended, and that regenerative agriculture delivers on its promises to remove greenhouse gases from the atmosphere and create a more resilient agricultural system.

5. *Redirecting Military Budget to Adaptation*

Ahmad argues that we can adapt better and greatly increase our resilience to climate change by redirecting the U.S. military budget and resources to our communities, particularly the most vulnerable. We can invest in more resilient infrastructure, healthcare, education, and social welfare. Healthcare helps us adapt because healthy people are better able to cope with extreme heat and cold.²⁸⁹ Better education and social welfare programs may increase income, which in turn may help communities adapt better and increase resilience. Lower-income areas may have fewer resources to prepare for and adapt to extreme weather.²⁹⁰ A Centers for Disease Control (“CDC”) study found that weather-related death rates were two to seven times higher in low-income counties than in high-income counties.²⁹¹ The deaths were due to extreme heat, extreme cold, floods, storms, and lightning.²⁹² The CDC expects the frequency and intensity of these events to increase because of climate change.²⁹³

Ahmad suggests we could also redirect part of our military budget to international efforts to adapt, especially in the Global South, developing countries, and island nations. That shift could increase our national security by

²⁸⁸ Marks, *supra* note 54, at 1033.

²⁸⁹ Nate Seltenrich, *Between Extremes: Health Effects of Heat and Cold*, NAT'L LIBR. OF MED. (Nov. 1, 2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4629728/pdf/ehp.123-A275.pdf> [<https://perma.cc/4APT-53GD>] (“Generally speaking, people most at risk of illness or death from exposure to high or low temperatures include those less able to regulate their body temperature due to age, those with pre-existing conditions or chronic diseases, and users (especially heavy users) of alcohol or drugs.”); Kathleen Doheny, *Handling the Heat: Are Some of Us Naturally Better at It?*, WEBMD (July 21, 2023), <https://www.webmd.com/a-to-z-guides/news/20230721/handling-the-heat-are-some-us-naturally-better-at-it> [<https://perma.cc/JZ6J-5NCB>] (extra weight, diabetes, taking certain medicines, and old age can reduce heat tolerance).

²⁹⁰ Jeffrey Berko et al., *Deaths Attributed to Heat, Cold, and Other Weather Events in the United States, 2006–2010*, 76 CDC NAT. HEALTH STAT. REP., 2014, at 7.

²⁹¹ *Id.*

²⁹² *Id.*

²⁹³ *Id.* at 1.

promoting peace and decreasing the chance of conflict over resource scarcity and forced migration.²⁹⁴

Ahmad argues that we cannot fund the climate adaptation we need while the U.S. spends such extraordinary amounts on its military:²⁹⁵ \$8.5 trillion over the next decade according to Congressional Budget Office projections.²⁹⁶ Instead, we should demilitarize, increase resilience, improve social well-being, and promote peace.

6. *Adaptation Under International Law*

Mayer chronicles thirty years of developing nations, including island states, repeatedly demanding financial support, technical assistance, and reparations to help them adapt to climate change.²⁹⁷ These demands changed international agreements, like the UNFCCC and the Paris Agreement, to include provisions on adaptation, in addition to provisions on mitigation. Financial support for adaptation, however, remained consistently below aspirational objectives.²⁹⁸ Developing countries then pushed for compensation for loss and damage caused by climate change, once again seeking to enhance their ability to adapt.²⁹⁹ These talks also stalled.³⁰⁰

Political demands thwarted, countries began litigating in national and international courts. Mayer notes the possibilities and limitations of traditional international law remedies like restitution, compensation, and satisfaction in supporting adaptation efforts.³⁰¹ He singles out innovative insurance mechanisms as potentially promising tools to help developing countries and island nations pay for the costs of adapting to climate change.³⁰²

C. *Environmental Justice & Climate Justice*

The environmental justice movement began in the 1980s when more than 500 environmental and civil rights activists united to protest the dumping of over 6,000 truckloads of PCB-laced soil in a landfill in Acton, North Carolina.³⁰³ Since then, the environmental justice movement has evolved into

²⁹⁴ Ahmad, *supra* note 52, at 848–49.

