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The private law of torts, property, and contracts will and should play an important role in resolving disputes regarding how private individuals and entities respond to and manage the harms of climate change that cannot be avoided through mitigation (known in climate change policy dialogue as "adaptation"). While adaptation is commonly presented as a problem needing legislative solutions, this Article presents a novel and overdue case for private law to take climate adaptation seriously.

To date, the role of private law is a significant blind spot in scholarly discussions of climate adaptation. Litigation invoking common-law doctrines in climate adaption disputes has not yet taken off the way that the wave of high-profile lawsuits against sources of emissions causing climate change has, but it is inevitable that it will, making it ripe for attention in legal scholarship. The Article begins in Part I by highlighting several features of climate change and adaptation that will place inevitable disruptive pressure on existing doctrines and principles of private law. The new normal of climate change questions some key factual predicates embedded in private law doctrine. For example, climate change is radically moving the long-stable upper and lower extremes of multiple biophysical conditions (what scientists call "nonstationarity"), meaning individuals increasingly will be unable to accurately predict the future based entirely on past data (what scientists call the "no-analog future").

Private law nonetheless must operate in a manner that provides practical and meaningful guidance to stakeholders, which will require it to confront the new realities presented by climate adaptation, including how

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private individuals and entities can no longer predict the future in the same ways that they have in the past. In Part II, the Article identifies a series of evaluative guideposts to help assess when changes to doctrines and principles of private law may be needed to address impending climate adaptation disputes.

Private law's basic architecture helps to define and manage relationships, clarify responsibilities, and provide remedies for harm—a tripartite framework we use in Part III to unravel a few key doctrinal pressure points that private law faces as it addresses a novel set of impending climate change adaptation claims. The principle of foreseeability—central to numerous doctrines that define relationships, responsibilities, and remedies across tort, property, and contract law—is likely to face some of the strongest pushback as we confront climate adaptation. We propose a "foreseeability of nonstationarity" principle and evaluate what that might mean for some core private law doctrines. This points towards expansion of the scope of obligations private law recognizes for various actors within their adaptation footprints. Existing private law principles can address wrongfulness even in the no-analog future of climate adaptation. It is important, however, that private law defenses recognize the nonstationarity of climate risks, as well as the lack of an analog future available to predict and address the harmful effects of climate change.

We conclude that private law can and will adapt to climate change. This process will be central to providing guidance as individuals, businesses, and other private actors confront new risks and harms as society adapts to a new natural world. But the path of private law's adaption matters, and how it approaches key principles such as foreseeability will be central to its capacity to provide meaningful guidance for private stakeholders adapting to the realities of climate change.

INTRODUCTION

Not surprisingly, climate change is conventionally framed as a public law problem. Averting and managing what is commonly heralded as a global scale "climate crisis" requires a wholesale reorientation of a broad range of behaviors, and the scale of harms that it will produce for current and future generations is massive.[1] Undeniably, this will require forward-looking, sweeping legal solutions that are well suited to legislative and regulatory responses and judicial engagement. That agenda has been on the world's stage for decades.[2]

By contrast, thus far private common-law solutions have taken a back seat in shaping legal responses to climate change. A wave of high-profile litigation recently initiated in state courts alleges that large-scale fossil fuel producers and sources of greenhouse gas emissions have *caused* climate change in lawsuits seeking damages or injunctive relief under public and private nuisance, trespass, negligence, and other common-law doctrines.[3] This trend and its implications for law, including in other common-law nations, have been

1. A 2018 assessment of impacts in the United States warns that "[i]n the absence of significant global mitigation action and regional adaptation efforts, rising temperatures, sea level rise, and changes in extreme events are expected to increasingly disrupt and damage critical infrastructure and property, labor productivity, and the vitality of our communities." U.S. GLOBAL CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT, VOLUME II: IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES, REPORT IN BRIEF 12 (2018), https://nca2018.globalchange.gov/downloads/NCA4_Report-in-Brief.pdf [https://perma.cc/4DMN-K69N] [hereinafter USGCRP, ADAPTATION IN THE UNITED STATES].

2. The United Nations Framework Convention on Climate Change went into effect in 1994 and, along with subsequent international agreements, has been the subject of twenty-six annual Conference of the Parties since then. *What Is the United Nations Framework Convention on Climate Change?*, UNITED NATIONS CLIMATE CHANGE, https://unfccc.int/process-and-meetings/what-is-the-united-nations-framework-convention-on-climate-change (last visited Nov. 8, 2022) [https://perma.cc/6AQP-JGMQ]; *Conference of the Parties*, UNITED NATIONS CLIMATE CHANGE, https://unfccc.int/process/bodies/supreme-bodies/conference-of-the-parties-cop (last visited Nov. 8, 2022) [https://perma.cc/8D54-YZFV]. *See generally* DANIEL A. FARBER & CINNAMON P. CARLARNE, CLIMATE CHANGE LAW (2018) (discussing the background and development of climate change law).

3. *See* Karen C. Sokol, *Seeking (Some) Climate Justice in State Tort Law*, 95 WASH. L. REV. 1383, 1384–1423 (2020) (providing a history and overview through 2020). The Sabin Center for Climate Change Law at Columbia University Law School maintains and regularly updates a database of ongoing and concluded climate change litigation matters including, as of this writing, over 1,400 U.S. judicial litigation matters and 628 judicial litigation matters in other nations. *About*, CLIMATE CHANGE LITIG. DATABASE, http://climatecasechart.com/about/ (last visited Nov. 3, 2022) [https://perma.cc/N4LP-TQUY] [hereinafter SABIN CENTER DATABASE]. The state common-law claim litigation matters are collected at *U.S. Climate Change Litigation: Common Law Claims*, CLIMATE CHANGE LITIG. DATABASE, http://climatecasechart.com/case-category/common-law-claims/ (last visited Nov. 25, 2022) [https://perma.cc/D9Z8-NHUB] [hereinafter SABIN CENTER DATABASE, *Common Law Claims*].

well covered in legal scholarship.[4] To date, however, the common law of torts, property, and contracts—the classic domain of "private law"[5]—has not surfaced in climate change litigation regarding how private actors can and should *respond* to climate change.[6] Nor has that theme received attention in legal scholarship beyond narrow, doctrine-specific coverage.[7]

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4. For an especially prescient early analysis of the viability of tort law claims against private entities alleged to have caused climate change, see generally Eduardo M. Peñalver, *Acts of God or Toxic Torts? Applying Tort Principles to the Problem of Climate Change*, 38 NAT. RES. J. 563 (1998). Two more recent important theoretical contributions are Douglas A. Kysar, *The Public Life of Private Law: Tort Law as a Risk Regulation Mechanism*, 9 EUR. J. RISK REGUL. 48 (2018) [hereinafter Kysar, *Public Life*]; and Douglas A. Kysar, *What Climate Change Can Do About Tort Law*, 41 ENV'T L. 1 (2011) [hereinafter Kysar, *What Climate Change Can Do*]. A sample of legal scholarship on the theme over the last two decades from various common-law jurisdictions includes Kimberly Barnes, *Democratizing Climate Change: Litigation for the Era of Extreme Weather*, 50 U. PAC. L. REV. 651 (2019); Robert F. Blomquist, *Comparative Climate Change Torts*, 46 VAL. U. L. REV. 1053 (2012); Lauren Case, *Climate Change: A New Realm of Tort Litigation, and How to Recover When the Litigation Heats Up*, 51 SANTA CLARA L. REV. 265 (2011); Michael Duffy, *Climate Change Causation: Harmonizing Tort Law and Scientific Probability*, 28 TEMP. J. SCI. TECH. & ENV'T L. 185 (2009); Daniel A. Farber, *Tort Law in the Era of Climate Change, Katrina, and 9/11: Exploring Liability for Extraordinary Risks*, 43 VAL. U. L. REV. 1075 (2009); Geetanjali Ganguly, Joana Setzer & Veerle Heyvaert, *If at First You Don't Succeed: Suing Corporations for Climate Change*, 38 OXFORD J. LEGAL STUD. 841 (2018); Carlo Vittorio Giabardo, *Climate Change Litigation and Tort Law. Regulation Through Litigation?*, 2019 DIRITTO & PROCESSO 361; David A. Grossman, *Warming Up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation*, 28 COLUM. J. ENV'T L. 1 (2003); Shi-Ling Hsu, *A Realistic Evaluation of Climate Change Litigation Through the Lens of a Hypothetical Lawsuit*, 79 U. COLO. L. REV. 701 (2008); Martin Olszynski, Sharon Mascher & Meinhard Doelle, *From Smokes to Smokestacks: Lessons from Tobacco for the Future of Climate Change Liability*, 30 GEO. ENV'T L. REV. 1 (2017); Jacqueline Peel, Hari Osofsky & Anita Foerster, *Shaping the 'Next Generation' of Climate Change Litigation in Australia*, 41 MELB. U. L. REV. 793 (2017); David Hunter & James Salzman, *Negligence in the Air: The Duty of Care in Climate Change Litigation*, 155 U. PA. L. REV. 1741 (2007); and Roda Verheyen, *Loss and Damage Due to Climate Change: Attribution and Causation – Where Climate Science and Law Meet*, 8 INT'L J. GLOB. WARMING 158 (2015).

5. By "private law," we are referring to legal doctrines and practices that define "the rights and duties of individuals and private entities as they relate to one another." John C.P. Goldberg, *Introduction: Pragmatism and Private Law*, 125 HARV. L. REV. 1640, 1640 (2012).

6. As of this writing, the Sabin Center Database includes no matters fitting the scope of this Article: disputes between private entities involving claims brought under tort, property, or contract law alleging harm from one party's failure to adequately adapt to climate change. SABIN CENTER DATABASE, *Common Law Claims*, *supra* note 3. Some cases involve claims under statutory regimes that a private company must incorporate adaptation infrastructure into industrial facilities. *See, e.g.*, Thomas Landers, Note, *A New Path to Climate Justice: Adaptation Suits Against Private Entities*, 30 GEO. ENV'T. L. REV. 321, 346–53 (2018) (discussing *CLF v. ExxonMobil*, a case that would require ExxonMobil to incorporate known climate risks into its stormwater management plans under federal statutes).

7. A few legal commentators have generally recognized that climate change adaptation will likely lead to private disputes requiring legal counsel. *See* Celeste Hammond, *The Evolving Role for Transactional Attorneys Responding to Client Needs in Adapting to Climate Change*, 47 J. MARSHALL L. REV. 543, 544 (2014); Marc L. Miller & Jonathan T. Overpeck, *Climate Change and the Practice of Law*, 47 ARIZ. ATT'Y 30, 31–37 (2010). A handful of articles flag the possibility of private adjudication of climate adaptation disputes, but these are typically doctrine-specific, and broader discussion of private law concepts receives little or no in-depth scholarly treatment. *See* references provided *infra* note 30. For a broad overview of climate adaptation law and policy in the

This is a significant blind spot in legal scholarship. The burgeoning litigation seeking to impose liability on those who are most responsible for causing climate change certainly deserves legal scholars' attention. But this speaks only to one side of the climate change challenge—limiting greenhouse gas emissions causing global warming and its harmful impacts, or "mitigation."[8] The essence of the climate mitigation lawsuits leveraging common-law claims—which have yet to proceed to trial let alone any final, enforceable judgment[9]—is that the defendants contributed substantially to greenhouse gas emissions and thus are liable for the injuries the plaintiffs have suffered due to the resulting climate change. Whether the common law is or is not well suited to addressing the complex issues raised by these cases seeking to assign liability for causing climate change is hotly debated[10] and is not the focus of this Article.

Rather, this Article argues that doctrines and practices central to the private law of torts, property, and contracts will and should play an important role in developing policy and resolving disputes regarding how individuals, businesses, and other private actors respond to and manage the harms of climate change that cannot be avoided through mitigation (known in climate change policy dialogue as "adaptation").[11] We argue further that climate adaptation will put pressure on some

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United States, including a suggestion that private law disputes will arise, see J.B. Ruhl, *Climate Adaptation Law*, *in* GLOBAL CLIMATE CHANGE AND U.S. LAW 641 (Michael Gerrard, Jodi Freeman & Michael Burger eds., 3d ed. 2023) [hereinafter Ruhl, *Climate Adaptation Law*]. For a more extensive set of studies of climate change adaptation and law, see THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL ASPECTS (Michael B. Gerrard & Katrina Fischer Kuh eds., 2012) [hereinafter LAW OF ADAPTATION].

8. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE (Priyadarshi R. Shukla et al. eds., 2022), https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf [https://perma.cc/K568-ET75] [hereinafter IPCC, MITIGATION].

9. *See* Leah Aronowsky, *The Limits of Climate Change Litigation*, N.Y. REV. BOOKS (Nov. 3, 2021), https://www.nybooks.com/online/2021/11/03/the-limits-of-climate-change-litigation/ [https://perma.cc/5VTU-CYGS] ("[T]o date, no case against the fossil fuel industry has made it to trial."). The lawsuits have faced various non-merits obstacles including removal, federal displacement, and the political question doctrine. *See* Johnathan H. Adler, *Displacement and Preemption of Climate Nuisance Claims*, 17 J.L. ECON. & POL'Y 217, 220–24 (2022) (evaluating the claims and the various obstacles to the lawsuits). The status of the cases is updated at SABIN CENTER DATABASE, *Common Law Claims*, *supra* note 3.

10. *See* Adler, *supra* note 9, at 259–62. Some even call these issues "too big . . . to litigate." Aronowsky, *supra* note 9 ("[L]awyers have come up against the limits of US tort law, as time and again the courts have ruled that climate change is too politicized, too international, too entangled in policy—too big, in short, to litigate.").

11. *See* Hans-Otto Pörtner et al., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Summary for Policy Makers*, *in* CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY 3, 5–7 (Hans-Otto Pörtner et al. eds., 2022), https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf [https://perma.cc/CS6V-GJX5] [hereinafter IPCC, IMPACTS] (defining adaptation in the climate change setting).

important principles and doctrines of the common law to adapt, and that it is important for this transition to occur in a manner that provides meaningful guidance to stakeholders. Litigation invoking common-law doctrines in climate adaption disputes has not yet taken off the way it has in the wave of mitigation liability cases, but it is inevitable that it will, making it ripe for the attention of legal scholars.

Climate change presents a vast array of new circumstances for our society—a new normal of constant change, including new risks of harm and a dynamic new set of expectations for social interactions across a multitude of dimensions.[12] In this respect, climate change has the potential to be as transformative for private law as was the Industrial Revolution.[13] Private individuals and entities seeking to manage their affairs will need to adapt to climate change throughout their social and economic interactions. It is inevitable that disputes will arise over whether they have failed to adequately adapt, giving rise to private "failure to adapt" claims. Even when private actors do invest in adaptation initiatives to protect their own interests, they may be inefficient or wasteful, or could cause harm to others, thus producing socially undesirable "maladaptation."[14] Many of these kinds of adaptation disputes are fertile for resolution through private common-law claims under tort, property, and contract doctrines. And many of

12. *See* WORKING GROUP II, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY 72–668 (Hans-Otto Pörtner et al. eds., 2022), https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf [https://perma.cc/9B3X-4CX9] [hereinafter IPCC, IMPACTS FULL REPORT] (describing impacts to water, energy supply, land cover, forests, biodiversity, coasts, oceans, agriculture, urban systems, transportation, air quality, human health, Indigenous peoples, and sector interactions); *see also infra* Part I.A.

13. *See* Hugh C. MacGill & R. Kent Newmyer, *Legal Education and Legal Thought, 1790–1920*, *in* 2 THE CAMBRIDGE HISTORY OF LAW IN AMERICA: THE LONG NINETEENTH CENTURY (1789–1920), at 36–67 (Michael Grossberg & Christopher Tomlins eds., 2008) (describing the change in legal education and culture in response to the United States' shift from an agrarian to industrial economy between 1790–1820). *See generally* MORTON J. HORWITZ, THE TRANSFORMATION OF AMERICAN LAW: 1780-1860 (1977) (discussing the massive transformation of American law as industry developed).

14. The Intergovernmental Panel on Climate Change ("IPCC") has defined "maladaptation" as "*actions* that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future." *See* IPCC, IMPACTS, *supra* note 11, at 7 n.15 (emphasis added). Failure to adapt, of course, may itself be a form of maladaptation. *See* E. Lisa F. Schipper, *Maladaptation: When Adaptation to Climate Change Goes Very Wrong*, 3 ONE EARTH 409, 411 (2020) (including no response as a form of maladaptation). For purposes of analyzing different forms of private law claims we discuss two distinct types of legal claims related to failure to adapt and maladaptation—a distinction that echoes the common law's long-standing recognition of a distinction between wrongdoing grounded in inaction (nonfeasance) as opposed to action (misfeasance). RESTATEMENT (THIRD) OF TORTS: PHYSICAL & EMOTIONAL HARM § 37 cmt. c (AM. L. INST. 2012). We do not, however, intend to suggest that the distinction between nonfeasance and misfeasance should drive doctrine or legal outcomes related to climate adaptation.

those disputes will arise in novel contexts that common-law doctrine has not previously addressed, such as the impacts of sea-level rise on uses of private property and of unprecedented heat waves on infrastructure,[15] and thus will challenge the common law itself to adapt to new risks and circumstances.

So what? After all, the common law has been adapting to "changed circumstances or new knowledge"[16] for centuries, including in response to new environmental conditions. For example, confronted with vast expanses of undeveloped land very much unlike the long-established urban and agricultural environment of England, American property law gradually modified doctrines—such as adverse possession, waste, and nuisance—to promote agricultural settlement and development.[17] Water rights law in Western states developed the prior appropriation doctrine in a water-scarce environment not well suited for the English riparian owner doctrine adopted in Eastern states.[18] The common law adapted then; so it will adapt again, this time to climate change. With countless other examples, the evolutionary capacity of the common law is widely regarded as one of its core features.[19]

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15. "From about 3,000 years ago to about 100 years ago, sea levels naturally rose and declined slightly, with little change in the overall trend." *Sea Level Change: How Long Have Sea Levels Been Rising? How Does Recent Sea-Level Rise Compare to That over the Previous Centuries?*, NASA, https://sealevel.nasa.gov/faq/13/how-long-have-sea-levels-been-rising-how-does-recent-sea-level-rise-compare-to-that-over-the-previous/ (last visited Nov. 25, 2022) [https://perma.cc/F34T-47MY]. Temperatures swing more widely but appear to be moving into a new trend upward. With the exception being 1998, nineteen of the hottest years since recordkeeping began in 1880 have occurred since 2000. *Global Climate Change: Vital Signs*, NASA, https://climate.nasa.gov/vital-signs/global-temperature/ (last visited Nov. 25, 2022) [https://perma.cc/MD2E-YLUU]. Both trends pose an existential threat to property and infrastructure globally. *See* IPCC, IMPACTS, *supra* note 11, at 5–33.

16. Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1031 (1992) (regarding nuisance doctrine). For numerous doctrinal examples, see Michael C. Blumm & J.B. Ruhl, *Background Principles, Takings, and Libertarian Property: A Reply to Professor Huffman*, 37 ECOLOGY L.Q. 805 (2010).

17. *See* John G. Sprankling, *The Antiwilderness Bias in American Property Law*, 63 U. CHI. L. REV. 519, 532 (1996) ("[Antiwilderness] ideology spawned an American judicial attitude that strongly favored the agrarian development of wilderness land.").

18. *See generally* Kait Schilling, *Addressing the Prior Appropriation Doctrine in the Shadow of Climate Change and the Paris Climate Agreement*, 8 SEATTLE J. ENV'T L. 97 (2018) (providing a history of the doctrine and assessment of its durability under climate change conditions).

19. *See* Douglas Brodie, *The Dynamics of Common Law Evolution*, 32 INT'L J. COMPAR. LAB. L. 45, 45 (2016) (discussing the evolution of employment common law); Nuno Garoupa & Carlos Gómez Ligüerre, *The Evolution of the Common Law and Efficiency*, 40 GA. J. INT'L & COMPAR. L. 307, 314 (2012) ("[T]he common law adjusts to local determinants that vary across the world."); Nicola Gennaioli & Andrei Shleifer, *The Evolution of Common Law*, 115 J. POL. ECON. 43, 47 (2007) (discussing the "theoretical foundation for the evolutionary adaptability of common law"); Daniel Klerman, *Jurisdictional Competition and the Evolution of the Common Law*, 74 U. CHI. L. REV. 1179, 1181 (2007) (analyzing the connection between jurisdictional competition and the development of common law); Douglas Glen Whitman, *Evolution of the Common Law and the Emergence of Compromise*, 29 J. LEGAL STUD. 753, 753 (2000) (examining the emergence of reliable common law in relation to a judge's decision to abide by or diverge from precedent).

If adaptation is in the common law's DNA, why would its adaptation to climate change be an exceptional case presenting novel issues for private law worthy of sustained examination? The short answer, elaborated upon below,[20] is that the scope, magnitude, and impact of climate change present social, economic, and environmental challenges at all scales, local to global, for at least the next few centuries—and we know this is what the future holds.[21] The new normal, in other words, will be a continuous and very long journey into changing and novel climate conditions and all that climate affects. Until we reach global net-zero carbon emissions, which will require extensive carbon removal by vast new sources of natural sequestration or new technologies,[22] the simple physical reality is that climate change will continue to disrupt temperatures, weather, and other biophysical patterns on the planet.[23] Indeed, unless massive-scale atmospheric carbon dioxide removal technology allows steep reductions in global atmospheric concentrations—i.e., net-negative emissions—global climate and biosphere systems will likely experience disruptions, some of them irreversible, for many centuries even after net-zero emissions are achieved.[24] Yet current global emissions reduction efforts are widely regarded as insufficient to limit increased warming to the international

20. *See infra* Part I.A.

21. *See* IPCC, IMPACTS, *supra* note 11.

22. See IPCC, MITIGATION, *supra* note 8, at 8–52.

23. *See* IPCC, IMPACTS, *supra* note 11.

