

**ADAPTING TO  
HIGH-LEVEL WARMING:  
LAW, GOVERNANCE,  
AND EQUITY**

Katrina F. Kuh & Shannon M. Roesler,  
editors

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## ALBANY LAW SCHOOL



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# Introduction



# Introduction

*Robin Kundis Craig, Katrina Fischer Kuh,  
J.B. Ruhl, and James Salzman*

At the Glasgow climate summit in November 2021, governments from around the globe declared their ambition to “hold the increase in the global average temperature to well below [2 degrees Celsius (°C)] above pre-industrial levels.”<sup>1</sup> This wordsmithing affirmed the goal set in the Paris Agreement in 2015 by the greatest number of heads of state ever at a negotiation. Fine words, to be sure, and a fine aspiration. The negotiators, however, were politicians and diplomats, not scientists. Robust science increasingly tells a different story. Warming beyond 2°C is likely and warming as high as 3°-4°C, possibly by the end of the 21st century, is a real possibility.

A few short months before the Glasgow climate summit, the authors of this book convened for the fifth workshop of the Environmental Law Collaborative (ELC), a group composed of environmental law professors from law faculties around the United States. Our group was not so sanguine about the prospects of limiting warming to well below 2°C. ELC members Robin Kundis Craig and J.B. Ruhl had recently authored a provocative article simply titled *4°C* that sets out the peer-reviewed science demonstrating that a “beyond 2°C” world is a likely trajectory and that a 4°C world cannot be ruled out. Also using peer-reviewed science, they described the vast disruptions this future could cause for both biophysical and social systems.<sup>2</sup> Subsequent modeling reflects growing acknowledgement that warming beyond 2°C is very likely. It also provides some reason to be hopeful that 3°C is a probable upper bound, although this optimism is tempered by uncertainty about implementation of announced mitigation policies, the potential to cross tipping points, and the dire impacts of even existing levels of warming.

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1. Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 13, 2015, *in* Report of the Conference of the Parties on the Twenty-First Session, U.N. Doc. FCCC/CP/2015/10/Add.1, annex , art. 2, ¶1 (2016).
  2. J.B. Ruhl & Robin Kundis Craig, *4°C*, 106 MINN. L. REV. 191 (2021).
  3. U.N. Nationally Determined Contributions Under the Paris Agreement Synthesis Report (Oct. 2022).

Today's newspapers make clear some of the consequences of just the 1.2°C warming experienced to date. It has become normal to witness “unprecedented” impacts in natural systems—record droughts or temperatures now occurring yearly in areas as far apart as the Arctic and the Antarctic—occurring much faster than previously expected.<sup>4</sup> Climate change disruptions extend not only to ecological systems, of course, but to social systems as well. Democratic systems of governance may be particularly unstable in the face of the relentless disruptions caused by climate change, including shocks to the economy, food systems, and internal migration, to name just a few. It would be naive to believe that governance in the United States will be immune to these instabilities.

Yet most legal scholarship to date has embraced the temperature goals enshrined in the Paris Agreement not only for mitigation, but for adaptation as well, by assuming 2°C warming as the upper bound and assessing adaptation policy on that basis.<sup>5</sup> The ELC sought to address the legal and governance challenges of higher level warming head-on, discussing and debating how law professors can meaningfully address the prospect of much greater climate change. Our chapters take seriously what science now tells us. If we are moving toward high-level warming significantly above 2°C, perhaps even a 4°C world, what will be the general and specific challenges to law and policy? How can governance systems and institutions adapt, today, in readiness for these future shocks?

This Introduction provides a short summary of the article, 4°C, describes the different authors' contributions in this volume, and poses a Rawlsian thought experiment about how to approach the law and policy challenges of this new world.

In their article, 4°C, Craig and Ruhl take as their starting point the recent “unprecedented” natural disasters around the globe of record temperatures, devastating fires, and floods—all events predicted by scientists a decade ago, but not yet supposed to be happening. Relying on scientific findings reported in leading peer-reviewed journals, the article starts by demonstrating why the

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4. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE 6-7, 9 (2019) [hereinafter 2019 IPCC OCEAN & ICE REPORT] (“Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850.”); IPCC, CLIMATE CHANGE 2014: SYNTHESIS REPORT 6-7 (2014) [hereinafter 2014 IPCC SYNTHESIS REPORT] (noting that the global land temperature is rising twice as quickly as it should naturally).