²⁹⁵ *Id.* at 855.

²⁹⁶ Farhad Manjoo, *We Must Stop Showering the Military with Money*, N.Y. TIMES (Jan. 13, 2022), <https://www.nytimes.com/2022/01/13/opinion/military-budget-build-back-better.html> [<https://perma.cc/K9V9-3ET7>].

²⁹⁷ Mayer, *supra* note 97, at 966–68.

²⁹⁸ *Id.* at 977.

²⁹⁹ *Id.* at 978.

³⁰⁰ *Id.* at 979.

³⁰¹ *Id.* at 986–89.

³⁰² *Id.* at 972.

³⁰³ Cinnamon P. Carlarne, *Climate Courage: Remaking Environmental Law*, 41 STAN. ENV'T L.J. 125, 147–48 (2022).

a global movement that emphasizes bottom-up organizing and centering the voices of those most harmed by pollution and other environmental injustices.³⁰⁴ Building on principles of participatory and distributive justice,³⁰⁵ the environmental justice and climate justice movements call for a broader and more inclusive vision of environmental law and policy that considers questions of power and inequality at the local, national, and international levels.³⁰⁶ The United States Environmental Protection Agency defines environmental justice as the “just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environment”³⁰⁷ Participation is a critical component of environmental justice because it empowers historically sidelined groups and helps governments tailor environmental policies to the unique needs of the communities they serve.³⁰⁸

An outgrowth of the environmental justice movement, the climate justice movement recognizes the disproportionate burden of climate change on lower-income communities and communities of color around the world; these communities, generally speaking, are the least responsible for anthropogenic climate change.³⁰⁹ Climate justice proponents aim to resituate the conversation around climate change by addressing the structural inequalities that gave rise to the current distribution of climate change harms. They seek to advance distinct policy outcomes, while ensuring meaningful participation in policy creation.³¹⁰ But these twin aims can be in tension with one another because consultation tends to move slowly compared with the urgent need to reduce greenhouse gas emissions and provide communities with sufficient resources to adapt to a world with more floods, droughts, and wildfires.³¹¹ Like the environmental justice movement, the climate justice movement seeks a “just transition” from a fossil-fuel based economy to a low-carbon economy.³¹² The just transition concept emerged in the 1980s when labor unions

³⁰⁴ Joan Martinez-Alier et al., *Between Activism and Science: Grassroots Concepts for Sustainability Coined by Environmental Justice Organizations*, 21 J. POL. ECOLOGY 19, 21 (2014).

³⁰⁵ Gerrard, *supra* note 47, at 204.

³⁰⁶ *Id.* at 206.

³⁰⁷ *Learn About Environmental Justice*, EPA, <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice#definitions> [<https://perma.cc/7BH3-FDGX>].

³⁰⁸ Gerrard, *supra* note 47, at 211–12 (explaining the role of participation in environmental justice and using the example of the Inflation Reduction Act’s block grants for recipient communities to facilitate community engagement in advisory groups).

³⁰⁹ Mayer, *supra* note 97, at 965–66; *see also* Audrey R. Chapman & A. Karim Ahmed, *Climate Justice, Human Rights, and the Case for Reparations*, 23 HEALTH AND HUM. RTS. J. 81, 85–86 (2021).

³¹⁰ Gerrard, *supra* note 47, at 212.