24. Even after net-zero is achieved, which will likely require extensive carbon removal, without substantial net-negative emission reductions through more carbon removal, temperatures will continue to rise for a century as the oceans release stored heat, and sea-level rise will continue for long after temperatures peak. Gerald A. Meehl, Warren M. Washington, William D. Collins, Julie M. Arblaster, Aixue Hu, Lawrence E. Buja, Warren G. Strand & Haiyan Teng, *How Much More Global Warming and Sea Level Rise?*, 307 SCIENCE 1769, 1772 (2005). Once that peak temperature is reached, without achieving net-negative emissions the planet will be warmer than pre-industrial levels, and the resulting biophysical disruptions will continue for at least one thousand years. *If Emissions of Greenhouse Gases Were Stopped, Would the Climate Return to the Conditions of 200 Years Ago?*, ROYAL SOC'Y, https://royalsociety.org/topics-policy/projects/climate-change-evidence-causes/question-20/ (last updated Mar. 2020) [https://perma.cc/KQ7R-PA7V]. And the upshot is that, even if greenhouse gas concentrations return to pre-industrial levels, many natural systems will have been permanently altered. *See id.* ("The current CO_2-induced warming of Earth is . . . essentially irreversible on human timescales.").

goal of 1.5ºC,[25] and carbon removal technology is in its infancy, with its long-term prospects uncertain.[26] The need for adaptation is inevitable.

Of course, private law routinely adapts to new technological changes, such as the automobile—and perhaps even someday, flying automobiles.[27] Private law has also evolved in response to new forms of risk and harm, as it did with industrialization and the rise of railroads.[28] On top of all of this, climate change presents some unique challenges given dynamic and continuing changes to the natural world in which social interactions operate. For many generations into the future, all humans (and all other species) on the planet will be continuously adapting to moving targets of climate change. Knowledge grounded in the past cannot help us predict this kind of climate future with any precise degree of certainty: the pace and upper bound of warming will continue to be updated in light of new data, and extreme weather and other biophysical conditions will continue to vary, often in novel patterns. So, as much as any of the changes in circumstances that the common law has addressed in the past, the dynamic long-term nature of climate change embeds the prospects of future change, and even a considerable degree of uncertainty, as an inherent part of the new normal.

Legal scholars already see climate change as necessitating fundamental disruption of the common-law focus in the context of climate change mitigation liability litigation.[29] But will climate

25. Despite commitments at all levels of public governance—and increasingly in the private sector—to pursue robust mitigation policies, mounting scientific research concludes there is a diminishing probability of attaining the internationally adopted goal of average global temperatures rising no more than 2.0ºC above pre-industrial temperatures, and ideally by no more than 1.5ºC. *See* J.B. Ruhl & Robin Kundis Craig, *4ºC*, 106 MINN. L. REV. 191, 203–17 (2021) (summarizing the extensive scientific literature on this theme). Even if 2.0ºC turns out to be the actual upper bound, average global temperatures already have exceeded 1.0ºC, with visible effects set in motion, and an additional 1.0ºC magnifies the extent of impacts substantially. *Id.* at 218–26 (summarizing scientific research). For the most recent comprehensive synthesis of research on the state of the climate and the drivers of climate change, see H. Damon Matthews & Seth Wynes, *Current Global Efforts Are Insufficient to Limit Warming to 1.5ºC*, 376 SCIENCE 1404, 1404–07 (2022).

26. Matthews & Wynes, *supra* note 25, at 1407–08.

27. Over time the automobile, for example, led to significant change in many doctrines of tort law. *See, e.g.*, Nora Freeman Engstrom, *When Cars Crash: The Automobile's Tort Law Legacy*, 53 WAKE FOREST L. REV. 293, 315–35 (2018).

28. *See, e.g.*, KENNETH S. ABRAHAM & G. EDWARD WHITE, TORT LAW AND THE CONSTRUCTION OF CHANGE: STUDIES IN THE INEVITABILITY OF HISTORY (2022) (discussing how changes in the economy and new technologies such as the railroad created new exposures to risks, leading to doctrinal changes in tort law).

29. Elizabeth Fisher, Eloise Scotford & Emily Barritt, *The Legally Disruptive Nature of Climate Change*, 80 MOD. L. REV. 173, 174 (2017) ("[C]limate change may be thought of as legally disruptive in that it requires a 'break' in the continuity of existing legal practices and doctrinal 'business as usual.' ").

adaptation disputes lead to changes to settled principles and doctrines of private law too? There is little doubt that climate change will substantially disrupt natural systems, which inevitably will disrupt social and economic systems too. Like the Industrial Revolution, this period of concentrated, intense change related to climate adaptation will put significant pressure on private individuals and entities to adjust their social and economic behaviors, leading to new forms of interactions and, inevitably, to new risks and harms leading to legal disputes.

As we argue in this Article, these future private climate adaptation disputes will not always fit neatly into established principles and doctrines of tort, property, and contract law. Some legal practitioners and scholars have already identified a need for the common law to change in specific private law contexts, such as contract performance doctrines,[30] but evaluating private law adaptation one doctrine at a time risks not seeing the forest for the trees. By no means are we suggesting that there is some universal theory that can be applied to guide all the necessary granular adaptive private law responses. Rather, we argue that stepping back to evaluate the climate adaptation challenge for private law through a holistic framing can help substantially in identifying the pressure points where climate change adaptation will challenge private law to move in new directions. That

30. For a broad assessment of contract performance doctrine and climate change adaptation, see generally Myanna Dellinger, *An "Act of God"? Rethinking Contractual Impracticability in an Era of Anthropogenic Climate Change*, 67 HASTINGS L.J. 1551 (2016), focusing on the defense of impracticability. Legal scholars and practitioners have also delved into the theme in more specific contractual settings. *See* Jocelyn L. Knoll & Shannon L. Bjorklund, *Force Majeure and Climate Change: What Is the New Normal?*, 8 J. AM. COLL. CONSTR. LAWS. 2 (2014) (construction industry contracts); Jessica R. Murfree & Anita M. Moorman, *An Examination and Analysis of Division I Football Game Contracts: Legal Implications of Game Cancellations Due to Hurricanes*, 31 J. LEGAL ASPECTS SPORT 123 (2021) (football game contracts); Geoffrey F. Palachuk, *The New Decade of Construction Contracts: Technological and Climate Considerations for Owners, Designers, and Builders*, 11 SEATTLE J. TECH. ENV'T & INNOVATION L. 171 (2021) (construction industry contracts). Assessments of other private law doctrines include Elena Mihaly, William Franczek & Andrew P. Selman, *Legal Liability of Design Professionals for Failure to Adapt to Climate Change*, 12 J. AM. COLL. CONSTR. LAWS. 4 (2018), tort and contract liability of design professionals; Samuel Niiro, *An Injury to the Inheritance: Locating an Affirmative Obligation to Climate Adaptation in the Law of Waste*, 52 COLUM. J.L. & SOC. PROBS. 653 (2019), property doctrine of waste; and Jessica Owley, *Changing Property in a Changing World: A Call for the End of Perpetual Conservation Easements*, 30 STAN. ENV'T L.J. 121 (2011), conservation easements in property law. The related field of disaster law addresses many private risk-management challenges—which will only be exacerbated by climate change—through tort law and insurance law. *See* James Ming Chen, *Correlation, Coverage, and Catastrophe: The Contours of Financial Preparedness for Disaster*, 26 FORDHAM ENV'T L. REV. 56 (2014) (discussing risk management in disaster law); Jim Chen, *Modern Disaster Theory: Evaluating Disaster Law as a Portfolio of Legal Rules*, 25 EMORY INT'L L. REV. 1121 (2011) (evaluating modern disaster law); Daniel Farber, *Symposium Introduction: Navigating the Intersection of Environmental Law and Disaster Law*, 2011 B.Y.U. L. REV. 1783 (discussing disaster law in conjunction with environmental law); Farber, *supra* note 4 (examining how tort law can be used to deter and respond to catastrophic risks).

kind of bigger picture assessment—viewing the private law of climate change adaptation as a punctuation of rapid evolution interrupting long periods of gradual evolution in private law doctrines—has not to date been undertaken in legal scholarship. Its time is overdue—climate change is well underway, and adaptation is sorely needed.[31]

The Article proceeds in four parts. As we discuss in Part I, several features of climate change, and in particular the urgency of adaptation, will place inevitable disruptive pressure on existing private law doctrines and practices. First, while the physical environment within which the common law evolved has always been dynamic—droughts come and go—it has had relatively stable upper and lower bounds for centuries. Planning science refers to this as "stationarity," and its stability has also allowed the common law to evolve in a predictable set of environmental conditions and variation.[32] Climate change has begun to disrupt those bounds across multiple environmental attributes, leading to an emerging scientific consensus that "stationarity is dead."[33] Second, climate change impacts and adaptation responses will transpire in highly interconnected networks of modern social, ecological, and technological systems—what physical and social scientists call "SETS."[34] Climate change impacts will reverberate and cascade throughout a far more complex medium than that within which the common law has evolved over previous centuries. Third, because of the first two effects, there is limited past experience to inform robust predictions of the future. Ecologists researching likely ecological disruptions refer to this as the "no-analog future,"[35] but it applies equally to human society as well, such as the patterns and outcomes of mass domestic and international migration.[36] Taken

31. *See* IPCC, IMPACTS, *supra* note 11, at 31 ("There is a narrowing window of opportunity to shift pathways towards more climate resilient development futures as reflected by the adaptation limits and increasing climate risks, considering the remaining carbon budgets.").

32. P.C.D. Milly, Julio Betancourt, Malin Falkenmark, Robert M. Hirsch, Zbigniew W. Kundzewicz, Dennis P. Lettenmaier & Ronald J. Stouffer, *Stationarity Is Dead: Whither Water Management?*, 319 SCIENCE 573, 573 (2008).

33. For an influential discussion, see *id.*

34. For example, the SETS concept has become influential in urban planning. *See* R. Patrick Bixler, Katherine Lieberknecht, Fernanda Leite, Juliana Felkner, Michael Oden, Steven M. Richter, Samer Atshan, Alvaro Zilveti & Rachel Thomas, *An Observatory Framework for Metropolitan Change: Understanding Urban Social–Ecological–Technical Systems in Texas and Beyond*, 11 SUSTAINABILITY 3611, 3615 (2019) ("In addition to [the socio-economic-demographic] and [ecological factors], infrastructure, technical, and technological aspects of the built environment in metropolitan areas are a significant factor for sustainability and resilience.").

35. The term was popularized in Douglas Fox, *Back to the No-Analog Future*, 316 SCIENCE 823, 823 (2007) ("These odd communities [are] called 'no analog' ecosystems because no modern counterparts for them exist[.]").

36. For example, in one influential study, geographer Mathew Hauer modeled the impacts of sea-level rise on coastal communities and estimated demand for relocation in the United States to

together, the stationarity is dead, SETS complexity, and no-analog future effects combine to pose an unprecedented and unpredictable medium of environmental and social disruption. Decisions private actors make regarding how to adapt within this new snarl of disruptions thus will affect not only their interests but those of others. We refer to this as the "adaptation footprint" within which private law will operate to resolve disputes between private actors in the era of climate change adaptation. Part I closes by broadly framing some likely new scenarios for private law disputes arising in adaptation footprints.

Can and will tort, property, and contract doctrine adapt to this complex and novel future? Of course. But how so? As we discuss in Part II, factual contexts matter to the common law's applications, and we argue that many features of impending climate adaptation litigation present novel forms of risk and harm that will inevitably place new pressures on settled principles and doctrines. This will demand a reassessment of principles immanent to some important private law doctrines and practices that traditional applications of the common law took for granted—or, at the very least, treated as dormant or settled.[37] We do not envision the need for a radical system-wide overhaul of the common law or for a new "law of the horse" for climate adaptation,[38] but as others have noted, the pace and nature of the impending legal transition will prove important to both public and private stakeholders.[39] We argue, therefore, that the common law will not and should not be left to adapt to climate change in a random or ad hoc manner. Rather, some recognized guideposts should inform the efficacy of private law's adaptation to climate change. In Part II, we identify

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be as high as 13 million people. Mathew E. Hauer, *Migration Induced by Sea-Level Rise Could Reshape the US Population Landscape*, 7 NATURE CLIMATE CHANGE 321, 321–25 (2017).

37. *Cf.* J.B. Ruhl & James Salzman, *Climate Change Meets the Law of the Horse*, 62 DUKE L.J. 975, 1002–14 (2013) (calling for a principled approach to climate change adaption, not to replace or supplant existing law but as an overlay on existing legal fields).

38. The "Law of the Horse" refers to an unnecessary effort to bring together and unify unrelated and duly self-contained bodies of law in order to solve new forms of disputes associated with novel activities or technologies. *See* Frank H. Easterbrook, *Cyberspace and the Law of the Horse*, 1996 U. CHI. LEGAL F. 207, 207:

> Lots of cases deal with sales of horses; others deal with people kicked by horses; still more deal with the licensing and racing of horses, or with the care veterinarians give to horses, or with prizes at horse shows. Any effort to collect these strands into a course on "The Law of the Horse" is doomed to be shallow and to miss unifying principles.

Judge Easterbrook credits the phrase to Karl Llewellyn. *Id.* at 214 (first citing Karl N. Llewellyn, *Across Sales on Horseback*, 52 HARV. L. REV. 725, 735, 737 (1939); and then citing Karl N. Llewellyn, *The First Struggle to Unhorse Sales,* 52 HARV. L. REV. 873 (1939)).

39. *See, e.g.*, Eric Biber, *Law in the Anthropocene Epoch*, 106 GEO. L.J. 1, 60–67 (2017) (arguing that the scope and pace of the impacts of climate change will require legal changes that parallel the revolution associated with industrialization in the late nineteenth and early twentieth centuries).

some criteria to evaluate impending private law solutions to climate change adaptation and help inform the efficacy of private climate adaptation law responses. We posit four guideposts: (1) reinforce the stability of law; (2) promote efficient adaptation; (3) protect against unfair and unjust forms of adaptation; and (4) encourage proactive precautionary adaptation. The first and last of these guideposts bookend a spectrum from a conservative adherence to the legal status quo to endorsement of a more radical "precautionary principle" approach to doctrinal reform. As we argue later, only tempered and targeted commitment to these bookend approaches is warranted in addressing climate adaptation. By contrast, the efficiency and social justice criteria, which we unpack in more detail, provide courts a more focused set of evaluative principles for addressing private law disputes.

In Part III, we present private law's long-standing focus on managing relationships, responsibilities, and remedies as a framework to unravel a few key doctrinal pressure points that private law will face as it is presented with disputes surrounding climate change adaptation. We evaluate how some established legal doctrines measure up to our climate adaptation guideposts[40] and provide preliminary insights to inform the application and innovation of these doctrines across various kinds of climate adaptation disputes. The principle of foreseeability—central to numerous doctrines that define relationships, responsibilities, and remedies across tort, property, and contract law—is likely to face some of the strongest pushback as we confront climate adaptation. We argue that this should appropriately point towards expansion of the scope of private law's obligations, but clear judicial recognition of these obligations can provide an important incentive for private individuals and entities going forward to plan for climate adaptation.

Absent clearly defined contractual obligations, we suggest that private law's responsibilities related to climate adaptation are best assessed through a reasonable care standard, particularly in circumstances where adaptation risks are reciprocal. Private law defenses must recognize the nonstationarity of climate risks as well as

40. Benjamin Zipursky calls this approach, which recognizes the functions of private law as well as its internal formal features, "pragmatic conceptualism." *See* Benjamin C. Zipursky, Palsgraf*, Punitive Damages, and Preemption*, 125 HARV. L. REV. 1757, 1757–58 (2012):

> New Private Law theorists recognize the value of a pragmatism that is sensitive to which functions the law serves, critical as to how well it is serving those functions, and open-minded about how it might better serve them. We insist, however, that understanding private law goes far beyond an appreciation of its salutary functions and its limits. The task requires understanding the concepts and principles entrenched in the law and the structures, institutions, and languages that implement these concepts through the practices of courts, legislators, and lawyers.

the lack of an analog future available to predict and address the harmful effects of climate change. We argue that the best default approach to doing so is through recognition that nonstationarity is now a foreseeable condition in planning for the future. In essence, private law will need to devise some way of taking account of what we call the "foreseeability of nonstationarity"—i.e., the knowledge that unprecedented extremes and novel conditions will be routine experiences. This has important implications for traditional private law defenses, such as act of God, which require a prior similar incident as a precondition to liability. We also explore how private law remedies present many complex issues and will be challenged to adapt as well, and we evaluate how possible remedies in various climate adaptation cases measure up to our guideposts.

Private law can adapt to climate change, and it will be central to providing guidance as we confront new risks and harms as society adapts to a new natural world. But the path of its adaptation matters, and how it approaches key principles such as foreseeability will be central to its capacity to provide meaningful guidance for private interests.

I. CLIMATE CHANGE ADAPTATION AND THE IMPENDING DISRUPTION OF PRIVATE LAW

What has come to be known as "the new private law" focuses its attention on bilateral, relational disputes between private individuals and other private entities, providing primarily backward-looking remedies for harms.[41] Private law typically affords an aggrieved person or private entity *a right to recourse* against another individual or private entity who is alleged to have acted wrongfully.[42] Climate change mitigation litigation requires a court to identify the causes of change to the climate and environmental systems, but the focused nature of impending private law disputes surrounding climate adaptation sidesteps the most complex causation questions. Instead, it focuses on how incremental improvements to adaptive behavior can be beneficial to society.

41. *See* Goldberg, *supra* note 5, at 1651–63 (defining the scope of "the new private law").

42. An ambitious comprehensive articulation of this understanding of private law is JOHN C.P. GOLDBERG & BENJAMIN C. ZIPURSKY, RECOGNIZING WRONGS 82–178 (2020), presenting civil recourse theory as an interpretation of tort and contract law, especially in chapters three & four. We do not claim any strong normative commitment to civil recourse theory as the only or best interpretive account of private law, but we rely on its approach primarily for explanatory purposes—i.e., to help identify the architecture and common features of private law across the domains of tort, property, and contract law.

Many of the harms presented by climate change are abstract and general, and private law helps to give a face to actual victims of tangible harms related to social interactions surrounding climate adaptation. Private law also shines a flashlight on basic questions related to when private actors' responses to changed conditions associated with climate change are wrongful. In specific applications, this backward-looking inquiry provides remedies to victims harmed by wrongful behaviors. At the same time, by addressing the foundational cost-internalization question that spans the various domains of private law, such applications can provide concrete answers—and give practical guidance to stakeholders—about expectations for social interactions.

Climate change impacts like rising seas and temperatures present shared systemic risks requiring community-wide risk management. Still, private law's bilateral, case-by-case approach to addressing the risks and harms associated with climate adaptation has advantages, even in some instances over ex ante legislation or regulation. Where the victim of another's failure to adapt or maladaptation has some control over the risks associated with adaptation—what we call symmetrical (or reciprocal) risk control scenarios—private law provides a particularly important tool for helping individuals and entities plan for and manage their interactions. In contexts where there is no adequate collective public law solution to climate adaptation, private law can help to fill in the gaps, simultaneously providing a victim a remedy for harm while also producing forward-looking guidance for stakeholders as society is confronted with new forms of risk and harm.[43] The principles and doctrinal features of various areas of the private law will also be internalized in the behaviors of private individuals and entities,[44]

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43. Though focused primarily on the interactions of *private* individuals and entities, the rights and duties of the government may be implicated by private law to the extent that the government is acting in its private capacity—e.g., as owner of private property. Goldberg, *supra* note 5, at 1640 n.1. We do not examine the use of private law doctrine to challenge how public entities have managed climate change adaptation in their public capacity, such as through maintaining or approving construction (or not) of seawalls and levees to protect private property along coasts from sea-level rise, which has also begun to surface in active litigation and legal scholarship. *See* Maxine Burkett, *Duty and Breach in an Era of Uncertainty: Local Government Liability for Failing to Adapt to Climate Change*, 20 GEO. MASON L. REV. 775 (2013); Alastair Marke & Marco Zolla, *Establishing Legal Liability for Climate Adaptation Failures: An Assessment of the Litigation Trend*, 2020 CARBON & CLIMATE L. REV. 187; Jacqueline Peel & Hari M. Osofsky, *Sue to Adapt?*, 99 MINN. L. REV. 2177 (2015); Jenna Shweitzer, *Climate Change Legal Remedies: Hurricane Sandy and New York City Coastal Adaptation*, 16 VT. J. ENV'T L. 243 (2014).

44. Andrew S. Gold, *Internal and External Perspectives: On the New Private Law Methodology*, *in* THE OXFORD HANDBOOK OF THE NEW PRIVATE LAW 3, 3 (Andrew S. Gold, John C.P. Goldberg, Daniel B. Kelly, Emily Sherwin & Henry E. Smith eds., 2021) [hereinafter THE OXFORD HANDBOOK] ("If there is a common feature that cuts across New Private Law scholarship, it is an interest in the internal point of view."); Rebecca Stone, *Economic Analysis of Contract Law*

providing guidance for stakeholders as they pursue their various endeavors. Such an approach might seem sluggish, but the common law provides important foundational principles that help to guide private stakeholders, especially when public law evolves slowly or fails to address social problems.[45] Common law can serve as a catalyst for and even inform future public law solutions to climate adaptation.[46]

Before we dive into the specifics of how private law can do this, it is important to identify the core features of climate change that will present novel and concentrated forms of risk and harm for private law, particularly in the context of social interactions surrounding adaptation. After identifying these features, we situate some impending forms of private disputes against the backdrop of the dynamic and systemic forms of risk presented with climate adaptation to identify a few common themes that are likely to present new challenges for the common law.