5. Researchers are, however, starting to call for preparation for higher level warming. See Daniel Steel et al., Opinion, *Climate Change and the Threat to Civilization*, 119 PROC. NAT’L ACAD. SCI., no. 42, Oct. 2022, <https://www.pnas.org/doi/epdf/10.1073/pnas.2210525119> and Luke Kemp et al., Perspective, *Climate Endgame: Exploring Catastrophic Climate Change Scenarios*, 119 PROC. NAT’L ACAD. SCI., no. 34, Aug. 1, 2022, <https://doi.org/10.1073/pnas.2108146119>.

commonly accepted target of 2°C requires societal transformations now that seem very unlikely. Even with these changes, carbon budgets indicate that temperatures will continue to rise.

To paint a more vivid picture of how a rising global mean temperature will challenge governance institutions, they summarize the scientific evidence of nonlinear change to the planet and the limits of human adaptive capacity, envisioning conditions in the United States under a 4°C scenario. This includes pervasive shifts in forest vegetation (particularly tropical forests), poleward range extensions, changes in abundance and distribution of terrestrial and marine species, and the potential collapse of large vulnerable ecosystems, such as the Amazon rainforest and Caribbean coral reefs.

Although the direct impacts of sea-level rise, drought, heat, and other threat factors may be uneven across the nation and across economic sectors, disruptions will occur in every region. Increasingly unliveable temperatures in some regions, lack of potable water in other regions, and the invasion of the sea in coastal regions are likely to drive significant internal migrations within U.S. borders. The country will feel effects from around the globe as well, where in all cases social-ecological conditions worsen as temperatures increase. Put simply, at 4°C, U.S. comparable wealth will not be enough to stop the “suitable zone” from exiting northward.

So what does this possible future mean for policy? Until fairly recently, the focus was on mitigation while adaptation took a back seat. The inevitability of rising sea levels, hotter climates, bigger storms, and other conditions has eventually forced adaptation into the policy discussion, and it is now seen as an essential partner of mitigation policy for both human communities and conservation resources. Adaptation rests on three modes: (1) resistance (also known as protect, fortify, or defend); (2) resilience (also known as adjust, accommodate, manage, or transform); and (3) retreat (also known as move, resettle, relocate, or avoid). Adaptation policies that have been developed, however, have largely centered around the 1.5°-2°C scenario.

The problem is that the 2°C world is likely the threshold at which, if crossed, climate change takes on new and highly unmanageable properties. Adaptation policy as currently modeled and integrated into “future proofing” policies does not consider runaway interacting positive feedback loops, cascade effects in the climate system, and the impacts they will have on social-ecological systems. As a result, there is growing concern that climate change beyond 2°C will swamp the capacities of planned adaptation and that transformational adaptation policies will need to operate at much larger scales, introduce novel strategies, and contemplate major changes and relocations.

Concluding that the current model is not nearly up to the challenge, Craig and Ruhl propose that a new framing is needed to prepare for adaptation beyond 2°C—a framing they call “redesign.” This means letting go of intact, in situ, and close-to-normal as the unyielding goal of adaptation. Even within the United States, we can expect massive human migrations and massive species migrations, relocation of agricultural crop and livestock land, expensive infrastructure projects to supply housing, water, transportation, and other needs for new and expanding human communities, as well as deep disruptions to insurance, finance, welfare, and other social and economic systems. Redesign is thus about designing and facilitating—perhaps even requiring—the relocations and reconfigurations necessary for these adaptations to succeed.

The remainder of their article, and indeed each of the chapters that follow in this book, focuses on governance in a world with high-level warming beyond 2°C. Craig and Ruhl argue that the United States, with strong leadership and funding from the federal government, needs to initiate anticipatory governance practices now to facilitate redesign adaptation in the future, beginning with a new national foresight research program.

In the chapters that follow, other authors offer different strategies, some even more ambitious. To set a broad context for each of these chapters, we first offer a thought experiment that illustrates the complexity and stakes of preparing for high-level warming.

The “veil of ignorance” thought experiment devised by the philosopher John Rawls has long haunted law school seminar rooms and lecture halls—and for good reason. In his ambitious 1971 book, *A Theory of Justice*, Rawls offered a way to determine just principles of law from a purely selfish perspective.<sup>6</sup> What would he have to say to us as we face the prospect of a 4°C world?

Imagine, he says, that you are the lawgiver operating today. If acting purely from self-interest, one would expect you to establish laws that favor you and your friends/family/colleagues. There’s no surprise that we see this behavior around us every day. Rawls’ thought experiment, though, changes the game. You are still the lawgiver, but you are now operating behind a veil of ignorance—you don’t know who you will be when the laws apply. Once you have established the laws and removed the veil, you will then learn whether you are rich or poor, white or black, young or old, a citizen of the United States or Bangladesh.