³¹¹ *Id.*

³¹² Darren McCauley & Raphael Heffron, *Just Transition: Integrating Climate, Energy and Environmental Justice*, 119 ENERGY POL’Y 1, 2 (2018).

advocated for an equitable planned-energy transition to avoid the mass displacement of fossil fuel industry workers.³¹³ In the climate justice context, a just transition means ensuring that historically-marginalized and low-wealth communities are able to participate in the energy transition and enjoy its benefits, like rooftop solar, electric cars, and energy-efficiency investments.³¹⁴ A just transition also requires minimizing the risks that the transition will create new burdens for lower-income communities, such as increased levels of co-pollutants; rising energy costs; the exploitation of rural communities for mineral wealth, like lithium and cobalt; and harming communities that economically depend on the fossil fuel industry.³¹⁵

The authors in this Symposium recognize that a just transition to a low-carbon economy may require disrupting past patterns of discrimination and rectifying them by using the law in both familiar and novel ways. Ultimately, a just transition will require cross-cutting, complementary strategies that include market-based approaches and direct government interventions to reduce greenhouse gas emissions and maximize environmental and social justice co-benefits.³¹⁶ The articles in this Symposium align with that approach, offering an array of thought-provoking strategies to help us equitably achieve greater climate and energy security.

1. *Creating the Environmental Justice Zone*

In *Sacrifice Zones*, Professor Jonathan Rosenbloom furthers the discussion of environmental and climate justice when advocating for the reinvigoration of “environmental justice zones.”³¹⁷ An environmental justice zone refers to a geographic area that is disproportionately burdened by environmental pollution and other hazards.³¹⁸ For example, municipal waste disposal sites are often located in communities with less socioeconomic and political influence that are populated by people of color, low-income individuals, and indigenous peoples.³¹⁹ Using environmental impact statements, community-driven research, and other tools, local governments can identify environmental justice zones and begin to rectify the environmental hazards that burden the community. Professor Rosenbloom offers Baltimore’s 2018 Crude Oil Terminal Prohibition and Los Angeles’s Clean Up Green Up Ordinance as examples of local governments using their zoning authority to combat

³¹³ *Id.* at 1.

³¹⁴ Gerrard, *supra* note 47, at 213.

³¹⁵ *Id.* at 214–15.

³¹⁶ *Id.* at 225–26.

³¹⁷ Rosenbloom, *supra* note 53, at 936–37.

³¹⁸ *Id.* at 929–30.

³¹⁹ *Id.* at 927–28.

hazardous land uses, like fossil fuel infrastructure, to revitalize environmental justice communities.³²⁰

2. *Climate Justice for Flood-Zone Communities*

In *Struggle Against the Water: Connecting Fair Housing Law and Climate Justice*, Professor Jade A. Craig combines Fair Housing law with environmental and climate justice principles to examine climate-retreat policy in flood zones. At the heart of environmental and climate justice is the fair treatment of all people, regardless of race, ethnicity, and socioeconomic strata, and ensuring that everyone has equal access to resources *and places* that are safe from environmental and climate-induced hazards.³²¹ Craig criticizes traditional environmental and climate justice scholars' myopic focus on the siting of hazardous land-uses in disproportionately Black and Latinx communities while overlooking the long history of those communities being relegated to the least desirable land.³²² He implores us to think more expansively about the "distributional justice concerns of environmental justice," arguing that environmental and climate justice requires uprooting the structural racism that gave rise to the current geographic distribution of these communities in flood zones.³²³ Craig's article shows us that the climate crisis presents an invaluable opportunity to build more inclusive and integrated communities. Let's not waste it.

3. *Energy Equity for Environmental Justice Communities*

In *Let the Sun Shine*, Professor Karen Consalo examines the potential for solar energy in environmental justice communities that have historically been excluded from the economic, social, and resiliency benefits of solar. Illinois' Solar for All program puts environmental justice front and center by committing 25 percent of all program funding to "environmental justice communities," which the state identifies and designates using the EPA's EJScreen tool and a self-designation process created by the Illinois Power Agency.³²⁴ Solar venders then receive Renewable Energy Credits ("RECs") from the state that they can redeem for cash to subsidize the price of solar installation for low-income subscribers.³²⁵ Residents in environmental justice communities that do not own property suitable for solar-array installation can still benefit from the "Community Solar" component of the Solar for All program by

³²⁰ *Id.* at 930.

³²¹ *Climate Equity*, EPA, <https://www.epa.gov/climateimpacts/climate-equity> [<https://perma.cc/652G-EZMJ>].