A. Private Law's No-Analog Future

It seems intuitive that climate disruption will disrupt private interests and relationships—that is the premise behind the need for climate adaptation. The question we tackle in this Article is whether private law doctrines will also need to adapt to manage those disruptions. At a granular level, the need for private law responses will depend on the nature and severity of climate disruption, which varies substantially across geographic regions: coastal areas face sea-level rise; arid areas may experience severe water scarcity; rising heat and humidity will make other areas inhospitable to human habitation.[47] Stepping back to take in a more general framing, however, several challenges of climate change and how we understand its impacts will

from the Internal Point of View, 116 COLUM. L. REV. 2005, 2008 (2016) (defining internalizers as "agents who adopt legal rules as reasons for action even when their self-interest (and other things they care about) dictates doing otherwise").

45. Thomas W. Merrill, *Private and Public Law*, *in* THE OXFORD HANDBOOK, *supra* note 44, at 575.

46. For the argument that tort law can produce information to help improve public law solutions to climate change, see Kysar, *What Climate Change Can Do*, *supra* note 4. Other scholars argue that public law must adapt because the common law will be inadequate to the adaptation challenge. *See* Victor B. Flatt, *Adapting Laws for a Changing World: A Systemic Approach to Climate Change Adaptation*, 64 FLA. L. REV. 269 (2012). A related theme is how the scope of private property rights might need to evolve to accommodate public climate change adaptation measures, such as restrictions on coastal development and regulations affecting water rights. *See* Holly Doremus, *Climate Change and the Evolution of Property Rights*, 1 U.C. IRVINE L. REV. 1091 (2011).

47. USGCRP, ADAPTATION IN THE UNITED STATES, *supra* note 1, at 115–61 (reviewing expected impacts in the United States by region).

drive a ubiquitous medium of disruption of the human interactions that private law helps to manage.

The first focuses on what exactly is meant by *disruption*. Although the Earth's climate system has changed dramatically over billions of years, for the past 8,000 years—and certainly for as long as the common law has been at work—our climate system has been remarkably stable.[48] To be sure, variability in weather patterns has led to severe droughts, hurricanes, wildfires, and other natural disaster events requiring public and private law responses.[49] But the upper and lower bounds of temperature, rainfall, floods, storm intensity, and other such events were relatively stable over millennial time scales. This "idea that natural systems fluctuate within an unchanging envelope of variability"—known as stationarity—became a foundational premise in the planning, design, financing, and operation of the world's infrastructure, agriculture, industry, and all other sectors.[50] Even major human interventions in natural systems, such as river channeling and damming, and low frequency climate shifts, such as the Atlantic multidecadal oscillation, have had sufficiently small overall effects as to allow us to rely on long-term stationarity for planning.[51]

With climate change already underway, scientific consensus is emerging that stationarity is dead. We have entered a long era of nonstationarity in three forms: nonstationarity (1) of climate averages, leading to a trend in an observed time series; (2) of climate variances, including of upper and lower bounds; and (3) of relationships between different climate components.[52] As a consequence, everything driven and affected by climate faces a nonstationary future as well, including infectious diseases, wildfires, ecosystem integrity, infrastructure, agriculture, and so on.[53] This does not mean that climate is random or

48. *See* Thomas F. Stocker, *Surprises for Climate Stability*, 367 SCIENCE 1425 (2020) (discussing the relative climate stability of the past eight thousand years compared to the preceding ice age); *How Has Climate Changed?*, AUSTL. ACAD. OF SCI., https://www.science.org.au/learning/general-audience/science-climate-change/2-how-has-climate-changed (last visited Nov. 25, 2022) [https://perma.cc/R5CW-YYJ3] (mentioning the stability of global temperatures over the past eight thousand years).

49. *See* DANIEL A. FARBER, JIM CHEN, ROBERT R.M. VERCHICK & LISA GROW SUN, DISASTER LAW AND POLICY (2nd ed. 2010) (examining legal ramifications of disasters in public and private sectors).

50. Milly et al., *supra* note 33, at 573.

51. *Id.*

52. Bernard Cazelles & Simon Hales, *Infectious Diseases, Climate Influences, and Nonstationarity*, 8 PLOS MED. 1212 (2006).

53. *See*, *e.g.*, Clifton P. Bueno de Mesquita, Caitlin T. White, Emily C. Farrer, Lauren M. Hallett & Katharine N. Suding, *Taking Climate Change into Account: Non-stationarity in Climate Drivers of Ecological Response*, 109 J. ECOLOGY 1491 (2021) (ecosystems); Cazelles & Hales, *supra* note 52 (infectious diseases); Jeremy S. Littell, Donald McKenzie, Ho Yi Wan & Samuel A. Cushman, *Climate Change and Future Wildfire in the Western United States: An Ecological*

arbitrary, though it does mean that predictions cannot rely solely on the past or on linear extrapolations. Rather, the assumption of stationarity for any predictive or planning purpose must be replaced with more complex probabilistic models of relevant future variables.[54]

As Robin Craig argued over a decade ago, nonstationarity has inevitable consequences for law as well.[55] Focusing on environmental and natural resources statutes, she observed that the stationarity assumption was central to their design, such as in the goals of ecosystem restoration and preservation.[56] Nonstationarity, she argued, will require shifting to a focus on maintaining ecosystem resilience and adaptive capacity,[57] which will require greater flexibility in forward-looking regulatory goals and processes.[58] As we argue in this Article, private law similarly cannot escape the need to adapt to nonstationarity. To be sure, there is already plenty of private law doctrine involving *weather* trends and events upon which to build, but nonstationarity is the result of *climate* change introducing new weather trends, variations, and events that private law has yet to process.

The second challenge is the complexity of the probabilistic models needed to anticipate and adapt to nonstationarity. In short, in making predictions or planning for the future, what exact phenomenon are we modeling? Over the past several decades, researchers have converged on the concept of social-ecological-technological systems ("SETS") as the representation of the complex interactions of those three increasingly interrelated domains—social institutions, ecological resources, and human infrastructure and technology.[59] The SETS

Approach to Nonstationarity, 6 EARTH'S FUTURE 1097 (2018) (wildfire); Milly et al., *supra* note 33 (infrastructure).

54. Milly et al., *supra* note 33, at 573.

55. Robin Kundis Craig, *"Stationarity Is Dead"—Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENV'T L. REV. 9 (2010).

56. *Id.* at 31–39.

57. *Id.* at 39–40.

58. *Id.* at 63–69; *see also* Jonathan W. Moore & Daniel E. Schindler, *Getting Ahead of Climate Change for Ecological Adaptation and Resilience*, 376 SCIENCE 1421 (2022) (reviewing forward-looking approaches to conservation that enable adaptation and resilience).

59. *See* Bixler et al., *supra* note 34 (reviewing SETS in urban sustainability); Artur Branny, Maja Steen Møller, Silviya Korpilo, Timon McPhearson, Natalie Gulsrud, Anton Stahl Olafsson, Christopher M. Raymond & Erik Andersson, *Smarter Greener Cities Through a Social-Ecological-Technological Systems Approach*, CURRENT OP. IN ENV'T SUSTAINABILITY, Mar. 2022, art. 101168, at 1 (discussing a SETS approach to smart city planning); Heejun Chang et al., *Assessment of Urban Flood Vulnerability Using the Social-Ecological-Technological Systems Framework in Six US Cities*, SUSTAINABLE CITIES & SOC'Y, Feb. 2021, art. 102786, at 1, 1–6 (analyzing different urban areas' flood vulnerability through a SETS framework); Ariel E. Lugo, *Effects of Extreme Disturbance Events: From Ecesis to Social-Ecological-Technological Systems*, 23 ECOSYSTEMS 1726 (2020) (reviewing research on the impact of extreme disturbances on SETS); Samuel A. Markolf, Mikhail V. Chester, Daniel A. Eisenberg, David M. Iwaniec, Cliff I. Davidson, Rae Zimmerman, Thaddeus R. Miller, Benjamin L. Ruddell & Heejun Chang, *Interdependent Infrastructure as*

concept fuses, and for many purposes improves upon, models of social-ecological and socio-technical systems used in physical and social sciences.[60] Of course, SETS are not new; rather, our understanding of them has improved dramatically, and that has led to a deep understanding that they are profoundly complex and becoming more so as global stressors magnify.[61] Not surprisingly, climate change adaptation research has increasingly adopted the SETS model as the lens through which to assess the complexity of climate change impacts within SETS, such as large cities and vast infrastructure systems.[62] Legal scholars also have begun to embrace the SETS model to inform the design of regulatory law.[63] Again, herein we argue that the private law of climate change adaptation must also account for, and at the very least will operate in, the context of SETS complexity.

The interaction of nonstationarity with the increasing complexity of SETS leads to a third challenge—greater uncertainty about the future because of a dearth of relevant past experience. Although paleoecologists can study the ecological effects of past global climate shifts on ecological traits such as pollen distribution,[64] SETS did not exist then, nor did the array of other severe anthropogenic effects on the planet—such as biodiversity loss, pollution, natural resource depletion, human introduction and redistribution of animal and plant species, and other impacts recently identified as defining the

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Linked Social, Ecological, and Technological Systems (SETSs) to Address Lock-In and Enhance Resilience, 6 EARTH'S FUTURE 1638 (2018) (recommending the analysis of infrastructure as SETS).

60. *See* Bixler et al., *supra* note 34 (describing the disciplinary evolution towards the SETS model); *see, e.g.*, Elinor Ostrom, *A General Framework for Analyzing Sustainability of Social-Ecological Systems*, 325 SCIENCE 419 (2009); Susara E. van der Merwe, Reinette Biggs & Rika Preiser, *A Framework for Conceptualizing and Assessing the Resilience of Essential Services Produced by Socio-technical Systems*, ECOLOGY & SOC'Y, June 2018, art. 12, at 1; Benjamin K. Sovacool & David J. Hess, *Ordering Theories: Typologies and Conceptual Frameworks for Sociotechnical Change*, 47 SOC. STUD. SCI. 703 (2017).

61. *See* Will Steffen et al., *Trajectories of the Earth System in the Anthropocene*, 115 PNAS 8252 (2018) (discussing actions in different fields needed to ensure climate stabilization).

62. *See* Chang et al., *supra* note 59 (cities); Markolf et al., *supra* note 59 (infrastructure). The IPCC report on adaptation "has a strong focus on the interactions among the coupled systems climate, ecosystems (including their biodiversity) and human society. These interactions are the basis of emerging risks from climate change, ecosystem degradation and biodiversity loss . . . ." *See* IPCC, IMPACTS, *supra* note 11, at 6.

63. *See* Barbara Cosens et al., *Governing Complexity: Integrating Science, Governance, and Law to Manage Accelerating Change in the Globalized Commons*, PNAS, Sept. 2021, art. e2102798118, at 1 (examining tensions and interactions between governments and SETS); Barbara A. Cosens, J.B. Ruhl, Niko Soininen & Lance Gunderson, *Designing Law to Enable Adaptive Governance of Modern Wicked Problems*, 73 VAND. L. REV. 1687 (2020) (discussing the role of law and government in adaptive governance and managing SETS).

64. *See* Fox, *supra* note 35 (discussing the use of fossil pollen to provide information about a region's past and predict future ecosystem changes).

dawn of the Anthropocene.[65] In short, knowing what happened in the distant past to, say, the distribution of a tree species during a phase of global warming, will not offer much useful guidance to probabilistic modeling of what happens in the next hundred years to a large coastal city facing two feet or more of sea-level rise.

The prospect of this no-analog future has been well-developed in ecological research,[66] with looming concerns that climate and other biophysical systems will cross "tipping points" leading to future ecosystem changes that will be novel, sudden, cascading, and potentially catastrophic.[67] They will be difficult to manage through conventional natural resources law, to say the least.[68] But it is implausible that such novel changes will affect only the ecological component of complex SETS—that is the point of the SETS model. Infrastructure interdependency, for example, poses significant cascade failure concerns given the likely rising frequency and intensity of extreme weather events.[69] Managing cascade failures in SETS has

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65. *See* Steffen et al., *supra* note 61 (discussing the unprecedent impacts on planetary processes caused by human activities).

66. *See* Fox, *supra* note 35 (discussing the potential for future no-analog climates and ecosystems); Diana Stralberg, Dennis Jongsomjit, Christine A. Howell, Mark A. Snyder, John D. Alexander, John A. Wiens & Terry L. Root, *Re-shuffling of Species with Climate Disruption: A No-Analog Future for California Birds?*, PLOS ONE, Sept. 2, 2009, at 1; John W. Williams & Stephen T. Jackson, *Novel Climates, No-Analog Communities, and Ecological Surprises*, 5 FRONTIERS ECOLOGY & ENV'T 475 (2007) (discussing the risk of future no-analog communities in tropical regions).

67. *See* IPCC, IMPACTS, *supra* note 11, at 18:

> Adverse impacts from climate hazards and resulting risks are cascading across sectors and regions . . . . These hazards and cascading risks also trigger tipping points in sensitive ecosystems and in significantly and rapidly changing social-ecological systems impacted by ice melt, permafrost thaw and changing hydrology in polar regions;

see also Timothy M. Lenton, Johan Rockström, Owen Gaffney, Stefan Rahmstorf, Katherine Richardson, Will Steffen & Hans Joachim Schellnhuber, *Climate Tipping Points—Too Risky to Bet Against*, 575 NATURE 592 (2019) (discussing different tipping point thresholds and the drastic consequences of failing to avoid them); Marten Scheffer et al., *Early-Warning Signs for Critical Transitions*, 461 NATURE 53 (2009) (explaining tipping points and the difficulty of predicting them). For example, there is evidence that the Greenland ice sheet is experiencing mass loss at accelerating rates and has "switch[ed] to a new dynamic state of sustained mass loss that would persist even under a decline in surface melt." Michalea D. King, Ian M. Howat, Salvatore G. Candela, Myoung J. Noh, Seongsu Jeong, Brice P.Y. Noël, Michiel R. van den Broeke, Bert Wouters & Adelaide Negrete, *Dynamic Ice Loss from the Greenland Ice Sheet Driven by Sustained Glacier Retreat*, 1 COMMC'NS EARTH & ENV'T 1, 1–2 (2020). Glaciers distinct from Greenland and the Antarctic ice sheet also are experiencing accelerating mass loss. Romain Hugonnet et al., *Accelerated Global Glacier Mass Loss in the Early Twenty-First Century*, 592 NATURE 726 (2021).

68. *See* J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1 (2008) (discussing the difficulty faced by administrative agencies in facing the threats posed by climate change to endangered species).

69. *See* Emily N. Bondank & Mikhail V. Chester, *Infrastructure Interdependency Failures from Extreme Weather Events as a Complex Process*, FRONTIERS WATER, Aug. 18, 2020, at 1. There is increasing concern among prominent climate scientists that cascade failures could spread widely through infrastructure and other social and economic systems with potentially catastrophic

become a focus of research across a wide array of fields, including regulatory law.[70] Climate-induced failures in infrastructure, supply chains, and other human systems are bound to become fodder for private law disputes as well.[71]

To summarize the doom and gloom thus far (we are merely the messengers of the bad news): the private law system is shifting from operating in the security of stationarity to a world of slow-building, novel disturbance trends such as sea-level rise, unprecedented extremes such as severe storms and droughts, and sudden cascade failures in climate and other physical and social systems. These will present an increasingly diverse and expanding profile of systemic risks for SETS, with increasingly complex causal chains and deep uncertainty about the future.

Importantly for our purposes, the systemic nature of these impacts and risks means that public and private actors will take actions (or not) having consequences not only for themselves but for others within what we call their "adaptation footprint." The adaptation footprint is defined by the question of who could be harmed by an actor's adaptive behavior, whether that be a failure to adapt or maladaptive measures. Climate adaptation is a relatively new initiative for public and private entities, meaning they have not previously given much thought to their climate adaptation footprints. Such footprints may be substantially different from, say, footprints of noise, pollution, contract failure, and other harms that are the traditional fodder of private law claims. To complicate matters further, as nonstationarity progresses—as the averages, extremes, and relationships of impacts continue to shift—one's adaptation footprint could change in scope and form in unexpected, novel ways. Sorting out who harmed who is inevitably complicated under those conditions. In the next Section we explore in broad detail how private law fits into this context of private actors' future adaptation footprints.

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impacts. *See* Luke Kemp et al., *Climate Endgame: Exploring Catastrophic Climate Change Scenarios*, PNAS, Aug. 1, 2022, art. e2108146119, at 1.

70. *See* J.B. Ruhl, *Governing Cascade Failures in Complex Social-Ecological-Technological Systems: Framing Context, Strategies, and Challenges*, 22 VAND. J. ENT. & TECH. L. 407 (2020) (summarizing scientific research and outlining regulatory challenges).

71. The COVID-19 pandemic has exposed the fragility of global interconnected infrastructure and supply chains. Lauren Chenarides, Mark Manfredo & Timothy J. Richards, *COVID-19 and Food Supply Chains*, 43 APPLIED ECON. PERSPS. & POL'Y 270 (2020) (food supply chains); Tinglong Dai, Muhammad H. Zaman, William V. Padula & Patricia M. Davidson, *Supply Chain Failures amid Covid-19 Signal a New Pillar for Global Health Preparedness*, 30 J. CLINICAL NURSING e1 (2020) (health care supply chains).

B. Private Law in the Adaptation Footprint

Climate adaptation thus far has been primarily a public planning exercise, with little hard law having developed beyond building codes addressing sea-level rise.[72] But many federal, state, and local government institutions have begun actively planning and developing policies for their relevant public adaptation footprints, and more comprehensive regulatory design and implementation will follow.[73] Although there are different formulations and terminologies, this emerging public policy can be sorted into three modes of possible human adaptation: *resistance* (also known as protect, fortify, or defend) focuses on building infrastructure and other mostly technological defenses to climate change impacts in order to protect human communities; *resilience* (also known as adjustment, accommodate, manage, or transform) uses policies designed to facilitate a community's capacity to cope with climate change where impacts cannot be effectively resisted; and *retreat* (also known as move, resettlement, relocation, or avoidance) comes into play when it is anticipated that resistance and resilience policies will not be technologically or economically practicable or sufficiently effective for reducing or avoiding harms.[74] These responses to climate change are not necessarily mutually exclusive and, in many contexts, may need to be deployed simultaneously.[75]

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72. *See* IPCC, IMPACTS, *supra* note 11, at 20 ("Most observed adaptation is fragmented, small in scale, incremental, sector-specific, designed to respond to current impacts or near-term risks, and focused more on planning rather than implementation . . . ."). Two leading legal scholars assessed the landscape in 2018, concluding that "[a]daptation law at both the international and domestic levels remains thin and fragmented." FARBER & CARLARNE, *supra* note 2, at 240.

73. *See* IPCC, IMPACTS, *supra* note 11, at 20 (describing increases in adaptation planning and implementation across regions). For summaries and predictions, see LAW OF ADAPTATION, *supra* note 7; and Ruhl, *Climate Adaptation Law*, *supra* note 7.

74. Ruhl & Craig, *supra* note 25, at 232–39 (using these three terms); *see also* Katharine J. Mach & A.R. Siders, *Reframing Strategic, Managed Retreat for Transformative Climate Adaptation*, 372 SCIENCE 1294, 1294 (2021) (using the terms resistance, accommodation, avoidance, retreat, and advance); Trip Pollard, *Damage Control: Adapting Transportation to a Changing Climate*, 39 WM. & MARY ENV'T L. & POL'Y REV. 365, 378 (2015) (listing the various terms); Mark Scott et al., *Climate Disruption and Planning: Resistance or Retreat?*, 21 PLAN. THEORY & PRAC. 125, 130 (2020) (using a variety of these terms); Robert R.M. Verchick & Joel D. Scheraga, *Protecting the Coast*, *in* LAW OF ADAPTATION, *supra* note 7, at 239 (using the terms resistance, adjustment, and retreat).

75. Jeroen C.J.H. Aerts, W.J. Wouter Botzen, Kerry Emanuel, Ning Lin, Hans de Moel & Erwann O. Michel-Kerjan, *Evaluating Flood Resilience Strategies for Coastal Megacities*, 344 SCIENCE 473, 473–75 (2014) (evaluating different mixes of strategies); Audrey Baills, Manuel Garcin & Thomas Bulteau, *Assessment of Selected Climate Change Adaptation Measures for Coastal Areas*, OCEAN & COASTAL MGMT., Mar. 1, 2020, at 1, 2, 4–6 (outlining a broad array of strategies and criteria for evaluating selection).

Private individuals and institutions also have begun to plan for climate change adaptation[76] and likely will follow the strategies of resistance (e.g., fortifying an industrial facility), resilience (e.g., contractual management of supply chains), and retreat (e.g., relocating vineyards). Like public adaptation actions, these private actions (or failures to act) will have potential consequences for other public and private entities within the relevant adaptation footprint. Disputes are bound to arise when one private actor harms another either by failing to adequately adapt through one of these modes (failure to adapt) or by adapting through measures having harmful spillover effects (maladaptation). Many of these harms could be avoided through public law measures requiring or regulating adaptation actions. But countless bilateral disputes will also arise between private entities regarding how one should appropriately adapt. Again, bilateral disputes are nothing new to the private law of torts, property, and contracts. What's new will be defining the relationships and harms within an actor's adaptation footprint that are relevant to private law's remedial purposes.