Rawls argues that operating in ignorance of your identity, you will choose principles that ensure the fair and equitable allocation of rights, duties, and

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6. JOHN RAWLS, *A THEORY OF JUSTICE* 136 (1971).



opportunities among everyone in the society. Because you don't know who you will be, it's best to provide for every possibility and favor people equally.

Prof. Edith Brown Weiss took Rawls' veil of ignorance one step further, asking what it means for sustainable development.<sup>7</sup> In her version, you not only do not know who you are, you also do not know *when* in the future you will live. It could be in the present, or three or six generations hence. If you were negotiating under this veil of ignorance, what types of rules would you want to impose?

In this framing, our obligations to future generations become immediate. Professor Weiss proposes a principle of "intergenerational equity" that would seek to ensure future people will "inherit the earth in as good condition as did their ancestors and with at least comparable access to its resources."<sup>8</sup> Because you don't know who you will be, it's best to provide for every possibility and favor people equally, now and in the future.

Let's play this mind game a little further. Imagine, if you will, that you are still the ruler operating behind a veil of ignorance—you do not know who you will be or when in the future you will be. But, and here's the twist, you *do* know that the world is unavoidably on a path to 4°C over the next century. You could live anywhere on that path—2°C, 3°C, 4°C—you don't know. With this knowledge, what laws would you establish today to best ensure a fair and equitable society over the next 100 years of climate change? And how would these be different than Professor Weiss' framing for sustainable development?

The climate change veil of ignorance alters the game in two important respects. First, although scientists can develop rough scenarios of what the world experiences along the climate change path, significant uncertainty remains, especially at local scales. You'll have to design rules for the future now without a firm grasp of what the future looks like for many people. Second, it is more likely than not that climate conditions for many people will deteriorate, making it nearly impossible to set up rules in the present that will ensure future generations inherit an earth in as good a shape as prior generations experienced. You can't stop sea-level rise or increasing temperatures, so you can't satisfy the goal of Professor Weiss' thought experiment.

These constraints change the kind of thinking that Rawls and Weiss expected of their rulemaker in three ways. First, given the century of vastly changing conditions that lies ahead, the rules you design today must be rap-

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7. Edith Brown Weiss, *In Fairness to Future Generations and Sustainable Development*, 8 AM. U. INT'L L. REV. 19 (1992).

8. *Id.* at 21.

idly adaptable as predicted changes evolve and unforeseen changes arise. If you wind up living in the 3°C world, you likely would not want to be bound by rules that applied in the 1.5°C world. As a result, you must design an *adaptive governance* regime, not a fixed set of rules with the hope of locking in socially just conditions in the present and going forward.

Second, you'll need to anticipate tipping points and nonlinear change trajectories without knowing when they will be triggered or what the other side looks like. When will massive domestic migration start, and where do the migrants go? What if you are one of those migrants? Your adaptive governance regime will need to include a substantial planning and monitoring component using updated scenario projections—what social scientists refer to as *anticipatory governance*.

Finally, in addition to the resource consumption trade-off dilemmas that sit at the heart of Weiss' exercise, your rules will also require an ongoing process for determining how much to invest at any given time in protective adaptation measures for future generations. What if you live in the future as a resident of a city that did not build adequate flood control infrastructure or heat wave relief opportunities? But how much should a previous generation have invested? You can't possibly make all those decisions in the present—there's too much uncertainty. The adaptive-anticipatory governance regime you design today thus must focus not only on sustainable resource conservation but also on sustainable adaptation capacity, ensuring continuous decision making for provision of physical and social adaptation infrastructure.

In summary, the climate change veil of ignorance demands a much more fluid governance process, one that continually anticipates unforeseeable change, nimbly adapts the rules, and manages over long time frames for adaptation measures that equitably protect future generations. The fairness question is not how to ensure future generations enjoy the same quality of life, but how to protect those (including possibly you) who will be much worse off.

The contributors to this book have taken up the challenge of thinking about law, governance, equity, and justice under high-level warming from multiple perspectives. The first chapters identify and offer solutions to address the mismatch between today's legal and regulatory systems—specifically, western water law, chemical and waste management, laws aimed at protecting biodiversity, and historic preservation laws—and the conditions and demands of high-level warming.