³²² Craig, *supra* note 51, at 745–46.

³²³ *Id.* at 746.

³²⁴ Consalo, *supra* note 48, at 837.

³²⁵ *Id.*

subscribing to a community solar array with no up-front cost.³²⁶ With Illinois' shining example, Professor Consalo provides a roadmap for state and city governments to overcome the obstacles that have prevented solar development in environmental justice communities across the United States.

4. *Climate Reparations for Global Justice*

Mayer asserts that climate change is a matter of global justice.³²⁷ The most vulnerable individuals, communities, and countries feel the effects most severely, although their greenhouse gas emissions are dwarfed by those of developed countries, who receive the lion's share of benefits from those emissions.³²⁸ He notes that, from the beginning of international negotiations, some states and organizations have framed climate change as a matter of justice and responsibility.³²⁹ Although the COP has documented decisions to fund technical assistance and establish a loss and damage fund for vulnerable nations, Mayer and others express doubt about whether developed countries will honor those decisions.³³⁰ COP28 in Dubai both confirms and challenges those doubts. COP28 trumpeted the decision to "operationalise[]" a loss and damage fund to help vulnerable countries repair loss and damage caused by climate change³³¹ and almost \$800 million in pledges to fund it.³³² That amount, however, is a drop in the ocean compared to the hundreds of billions of dollars *per year* that may be needed.³³³ Mayer's recommended solution, as noted above, is to sue in international tribunals and use the resulting decrees to pressure national governments into international negotiations for adequate reparations.

5. *Redirect Military Spending to Promote Climate Justice*

Like Mayer, Ahmad asserts that mitigating and adapting to climate change are issues of morality, equity, and human rights.³³⁴ She passionately argues that military budget discussions must include fair allocation of resources to ensure that communities facing the greatest environmental

³²⁶ *Id.* at 839.

³²⁷ Mayer, *supra* note 97, at 965.

³²⁸ *Id.* at 965–66.

³²⁹ *Id.* at 975–76.

³³⁰ *Id.* at 982.

³³¹ Morton et al., *supra* note 130.

³³² First Global Stocktake, *supra* note 125, para. 87.

³³³ Nina Lakhani, *\$700m Pledged to Loss and Damage Fund at Cop28 Covers Less than 0.2% Needed*, THE GUARDIAN (Dec. 6, 2023, 11:00 AM), <https://www.theguardian.com/environment/2023/dec/06/700m-pledged-to-loss-and-damage-fund-cop28-covers-less-than-02-percent-needed> [<https://perma.cc/G5HN-7TKD>].

³³⁴ Ahmad, *supra* note 52, at 876–77.

injustices are able to mitigate and adapt to climate change.³³⁵ This requires not only reallocating financial resources but a new way of thinking, which gives priority to the needs of our most vulnerable communities.³³⁶ In Marc Luyckx Ghisi's conception of transmodernity, which Ahmad incorporates in her analytical frame, all cultures sit at a "common table . . . on an equal footing."³³⁷ Ahmad calls for a shift in United States policy away from military and environmental domination toward climate justice, community empowerment, humanitarian assistance, and climate finance to support adaptation efforts and loss-and-damage funds for those most vulnerable to climate change.

D. *Climate Displacement & Migration*

For decades, indigenous coastal communities in Alaska have watched their villages slip into the sea as permafrost melts at an alarming rate.³³⁸ At least thirty-one Alaskan villages are imminently threatened by flooding and erosion caused by sea-level rise.³³⁹ For some of these communities, like Shishmaref, an Inupiat community on the Sarichef Island of the Bering Sea, relocation is the only sustainable solution. Shishmaref has grappled for decades with the loss of buildings and critical infrastructure caused by storm surges, with its shoreline receding more than 200 feet since 1969.³⁴⁰ Without sea ice as a critical buffer for storm surges, the town will continue to lose about ten feet of shoreline per year. Government officials spent more than \$27 million on adaptation measures to protect the coastline, but those efforts have not been enough to stave off relocation.³⁴¹ The people of Shishmaref have twice voted to relocate the city, but lack of funding and disagreement over potential sites have stalled their efforts. Residents are also concerned that moving Shishmaref will destroy their cultural identity—one that is uniquely shaped by their ancestors' 4,000-year-old traditions and relationship to the land.³⁴²

³³⁵ *Id.*

³³⁶ *Id.*

³³⁷ Marc Luyckx Ghisi, *Towards a Transmodern Transformation of Our Global Society: European Challenges and Opportunities*, 15 J. FUTURE STUD. 39, 41 (2010).