Consider, for example, sea-level rise along a low-lying coastal region. If public institutions do not provide resist-mode infrastructure such as seawalls, what duty does a littoral property owner have to take adaptive measures to protect not only her property but also property of nearby littoral and inland property owners? What if she does take measures to protect her property but those measures harm adjacent properties? If public regulation specifies protective measures for chemical storage facilities to reduce the risk of chemical releases during severe storms, does a facility have a duty to anticipate the need for yet more protective measures as sea levels continue to rise? If damage at the chemical facility cuts off supplies to area businesses, is the facility exposed to contract performance claims? How should design and

76. For overviews and assessments, see Alina Averchenkova, Florence Crick, Adriana Kocornik-Mina, Hayley Leck & Swenja Surminski, *Multinational and Large National Corporations and Climate Adaptation: Are We Asking the Right Questions? A Review of Current Knowledge and a New Research Perspective*, 25 WIRES CLIMATE CHANGE 517 (2016); Laura M. Canevari-Luzardo, Frans Berkhout & Mark Pelling, *A Relational View of Climate Adaptation in the Private Sector: How Do Value Chain Interactions Shape Business Perceptions of Climate Risk and Adaptive Behaviours?*, 29 BUS. STRATEGY & ENV'T 432 (2020); Erik Glaas, E. Carina H. Keskitalo & Mattias Hjerpe, *Insurance Sector Management of Climate Change Adaptation in Three Nordic Countries: The Influence of Policy and Market Factors*, 60 J. ENV'T PLAN. & MGMT. 1601 (2017); Allie Goldstein, Will R. Turner, Jillian Gladstone & David G. Hole, *The Private Sector's Climate Change Risk and Adaptation Blind Spots*, 9 NATURE CLIMATE CHANGE 18 (2019); Maria-Therese Gustafsson, Jorge E. Rodriguez-Morales & Lisa M. Dellmuth, *Private Adaptation to Climate Risks: Evidence from the World's Largest Mining Companies*, CLIMATE RISK MGMT., Dec. 2021, art. 100386, at 1; Brayton Noll, Tatiana Filatova & Ariana Need, *How Does Private Adaptation Motivation to Climate Change Vary Across Cultures? Evidence from a Meta-Analysis*, INT'L J. DISASTER RISK REDUCTION, June 2020, art. 101615, at 1; and Swenja Surminski, *Private-Sector Adaptation to Climate Risk*, 3 NATURE CLIMATE CHANGE 943 (2013).

construction professionals account for the need to adapt building and infrastructure design to the known future of unprecedented storms? Now add in rising temperatures: Must coastal property owners manage habitat to reduce introduction of vectors carrying diseases such as malaria? Must warehouses anticipate increasing heat and humidity and take measures to protect inventory? The list could go on and apply to other risks and regions, such as extreme drought (is water conservation an adaptation duty?) and extreme rainfall (what are a property owner's stormwater management duties given more extreme rainfall events?). The scale of disputes also could become much larger, as evidenced by the cascade infrastructure failures experienced during the frigid Texas winter of 2021.[77]

Again, we recognize that many of these risks can be addressed through public regulation, and that none of these questions is foreign to the private law tradition. Indeed, they are the intuitive questions to ask. But our point is that they will be asked in the entirely new context of dynamic climate adaptation footprints in which conditions are a moving target.

The private law system has *never* processed bilateral disputes under those kinds of dynamic planetary conditions and their impacts on SETS. It stands to reason that the answers to questions like those above may come out differently than they have in the long period of predictable stationarity. At the very least, that possibility should not be ignored. As noted, some legal scholars and practitioners have begun to probe the role of private law in managing adaptation footprints in narrow doctrinal contexts.[78] A few such treatments have creatively proposed far-reaching doctrinal change.[79] It is possible that this kind of bottom-up, doctrine-by-doctrine approach could over time lead to formulation of broader principles to guide development of private law responses more generally. On the other hand, the private law works as a system to effectuate broad goals through bedrock doctrinal features, such as foreseeability, which define the relationships, rights, and remedies relevant to specific doctrines. What should those broad goals of private law be with respect to climate change adaptation, and what

77. *See* Jim Rossi & Michael Panfil, *Climate Resilience and Private Law's Duty to Adapt*, 100 N.C. L. REV. 1135 (2022) (discussing a new wave of tort claims against utilities for "failure to adapt" to climate change in infrastructure planning, including lawsuits emanating from power outages from the Winter 2021 Texas storm).

78. *See* sources cited *supra* note 30.

79. Rashmi Dyal-Chand, *Sharing the Climate*, 122 COLUM. L. REV. 581, 584 (2022) (proposing rights of "deliberative co-management" between adjacent property owners to adapt to climate change); Tara K. Righetti & Joseph A. Schremmer, *Waste and the Governance of Private and Public Property*, 93 U. COLO. L. REV. 609 (2022) (proposing a renewed and strengthened application of waste doctrine across a variety of resources and applications).

bedrock principles should guide private relationships, rights, and remedies in climate adaptation footprints? Choosing this more holistic framing, we turn to those questions in Parts II and III, respectively.

II. GUIDEPOSTS FOR EVALUATING PRIVATE LAW'S RESPONSES TO CLIMATE ADAPTATION

At bottom, what do we want private law to do, if anything, to shape the way private actors adapt to climate change? It seems inevitable from the foregoing descriptions of climate change impacts that climate change adaptation will become fodder for private disputes, and that private law will be asked to evolve in response. Here we consider collective goals private law could use as a framework for evaluating the efficacy of possible doctrinal changes (which we turn to in Part IV). We present four evaluative criteria: (1) preserve the stability of the law; (2) promote efficient adaptation; (3) advance socially just adaptation; and (4) prioritize proactive precautionary adaptation. We unpack each below and assess what work private law could do to promote each of these guideposts. With respect to each guidepost, we believe that for many purposes there are advantages to private law solutions over the public law alternative. The stability and precautionary guideposts, however, are likely to be of only limited usefulness in addressing private law responses to climate adaptation. In looking to the various guideposts, therefore, courts applying private law doctrine need to be attentive to tensions between the goals and strike a balance, rather than fixate on one guidepost to the exclusion of others.

A. Adaptation Neutrality for Stability of Law

Doctrinal change in the common law can itself be disruptive of settled economic and social interests and relationships. The most conservative approach to climate change adaptation, therefore, would be to minimize doctrinal change by preserving private law's stability. As Richard Epstein has written, "Social circumstances continually change, but it is wrong to suppose that the substantive principles of the legal system should change in response to new social conditions."[80] Epstein goes so far as to suggest that in private law matters, the law "can best perform its essential function[s] only if it remains constant."[81]

80. Richard A. Epstein, *The Static Conception of the Common Law*, 9 J. LEGAL STUD. 253, 254 (1980).

81. *Id.*

Using this approach, private law would, in essence, be neutral with respect to any new social facts presented by climate change or policies regarding adaptation.

Adopting this "adaptation neutrality" approach, courts processing climate adaptation disputes would embrace private law's doctrinal status quo. Where private law does not fit new social facts or cannot address the conflicts presented by climate adaptation, this approach defaults to public law and private markets to fulfill collective adaptation goals. As Epstein argues, when the common law changes, it is often in response to legislation and not to judges imposing new values or recognizing changes on their own.[82] In a sense, this neutrality approach provides parties with a strong form of stability. It helps to reinforce expectations by eliminating private law as a source of new obligations and responsibilities for human interactions. A neutrality approach thus may present private individuals and entities with certainty against the backdrop of a dynamic new world characterized by nonstationarity and the lack of an analog future that looks anything like the comforts of the past.

The unprecedented, dynamic, and unpredictable context of climate change, however, makes this approach extremely difficult to apply at maximum strength. Even when it can be applied to allow for an occasional exception due to new facts and circumstances, we are not sure it is an honest use of legal doctrine. At some level, the common law's exception for poor fit may itself swallow a rule, or lead to bending it without any clear principle or decision criterion.[83] Doctrines relying on broad principles (or perhaps more akin to standards than rules), such as foreseeability and duty to mitigate, have evolved over time against a backdrop of climate stationarity. When the outlier-extreme storm, heat wave, drought, and wildfire continue to become more intense over time and sea levels continue to rise, forcing private law to remain stationary would be its own form of a failure to adapt. As parties increasingly allege that they have been harmed by another actor's failure to adapt or maladaptation, it will become difficult for courts to ignore that the disputes are over adaptation behavior. And if the reason for adapting private law is the need to adapt to climate change, a policy-neutral approach that disregards social goals for adaptation will risk producing maladaptive outcomes.

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82. *Id.* at 268 (discussing how legislation in England led to changes in the common-law rule against perpetuities).

83. For an argument in favor of a principled rule-bending approach in applying the Federal Rules of Evidence, see Edward K. Cheng, G. Alexander Nunn & Julia Ann Simon-Kerr, *Bending the Rules of Evidence*, NW. U. L. REV. (forthcoming 2023).

On the other hand, we are not advocating change to private law doctrines for the sake of change and ad hoc experimentation. The common law does not evolve by meandering or walking randomly through disruptive natural and social change. Nor are we suggesting that changes be guided by the desires of powerful interest groups, like the pro-growth and pro-competition doctrinal changes designed to favor business interests in the Industrial Revolution.[84] Rather, our three other guideposts incorporate some modest goals that seem appropriate to consider when designing any new climate change adaptation law, public or private: Will the change in law promote adaptation behavior that (1) is efficient; (2) is equitable, fair, and just; and (3) manages future risk effectively? As functional guideposts, these cannot always be co-optimized, so it will also be important to ask whether the trade-offs the legal change strikes between them have been balanced to best serve overall adaptation policy goals.

B. Encouraging Efficient Adaptation

Private law is often broadly designed to promote efficient outcomes. Three distinct notions of efficiency are implicated by private law's responses to climate adaptation.

First, and most narrowly, private law focuses on promoting efficiency between the parties to a dispute. Private law routinely does this through cost internalization. Tort law, for example, imposes liability for harm resulting from a failure to adapt as a way of internalizing the costs of harm. For example, the prospect of tort liability against utilities confronting an increased frequency of wildfires in dry climate areas can help to incentivize utilities to invest in storm preparation or technologies that can reduce the risks of harms to others.[85] Thus, in addition to the backward-looking function of compensating harms, private law—through cost internalization—provides guidance in the future and can effectuate future deterrence of conduct that presents risks in light of climate adaptation.

In the context of climate adaptation, it is also important for private law to be attentive to how the imposition of liability can have adverse behavioral effects on individuals or private entities. Moral hazard is one such concern: If private law were to define liability for failure to adapt or for maladaptation too broadly, this would decrease the incentives for individuals or private entities to make investments

84. *See* HORWITZ, *supra* note 13, at 254.

85. For discussion, see Rossi & Panfil, *supra* note 77, discussing liability against utilities for harms associated with wildfires in California.

in adaptation in the first place. In certain instances, it is more efficient for a potential victim—such as a property owner building a vacation home in a climate vulnerable beach area—to make their own investment in precautions at the front end rather than having the law provide for ex post compensation. For example, a property owner may be able to purchase private insurance for potential losses, or where private insurance is not available, a property owner may be in the best position to invest in storm windows, raised foundation piers, or backup electricity to adapt to new climate risks and to minimize the likelihood of harms associated with coastal storm surge. Private law's bilateral dispute architecture gives a court the focused opportunity to identify the cheapest cost avoider regarding adaptation risks—the plaintiff or defendant—and to assess the efficiency of imposing liability between the parties in specific contexts.

A second efficiency concern with private law responses to adaptation is that, while the common law needs to promote adaptation, private law is not a one-way ratchet favoring investments in adaptation at all costs. Private law responses to adaptation must avoid promoting wasteful or harmful investments in adaptation infrastructure. Public law responses to adaptation focus heavily on whether investments in adaptation are cost justified, and so too should private law responses. For example, new weather variations contribute to an increased risk of power outages in many areas of the country. But energy reliability is expensive, and no electric power system is one-hundred percent reliable. Utility regulators frequently focus on whether additional investments in the electric power distribution system are necessary in light of their anticipated costs and benefits.[86]

An advantage of private law versus more "sticky" public law responses to adaptation is the capacity to proceed incrementally, along with flexibility and a capacity to learn and evolve over time. Government regulators addressing climate adaptation can, and sometimes do, make costly mistakes in their public responses, especially when they do not have complete information about solutions or when they overinvest in a single adaptation response. On the one hand, private law remedies must be clear: unless the consequences of nonadaptation are transparent and private enforcement is robust and internalizes the costs of potential harm from a failure to invest in adaptation, private law will enable underinvestment in adaptation. On the other hand, the common law must be mindful of how some private investments in adaptation can be wasteful and harmful too. Just like collective responses, private investments in adaptation can produce

86. For discussion, see *id.* at 1170–74.

socially maladaptive results, causing more harms than they rectify. Private law provides a way of avoiding some of the costly errors that collective ex ante responses to adaptation (such as regulators choosing the wrong technological responses) can produce in novel risk scenarios where information is uncertain or our understanding of how to address risks is evolving rapidly. Importantly, private law's capacity to adjudicate maladaptation claims (as well as failure-to-adapt claims) provides a check of sorts on claim selection bias, in a manner that may allow the adjudication of climate change adaptation claims to evolve in the direction of more efficient common-law rules.[87] To the extent that courts apply traditional private law remedies, such as paying damages, rather than mandating investments by a defendant, private law's resolution of adaptation claims may not raise as significant a concern with social waste as public law responses to adaptation.[88]

Third, courts adjudicating adaptation claims must be attentive to decision costs. In many instances, the harms produced by climate change and addressed by adaptation are not concentrated on one or just a few individuals but affect a large, more diffuse group of victims. Climate adaptation potentially opens up a floodgate of private litigation claims that could impose significant costs on the judicial system and impair the ability of courts to give the most meritorious and significant claims the attention that they need. Concerns with opening the floodgates of litigation can be managed in many instances through procedural mechanisms such as class actions, but as a policy guidepost, it is still important for courts to evaluate whether the decision costs associated with novel claims justify the benefits.

C. Promoting Fair and Socially Just Adaptation

There is little doubt that climate adaptation presents profound questions of social justice.[89] These include basic issues related to

87. *See* George L. Priest, *The Common Law Process and the Selection of Efficient Rules*, 6 J. LEGAL STUD. 65 (1977) (arguing that the allocative costs of inefficient common-law rules will help to address selection biases litigation, motivating the evolution of the common law more towards efficient results).

88. Importantly, a variety of defenses to private law claims provide courts a vehicle that can strike a balance between collective government regulation and private responses to adaptation. These include defenses such as preemption. For regulated industries, defenses such as the filed rate doctrine can also help to safeguard private law from veering too far towards socially wasteful judicial interventions into adaptation. *See* Jim Rossi, *Lowering the Filed Tariff Shield: Judicial Enforcement for a Deregulatory Era,* 56 VAND. L. REV. 1591, 1605–15 (2003) (discussing the history and purposes of the filed rate doctrine as a way of striking a balance between common-law intervention and regulation).

89. *See* IPCC, IMPACTS, *supra* note 11, at 27 ("Adaptation planning and implementation that do not consider adverse outcomes for different groups can lead to maladaptation, increasing

procedural fairness—how various individuals and groups are treated throughout the legal process—in addressing climate adaptation.[90] But they also include fundamental questions related to the equitable distribution of basic resources, such as health care, drinking water, and energy.[91]

There is overwhelming evidence that climate change will impose disproportionate risks of harm on vulnerable populations, including communities of color and systematically impoverished persons.[92] Socially or economically disadvantaged individuals and communities are often unable to address adaptation harms on their own. Collective public law solutions such as subsidies will need to be used to reduce inequities in the distribution of adaptation harms and benefits. But public law solutions often have a long history of overlooking unfair and inequitable outcomes,[93] and collective action obstacles often plague ex ante legislative responses to problems related to climate adaptation.[94] Even where collective responses to adaptation are available, there is some evidence that they can systematically disadvantage the most vulnerable communities who lack political power.[95]

Private law solutions to adaptation conflicts can help to reinforce recognized legal entitlements—an approach widely associated with

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exposure to risks, marginalising people from certain socioeconomic or livelihood groups, and exacerbating inequity.").

90. *See, e.g.*, Breena Holland, *Procedural Justice in Local Climate Adaptation: Political Capabilities and Transformational Change*, 26 ENV'T POL. 391, 392–93 (2017).

91. *See, e.g.*, Elkanah O. Babatunde, *Distributive Justice in the Age of Climate Change*, 33 CANADIAN J.L. & JURIS. 263, 263–66 (2020).

92. *See, e.g.*, EPA, CLIMATE CHANGE AND SOCIAL VULNERABILITY IN THE UNITED STATES: A FOCUS ON SIX IMPACTS (Sept. 2021), https://www.epa.gov/cira/social-vulnerability-report [https://perma.cc/M356-DM7H] (highlighting how climate change presents a significantly higher level of risk for minority, poor, uneducated, and elderly communities than the rest of the U.S. population).

93. *See* CHARLES M. HAAR & DANIEL W. FESSLER, THE WRONG SIDE OF THE TRACKS: A REVOLUTIONARY REDISCOVERY OF THE COMMON LAW TRADITION OF FAIRNESS IN THE STRUGGLE AGAINST INEQUALITY (1986) (chronicling a long and persistent history of discrimination against minority and poor individuals in the provision of basic utility services, such as electric power and clean drinking water).

94. For one especially perceptive account of this problem addressing how political externalities can distort legislative responses to disaster management, see Ben Depoorter, *Horizontal Political Externalities: The Supply and Demand of Disaster Management*, 56 DUKE L.J. 101 (2006).

95. For example, one study shows that storm disaster relief advantages White, middle-class communities and can actually broaden the societal racial wealth gap. Junia Howell & James R. Elliott, *Damages Done: The Longitudinal Impacts of Natural Hazards on Wealth Inequality in the United States,* 66 SOC. PROBS. 448, 461–64 (2019) (showing based on FEMA data that White communities accumulate more wealth from disaster relief than Black- or other minority-concentrated communities).

modern corrective justice accounts of private law.[96] Like other private law claims, seeking a remedy for harms caused by climate adaptation can also serve as a form of civil recourse for individuals (and groups) who are wronged by others—reinforcing notions of fairness, regardless of the substantive outcome.[97] We do not, nor does the common law, view distributive inequality in society as a wrong for which recourse is automatically available. Still, it would be a mistake to ignore distributive justice concerns altogether in assessing private law doctrines in tort, property, and contract law disputes.[98] A distributive justice approach to private law seems particularly well suited to novel risk scenarios that concentrate harms on vulnerable victims.[99] Modern private law claims, such as toxic torts, provide a way of identifying a particular plaintiff (or group of private plaintiffs) that are systematically harmed, linking a victim's lived experiences of harm to a wrongdoer. Data concerning the vulnerability of particular communities can aid courts in identifying forms of risk and harm that are concentrated on those who are unable to absorb a loss through insurance or who have little or no way of avoiding a risk on their own.[100] To the extent that the risks of harm from climate adaptation are disproportionately or systemically focused on vulnerable individuals or communities with particular characteristics,[101] it is not inappropriate

96. Similarly, in the context of private law mitigation lawsuits, Dan Farber has suggested a corrective justice approach may be appropriate for many forms of climate harm. *See* Daniel A. Farber*, Basic Compensation for Victims of Climate Change*, 155 U. PA. L. REV. 1605, 1641–43 (2007). For a critical response noting the causation challenge with a corrective justice approach to such harm, see Matthew D. Adler, *Corrective Justice and Liability for Global Warming*, 155 U. PA. L. REV. 1859, 1863–64 (2007).

97. *See* Benjamin C. Zipursky, *Civil Recourse, Not Corrective Justice*, 91 GEO. L.J. 695, 700 (2003).

98. *See* JAMES GORDLEY, FOUNDATIONS OF PRIVATE LAW: PROPERTY, TORT, CONTRACT, UNJUST ENRICHMENT 11–13 (2006) (arguing that distributive justice should matter to private law); Arthur Ripstein, *Private Order and Political Justice: Kant and Rawls*, 92 VA. L. REV. 1391, 1409 (2006) (articulating a vision of private law that does not focus on a narrow notion of correcting entitlements but on Kantian and Rawlsian notions of securing "for private persons the exercise of their first moral power, the capacity to set and pursue a conception of the good, in the face of the equally valid claims of all other private persons to do the same").

99. *See*, *e.g.*, Aditi Bagchi, *Distributive Injustice and Private Law*, 60 HASTINGS L.J. 105, 141–43 (2009) (arguing that private law helps to ensure that our rights and responsibilities to one another as individuals are adjusted to reflect background wrongs that the state has failed to remedy—and presenting the example of asbestos as a context where some relaxation of the formal evidentiary requirements of causation is warranted to recognize mass harms that are disproportionately concentrated on victims who had little to begin with).

100. *See also* Dierdre Zoll, *Climate Adaptation as a Racial Project: An Analysis of Color-Blind Flood Resilience Efforts in Austin, Texas*, 14 CLIMATE JUST. 288, 294–97 (2021) (finding unequal exposure to flood risk and to flood resilience initiatives in communities of color).

101. *See*, *e.g.*, Joseph Wenta, Jan McDonald & Jeffrey S. McGee, *Enhancing Resilience and Justice in Climate Adaptation Laws,* 8 TRANSNAT'L ENV'T L. 89, 89–91 (2019).

for private law to recognize certain victims, or groups of victims, as having especially strong claims of recourse.

When these kinds of distributive justice ideas are embraced, courts might recognize novel private law claims to address the harms of climate adaptation. For example, could the warranty of habitability in leasing[102] incorporate a duty to upgrade heating or cooling as climate change effects intensify? Or might such warranties be extended to provide new forms of flood protection for certain communities, especially those who have little or no access to private insurance? More broadly, might it be appropriate for courts to recognize a "warranty of adaptation" for vulnerable individuals or groups through private law decisions?

Attention to distributive justice concerns could certainly enable some doctrinal extensions for private law. But attention to distributive justice in addressing climate adaptation disputes does not require radical doctrinal change. Consider Martha Nussbaum and Amartya Sen's idea of justice as grounded in the flourishing of human capacity.[103] In order for individuals to flourish in a world of climate change, they must have access to various adaptation mechanisms and technologies. And they must not be adversely affected by adaptation in ways that undermine their capacity to flourish in the new normal that climate change brings, even if they lack power or a political voice to influence collective solutions. Climate change is likely to produce forms of systemic harm due to race or poverty, and the failure of an individual or business to adapt to new risks can exacerbate those harms.[104] Importantly, too, adaptation measures that produce net social benefits can still generate harms in the lived experiences of particular individuals or groups[105]—making maladaptive claims a particularly fertile forum for the private law to address social justice concerns. For example, building out the power grid to withstand hurricane-level storms might adversely affect minority and impoverished communities that are disproportionately saddled with new power substations or

102. *Implied Warranty of Habitability*, BLACK'S LAW DICTIONARY (11th ed. 2019) ("In a residential lease, a warranty from the landlord to the tenant that the leased property is fit to live in and that it will remain so during the term of the lease.").