In the chapter, “Western Water Rights in a 4°C Future,” Karrigan Börk, Shi-Ling Hsu, and Kevin Lynch consider the hydrologic impacts of climate

change at three scales (across the West, within the Colorado River Basin, and in the San Juan Basin), explain the pathologies of continuing to rely on use-based appropriative water rights under high-level warming, and recommend four steps to adapt western water law: (1) better enforcement of existing laws to ensure the reasonableness and public benefit of existing and future water rights; (2) greater flexibility in existing allocations of water; (3) explicit focus on adjusting water law in an equitable way, including changes that address the racist history of western water rights; and (4) preparation for future short- and long-term water shortages.

Michael B. Gerrard applies a similar lens to the legal regimes governing the management of chemicals and waste in his chapter, “Waste and Chemical Management Beyond 2°C.” With at least 60% of Superfund sites not on federal property and 3,200 stationary source facilities covered by the Clean Air Act program for the prevention of accidental releases of hazardous chemicals in locations that may be at risk from the effects of climate change, high-level warming poses a critical threat to the safe storage of chemicals and waste. Gerrard surveys the patchwork of laws governing chemical and waste management, highlighting ways in which existing laws do not adequately contemplate climate-related threats, as well as some recent legal reforms motivated by a recognition of the threats posed by climate change. Concluding that no existing laws envision a world beyond two degrees, he then offers ideas for legal reform to prepare for high-level warming.

David Takacs explains the futility of trying to protect biodiversity using approaches that silo biodiversity from climate change mitigation and adaptation. His chapter, “In a 4°C World, the Inexorable Climate Change-Biodiversity Nexus,” provides examples of a new approach, climate-biodiversity mitadaptation, that intertwines climate change and biodiversity goals, reflecting a legal and cultural paradigm shift that embraces interconnection with the natural world.

Michele Okoh closes out the book’s first section with her chapter, “America Erased,” an unsettling examination of how ill-equipped U.S. law, in particular historical preservation law, is to preserve history, culture, and community after the inevitable geographic loss and internal displacement occasioned by high-level warming.

The next set of chapters imagine more broadly the challenges of effective governance—across a range of laws, through democratic processes—under high-level warming. These chapters identify the strains that high-level warming will place on existing modes of governance and suggest reformed or new governance approaches and strategies.

In her chapter, “Climate-Changed Communities,” Sarah Fox confronts the distinct challenges to local governance in communities that will shrink, perhaps even disappear, and communities that will grow in response to high-level warming. She proposes constructing a new set of governance possibilities to redefine existing local boundaries, strengthen inter-local cooperation, and provide local governments with greater fiscal freedom to respond to climate-induced changes in property value and population. For shrinking communities experiencing significant population out-migration, this redefinition of boundaries may include disincorporation, potentially followed by annexation into a neighboring jurisdiction.

Kevin J. Lynch likewise considers governance under high-level warming through a federalism lens, exploring in his chapter, “Preemption: Opportunities and Obstacles for Climate Adaptation,” how state-level preemption doctrine can be reimaged and applied to support climate adaptation. This requires threading a needle, as high-level warming will make it important both for state legislatures to be able to preempt local policies that would inhibit climate adaptation and for local governments to exercise greater autonomy—consistent with Fox’s recommendations—to craft locally relevant adaptation solutions. Using examples of how pathologies in preemption doctrine derailed mitigation in some contexts as a precautionary tale, Lynch suggests how to prevent preemption pathologies from inhibiting climate adaptation, including recommending: (1) clear guidance from state legislatures to prevent broad and unjustified judicial findings of implied or field preemption; (2) support for greater and more specific rights-based approaches to addressing climate change, such as environmental rights amendments in state constitutions or rights of nature; and (3) judicial adoption of a clear statement rule requiring a clear declaration of legislative intent to preempt to override local adaptation policy.

In the chapter that follows, “Reframing Winter Storm Uri,” Melissa Powers likewise tells a precautionary tale. The chapter focuses on how public discourse can drive policy development and governance, considering specifically intersections between narratives around climate dislocation and crisis and the emergency of specific climate policies. Her chapter explains how the energy crisis during Winter Storm Uri was (counterintuitively) used to double down on fossil fuel policies and undercut renewable energy policies. She uses Texas’ response to Winter Storm Uri to illustrate how storytelling and discourse powerfully shape the societal response to climate crises through policy framing. Powers exhorts clean energy and climate advocates

to actively frame policy responses to climate dislocation, and specifically energy crises, to better support mitigation going forward.