³³⁸ Elizabeth Marino, *The Long History of Environmental Migration: Assessing Vulnerability Construction and Obstacles to Successful Relocation in Shishmaref, Alaska*, 22 GLOB. ENV'T CHANGE 374, 374–78 (2012).

³³⁹ Victoria Herrmann, *Alaskan Villages Imperiled by Global Warming Need Resources to Relocate*, ARCTIC INST. (July 29, 2015), <https://www.thearcticinstitute.org/alaskan-villages-imperiled-global-warming> [https://perma.cc/9EFS-L2MQ].

³⁴⁰ *City of Shishmaref, Alaska Sarichef Island: Relocation Site Selection Feasibility Study*, AECOM TECH. SERVS., INTRODUCTION 1 (2016), https://www.commerce.alaska.gov/web/Portals/4/pub/Shishmaref_Site_Selection_Feasibility_Study_FINAL_022316.pdf [https://perma.cc/XVV2-HVCA].

³⁴¹ *Id.*

³⁴² See Luis Andres Henao, *Climate Migration: How One Alaska Village Resists Despite Threats*, ANCHORAGE DAILY NEWS, <https://www.adn.com/alaska-news/rural-alaska/2022/10/30/climate-migration-how-one-alaska-village-resists-despite-threats/> [https://perma.cc/

While Shishmaref is among the first managed-retreats in the United States explicitly linked to anthropogenic climate change, it will not be the last. Thirteen million United States coastal residents are expected to be displaced by the end of the century due to sea-level rise.³⁴³ In 2022 alone, natural disasters displaced 3.3 million Americans, with nearly a million displaced in Florida.³⁴⁴ Managed retreat will be a necessary tool in the fight against climate change.³⁴⁵

The authors in this Symposium address the implications of climate migration for the international and local communities, and in doing so, draw intriguing connections to the topics of international law, reparations, national security, and fair housing and zoning laws. Decisions to migrate are complex and multifaceted, so our solutions must be equally complex. The authors describe ways that society can chart a new course to address the plight of climate refugees—using familiar legal tools while remaining firmly rooted in dignity and justice for the victims of climate change.

1. *Managing Retreat from Floodplains and Sacrifice Zones*

Both Professor Rosenbloom and Professor Craig predict that climate retreat will be necessary to adapt to climate change and that these relocations will be an opportunity to right historic wrongs and create more resilient communities. Craig in *Struggle Against the Water* explains that the term “[m]anaged retreat” is broader than climate retreat because it includes “methods of adapting to the climate risk as well as the relocation of residences and other property ‘out of harm’s way.’”³⁴⁶ He envisions choice-based managed-retreat policies that build on federal, state and local buyout programs to provide Black and Latinx communities in floodplains with the resources to move to higher ground or remain in place. Governments must analyze the cost and benefit of relocation compared to improving infrastructure and remaining in place. But as the cost of improvements increase, relocation should receive stronger consideration.³⁴⁷ To facilitate equitable climate relocations, Craig and Rosenbloom seem to agree that local governments must comprehensively address the needs of relocated residents with adequate compensation that often exceeds the requirements of the Fifth Amendment Takings Clause. Rosenbloom also suggests that governments provide relocated residents access to

6FCV-BYG9] (Oct. 30, 2022).