103. *See* MARTHA NUSSBAUM, CREATING CAPABILITIES: THE HUMAN DEVELOPMENT APPROACH 17–20 (2011); AMARTYA SEN, THE IDEA OF JUSTICE 231–47 (2009).

104. *See* ROSEMARY LYSTER, CLIMATE JUSTICE AND DISASTER LAW 156–235 (2016) (advancing a capability approach to climate disaster policy, including a focus on climate adaptation); David Schlosberg, Lisette B. Collins & Simon Niemeyer, *Adaptation Policy and Community Discourse: Risk, Vulnerability and Just Transformation*, 26 ENV'T POL. 413 (2017) (theorizing a capabilities approach to climate adaptation).

105. *See* Benjamin K. Sovacool, *The Complexity of Climate Justice*, 3 NATURE CLIMATE CHANGE 959, 960 (2013) (summarizing a study that "discovered differences within communities that can lead to injustices even when adaptation interventions have net benefits overall").

other facilities. Private law can provide an opportunity for recourse for such harms, even where adaptation produces benefits for most other members of a community or is beneficial to a community on balance. At the very least, private law's doctrines and remedies must not become a refuge for reproducing harms that are inconsistent with the human capacity notion of social justice.

D. Proactive Precautionary Adaptation

At a general level, the precautionary principle advises that inaction in addressing climate adaptation is not justified by uncertainty about the type and magnitude of risks.[106] A public law solution could elevate protection of public health and safety above efficiency when considering design of seawalls or employee health standards. But might uncertainty regarding when and where climate change will have an impact, as well as about the intensity of those impacts, be so substantial that private law doctrinal change should also adopt a precautionary approach? And what would embracing a precautionary principle approach to adaptation mean for private law?

Applications of the precautionary principle to climate change are frequently based on the notion of risk aversion.[107] Even Cass Sunstein, who is one of the leading critics of the precautionary principle, acknowledges that it might have some role in addressing catastrophic risks as a form of societal insurance against the worst kinds of harm or, in some cases, as a planning exercise in "selecting the worst-case scenario and attempting to eliminate it."[108] Another rationale for the precautionary principle is based on uncertainty about the physical environment's inability to tolerate permanent damage associated with climate change or about how various tipping points in temperature might present permanent changes in climate[109]—a sort of concern that

106. *See* Daniel A. Farber, *Coping with Uncertainty: Cost-Benefit Analysis, The Precautionary Principle, and Climate Change*, 90 WASH. L. REV. 1659 (2015); *see also* Jonathan Remy Nash, *Standing and the Precautionary Principle*, 108 COLUM. L. REV. 494, 500 (2008) ("[T]he precautionary principle calls for the use of caution in making regulatory decisions when risk or uncertainty is present.").

107. David Dana, *The Contextual Rationality of the Precautionary Principle*, 35 QUEEN'S L.J. 67, 74–80 (2009) (noting that climate change is an area where people systematically "irrationally over-weigh the costs of regulating and irrationally under-weigh the costs of regulatory inaction").

108. Cass R. Sunstein, *The Catastrophic Harm Precautionary Principle*, ISSUES LEGAL SCHOLARSHIP, Feb. 2007, at 28; *see also* CASS R. SUNSTEIN, WORST-CASE SCENARIOS (2007).

109. While some such as Sunstein view the precautionary principle as a reality given the psychological or behavioral limits of human decisionmaking, it is more conventionally embraced as a decisionmaking tool where there is a lack of complete scientific certainty about the physical world. *See, e.g.*, Christopher D. Stone, *Is There a Precautionary Principle?*, 31 ENV'T L. REP. 10790, 10790 (2001) (describing the precautionary principle in terms of a triple negative—i.e., that a *lack* of scientific evidence is *not* a reason *not* to act, and emphasizing that for many forms of harm

might mean a precautionary principle is a particularly well-equipped tool for addressing the efficacy of legal rules for the effects of nonstationarity.[110] In this spirit, Doug Kysar has argued that climate change is a particularly appropriate context for applying a precautionary principle, given the lack of consensus and accompanying uncertainty about desired social outcomes.[111] Invocation of the precautionary principle is common in public regulatory responses to climate adaptation. So, would similar concerns make this a well-suited principle for addressing some private law disputes surrounding adaptation?

We hesitate to embrace the precautionary principle as a tool for assessing the efficacy of common-law responses to all climate adaptation disputes. Embracing the precautionary principle over other policy guideposts can come at a significant cost. Critics of the precautionary principle commonly complain about its vagueness.[112] The precautionary principle can certainly be invoked to justify additional investments in adaptation, especially where there is systemic inaction or underinvestment in widely recognized adaptation solutions. For example, it seems well suited to concerns related to a failure to adapt where there is a consensus about technological or infrastructural solutions to the impacts of climate change. But it is not clear what this would add that cost internalization does not also capture. And if embraced too broadly, the precautionary principle may undermine incentives for private individuals or entities to invest in adaptation measures in the first place. For example, where there is uncertainty about the risks and benefits associated with private investments in new planning approaches, infrastructure, or technologies (consider, for

society should take a preventative approach to regulation, commonly considered the "better safe than sorry" approach to regulating against the backdrop of scientific uncertainty). Importantly, uncertainty about science does not necessarily advise categorical regulatory approaches to prevent all harmful conduct; a precautionary principle could just as well advise in favor of policy incrementalism to produce more learning about the physical world, risks, and harms. *See, e.g.*, Holly Doremus, *Precaution, Science, and Learning While Doing in Natural Resource Management*, 82 WASH. L. REV. 547, 548–50 (2007). Arguably, this is exactly the kind of learning that an incremental common-law approach reinforces.

110. *Cf.* Craig, *supra* note 55, at 9, 48 (noting that while current environmental laws are based on ecological stationarity, future climate change adaptation laws should "embrac[e] an unyielding commitment to precautionary regulation").

111. Douglas A. Kysar, *It Might Have Been: Risk, Precaution and Opportunity Costs*, 22 J. LAND USE & ENV'T L. 1, 14 (2006).

112. *See*, *e.g.*, Cass R. Sunstein, *Beyond the Precautionary Principle*, 151 U. PA. L. REV. 1003, 1004 (2003) (challenging the precautionary principle "not because it leads in bad directions, but because, read for all that it is worth, it leads in no direction at all"); Jonathan B. Wiener, *Precaution in a Multirisk World*, *in* HUMAN AND ECOLOGICAL RISK ASSESSMENT: THEORY AND PRACTICE 1509, 1513 (Dennis J. Paustenbach ed., 2002) (noting that there is no single definition of the precautionary principle, which is "varied" and "often vague").

example, geoengineering), a precautionary principle could just as well be used to justify private inaction on adaptation. To the extent that the precautionary principle applies at all to private climate adaptation disputes, courts need to be careful not to apply it in sweeping ways that deter private investments and experimentation in addressing adaptation, even where there is some uncertainty about the risks of harm. In those contexts where a failure to invest in adaptation can result in irreversible harm, however, the precautionary principle may still serve some limited role as a guidepost for assessing legal rules. Especially with respect to catastrophic risks, where there is uncertainty and a need to encourage assessment of worst-case, low-probability risks, a precautionary principle might capture some concerns that traditional efficiency analysis fails to take into account.

III. HOW DOES THE PRIVATE LAW OF RELATIONSHIPS, RESPONSIBILITIES, AND REMEDIES MEASURE UP?

This Part unpacks private law into three core components—relationships (*with whom am I connected under private law*?), responsibilities (*what duties do I owe them, or what makes harmful conduct wrongful*?), and remedies (*what recourse does a court provide for wrongful conduct that is harmful*?). Drawing on the concepts and guideposts built out in Parts I and II, we explore these three broad themes through examples of specific private law principles, doctrines, and practices that are likely to come under pressure with climate adaptation claims, and we assess how the guideposts can inform the direction and intensity of change. As we suggest, the core principles and doctrines of private law are well suited to addressing many disputes related to climate adaptation. At the same time, clarification and adjustment of some embedded common-law principles and doctrines can provide much-needed guidance to private individuals and entities in approaching the management of climate adaptation risks.

A. Which Relationships Are Relevant in the Adaptation Footprint?

If, as most experts predict, climate change causes massive disruption of the environment and economy, it seems inevitable that everyone in society will need to adapt to a new climate normal. With respect to many activities, individuals and entities will need to reconsider who is a neighbor—put another way, who is within my adaptation footprint?—especially "in a shrinking world in which risks

and consequences can be traced just a bit farther."[113] For this reason, we would expect climate adaptation to lead to expansion of some private obligations related to tort, property, and contract. This may seem an obvious point—especially given private law's expansive approach to duty—but jurisdictions that embrace an expansive duty approach tend to invoke arbitrary and unprincipled limitations on duty to support categorical decisions of no liability, especially when confronted with novel risks.[114]

As a starting place for assessing duty, tort law's foreseeability principle provides a powerful doctrinal tool for reassessing the reach of private law's obligations in light of actors' relationships within climate adaptation footprints. As courts apply this principle, the adaptation guideposts provide a useful set of policy tools for incentivizing private adaptation investments and safeguarding against inefficient private adaptation measures that may cause harm to the most vulnerable. Importantly, we believe that the definition of these obligations will not only inform and reinforce private law's ex post responses to adaptation but also help to promote stability and provide private individuals and entities with the kind of forward-looking guidance they need to make private decisions related to climate adaptation risks in their social interactions.

1. Legal Obligations Based on "Foreseeability of Nonstationarity"

Understandings of private law embrace the idea of a general obligation for those interacting in the modern economy to exercise reasonable care.[115] Still, even where modern courts recognize a duty of care, they consistently fall short of recognizing a duty to "the world at large."[116] For modern courts, even though there is a consensus supporting expansive tort obligations,[117] defining the scope of

113. *See* Ellen M. Bublick, *Tort Common Law Future: Preventing Harm and Providing Redress to the Uncounted Injured*, 14 J. TORT L. 279, 308 (2022).

114. *See* Dilan A. Esper & Gregory C. Keating, *Abusing "Duty,"* 79 S. CAL. L. REV. 265, 268 (2006) (chronicling how a proliferation of "no duty" decisions among California appellate courts are abusing the concept of duty, misshaping the law, and disrespecting the role of the jury).

115. As was famously endorsed by Judge Cardozo's opinion in *MacPherson v. Buick Motor Co.*, 111 N.E. 1050, 1053–55 (N.Y. 1916), rejecting privity as a formal limitation on duty in tort in favor of duty grounded in a foreseeable class of victims where a manufacturer places in the marketplace a retail product that presents a risk of danger to life and limb.

116. *See* Benjamin C. Zipursky & John C.P. Goldberg, *The Myths of* MacPherson, 9 J. TORT L. 91, 101 (2016) ("It is more than a little strange to read into *MacPherson* the notion that legal duties must be understood as running to government, or to the public at large, or to no one at all.").

117. This is reflected in the first provision of section 7(a) of the *Restatement (Third) of Torts*: "An actor ordinarily has a duty to exercise reasonable care when the actor's conduct creates a risk of physical harm." RESTATEMENT (THIRD) OF TORTS: PHYSICAL & EMOTIONAL HARM (AM. L. INST. 2010). The *Restatement (Third) of Torts* reserves the ability for a court to determine that no duty

relationships still remains central to private law's recognition of obligations. In defining the private duty to adapt, courts will need to define the scope of relationships in a manner that reinforces goals such as cost internalization without expanding liability so far that it produces new forms of uncertainty or other adverse policy consequences. Defining the scope of the private duties will thus be central to private law's success in addressing climate adaptation risks.

One approach that courts could take to reinforce reliance interests and promote certainty is to embrace narrow obligations based on the tradition of the common law. Despite the consensus favoring an expansion of duty, in novel risk contexts many courts recognizing obligations embrace formalities to define the scope of liability narrowly—what is commonly understood as the "limited duty" approach to private law.[118] To take one example, several jurisdictions have limited employer tort liability towards family members of employees who have been exposed to harmful levels of asbestos in the workplace.[119] In refusing liability for these "secondary" or "take-home" asbestos claims, these courts conclude that the employer owes no duty to a nonworker because of a lack of a preexisting relationship,[120] as well as because the exposure occurred outside of the spatial confines of the employer's premises.[121] Similarly, in the property context, courts have grappled with the scope of duty sellers and brokers have to disclose offsite conditions such as planned highways or waste disposal sites, with some courts limiting disclosure duties to onsite conditions or

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of reasonable care attaches to a party for "exceptional cases," *id.* at § 7(b), though it does not define what these are.

118. Despite embracing what is widely seen as an expansive approach to tort obligations, even the *Restatement (Third) of Torts* acknowledges the continued significance of the limited duty approach for modern courts. *Id.* According to section 7(b), "when an articulated countervailing principle or policy warrants denying or limiting liability in a particular class of cases, a court may decide that the defendant has no duty or that the ordinary duty of reasonable care requires modification." *Id.*

119. *See also* Rebecca Leah Levine, Note, *Clearing the Air: Ordinary Negligence in Take-Home Asbestos Exposure Litigation*, 86 WASH. L. REV. 359, 360 (2011) (noting that, as of the date of publication, a majority of the states that have addressed the issue have rejected take-home asbestos negligence claims based on limited duty).

120. *See* Nelson v. Aurora Equip. Co., 909 N.E.2d 931, 935–37 (Ill. App. Ct. 2009) (finding no duty based on lack of a relationship between defendant and plaintiff); Gillen v. Boeing Co., 40 F. Supp. 3d 534, 538–39 (E.D. Pa. 2014) (noting that parties are "legal strangers" is a significant consideration limiting duty of plaintiff husband's employer to protect her from exposure to asbestos).

121. *See In re* Certified Question, 740 N.W.2d 206, 216–17 (Mich. 2007) (finding no duty is owed to a plaintiff who has "never been on or near defendant's property and had no further relationship with defendant"); *In re* N.Y.C. Asbestos Litig., 840 N.E.2d 115, 122 (N.Y. 2005) (noting practical concerns with "limitless liability" to the extent that duties are expanded beyond the workplace premises); CSX Transp., Inc. v. Williams, 608 S.E.2d 208, 210 (Ga. 2005) (noting that "an employer's duty to provide a safe workplace does not extend to persons outside the workplace").

specific offsite conditions.[122] Courts following this limited duty approach focus on the formalities of relationships or predefined spatial characteristics to support a finding of no duty of care, even for foreseeable risks associated with modern activities such as the use of asbestos in manufacturing and location of waste disposal sites. This approach to defining duty narrowly draws on widely recognized common-law rules to limit liability in a manner that reinforces reliance interests and avoids some of the policy consequences of expanding liability.

In contrast to this limited duty approach, other modern courts embrace a more expansive approach to duty, even where this presents some difficult policy questions. For example, some courts require seller disclosure of offsite conditions that would have a foreseeable material impact on the value of the property.[123] Similarly, some jurisdictions have rejected a limited duty approach to take-home asbestos injuries, instead imposing obligations on employers based on tort law's foreseeability principle.[124] A leading California opinion holding that an employer owes a duty to members of the employee's household reasoned that "the risk of take-home asbestos exposure 'is likely enough in the setting of modern life that a reasonably thoughtful [employer or property owner] would take account of it in guiding practical conduct' in the workplace."[125] This duty, according to the court, "depends upon the foreseeability of the risk and a weighing of policy considerations for and against imposition of liability."[126] Even where injuries are foreseeable, the court acknowledged no duty could still be found "where the social utility of the activity concerned is so great, and avoidance of the injuries so burdensome to society, as to outweigh the compensatory and cost-internalization values of negligence liability."[127] With respect to second-hand asbestos, the court reasoned, the advantages of cost internalization through tort liability soundly outweighed any expected burdens.[128]

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122. *See* Florrie Young Roberts, *Off-Site Conditions and Disclosure Duties: Drawing the Line at the Property Line*, 2006 BYU L. REV. 957, 957–58 (2006).

123. *Id.* at 960–69.

124. *See, e.g.*, Kesner v. Superior Ct., 384 P.3d 283, 303–05 (Cal. 2016); Satterfield v. Breeding Insulation Co., 266 S.W.3d 347, 372–75 (Tenn. 2008); Olivo v. Owens-Ill., Inc., 895 A.2d 1143, 1150–51 (N.J. 2006).

125. *Kesner*, 384 P.3d at 294.

126. *Id.* (quoting Erlich v. Menezes, 981 P.2d 978, 983 (Cal. 1999)); *accord* Rowland v. Christian, 443 P.2d 561, 566–69 (Cal. 1968) (adopting an expansive approach to duty in negligence cases related to passive conditions on land, recognizing policy concerns with the traditional common-law categories for duties owed by occupiers of land).

127. *Kesner*, 384 P.3d at 295.

128. *Id.*

Tort law's foreseeability principle provides courts with a useful starting point for placing some limit on relationships for climate adaptation harms. With climate adaptation, the relevant scope of common-law relationships is not fixed in time by contract or by past or perceived status quo property entitlements. Rather, internalizing the costs associated with various activities surrounding climate adaptation will require a fluid, evolutionary approach to tort obligations and property entitlements, given continued climate change and expanding understandings of the adaption footprint, nonstationarity, and SETS effects. A failure to define duties to allow an individual harmed by another person's failure to adapt to foreseeable changes to climate or weather conditions would allow many adaptation harms, much like the harms of take-home asbestos, to escape without remedy.[129]

The essence of what we are suggesting is a presumption of the "foreseeability of nonstationarity" in addressing the scope of private law obligations. This recognizes and promotes knowledge that climate extremes, averages, and relationships are in constant flux, requiring actors to anticipate that the next storm is the new worst storm, that sea levels are rising, and that actions they take reverberate within their adaptation footprints. Defining a duty to adapt based on a foreseeability of nonstationarity principle certainly presents some new challenges for courts, but these are not unfamiliar in kind. As Judge Cardozo famously noted in *Palsgraf v. Long Island Railroad*, a duty is triggered where "the eye of vigilance perceives the risk of damage" but not where no hazard is "apparent to the eye of ordinary vigilance."[130] Tort law's foreseeability principle will thus require courts to assess facts related to the risks of various activities, albeit at a general contextual level.

As a practical matter, applying a foreseeability principle hinges on the degree of certainty to which harms to a specific set of persons can be reasonably identified.[131] Though recognized as a classic issue of law, recognition of a duty ultimately depends on the contexts in which specific individuals and private entities interact, and the nature of these interactions. Modern understandings of the adaption footprint, nonstationarity, and SETS effects can inform how societal understandings of reasonable foreseeability have expanded to include

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129. For the general argument that the recognition of new duties in tort law based on negligence can help to induce safer conduct through a relational notion of negligence emphasizing a "loci of responsibility" grounded in duty, see John C.P. Goldberg & Benjamin C. Zipursky, *Accidents of the Great Society*, 64 MD. L. REV. 364 (2005).

130. 162 N.E. 99, 99–101 (N.Y. 1928). Judge Andrew's dissenting opinion conceives of an even more expansive form of the duty of care, "imposed on each one of us to protect society from unnecessary danger, not to protect A, B, or C alone." *Id.* at 102 (Andrews, J., dissenting).

131. *See id.* at 101 (majority opinion).

adaptation risks in light of climate change. Importantly, however, the use of these general facts in applying the foreseeability principle to define common-law obligations operates at a broad level of generality. The definition of duty based on foreseeability hinges on general facts related to the risk of harm but (unlike the establishment of other tort elements) does not depend on specific scientific consensus of causation.[132]

A significant challenge courts will face in applying this principle is how to define the scope of obligations for adaptation without embracing arbitrary limitations based on technical formalities. As a basic principle of tort law, courts generally acknowledge that a duty is not owed to the world at large; rather, the private law of negligence is fundamentally relational. This requires courts to define limits on obligations. In the context of second-hand asbestos, for example, the California Supreme Court did not find that employers owe a duty to the world at large for injuries from second-hand asbestos but limited the scope of the duty to members of the worker's household.[133] The court reasoned that, while the foreseeable risks of harm from asbestos weighed in favor of recognizing a duty, policy did not undermine the need to recognize a duty of care. In fact, policy concerns also advised in favor of placing some limit on the scope of these obligations.[134] Similarly, in assessing a utility's liability to noncustomers for physical injury occurring during a mass blackout, the New York Court of Appeals recognized "an ability to extend the defendant's duty to cover specifically foreseeable parties but at the same time to contain liability to manageable levels" as central to defining the scope of the utility's duty.[135] In addressing harms related to building maintenance, the New

132. *Kesner*, 384 P.3d at 293 (noting no requirement of "scientific consensus to establish foreseeability in the context of duty analysis").

133. *Id.* at 298 ("By drawing the line at members of a household, we limit potential plaintiffs to an identifiable category of persons who, as a class, are most likely to have suffered a legitimate, compensable harm.").

134. *Id.* at 295. Relevant policy considerations include

> the moral blame attached to the defendant's conduct, the policy of preventing future harm, the extent of the burden to the defendant and consequences to the community of imposing a duty to exercise care with resulting liability for breach, and the availability, cost, and prevalence of insurance for the risk involved.

Id. at 294–295 (quoting Rowland v. Christian, 443 P.2d 561, 567 (Cal. 1968)).