Powers' emphasis on the importance of communication and discourse is underscored in the chapters that follow. Jessica Owley, Karen Bradshaw, Keith Hirokawa, and Robin Kundis Craig use high-level warming to illustrate the limitations of a core feature of existing environmental governance—a reliance on environmental baselines to anchor law and policy, define its aims, and evaluate its success. In their chapter, “The Tyranny of Baselines,” the authors explain how environmental baselines can create a bias in favor of a (sometimes deeply unsatisfactory) status quo; perpetuate existing inequality; invite resource-draining debates about where to set the baseline; and become so deeply embedded in law and policy as to defy needed reexamination. The authors identify promising new governance alternatives to baselines better suited to navigating climate change, including goal-oriented collaboration, collaborative analysis, collaborative governance, and improved communication that enables co-created policy.

Joshua Ulan Galperin closes out this section of the book with a chapter, “4Cs at 4°C: Counting, Contestation, Communication, and Consideration for Collectively Constructing Concepts of Climate Change,” which observes that the balance of nature—similar to the concept of baselines—has long served as an anchoring principle for environmental governance despite the fact that it is scientifically inaccurate. He believes shared stories, even if they are inaccurate myths, can help ground environmental governance and, like the authors of the *Tyranny* chapter, he focuses on collaboration as an alternative shared story to support environmental governance under high-level warming. Galperin centers process over outcome, exhorting that a belief in a robust and healthy democratic process and the collective decisionmaking it enables can undergird an effective societal response to high-level warming.

The book's concluding chapters focus on equity and justice under high-level warming. In “Environmental Justice Beyond 2°C,” Clifford J. Villa deploys a nuanced history of the development and meaning of environmental justice to explore what environmental justice could or should mean under high-level warming. Does the concept of environmental justice continue to have salience when everyone is harmed by climate change? Villa answers yes and uses a close account of the 2022 fires in the Sangre de Cristo Mountains in northern New Mexico and their impact on local residents to illustrate the salience of environmental justice, even when climate harms are widespread. By describing the harms to local residents with an eye to their unique life-

ways and culture, he illustrates the value of a justice lens to inform improved governmental responses to climate change.

Villa's chapter endorses a continued commitment to justice, even under the stress and demands of high-level warming. Katrina Fischer Kuh's chapter, "Avoiding Performative Climate Justice," interrogates how best to actualize that commitment. Envisioning how high-level warming will strain institutions and strain political will on immediate needs, Kuh argues that policymakers today should make precommitments to justice in mitigation and adaptation law that are enduring, automatic, and early (before the onset of emergency climate conditions). She then surveys select state climate laws, identifying measures that constitute effective precommitments to justice and others that do not and therefore risk dissolving in the face of high-level warming.

Robin Kundis Craig's chapter, "Survival Equity and Climate Change Triage: How to Decide Who Lives and Who Dies," confronts the uncomfortable truth that decisions about climate policy are, and will increasingly become, decisions about who lives and who dies. Her chapter considers pathways to advance survival equity that would equalize every human's chances of surviving despite climate change, including through the use of principles developed in the context of medical triage. After concluding that medical triage principles will not be applied in an equitable fashion across national borders in the context of high-level warming, Craig endorses policies that reduce consumerism and equitably discourage the human population's continued growth as the best means to achieve survival equity.

In "Supplying Life Necessities in a Climate-Changed Future," Shi-Ling Hsu advances another strategy to avoid the inequitable distribution of food, water, and energy during climate-driven shortages. He proposes a new governance tool for high-level warming: the creation of a governmental "Resources Trust" that would inject a supplemental supply of life necessities into the market to relieve immediate crises of supply.

In the book's final chapter, "Decentering Dominance for Climate Adaptation in a Worst-Case Climate World," Cinnamon P. Carlarne and Keith H. Hirokawa echo Craig's pessimism that triage conducted against the backdrop of prevailing social and political inequities would produce even more inequitable outcomes. Their remedy is to work to surface and dismantle those inequities most relevant to climate change—what they term "climate dominance." In applying a climate dominance perspective to climate migration, climate gentrification, and ecosystem management, they show how identifying and decentering climate dominance now can allow for more equitable and effective adaptation planning going forward.

The authors of this volume agreed to seriously consider the possibility of a future shaped by high levels of warming. We decided to take on this project because the possibility of high-level warming is significant and largely ignored in existing law and policy. We peered into that bleak future and thought deeply about how law, governance, and equity could help to keep the plumb line in a world heated out of control. Many of the ideas proposed in this book sound wildly ambitious today, but will ultimately appear modest when weighed against the on-the-ground conditions of extreme climate change.