³⁴³ Linda Poon, *Where America’s Climate Migrants Will Go as Sea Level Rises*, BLOOMBERG NEWS (Feb. 3, 2020, 7:06 AM), <https://www.bloomberg.com/news/articles/2020-02-03/mapping-migration-in-the-face-of-climate-change> [https://perma.cc/5STX-TQ28].

³⁴⁴ Zack Budryk, *3.3 Million People Displaced by Natural Disasters in US Last Year*, THE HILL (Jan. 17, 2023, 11:53 AM), <https://thehill.com/policy/energy-environment/3816264-3-3-million-people-displaced-by-natural-disasters-in-us-last-year/>.

³⁴⁵ See Craig, *supra* note 51, at 740.

³⁴⁶ *Id.* at 740.

³⁴⁷ *Id.* at 767.

legal counsel, financial advisors, real estate brokers, and other essential support services.³⁴⁸

In addition to addressing the needs of relocated residents, Professor Rosenbloom discusses how relocation can provide ecological and resilience benefits by creating much-needed buffer zones for wildlife and native flora, degradation of plastic pollution, and reemergence of natural waterways, among other ecological services.³⁴⁹ Using Chernobyl as an example, Rosenbloom explains that in the wake of the nuclear accident, large-scale human evacuation paved the way for the Greater Spotted Eagle and an endangered species of wild horse to flourish, while also increasing wetland and forest areas by 680 percent and 14 percent respectively.³⁵⁰ Although Chernobyl remains highly contaminated, it provides an example of the remarkable effects of removing humans from sacrifice zones. When we remove people from the immediate path of climate destruction, we make them safer while creating much-needed buffering for climate adaptation and ecological restoration.

2. *Climate Migrations Reflect the Diffuse Nature of Climate Change*

Professor Mayer discusses in *Climate Reparations* how climate migration exemplifies the diffuse nature of climate-change harm and the difficulties of attributing harm in the reparations context. How physical phenomena affect society, including slow-onset events like sea-level rise, depends in large part on local circumstances, including natural phenomena and land-use and coastal management policies. Because phenomena like sea-level rise do not inflict direct harm on individuals, Mayer rejects the label of the “climate refugee” in the classical sense used by many law and policy scholars. He describes the political complications of imposing restitution and resettlement obligations on greenhouse gas-emitting states that bear only a fraction of the responsibility for climate change. In view of these political and social challenges, Mayer proposes a more meaningful role for multilateral negotiations, with international courts playing an instrumental role in “reframing the prevailing narrative” away from comprehensive reparations and towards targeted reparations for specific climate wrongs, like breaches of international climate agreements.

E. International to National to State to Local

Climate policy has, roughly speaking, proceeded from international to national to state and local levels. Much of the early effort on climate change policy occurred at the international level. The IPCC and UNFCCC were the first substantial, coordinated efforts to develop climate change science and

³⁴⁸ Rosenbloom, *supra* note 53, at 952.

³⁴⁹ *Id.* at 951.

³⁵⁰ *Id.* at 953–54.

policy. International efforts in turn catalyzed national and regional efforts to adopt climate change laws and policies. When international and national efforts stalled in the late 1990s and early 2000s, many U.S. states began adopting laws and policies to mitigate and adapt to climate change. The same happened at local levels in municipalities across the world. Work now proceeds at all these levels and places, simultaneously, leading some to describe climate policy as multi-level and “polycentric.”³⁵¹ This Symposium captures that spectrum.

1. *International Law for Climate Reparations*

Professor Mayer’s article focuses on climate reparations for vulnerable developing countries, including island nations, under international law.³⁵² This issue has been negotiated at the international level since at least the early 1990s with little success. Although the issue is old, Mayer outlines a new and promising approach using the emerging trend of climate litigation in international forums, like the Inter-American Court of Human Rights. He recommends seeking advisory opinions in those forums for breach of a state’s international law obligation to mitigate climate change, relying on well-established rules on state responsibility for internationally wrongful acts. States can use the resulting decrees to pressure national governments and catalyze international negotiations over climate reparations. Finally, instead of seeking classical international law remedies like restitution, compensation, or satisfaction, he recommends innovative forms of reparations, like insurance mechanisms, a global tax and transitional justice remedies.