135. Strauss v. Belle Realty Co., 482 N.E.2d 34, 37–38 (N.Y. 1985). Even though the utility's obligation to provide service to a customer was "rooted in contract," the court recognized that this obligation can also "engender a duty owed to those not in privity." *Id.* at 36. This is consistent with other jurisdictions that recognize that the status of a plaintiff as a customer is not determinative of whether a duty of care is owed when utility service is interrupted and the interruption causes harm. Goldberg v. Fla. Power & Light Co., 899 So. 2d 1105 (Fla. 2005) (noting that that an electric utility that had discontinued power to repair a line owed an obligation to a private motorist who was harmed at a traffic intersection). An earlier Florida case that defined duty for utilities based

York Court of Appeals reasoned that a business defendant owes a duty to "a known and identifiable" group so long as the business functions being performed are not directed to a "faceless or unlimited universe of persons."[136]

To the extent that courts must place limits on the scope of duty, climate adaptation's guideposts provide some useful tools to help courts strike a nonarbitrary policy balance between expanding obligations to address adaptation risks and the burdens that new obligations are likely to impose on defendants and society more generally. With respect to physical or property harms to those in the foreseeable geographic footprint of climate adaptation, it is efficient to expand protected relationships to include harms associated with adaptation as a way of internalizing the costs of harm. But at some level, concerns with opening up the floodgates of litigation may compel a court to limit the scope of relationships giving rise to private rights and duties in light of climate adaptation to an identifiable and discrete set of individuals and private entities. Courts also need to be mindful of the availability of insurance, and in situations where the victim is readily able to insure for adaptation risk, a narrower definition of obligations may be appropriate. Moreover, to the extent that the harms from adaptation take on a nonphysical form—such as economic loss or emotional harm—there is a concern that a floodgate of small claims with difficult causation issues could crowd out the ability of courts to address the most significant harms and losses in a way that promotes society's responsibilities towards its most vulnerable victims.[137]

The foreseeability approach to defining the scope of obligations in private law has especially important implications for how we

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on a foreseeable zone of risk approach observed, too, that though power companies "are not insurers, they nevertheless must shoulder a greater-than-usual duty of care in proportion to the greater-than-usual zone of risk associated with the business enterprise they have undertaken"—particularly since "[e]lectricity has unquestioned power to kill or maim." McCain v. Fla. Power Corp., 593 So. 2d 500, 504 (Fla. 1992).

136. Palka v. Servicemaster Mgmt. Servs. Corp., 634 N.E. 189 (N.Y. 1994) (allowing hospital employee to sue contractor who negligently installed a fan that fell and injured her, even though she was not specifically identified in the contract). Relevant factors include "reasonably interconnected and anticipated relationships; particularity of assumed responsibility under the contract and evidence adduced at trial; displacement and substitution of a particular safety function designed to protect persons like this plaintiff; and a set of reasonable expectations of all the parties." *Id*. at 194–95.

137. For discussion of how these concerns often lead to limited duties in negligence for pure economic loss or emotional harm cases, see Peter Benson, *The Problem of Pure Economic Loss*, 60 S.C. L. REV. 823 (2006), discussing how tort law traditionally disfavors recovery for pure economic loss in negligence; and Betsy J. Grey, *The Future of Emotional Harm*, 83 FORDHAM L. REV. 2605 (2015), discussing traditional common-law limitations on duty for negligent recovery of emotional distress, and calling into question these duty limitations where emotional harm can be validated through scientific evidence.

understand the adaptation footprint for infrastructure. To date, the world's existing infrastructure has (reasonably) been built based on stationarity-based planning and assumptions. But it is already showing signs of stress as temperatures and other conditions move into nonstationarity. For example, when temperatures in the U.K. reached 40°C in July 2022, surpassing all historical records, "parts of the rail network came close to paralysis because the rails on British track beds are optimised to be stress-free at 27°C. Temperatures in the high 30s are outside their comfort zone."[138] Infrastructure of all types face this problem going forward,[139] with failures potentially cascading across interdependent infrastructural lines and across multiple sectors.[140] It is essential, therefore, that public and private infrastructure designs anticipate nonstationarity and the potential for any one component of the interdependent infrastructure system to threaten the entire system and the associated SETS.[141] In other words, going forward, infrastructure developers must abandon stationarity-based planning and consider how climate change will act on the infrastructure over its anticipated useful lifetime—inevitably expanding the scope of their obligations towards others for harm.

Foreseeability of nonstationarity can also provide a useful starting principle for courts addressing obligations in property disputes related to climate adaptation. The property doctrines most likely to be affected by climate adaptation litigation will intersect with tort law (e.g., nuisance claims for failure to adapt) or contract law (e.g., interpretation of covenants regarding adaptation measures). Specialized property doctrines recognize that one property manager's actions have competing and spillover effects on other property managers spatially (e.g., the doctrine of support) and temporally (e.g.,

138. *Today's Heatwaves Are a Warning of Worse to Come*, ECONOMIST (July 20, 2022), https://www.economist.com/leaders/2022/07/20/todays-heatwaves-are-a-warning-of-worse-to-come [https://perma.cc/X8L2-WRB8].

139. *See* IPCC, IMPACTS, *supra* note 11, at 18–19 ("In cities and settlements, climate impacts to key infrastructure are leading to losses and damages across water and food systems, and affect economic activity, with impacts extending beyond the area directly impacted by the climate hazard . . . .").

140. *See id.* at 18 ("Multiple climate hazards will occur simultaneously, and multiple climatic and non-climatic risks will interact, resulting in compounding overall risk and risks cascading across sectors and regions. Some responses to climate change result in new impacts and risks."); Bondank & Chester, *supra* note 69, at 1–2 ("The complexity of interactions causes failures to cascade in unpredictable ways, often between different infrastructure systems.").

141. *See* IPCC, IMPACTS, *supra* note 11, at 24 ("Considering climate change impacts and risks in the design and planning of urban and rural settlements and infrastructure is critical for resilience and enhancing human well-being . . . .").

the doctrine of waste).[142] Climate adaptation will present new kinds of competing interests and spillover issues (e.g., failure to protect against sea-level rise) and new conceptions of how far these spillover effects extend in each owner's adaptation footprint. Just as in tort law, therefore, courts addressing property disputes will need to define the scope of obligations, and a sense of the foreseeability of nonstationarity can help to inform the spatial and temporal implications of an expanded adaptation footprint for various uses of property in the context of climate adaptation.

For example, does a property owner's failure to invest in a seawall or levee create an obligation to neighboring property owners who suffer harm as a result? This kind of infrastructure investment presents a classic holdout problem where private governance may fail to produce sufficient investments in adaptation. At the extreme, government may invest in adaptation measures, such as seawalls, and could draw on eminent domain power to overcome these holdout problems. But private law remedies may also play a role in encouraging investments in adaptation. Nuisance law might draw on foreseeability principles in addressing potential adaptation liability related to conditions of land. Many (though not all) climate adaptation harms will be traced to a failure to adapt property, such as a failure to build a seawall to protect neighboring property, or failure to safely manage vegetation and structures exposed to increasing wildfire risk. Tort law's foreseeability principle highlights how obligations related to nuisance law should be defined first and foremost with respect to the risks of harms rather than through formalities such as an action/inaction distinction.[143] The foreseeability of nonstationarity principle can inform how other property law doctrines, such as the doctrine of waste, might be invoked to require adaptive management of property.[144]

142. *See* Christopher Serkin, *What Property Does*, 75 VAND. L. REV. 891, 895 (2022) (arguing that property law "is best understood as mediating between competing reliance interests that can change over time").

143. *See* H.R. Moch Co. v. Rensselaer Water Co., 159 N.E. 896, 898 (N.Y. 1928) ("If conduct has gone forward to such a stage that in action would commonly result, not negatively merely in withholding a benefit, but positively or actively in working an injury, there exists a relation out of which arises a duty to go forward."); *id*. ("The query always is whether the putative wrongdoer has advanced to such a point as to have launched a force or instrument of harm, or has stopped where inaction is at most a refusal to become an instrument for good."); *see also* Christopher Serkin, *Passive Takings: The State's Affirmative Duty to Protect Property*, 113 MICH. L. REV. 335, 378 (2014) ("By defining the content of property, the government is analogous to the driver who sets the car in motion. The government cannot later claim that it did not act when that definition of property comes crashing into some new reality.").

144. *See* Niiro, *supra* note 30, at 677 (discussing how waste doctrine can be used to invoke tenants to protect their property located in vulnerable areas).

Small-scale disputes like those between adjacent owners or landlords and tenants over physical damages such as flooding will present fairly straightforward facts regarding the scope of obligations. Property owners along coasts are likely well aware that storms are worsening, and in western states they are likely well-informed of heightening wildfire risks and intensity. Particularly given that these kinds of disputes are likely to recur frequently, courts can develop rules of practice regarding how property managers are expected to account for extreme storms, drought, and other novel conditions, and guard against harming adjacent properties and other interests obviously in harm's way. Property law will be less effective, however, when risks are systemic and cumulative at larger scales, such as in a community that generally is not practicing sound vegetation management for wildfire control. If mismanagement of property is the community norm, property law will find it difficult to assign liability to particular owners when a storm or wildfire harms all properties. Public regulation is likely to be more effective and necessary in defining baseline property management practices. Insurance can also play a role in protecting against such risks. With respect to some of the most significant property risks associated with climate change, however, such as protecting against hurricane damage in Florida or wildfire risk in California, concerns abound regarding the effectiveness and administration of insurance programs;[145] so, it is not clear that private insurance alone can address adaptation risks without some recognized clarification of the scope of liability for a failure to adapt.

2. Private Obligations as a Safeguard Against Maladaptation

While recognition of a clear duty to adapt is important, expanding private law obligations related to climate adaptation harms should not serve as a one-way ratchet for courts to endorse investments in adaptation at all costs. Private investments in adaptation can produce benefits, but they also can present new forms of risk and harm. Private law's recognition of obligations can also help to protect against wasteful or harmful forms of private adaptation to climate harms.

Consider, for example, coastal erosion and property disputes between neighbors associated with sea-level rise. With increased attention to sea-level rise, private property owners often fixate on the question of "how can I protect *my* shoreline?" Not surprisingly, through collective political decisions many coastal communities have invested

145. *See, e.g.*, CAL. DEP'T OF INS., TRIAL BY FIRE: MANAGING CLIMATE RISKS FACING INSURERS IN THE GOLDEN STATE (2018), https://www.law.berkeley.edu/wp-content/uploads/2018/09/Trial-by-Fire-September-2018.pdf [https://perma.cc/R8Q5-RCPQ].

public resources in seawalls or levees to protect private property owners.[146] But some private property owners face stronger incentives to make their own investments in seawall fortification, and some property owners have greater capacity to make their own investments in adaptation. For example, as a way of protecting what are perceived as existing property entitlements, a private neighborhood association may invest in seawall fortifications to protect existing property owners in a community.

But even well-intentioned investments by property owners who voluntarily take the initiative to manage climate adaptation, such as those who build private seawalls and levees to protect their own property, can impose significant harms on others. Seawalls and levees are especially likely to cause feedback harms to neighboring communities in bays and on estuaries due to their partially enclosed nature.[147] Similarly, a landowner who improves her residential resilience to storm surges by building her home on a raised open platform (on stilts) may simply be shifting the problem inland. Some jurisdictions go so far as to ban property owners from building fortifications without prior regulatory approvals, and some require homes be built on raised open platforms.[148] Absent an ex ante collective prohibition on fortifications or rule about building structures, to what extent do those who make an adaptation investment in such measures owe an obligation to those property owners in nearby (often downstream) unprotected communities who have not made similar investments, or to those who may incur greater sea level fortification costs due to hydrodynamic effects? Does this require the recognition of new rights and duties beyond those private property owners who make actual investments in sea level rise fortifications or building resilience measures to protect existing property entitlements?

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146. *See* Ruhl, *Climate Adaptation Law*, *supra* note 7, at 621–24; *see also* Jeroen C.J.H. Aerts et al., *Evaluating Flood Resilience Strategies for Coastal Megacities*, 344 SCIENCE 473 (2014); Audrey Bailles, Manuel Garcin & Thomas Bulteau, *Assessment of Selected Climate Change Adaptation Measures for Coastal Areas*, 185 OCEAN & COASTAL MGMT. 105059 (2020).

147. *See* Michelle Hummell, Robert Griffin, Katie Arkema & Anne D. Guerry, *Economic Evaluation of Sea-Level Rise Adaptation Strongly Influenced by Hydrodynamic Feedbacks*, PNAS, July 12, 2021, art. e2025961118, at 1.

148. For example, South Carolina has banned seawalls, though many states such as Florida and California allow coastal armoring subject to permitting, typically with some assessment of adverse impacts. *See* Robert S. Young, *Florida Without Its Beaches: Seawall Dooms State Oceanfronts*, ORLANDO SENTINEL (Sept. 25, 2017, 1:15 PM), https://www.orlandosentinel.com/opinion/os-ed-florida-without-beaches-blame-seawalls-20170925-story.html [https://perma.cc/Y3W5-K8DD]; *see also* MOLLY LOUGHNEY MELIUS ET AL., STANFORD L. SCH., 2015 CALIFORNIA COASTAL ARMORING REPORT: MANAGING COASTAL ARMORING AND CLIMATE CHANGE ADAPTATION IN THE 21ST CENTURY (2015).

Failure to recognize obligations towards other property owners for harms caused by seawall fortifications and other adaptive responses could lead to overinvestment in adaptation measures that are likely to cause harm to others. These harms are likely to be most significant for disadvantaged and minority communities that cannot afford their own fortification measures but who suffer hydrodynamic feedback effects due to other communities' investments in sea-level rise fortifications.[149] It is thus appropriate for the common law to recognize private claims against those who invest in adaption in a manner that causes harm to another property owner. Foreseeability also provides a useful principle in recognizing how investments in adaptation can produce new harms if the interests of other property owners, including those who live in unprotected communities, are not considered in building seawalls or levees. In addition to recognizing new relationships under the private law, it is also appropriate for courts to limit the scope of obligations based on climate adaptation's policy guideposts—even where some harm may be foreseeable.

3. Clearer Guidance for Private Stakeholders

Importantly, recognition of expanded private law obligations to exercise reasonable care regarding climate adaptation is not a roving invitation for courts to make collective decisions about adaptation measures. If and when courts get involved in particular disputes, application of the common law to private disputes helps to inform the expectations of the specific parties to a dispute. Less appreciated is a point that is central to what is known as "the new private law":[150] Beyond the resolution of specific disputes, clarification of private obligations related to climate adaptation can produce much-needed guidance for private individuals and entities as they take the initiative of managing the future risks of harm associated with climate adaptation.

Against the backdrop of private law, "private governance" provides a self-ordering mechanism for private parties and entities to manage the level and allocation of risks in their relationships within perceived adaptation footprints.[151] Individuals and private entities

149. *See* Hummel et al., *supra* note 147 (discussing the regional economic damages stemming from shoreline fortification in the San Francisco Bay).

150. *See, e.g.*, Goldberg, *supra* note 5, at 1651–63 (discussion of new perspectives on private law and the distinction between what is private and what is public).

151. Private environmental governance occurs when private individuals or organizations perform traditional governmental functions, such as providing public goods or managing externalities. For discussion of the benefits of private governance, see MICHAEL P. VANDENBERGH & JONATHAN M. GILLIGAN, BEYOND POLITICS: THE PRIVATE GOVERNANCE RESPONSE TO CLIMATE

may—and the law should encourage them to—enter into agreements between themselves to address the potential harms related to climate adaptation.[152] As a response to adaptation risks in a coastal community, for example, a private developer of a commercial project could invest in seawalls to protect not just its own assets but also to help protect other property owners in a community.[153] A private property owner who faces risks of harm from flooding might be able to purchase insurance—a contractual solution to potential adaptation harms—to address these risks. Commercial and residential lease provisions can allocate responsibilities for maintaining adaptation measures. Manufacturers, too, can build some redundancy into supply chains to guard against interruptions caused by outlier storms.

While private governance can address many adaptation risks, "far too little is known about its potential drivers, challenges, benefits, and risks."[154] Private governance may ultimately prove incapable of addressing the full range of problems that climate adaptation presents.[155] But at the very least, clarifying the scope of legal obligations makes private bargaining about adaptation more likely. By clarifying the scope of relationships related to climate adaptation, grounded in legal doctrines related to duty and other obligations, the law is more likely to reinforce socially beneficial practices among private individuals and entities as they make decisions to invest in various approaches to managing climate adaptation risks.

Consider, for example, property harms from flooding. To the extent that courts clearly define the scope of obligations to recognize a duty for harm, property owners who are not protected by tort law are more likely to purchase private insurance. Even if insurance for adaptation harms is not presently available, the clarification of private obligations could help to encourage the development of new forms of

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CHANGE (2017); and Michael P. Vandenbergh, *Private Environmental Governance*, 99 CORNELL L. REV. 129 (2013).

152. Importantly, we distinguish between "private governance"—voluntary, noncollective solutions among stakeholders—and "private law"—which relies on judicial enforcement to effectuate a collective response through the common law.

153. For an exploratory discussion of private adaptation measures, see Michael P. Vandenbergh & Bruce M. Johnson, *The Role of Private Environmental Governance in Climate Adaptation*, FRONTIERS CLIMATE, Sept. 10, 2021, art. 715368, at 1.

154. *Id.* at 5.

155. A recognized weakness of private sector approaches is that they can lead to undesirable outcomes where market and social pressures do not align with the public interest. Vandenbergh, *supra* note 151. Successful private governance of adaptation requires private parties to identify risks ex ante and to bargain for terms in a contract. Ex ante bargaining between parties about adaptation harms may prove especially unlikely in situations where potential victims discount extreme (or tail) risks, or where the harms associated with adaptation are diffuse across multiple victims (rather than concentrated on a few).

private insurance. It is therefore most appropriate for courts to impose limits on the scope of liability in those situations where vulnerable property owners are most likely to have the capacity to insure against climate adaptation harms. Clarification of a limited scope of obligations for a failure to adapt to climate risks could also encourage mortgage or other lenders to take these risks into account in deciding whether to loan money to land purchasers, commercial developers, and infrastructure projects.

An expanded adaptation footprint and accompanying recognition of legal obligations related to adaptation should also provide useful guidance to parties in approaching commercial arrangements. Contracting parties who have clear obligations are more likely to use ex ante bargaining to contract around the law's obligations, to the extent that they wish to modify defaults. For example, this should lead to clearer efforts to waive liability in electric power sales contracts, especially in those situations where a customer is as well positioned as a utility to protect against service interruption due to extreme weather. With recognition of an expanded scope of obligations, commercial parties will also be more likely to develop boilerplate contract provisions addressing adaptation risks with upstream suppliers. Over time, this should help to encourage the development of boilerplate language in various commercial contexts for recurring forms of adaptation risk.[156]

B. Responsibilities for Climate Adaptation

As with delimiting the scope of relationships, private law's definition of responsibilities is likely to face pressures to evolve as courts address climate adaptation's risks. Courts will face inevitable pressure to expand liability for climate adaptation harms, especially in those situations where there are high levels of uncertainty associated with climate disputes (underscored by the precautionary principle guidepost). While some of the highest-profile adaptation disputes to date involve strict liability for wildfire harms caused by utilities,[157] climate adaptation is an unlikely candidate for the private law to move in the direction of strict liability.[158] Rather, courts applying common-law principles will provide the most benefit for stakeholders by applying

156. Supply chain contracts are one commercial scenario where contractual boilerplate concerning adaptation risks could play an increasingly important role. *See* Michael P. Vandenbergh & Patricia Moore, *Governance by Contract: The Growth of Environmental Supply Chain Contracting* (Vanderbilt Univ. L. Sch. Legal Stud. Rsch. Paper Series, Working Paper No. 22-07, 2022), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4098237 [https://perma.cc/7JJ9-7M4D].

157. *See infra* notes 162–163.

158. *See infra* Section III.B.1.

a negligence principle to adaptation disputes, allowing flexibility in the evolution of the standard of care and for greater experimentation with jurisdictional approaches to adaptation. In defining the responsibilities of various stakeholders, courts also need to revisit the viability of the act of God defense to recognize that in the Anthropocene epoch, predictions about climate adaptation are increasingly embedded in the expectations of private individuals and entities.

1. Reducing Risks and Producing Better Information About Risk Management

In assigning responsibility for climate adaptation, courts will need to define the substantive standard of care applicable to climate adaptation harms. Many climate adaptation injuries, including some of the most extreme adaptation harms (e.g., property damage from wildfires or hurricanes; failure of major infrastructure), are notoriously difficult to predict in terms of locational impacts and severity. These uncertainties suggest some need to be attentive to the precautionary principle guidepost in assessing the legal grounds for assigning responsibility for climate adaptation.

With respect to emerging and incompletely understood risks of harm, including those associated with climate change, some have suggested that tort law invoke strict liability, rather than negligence. David Weisbach argues that the most workable method of assigning responsibility for climate change mitigation is a strict liability approach rather than negligence (which he finds unworkable).[159] In contexts where there is great uncertainty, strict liability may have particular appeal as a categorical approach to cost internalization. For example, Tom Merrill and David Schizer propose a form of strict liability for contamination harms that hydraulic fracturing for natural gas or oil may cause to groundwater.[160] They view strict liability in the context of harms to groundwater from fracking as a "form of protection for those injured by technological innovations, while information gradually accumulates that may eventually lead to more protective ex ante regulation."[161]

With respect to climate adaptation harms, in contexts where there is uncertainty about future risks and harms, to what extent should private law take a similar approach to liability, in the hope that

159. David Weisbach, *Negligence, Strict Liability and Responsibility for Climate Change*, 97 IOWA L. REV. 521, 560–61 (2012).

160. Thomas W. Merrill & David M. Schizer, *The Shale Oil and Gas Revolution, Hydraulic Fracturing, and Water Contamination: A Regulatory Strategy*, 98 MINN. L. REV. 145, 259 (2013).