2. *International and National Law for U.S. Military Emissions*

Professor Ahmad’s *Military Climate Emissions* tackles an international problem, the enormous yet uncounted greenhouse gas emissions of the world’s militaries.³⁵³ Her proposed solutions operate at both international and national levels. She argues strongly for directing part of the U.S. military budget to international climate change mitigation and adaptation, to support the Paris Agreement and subsequent agreements like those at COP28 regarding a loss and damage fund. She recommends disarmament agreements to reduce military stockpiles and the potential for armed conflict, which can reduce the carbon emissions of wars and military preparedness. Bilateral and

³⁵¹ See, e.g., Elinor Ostrom, *A Polycentric Approach for Coping with Climate Change*, WORLD BANK (2009), <https://documents1.worldbank.org/curated/en/480171468315567893/pdf/WPS5095.pdf> [<https://perma.cc/D946-SBVU>]; Don Grant et al., *Can Transnational Municipal Networks Mitigate the Carbon Pollution of the World’s Power Plants?: An Empirical Analysis*, 2 NPJ CLIMATE ACTION, 2023, at 1.

³⁵² See Mayer, *supra* note 97, at 963.

³⁵³ Ahmad, *supra* note 52, at 883–90.

multilateral international agreements would be the vehicles to implement these suggestions.

At the national level, National Defense Authorization Acts and other congressional appropriations are ways to implement her suggestions to: (1) reallocate the U.S. defense budget and resources to stimulate economic growth by investing, for example, in healthcare and education; and (2) reallocate resources from Special Operations Forces to climate adaptation. Department of Defense regulations and internal policies might also play a role.³⁵⁴

3. *National and State Law for Regenerative Agriculture*

Professor Marks's *Transitioning to Regenerative Agriculture One French Fry at a Time* operates at national and state levels.³⁵⁵ She proposes state or national registries of agricultural carbon sequestration contracts to put farmers on more equal footing with large companies buying carbon credits; a uniform national definition of regenerative agriculture under federal food labeling law to prevent companies greenwashing their carbon emissions with dubious agricultural practices; increased federal and state research to define and standardize methods to measure the carbon sequestered in farmland; and federal securities regulations that require companies to report their ESG commitments and disclose the role that carbon offsets play in their climate-related business strategy to ensure companies are not greenwashing.

4. *Using All Levels of Government to Manage Climate Retreat and Encourage Distributed Solar Energy*

Professor Jade A. Craig's *Struggle Against the Water: Connecting Fair Housing Law and Climate Justice* proposes changes at federal, state, and local levels to redress historic housing discrimination through climate retreat, relocation, and buyout programs.³⁵⁶ At the local level, Craig advocates for increasing community participation in state and local fair housing and climate retreat planning because "[t]he answer lies in a robust community participation process in which community members make decisions based on data and their particular visions for the future of their communities."³⁵⁷ Craig argues that local governments should use climate migration as an opportunity to improve their land-use planning tools and facilitate community integration in the jurisdiction's climate-safe areas.

As currently constructed, federal and local buyout programs fail to provide Black and Latinx communities with sufficient resources to effectuate buyouts because the pre-flood fair market value paid to the property owners

³⁵⁴ *Id.* at 886–87.

³⁵⁵ Marks, *supra* note 54, at 1055–69.

³⁵⁶ Craig, *supra* note 51, at 768–91.

³⁵⁷ *Id.* at 787.

often does not provide enough funds for residents to pay off their mortgage and purchase homes at higher ground. To effectively incentivize homeowners in floodplains to sell their property, Craig advocates for federal, state, and local buyout programs that provide full compensation for dispossession and the costs of relocating to higher-opportunity areas.