161. *Id.*

we will eventually learn enough about how technologies and related harms to regulate them in the future? This is hardly a hypothetical question. The most high-profile climate adaptation litigation to date—involving utility liability for property damaged by massive wildfires in California—applied strict liability for climate-induced wildfire risks.[162] Under this doctrine, Pacific Gas & Electric ("PG&E") was forced to bear liability for billions of dollars in devastation caused by wildfires connected to its operations in 2017 and 2018.[163]

California's approach to utility wildfire liability is unique and has little foundation in tort doctrine, which typically reserves the application of strict liability to a defendant engaged in an "abnormally dangerous activity"—i.e., an activity that produces a "highly significant risk of physical harm even when reasonable care is exercised" and is "not one of common usage."[164] In contrast to California's strict liability approach for wildfires, most jurisdictions would consider allegations that a utility failed to meet technical standards in operation or planning of the grid under a negligence standard.[165] Uncertainty abounds with climate adaptation, but this alone should not point courts to strict liability for most climate adaptation risks. As we suggest above, there is some question regarding how useful the precautionary principle is in addressing climate adaptation risks, especially in situations where private law seems to encourage voluntary private investments in infrastructures and technologies to respond to adaptation that are untested and that may present some new forms of risk. To the extent that courts do see value to the precautionary principle in addressing climate adaptation, it is most likely to be appealing in the context of catastrophic risks. Even in that context, strict liability is best preserved

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162. Under the California Constitution, the state applies a doctrine of inverse condemnation to electric utilities, imposing strict liability for any wildfire caused by utility equipment. COMM'N ON CATASTROPHIC WILDFIRE COST & RECOVERY, FINAL REPORT OF THE COMMISSION ON CATASTROPHIC WILDFIRE COST AND RECOVERY 4 (2019); *see also* Jeremy Gradwohl, Comment, *Electric Utility-Cased Wildfire Damages: Strict Liability Under Article I, Section 19 of the California Constitution*, 92 TEMP. L. REV. 595 (2000) (describing the California inverse condemnation approach as "unique").

163. Pac. Gas & Elec. Co., Inv. No. 19-06-015, at 3 (Cal. Pub. Utils. Comm'n May 7, 2020), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M336/K236/336236538.pdf [https://perma.cc/FF3M-98JH] (summarizing the settlement over harms from the 2017 and 2018 wildfires caused by PG&E); *see also* Ivan Penn, Lauren Hepler & Peter Eavis, *PG&E Reaches $13.5 Billion Deal with Wildfire Victims,* N.Y. TIMES (Dec. 6, 2019), https://www.nytimes.com/2019/12/06/business/energy-environment/pge-wildfire-victims-deal.html [https://perma.cc/2F2W-JRY8].

164. RESTATEMENT (THIRD) OF TORTS: PHYSICAL & EMOTIONAL HARM § 20(b) (AM. L. INST. 2010).

165. *See* Rossi & Panfil, *supra* note 77, at 1176 (noting that jurisdictions other than California apply a negligence standard); David Hunter & James Salzman, *Negligence in the Air: The Duty of Care in Climate Change Litigation*, 155 U. PA. L. REV. 1741 (2007).

for exceptional situations in which a defendant clearly has superior control over the levels of risk and ensuing harm associated with adaptation.

From the perspective of efficiency, the application of strict liability to climate adaptation produces no incentive for potential victims to invest in risk reduction. Potential victims protected by strict liability are effectively insured through the tort system and, thus, lack the incentive to purchase private insurance, even when insurance is readily available and within economic reach. To the extent that strict liability serves as a form of insurance against harms, it can also present a moral hazard problem. For example, a guarantee of recovery may encourage homeowners to move to areas that are vulnerable to wildfire or hurricane risk, increasing the overall risk of harm associated with extreme climate events. By contrast, in contexts where insurance is available or victims can reduce risks associated with climate adaptation—situations that might be said to present reciprocal risk management opportunities—we argue that a negligence standard is more appealing.[166] Strict liability should therefore be invoked as a basis for liability for adaptation harms in situations where unconventional technologies are voluntarily invoked to manage adaptation—scenarios that we define above as maladaptation—and there is little or no likelihood of victim insurance or reciprocal opportunity for risk reduction.[167]

Moreover, whatever benefits strict liability has for cost internalization, a strict liability approach does not generate any information or provide guidance to individuals or entities about ways to reduce risk across various activities.[168] Unlike a strict liability approach, which would automatically impose liability on those who

166. *Cf.* George Fletcher, *Fairness and Utility in Tort Law*, 85 HARV. L. REV. 537 (1972) (arguing that negligence is the appropriate rule for reciprocal risks, while strict liability should only be reserved for nonreciprocal risks). Fletcher is focused on fairness as much as efficiency, but our point is that reciprocity of similar risks of harm also presents opportunities for more efficient risk management.

167. For example, it might have some application to novel industrial investments in technology to address adaptation risks—such as the use of new pesticides or genetically modified crops to increase food production in light of new weather patterns—but not to those situations involving conventional activities that are reciprocal, such as most harms between neighbors in managing property. An exception might be nonreciprocal harms between neighbors—e.g., blasting activities by a neighboring property owner to manage increased risks of landslides due to climate change or a commercial establishment's storage of rainwater for irrigation purposes to manage drought. Also, we recognize that traditional property torts outside of negligence, such as trespass, will have some role to play in the management of property disputes related to the management of adaptation risks.

168. For similar reasons, Holly Doremus advocates against a strong preventative approach to managing environmental harms where there is scientific uncertainty, instead favoring the kind of learning that can be produced through iterative policy management. *See* Doremus, *supra* note 109.

cause harm associated with climate adaptation, a negligence standard applies case-by-case, judging behavior across different factual contexts. Iterative decisions about the appropriate kind of conduct allow judges and juries to learn and react to real-world developments over time. Such an approach is well suited to situations where technologies and industry customs are developing in response to new forms of risk. As Cathy Sharkey observes, negligence "can set in motion experimentation with various risk-minimization methods, with different jurisdictions embracing various measures to avoid, mitigate, and/or adapt to risks of harm."[169] Tort cases applying a standard of care can thus serve as a "dynamic trial and error process," generating and assessing "additional information regarding both risks and innovative techniques for mitigating and/or adapting to those risks."[170]

This allows private law to fill "gaps" in climate adaptation regulation, but that is not all it does. It also envisions the outcomes of litigation, such as tort judgments, as proactively informing and serving as a catalyst for more protective regulatory approaches to climate adaptation.[171] To the extent that different jurisdictions take different approaches to defining the particulars of responsibilities, each state's common law can serve as a laboratory for policy experimentation. And over time, if significant inconsistencies in states' approaches were to develop, industry would be encouraged to lobby for uniform national regulation[172]—which might help to overcome collective action problems and national legislative gridlock to addressing various harms associated with climate adaptation.

2. Narrowing Defenses for Avoidable Climate Adaptation Harm

A long-standing tort defense excuses defendants from liability for harms caused by an "act of God."[173] Some jurisdictions call this the

169. Catherine M. Sharkey, *Common Law Tort as a Transitional Regulatory Regime: A New Perspective on Climate Change Litigation*, *in* CLIMATE LIBERALISM: PERSPECTIVES ON LIBERTY, PROPERTY AND POLLUTION 103, 104 (Jonathan Adler ed., 2023).

170. *Id.*

171. *See* Kysar, *What Climate Change Can Do*, *supra* note 4 (arguing that climate torts can help to inform regulatory solutions).

172. Sharkey, *supra* note 169 (manuscript at 2).

173. Rylands v. Fletcher [1868] 3 LRE & I. App. (HL) 330, 330 (appeal taken from Ir.) (citing Court of Excequer Chamber's recognition that *vis major* or act of God, where supported by the facts, can serve as an excuse to imposition of strict liability).

"vis major"[174] or "force of nature"[175] defense. A parallel doctrine of contract law is the force majeure defense, which commonly excuses a breaching party in the face of unusually severe, unexpected weather and other events.[176]

As a general matter, for example, an electric utility may only interrupt energy service in an emergency when it is reasonably necessary to safeguard the utility or the public, and this cannot be done in an arbitrary manner.[177] Well-established case-law principles recognize that a utility forced to interrupt service during an extreme weather event can be insulated from tort or contract liability for harms to customers if this event is attributed to an act of God.[178] In an early suit in Florida, a court found no liability for a disruption of service that directly resulted from a hurricane because as an act of God it provided a legal justification for nondelivery.[179] In other circumstances, courts might deny imposing liability where equipment malfunctions due to weather because a utility's tariff explicitly exculpates the utility from liability for disruptions caused by severe weather.[180]

Climate adaptation calls into question whether act of God should continue to serve as a defense at all to tort disputes related to climate adaptation. To begin, as has been recognized elsewhere,[181] the defense is doctrinally redundant, given tort law's requirements to establish

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174. *See* Goldberg v. R. Grier Miller & Sons, Inc., 182 A.2d 759, 761 (Pa. 1962) (emphasizing the need to instruct juries on *vis major* instead of act of God because the act of God defense is confusing and might encourage excusing wrongdoing due to divine intervention, and because a secular verdict requires "down-to-earth, tangible, mathematical analysis").

175. In the original *Restatement of Torts* and the *Restatement (Second) of Torts*, "force of nature" is used in lieu of "act of God." RESTATEMENT OF TORTS §§ 195 cmt. e, 290 cmt. h, 302, 324 cmt. b, 338 cmt. b, 349 cmt. b, 365 cmt. a, 368 cmt. e, 377 cmt. c, 450; 451, 470 cmt. a, 510, 522, 817 cmt. l, 848 cmt. b (AM. L. INST. 1934); RESTATEMENT (SECOND) OF TORTS §§ 7 cmt. c, 25 cmt. a, 195 cmt. e, 199 cmt. b, 290 cmt. i, 302, 314A cmt. d, 324 cmt. b, 338 cmt. b, 349 cmt. b, 365 cmt. a, 368 cmt. j, 377 cmt. c, 433A cmt. a, 442A cmt. a, 442B cmt. b, 443 cmt. a, 450, 451, 504, 510, 522, 817 cmt. m (AM. L. INST. 1965). *But see* RESTATEMENT (SECOND) OF TORTS § 328A cmt. b (AM. L. INST. 1965). The *Restatement (Third)* actually defines an "act of God" as "a serious and unusual adverse natural event." RESTATEMENT (THIRD) OF TORTS: PHYSICAL & EMOTIONAL HARM § 3 cmt. 1 (AM. L. INST. 2010).

176. For discussion, see Knoll & Bjorklund, *supra* note 30.

177. Nat'l Food Stores, Inc. v. Union Elec. Co., 494 S.W.2d 379 (Mo. Ct. App. 1973).

178. *See, e.g.*, Monolith Portland Midwest Co. v. W. Pub. Serv. Co., 142 F.2d 857, 859 (10th Cir. 1944).

179. *See* Fla. Power Corp. v. City of Tallahassee, 18 So. 2d 671 (Fla. 1944).

180. *See* Sheffler v. Commonwealth Edison, 955 N.E.2d 1110 (Ill. 2011) (refusing customer class action for service interruption where tariff limited recovery to malfunctions "not caused by weather"). *But see* Nat'l Union Ins. Co. of Pittsburgh v. Puget Sound Power & Light, 972 P.2d 481 (Wash. App. 1999) (refusing to allow an act of God defense to windstorm-related service interruption claim based on a tariff that limits damages that "result from" circumstances beyond the utility's control).

181. *See* Denis Binder, *Act of God? Or Act of Man?: A Reappraisal of the Act of God Defense in Tort Law*, 15 REV. LITIG. 1 (1996).

duty and causation. In negligence cases, invocation of the act of God defense might be understood as a shorthand way of concluding that a defendant owes no duty of due care because the plaintiff is not a foreseeable victim of anything within the care of the defendant in the first place.[182] But, if a court is simply using the act of God defense as a shorthand way to limit the scope of a defendant's duty for a category of cases associated with a catastrophic event, this could readily be addressed by a court as a policy limitation on duty and would not warrant an independent defense to a negligence claim.[183]

The act of God defense in tort also is redundant and unnecessary given the modern law of causation. Modern tort law does not require the identification of a single cause of harm and allows for the attribution of responsibility to intervening causes.[184] Where there is a preventable human cause of the harm within the control of the defendant (or where the defendant exercising reasonable care would make the harm avoidable), it is thus redundant—if not completely inappropriate—to apply the act of God defense.[185]

Some federal environmental statutes creating private environmental torts allow defendants to raise an act of God defense,[186]

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182. *Id*. at 78 ("If an event is truly so unforeseeable as to constitute an act of God, then there would, in fact, be no duty under traditional negligence analysis.").

183. Importantly, if the doctrine is simply a restatement of the duty element of negligence, it would not apply at all to strict liability torts, despite a long-standing line of cases recognizing that *vis major* or act of God is a defense to strict liability torts. *See* Rylands v. Fletcher, [1868] 3 LRE & I. App. (HL) 330, 330 (appeal taken from Ir.) (citing Court of Exchequer Chamber's recognition that *vis major* or act of God, where supported by the facts, can serve as an excuse to imposition of strict liability). As Gregory Keating has observed:

> The basis of the 'Act of God' doctrine is not as clear as one might hope. On one interpretation, the defendant had no "duty" with respect to these risks because they were so abnormal as to be unforeseeable. This sounds suspiciously like a negligence doctrine. On another interpretation, the relevant harms did not issue from the distinctive risks created by the presence of the abnormally dangerous activity.

Gregory Keating, *The Idea of Fairness in the Law of Enterprise Liability*, 95 MICH. L. REV. 1266, 1291 n.83 (1997).

184. According to the *Restatement (Third) of Torts*, "[w]hen a force of nature or an independent act is also a factual cause of harm, an actor's liability is limited to those harms that result from the risks that made the actor's conduct tortious." RESTATEMENT (THIRD) OF TORTS: PHYSICAL & EMOTIONAL HARM § 34 (AM. L. INST. 2010). Though framed as a potential limit on liability, this basically restates the principle of intervening causation and the recognition that there can be multiple actual causes of harm.

185. For a similar argument, see Binder, *supra* note 181, at 27.

186. The Clean Water Act ("CWA") shields an owner or operator of a vessel, onshore facility, or offshore facility from liability for cleanup costs if the discharge of oil or a hazardous substance was caused by an act of God, defined as "an act occasioned by an unanticipated grave natural disaster." 33 U.S.C. § 1321(a)(12). Congress adopted the CWA definition of "Act of God" verbatim in the Oil Pollution Act ("OPA") of 1990. 33 U.S.C. § 2701(1). Under the OPA, a responsible party is not liable for the discharge of oil and any resulting damages or cleanup costs if the sole cause was an act of God. 33 U.S.C. § 2703(a)(1). Congress expanded upon the CWA's definition in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"),

but as a practical matter, courts have not allowed the defense to insulate statutory tort defendants from liability.[187] Some state courts have also narrowed the application of the defense in a manner that effectively forecloses it whenever a plaintiff can establish concurrent causation. In *Arkansas Valley Electric Cooperative Corp. v. Davis*, the plaintiff was injured after coming into contact with a fallen electric power line after a storm.[188] The defendant utility argued that the injury was due to an act of God. The court concluded, however, that a jury could reasonably find that the utility had failed to replace a pole "which they knew to be deteriorated," and it held that "[i]f an act of God concurs with the negligence or fault of man to proximately cause damages, the negligence or fault is not excused by the act of God."[189] Effectively, this approach treats the act of God defense as a specific application of the law of concurrent cause.

To the extent that jurisdictions continue recognizing an act of God tort defense independent of the doctrines of duty and actual causation, its application needs to recognize that many climate adaptation risks do not adhere to assumptions of stationarity and that the no-analog future necessitates addressing adaptation risks even if past interventions were unnecessary or futile. Modern climate science suggests that extreme events are not rare and are increasingly foreseeable. So here, as in the assessment of relationships, we argue that the common law should presumptively recognize the foreseeability of nonstationarity. In many parts of the United States, the storm of record has effectively become the new normal due to increased variations in extreme weather patterns, and this will continue to be a moving target.[190] The nonstationarity of climate conditions, however, would suggest that no prior similar event is necessary to support tort liability. Even if the probability of an extreme weather event is very low

otherwise known as the Superfund law. Under CERCLA, an otherwise responsible party is not liable for hazardous substance cleanup costs if that party can prove, by a preponderance of the evidence, that the release and the resulting damages were caused solely by an act of God. 42 U.S.C. § 9607(b)(1). CERCLA defines an act of God as "an unanticipated grave natural disaster or other natural phenomenon of an exceptional, inevitable, and irresistible character, the effects of which could not have been prevented or avoided by the exercise of due care or foresight." 42 U.S.C. § 9601(1).

187. *See* Sarah Quiter, *Viability of the "Act of God" Defense in a Superstorm World*, HUNTON ANDREWS KURTH: THE NICKEL REPORT (Oct. 5, 2017), https://www.huntonnickelreportblog.com/2017/10/viability-of-the-act-of-god-defense-in-a-superstorm-world/ [https://perma.cc/7MDQ-JR2E] (noting that, though Congress recognized the act of God defense in theory in several federal environmental law statutes, there is no reported case applying this defense to preclude liability under these statutes).

188. 800 S.W.2d 420 (Ark. 1990).

189. *Id.* at 421, 423.

190. *See supra* Part I.A.

and cannot be grounded in a prior similar event in the specific locality, improvements in predictive modeling approaches (such as extreme scenario planning) will often allow private individuals or commercial entities to anticipate some probability of extreme events.[191]

Despite this, precedents in many jurisdictions still would allow an act of God defense to insulate a defendant from liability where a plaintiff does not present evidence of past similar weather events in the locality. According to the Alabama Supreme Court, for instance, an act of God defense "applies only to events in nature so extraordinary that the history of climatic variations and other conditions in the particular locality affords no reasonable warning of them."[192] Such an approach allows the defense to preclude tort liability for an unusual natural event if it is has not happened in that specific area. Even courts refusing to apply the act of God defense suggest that something cannot be an act of God where there is evidence that the same kind of event has occurred in the past,[193] suggesting that a lack of a prior similar event in the locality is a predicate to the availability of an act of God defense.

To the extent that an act of God defense applies at all to climate-related harms, the approach of these courts is misguided in failing to recognize the nonstationarity of climate conditions and the lack of a past analog for predicting the future. In contrast to those jurisdictions that define act of God with respect to a lack of evidence of prior similar weather in a locality, courts addressing climate adaptation torts must apply the act of God defense to only *wholly unforeseeable* weather patterns, given the current state of available climate science. In effect, a few jurisdictions already endorse this kind of doctrinal approach to the act of God defense. According to an early California Supreme Court opinion, for an act of God defense to succeed, "[T]he earth must be convulsed, the lightning must kindle the fire, the air must blow in tempests or tornadoes, and the water must come in waterspouts or sudden irruptions of the sea . . . by the forces of nature, uncontrolled and unaided by the hand of man . . . ."[194] California also recognizes that

191. *See* May Haggag, Ahmad S. Siam, Wael El-Dakhakhni, Paulin Coulibaly & Elkafi Hassini, *A Deep Learning Model for Predicting Climate-Induced Disasters*, 107 NAT. HAZARDS 1009 (2021).

192. Bradford v. Stanley, 355 So. 2d 328, 330 (Ala. 1978).

193. *See* Kennedy v. Union Elec. Co., 216 S.W.2d 756, 763 (Mo. 1948) (not an act of God if higher rainfalls occurred thirty-eight years earlier); McKinley v. Hines, 215 P. 301, 302 (Kan. 1923) (unusually severe blizzard was not an act of God since equally severe blizzards occurred in the past); Corrington v. Kalicak, 319 S.W.2d 888, 892 (Mo. Ct. App. 1959) (defining acts of God as events so "extraordinary that the history of climatic variations in the locality affords no reasonable warning of their coming"); Radburn v. Fir Tree Lumber Co., 145 P. 632, 633 (Wash. 1915) (declining to hold defendant liable for unprecedented natural causes such as extraordinary rainfall).

194. Polack v. Pioche, 35 Cal. 416, 417 (1868).

the natural forces behind an act of God must be "entirely independent of any human agency" and must be of a character that is "inevitable" and "irresistible."[195] As the California Supreme Court observed in rejecting an act of God defense based on an irregularly heavy rainfall, "[t]here is nothing in the nature of the rainstorm involved in this case which makes it so totally unforeseeable as to act as a superseding cause."[196]

Other cases suggest that extreme and record weather events are foreseeable and do not necessitate an act of God defense. In *National Food Stores*, a utility was unable to meet increased demand for power in response to what it claimed to be a record heat wave.[197] The plaintiff's suit alleged negligence for failing to properly notify customers of planned shutoffs during the emergency. But a Missouri appellate court recognized that a part of the duty includes planning for foreseeable or contemplated changes in consumer demand and that it was not necessary for the utility to have knowledge of a specific customer's susceptibility to damage.[198] Likewise, a New York court upheld a determination that a utility was liable for a failure to provide adequate power to a movie theater because it could have anticipated the outage.[199] The utility generated power from a dam, but when a mill upstream prevented water flow, it was unable to operate the plant adequately.[200] The court found it was reasonable for a jury to have concluded the utility could "have anticipated or expected such a situation to arise" and "should have made provision therefor."[201] Thus, in addressing the appropriateness of an act of God defense, many courts already routinely apply an obligation to properly plan to ensure adequate service based on the notion of a risk of harm to foreseeable victims within the control of the utility.

At the very least, courts should be suspicious of a defendant's claim that an unprecedented climate emergency is an automatic shield from liability based on an act of God. To the extent that courts considering climate adaptation torts are assigning responsibility based on cost-internalization principles, the key inquiry is whether risks and harms are avoidable (rather than inevitable), especially where there is

195. *Id*. at 417–18.

196. S. Pac. Co. v. City of L.A., 55 P.2d 847, 849 (Cal. 1936) (noting that "[r]ainfall is foreseeable in most places" and for this reason, there "is no point at which an expectable heavy rain becomes an act of God by reason of its unusual volume.").