Similarly, Professor Kara Consalo demonstrates how complementary layers of federal, state, and local incentives are the best way to encourage installation of distributed solar energy systems³⁵⁸ and the benefits they bring, especially to lower-income and weather vulnerable communities: lower greenhouse gas emissions, better air quality, lower electricity costs for homes and businesses, and increased resilience to extreme weather.³⁵⁹

5. *Climate-Informed Zoning for Local Governments*

Finally, Professor Rosenbloom's *Sacrifice Zones* deals almost exclusively with local zoning law.³⁶⁰ As the first responders when disaster strikes, city and local governments are well-positioned to assess their communities' needs and vulnerabilities and make lasting land-use decisions that affect their ability to respond to climate-induced disasters.³⁶¹ And yet, most cities do not have zoning laws that are amenable to climate adaptation. On the contrary, Rosenbloom tells us that the Euclidean zoning model has been implemented in a manner that, while neutral on its surface, has perpetuated racial and socioeconomic disparities and left Black and Latinx communities disproportionately vulnerable to climate change. While some amendments have been made over time, most cities continue to lack zoning provisions or regulations addressing climate adaptation.

Rosenbloom proposes combining the existing flexible zoning tools of overlay and floating zones with a new tool, environmental justice zones, to create sacrifice zones. While sacrifice zones will not fix the inflexibility of many jurisdictions' zoning laws, they will at least provide local governments with an important tool to "act decisively and confidently in the response to climate change."³⁶² In a world with more floods, wildfires, drought, and powerful storms, local governments will need every regulatory tool at their disposal to protect their constituents. Sacrifice zones are a great start because they leverage familiar legal tools to respond to the dynamic challenges of climate change.

³⁵⁸ Consalo, *supra* note 48, at 839–40.

³⁵⁹ *Id.* at 794.

³⁶⁰ Rosenbloom, *supra* note 53, at 891.

³⁶¹ Margaret Badding, *Climate Adaptation at the Local, State, and Federal Levels*, ENV'T L. INST. (Nov. 10, 2021), <https://www.eli.org/vibrant-environment-blog/climate-adaptation-local-state-and-federal-levels> [<https://perma.cc/Q26R-Y5NZ>].

³⁶² Rosenbloom, *supra* note 53, at 962.

CONCLUSION

A. Frank's Story Joins Kyle's

I met Professor John Dernbach, of Widener Law Commonwealth, in 2018. He and Professor Michael Gerrard of Columbia University Law School's Sabin Center for Climate Change Law were on the verge of publishing a book, *Legal Pathways to Deep Decarbonization in the United States*, that outlined over 1,000 legal options for deeply reducing United States greenhouse gas emissions by 2050. It was based on the Deep Decarbonization Pathways project,³⁶³ which showed that deep decarbonization was technically feasible and affordable. John and Michael were not only publishing a book. They were also creating a network of pro bono attorneys, professors, and law students to draft model laws to implement the book's suggestions. They created a website to publish the models,³⁶⁴ so that federal, state and local advocates could adopt them.

I stopped hiding my head in the sand. I left the job that I loved at the U.S. EPA to follow my wife to the William S. Boyd School of Law at the University of Nevada, Las Vegas. Boyd generously allowed me to start a Climate and Sustainability Law Project. I volunteered to draft model legislation for Legal Pathways and created a Climate Law Practicum to involve students in the drafting. Thirty-one students have taken or are now taking the course. Kyle-Matthew Taylor, the co-author of this article, is one of them.

Kyle and I realized that each of us can make a difference in the fight against climate change. We are honored to join the Nevada Law Journal and the authors of this Symposium in that fight. We need not hide from a fearful future; we can do something about it.

B. Hope and Challenge

This Symposium lights new paths through a future that sometimes seems dark. Our authors show us how to work for a better, more just future for our children and grandchildren. They show us new, innovative ways to build that future. We have laws and policies to write and amend, international litigation and mediation to pursue, and budgets and organizations to redirect.

Time is short. Let's get to it.

³⁶³ See *supra* Section I.A.5.

³⁶⁴ See *Model Laws for Deep Decarbonization in the United States*, LPDD, <https://lpdd.org/> [<https://perma.cc/4Y6J-PEQS>].