197. Nat'l Food Stores, Inc. v. Union Elec. Co., 494 S.W.2d 379, 383–84 (Mo. Ct. App. 1973).

198. *Id*.

199. Curry v. Norwood Elec. Light & Power Co., 211 N.Y.S. 441 (Cnty. Ct., 1925).

200. *Id*. at 443.

201. *Id*. at 443–44.

evidence that that they resulted from a defendant's failure to exercise due care. This is consistent with the approach of states that would limit applicability of the act of God defense to instances where the damage caused by the severe weather is unpreventable.[202] As a practical matter, a party's liability still may hinge on the degree to which there are other foreseeable causal events within the control of the defendant—questions that a court and jury in tort law can address under doctrines related to breach and proximate cause. As one court has observed, the act of God defense "applies only to events in nature so extraordinary that the history of climatic variations and other conditions in the particular locality affords no reasonable warning of them."[203] Any application of an act of God defense should thus be limited to only those situations that are truly beyond a defendant's control, or are so extraordinary and unanticipated that they could not have been foreseen or prevented by the utility's exercise of reasonable care.

There are, of course, remaining questions about how much evidence of foreseeability is necessary to support liability under private law, but these are best adjudicated as facts before a jury related to the applicable standard of care. With respect to extreme events, courts should be mindful that a low-probability event does not preclude tort liability, even if it is a first-time event. By definition, extreme weather is a classic low-probability, high-impact event, and there is always some uncertainty about the behavior of the weather. For example, where an extreme weather event recurs over a commercial entity's business planning cycle (often five to ten years, and sometimes longer), or where a commercial firm has not itself made planning or risk assessment efforts related to climate, courts are well equipped to consider evidence related to predictive modeling. Although a past similar event is some evidence of foreseeability relevant to the issue of breach, the assessment of foreseeability in specific contexts should not fixate on whether there has been a past event as a touchstone of whether a future event is foreseeable. Rather, in assessing breach, courts need to consider the full range of predictive evidence that would be available to the industry, including data and forecasting techniques that can identify not only changes in average weather but variance in weather patterns.[204] Commercial entities, including electric and gas utilities, are

202. *Nat'l Food Stores, Inc.*, 494 S.W.2d at 382 (noting case law that limits the act of God defense to situations outside of the defendant's control).

203. McFarland v. Entergy Miss., Inc., 919 So. 2d 894, 903 (Miss. 2005) (citing federal cases from the Eleventh Circuit, Alabama, and Oklahoma precedents); *see also* Corrington v. Kalicak, 319 S.W.2d 888, 892 (Mo. Ct. App. 1959) (providing a similar definition for the act of God defense).

204. For a similar argument in the context of force majeure and climate change, see Knoll & Bjorklund, *supra* note 30.

better equipped to predict, with refined geographic and temporal specificity, impacts of climate change.[205] Knowledge is still evolving, but there is increasing capability to identify the physical risks of climate change to infrastructure and business operations with impressive specificity and foresight, with some available climate impact tools tailored to areas as specific in spatial dimension as a single square mile and updated on a daily, hourly, and minute basis.[206] In the context of utility planning, for example, such evidence is widely available to utilities and regulators, and is routinely used to model system peaks and plan for capital expenditures. Indeed, insurance companies and financial markets routinely offer risk management products to the industry that assess weather evidence on a granular basis.[207] If the act of God defense has any application at all to tort-related climate claims involving a defendant's commercial operations, it should be limited to situations where a first-time weather event is simply not knowable—though to the extent the risk of harm to a victim is wholly unforeseeable there would be no duty owed for the harm in the first place (again making the defense redundant, if courts limit the scope of duty).

Consider, too, contractual force majeure. In this context, contractual language excuses performance under various conditions, or in instances where there is no such language, doctrines of impossibility or impracticability may come into play.[208] Effectively, a force majeure clause allows the parties to a contract to allocate risks associated with

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205. Note as well that climate science likewise continues to advance in specificity with respect to the relationship between patterns of increasing emissions and climate change. This study of climate change attribution is generally outside the scope of this Article, as that level of granular prediction is not necessary to support the duty to adapt. For further discussion, see Sophie Marjanac & Lindene Patton, *Extreme Weather Event Attribution Science and Climate Change Litigation: An Essential Step in the Causal Chain?*, 36 J. ENERGY & NAT. RES. L. 265, noting how the science of event attribution may increasingly become a driver of climate litigation, especially to the extent that it informs predictions of future weather.

206. *See* U.S. GLOB. CHANGE RSCH. PROGRAM, 1 CLIMATE SCIENCE SPECIAL REPORT FOURTH NATIONAL CLIMATE ASSESSMENT 1 (2017).

207. For example, like other companies, utilities can purchase weather hedges, a derivative investment that allows companies to manage the risk of financial consequences of unusually severe weather. *See* Joanne Morrison, *Managing Weather Risk: Will Derivatives Use Rise?*, FUTURES INDUS. 26 (Jan./Feb. 2009), https://www.cmegroup.com/trading/weather/files/Jan_Feb-WeatherRisk_rev.pdf [https://perma.cc/B9EG-D4FD]; *see also* Gabe Grosberg, *Can U.S. Utilities Weather the Storm*, S&P GLOB. (Nov. 8, 2018), https://www.spglobal.com/en/research-insights/articles/can-u-s-utilities-weather-the-storm [https://perma.cc/Q6CV-F6FE] (noting that utilities are increasingly using innovative financial products to address extreme weather risks, "including catastrophic bonds and weather derivative bonds").

208. *See* RESTATEMENT (SECOND) OF CONTS. § 261 (AM. L. INST. 1981) (addressing the impracticability of performance). According to the *Restatement (Second) of Contracts*, "extreme impracticability of performance may properly be regarded as having the same effect as strict impossibility of performance," and performance is impossible when "it can only be done at an excessive and unreasonable cost, for which the parties had not bargained." 17A AM. JUR. 2D *Contracts* § 643 (2020) (summarizing the *Restatement* rule).

specified conditions, which sometimes include unusually severe or unexpected adverse weather.[209] Such clauses are subject to contract negotiation and their terms and obligations may vary across different industries. Where contractual terms are ambiguous, however, a similar principle—i.e., given a presumption of nonstationarity, is the risk readily avoidable?—should apply to their interpretation. As with tort law's act of God defense, the ultimate question for a court faced with a weather-based force majeure defense to breach of contract is the extent to which the parties to a contract can control the risks of harm related to severe weather interruptions. At some level, the expectations of the parties at the time of contracting—or, in the case of an ongoing supply arrangement, at the time that contractual obligations were renewed—are relevant, and some factual assessment of the parties' expectations should inform the interpretation of ambiguous force majeure terms. Importantly though, the expectations of the parties are just the beginning, not the end, of the judicial assessment of force majeure.

As with torts, where clear evidence of actual expectations is lacking, courts addressing contractual force majeure claims are attentive to whether the party claiming force majeure could have prevented the harm. According to the Third Circuit, "[Force majeure] shall not mean or include any cause which by the exercise of due diligence the party claiming force majeure is able to overcome."[210] Where a harm is avoidable, a party "must show that it tried to overcome the results . . . by doing everything within its control to prevent or to minimize the event's occurrence and its effects."[211] Such an approach provides ongoing incentives for parties to clarify expectations related to force majeure in future contract negotiations, to contractually assign risks to parties who are best positioned to control them, and to purchase insurance or seek alternative supply arrangements for weather contingencies.

Similar to the COVID-19 pandemic, which has resulted in changes to contractual force majeure boilerplate language related to health pandemics,[212] as contracting parties learn more about the effects

209. *See* sources on force majeure and climate change cited *supra* note 30.

210. Gulf Oil Corp. v. FERC, 706 F.2d 444, 448 n.8 (3d Cir. 1983).

211. *Id*. at 454; *see also* Constellation Energy Serv. of N.Y., Inc. v. New Water St. Corp., 46 N.Y.S.3d 25, 28 (App. Div. 2017) (force majeure based on Hurricane Sandy is not an absolute defense where the party invoking force majeure cannot establish that its failure to perform was the "unavoidable result of the storm").

212. *See Force Majeure Under the Coronavirus (COVID-19) Pandemic*, PAUL WEISS (Mar. 16, 2020), https://www.paulweiss.com/practices/litigation/litigation/publications/update-force-majeure-under-the-coronavirus-covid-19-pandemic?id=30881#_edn18 [https://perma.cc/79QB-XPJN]. For other assessments of contractual force majeure and COVID-19, see Alisa Baird, *Litigating an Invisible Enemy: Will the United States Insurance Industry Survive the COVID-19*

of climate and various approaches to adaptation, the underlying facts will change. Especially given our proposed presumption of foreseeability of nonstationarity, in evaluating force majeure the primary focus for judicial assessment of ambiguous contractual language should focus on the extent to which parties can control the risk—not the subject knowledge of contracting or actual foreseeability of specific risks.[213] In the context of climate adaptation harms, given the presumption of foreseeability of nonstationarity, it is appropriate for both contract and tort law to approach these kinds of issues with an ex post assessment of which party is in the best position to control the risk that is causally connected to harm, not by looking exclusively to ex ante indicators to determine actual prediction of risks.

Importantly, dispensing with an act of God defense does not commit private law to treating any harm connected to climate as foreseeable! We are not claiming, for example, that a utility should be able to foresee the consequences of a warming climate beyond the capacity of prevailing scientific expertise. Nor are we suggesting that foreseeability is irrelevant to adjudicating wrongfulness in private law. Rather, tort law, as well as many aspects of property and contract law, already provides both plaintiffs and defendants ample opportunity to define the scope of duty and to adjudicate specific facts relating to

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Pandemic? An Insurance Defense Guide to SARS-CoV-2 Litigation in a Post-Pandemic American Judicial System, 56 TULSA L. REV. 169 (2021), providing an insurance defense perspective on force majeure and the COVID-19 pandemic; Andrew A. Schwartz, *Contracts and COVID-19*, 73 STAN. L. REV. ONLINE 48, 58 (2020), https://www.stanfordlawreview.org/online/contracts-and-covid-19/ [https://perma.cc/WM5J-Q7V4], arguing that the COVID-19 pandemic should qualify as a force majeure event because of its similarities to other natural disasters, including earthquakes and hurricanes—even if those disasters are "partially a consequence of human-caused climate change"; Danielle Kie Hart, *If Past Is Prologue, Then the Future Is Bleak: Contracts, COVID-19, and the Changed Circumstances Doctrines*, 9 TEX. A&M L. REV. 347 (2022), arguing that changed circumstances doctrines should be more widely available to excuse contractual performance; Farshad Ghodoosi, *Contracting Risks*, 2022 U. ILL. L. REV. 805, presenting empirical evidence that control over the risks, not foreseeability or intent, is at the core of judicial analysis of force majeure clauses; Linda A. Sharp, Annotation, *COVID-19 Related Litigation: Effect of Pandemic on Contractual Obligations*, 73 A.L.R. 7th Art. 2 (2022), summarizing courts grappling with the COVID-19 pandemic and force majeure clauses; Piper Hampton, *Finding Our New Normal: Reevaluating Force Majeure Within Oil and Gas Contracts in the Wake of COVID-19*, 7 OIL & GAS, NAT. RES. & ENERGY J. 149 (2021), breaking down whether COVID-19 and associated government restrictions were sufficient to satisfy the requirements to excuse performance under force majeure, the UCC, impracticability, and frustration of purpose doctrines in the oil and gas industries; and Amy Sparrow Phelps, Comment, *Contract Fixer Upper: Addressing the Inadequacy of the Force Majeure Doctrine in Providing Relief for Nonperformance in the Wake of the COVID-19 Pandemic*, 66 VILL. L. REV. 647 (2021), summarizing courts grappling with contractual obligations under COVID-19, such as force majeure clauses.

213. *Cf.* Ghodoosi, *supra* note 212 (presenting evidence from a machine learning analysis of published opinions that suggests that control of the risks is more central to judicial assessment of force majeure disputes than subjective intent or actual foreseeability). For similar reasoning applied to the defense of impracticability, see Dellinger, *supra* note 30.

foreseeability in evaluating wrongfulness (such as breach of duty in tort law) as well as in the application of proximate cause.

As an example, consider, again, harms caused by a failure to adapt rail infrastructure to extreme heat conditions.[214] When infrastructure failures occur due to climate change and failure-to-adapt litigation ensues over harms that result, infrastructure providers would be hard-pressed to argue in defense that they could not have foreseen nonstationarity as a general consequence of climate change. But what exactly should they have foreseen? Especially in the case of a novel cascade failure, how expansive an approach should private law take in defining responsibilities given the expanded reach of an adaptation footprint?

The four guideposts outlined in Part II could inform how private law defines responsibilities in specific contexts. The stability of a law guidepost approach would be minimalist in changing settled principles of foreseeability as determining responsibilities for failure to adapt. Failing entirely to factor in well-modeled effects of climate change by doing nothing would likely be a breach of duty. In the case of the U.K. rail lines, for example, continuing to optimize new rail lines for 27°C would be unjustified.[215] But the extent of foreseeability would be guided by such experiences and what can be reasonably anticipated from them across various factual contexts, not by the mere possibility of future extremes and cascade failures. The efficient adaptation guidepost approach would emphasize balancing the costs of preparing for climate change against the reasonably expected adaptation benefits of increased infrastructure integrity. This would likely not lead to a duty to design for worst-case tail scenarios and complex cascade failures but could impose a duty to foresee that conditions will continue to worsen and to take cost-effective measures in preparation. The social justice guidepost approach might demand more than cost-effective preparation when it is anticipated that infrastructure failure could pose disproportionate injuries to vulnerable populations unable to self-protect through insurance or their own private adaptation measures. And the precautionary guidepost approach would go further across the board in requiring infrastructure design to anticipate higher-risk, lower-probability scenarios. Precaution may be more warranted if it appears that mitigation policies are failing to gain traction on tempering climate change. When grounded in case-specific contexts, the efficiency, justice, and precautionary approaches would focus the attention of courts (and especially finders of fact) on factors such as the

214. *See supra* note 138 and accompanying text.

215. *See* ECONOMIST, *supra* note 138.

availability of impact and risk modeling relevant to the infrastructure, the sophistication of the infrastructure provider, the cost and efficacy of additional risk reduction, and the adaptation capacity of the injured parties.

C. Remedies for Climate Adaptation Harms

The wave of climate liability litigation currently working its way through state courts seeks both injunctive relief to reduce emissions and compensatory damages for past and future injuries, including costs of adaptation.[216] In the climate adaptation context, injunctive relief could well be important for the most egregiously wrongful maladaptive behaviors. For example, in certain instances, the only way for a court to effectively provide recourse for a climate adaptation harm may be to issue an order compelling restoration of the status quo ante, such as a court ordering removal of a private seawall that causes flooding for downstream property owners. Negative injunctions (prohibiting future activities) would seem better suited to the task of managing some of the more egregious forms of affirmative maladaptation; however, courts are unlikely to have the expertise to fashion injunctive relief to mandate specific adaptation technologies or investments, making injunctive relief less effective (if appropriate at all) in the context of private law failure-to-adapt claims. Compensatory damages thus will be the focus of private climate adaptation disputes.

1. Calculation of Compensatory Damages

The core remedies challenge that private law needs to confront for climate adaptation will involve the calculation of compensatory damages for adaptation harm. On the one hand, to the extent that private law climate adaptation claims present a discrete and identifiable plaintiff, they may not suffer from what Shi-Ling Hsu calls the "identifiability bias"—the challenge that many victims of climate change are faceless, unidentifiable abstractions.[217] On the other hand,

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216. SABIN CENTER DATABASE, *Common Law Claims*, *supra* note 3; *see, e.g.*, Am. Elec. Power Co. v. Connecticut, 564 U.S. 410 (2011) (dismissal of public nuisance lawsuit seeking imposition of caps on and reduction of greenhouse gas emissions from power companies on the grounds that the Clean Air Act displaced federal common-law claims).

217. Shi-Ling Hsu, *The Identifiability Bias in Environmental Law*, 35 FLA. ST. U. L. REV. 433 (2008). To the extent private law focuses on discrete, identifiable victims with standing to sue, it typically will avoid the complex issue of providing remedies for harms to future generations, including how to calculate damages for future generations. We do not intend to trivialize the significance of these harms but think that today's private law recourse is likely only to provide indirect recourse for future generations.

the lack of an analog future for addressing climate adaptation necessarily makes any calculation of compensatory remedies complex, especially in those situations where the harms related to climate adaptation for an identified victim are expected to continue into the future.[218]

For example, a local government in Texas sued a chemical manufacturer after flooding caused its facility to lose power and become unable to properly refrigerate certain chemicals stored at the facility. That, in turn, led to an explosion, fires, and a massive release of toxic emissions.[219] The county alleged that portions of the facility were built in a documented floodplain and asked for a court order directing the defendant to hire an independent disaster preparedness auditor and to comply with the auditors' recommendations.[220] Many climate adaptation claims will not be well suited to a one-time compensatory damages finding at the time of trial, as is traditional to private law. Courts addressing private climate adaptation claims will be presented with novel opportunities to draw on expert-managed remedies, including remedies that adjust compensation for present claimants into the future. Elsewhere in private law, courts have used adjustable compensatory remedies, particularly in addressing unrealized future harm associated with mass torts that do not involve a single accident.[221]

In terms of calculating compensatory damages, a climate failure-to-adapt claim raises the fundamental question of whether risk itself is a form of compensable harm.[222] The established common-law answer for

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218. For a general survey of similar challenges in the context of climate mitigation, see Farber, *supra* note 96.

219. Complaint at ¶ 7.21, Harris Cnty. v. Arkema, No. 201776961 (Harris Cnty. Dist. Ct. 2017).

220. *Id.*

221. *See* Alexandra D. Lahav, *Mass Tort Class Actions—Past, Present and Future*, 92 N.Y.U. L. REV. 998 (2017) (discussing deterrence theory and its relation to resolutions in mass tort class actions). In mass tort cases, courts struggled early on to strike a balance between presently injured plaintiffs and future plaintiffs, using procedural protections in class actions to attempt to balance the interests of present and future claimants. *Id.* at 1006–08. But Supreme Court decisions ultimately closed off the use of mass tort class actions in cases involving future claimants, and perhaps even in all mass tort cases. Amchem Prods., Inc. v. Windsor, 521 U.S. 591, 626–28 (1997) (noting the tensions between the interests of presently injured members and those who may suffer future harms as a result of exposure and the risk that future victims were not adequately informed of the class settlement); Ortiz v. Fibreboard Corp., 527 U.S. 815, 854–57 (1999) (denying class certification because, among other deficiencies, the class did not sufficiently protect the conflicting interests of present and future victims).

222. *See* Claire Finkelstein, *Is Risk a Harm?,* 151 U. PA. L. REV. 963, 965–66 (2003) (arguing that risk infliction could conceivably be a compensable harm under the tort regime); John C.P. Goldberg & Benjamin C. Zipursky, *Unrealized Torts*, 88 VA. L. REV. 1625, 1629–30 (2002) ("Although, on this conception, heightened-risk claims are not claims for inchoate torts, they may appear quite close to being such claims by expanding the definition of injury to include heightened risk.").

most tort and contract claims is a resounding no.[223] Nothing inherent to private climate adaptation tort or breach of contract claims will change the fact that risk in and of itself (without some other form of injury) is not typically an independently compensable harm. Private law adjudication of adaptation disputes should still expect a plaintiff seeking monetary recovery to show some form of physical harms, property harms, or economic losses in order. Yet, while climate adaptation will require private law to recognize causes of action where a plaintiff cannot establish some cognizable injury, we argue that two important caveats are in order.

First, in calculating compensatory adaptation damages, as in other instances under tort and contract law, courts will often need to be attentive not only to present but to future risks of harm. The calculation of actual damages in the future depends on climate forecasting as well as the discount rate. Assumptions about climate change will inevitably affect the calculations of damages for a broad range of environmental and climate torts, as well as with respect to breach of contract claims. In evaluating damages, courts calculating future monetary damages need to be particularly attentive to various scenarios regarding future conditions over time frames relevant to the harm assessment—how much will sea levels rise, how much warmer will the region become?—as well as the applicable discount rate for future harms.[224] As Dan Farber has warned, "the wider the sphere of compensable harms, the greater the problems of proof and the greater the administrative expense of providing compensation."[225] Thus, it is important to begin discussions of compensation with "a more manageable set of harms."[226]

223. Metro-N. Commuter R.R. Co. v. Buckley, 521 U.S. 424, 440–41 (1997) (summarizing various common-law cases holding that emotional distress without physical injury is not a compensable harm in negligence, and denying recovery under the Federal Employers' Liability Act to a plaintiff exposed to asbestos dust where there was no physical manifestation of injury). For criticism of this approach to requiring injury, and the argument that private law should allow plaintiffs to seek compensation in claims where there is a substantial risk of harm even if no past damages can be proven, see Ariel Porat & Alex Stein, *Liability for Future Harm*, in PERSPECTIVES ON CAUSATION 221 (Richard Goldberg, ed., 2011), arguing that the virtues of the legal regime allow tort victims to decide if they want to recover for an expected harm or to wait to see if it materializes into an actual harm; and Goldberg & Zipursky, *supra* note 222.

224. Of course, the issues here can quickly become too complex for the typical court or jury to process. *See, e.g.*, LOSS AND DAMAGE FROM CLIMATE CHANGE: CONCEPTS, METHODS AND POLICY OPTIONS (Reinhard Mechler, Laurens M. Bouwer, Thomas Schinko, Swenja Surminski & JoAnne Linnerooth-Bayer eds., 2019) (discussing various approaches to calculating the damages from climate change). To the extent that private law does not provide recourse to nonidentifiable victims, such as future generations, the practical problems presented to course are much more likely to focus on a discrete set of individuals and a more manageable time frame than is presented by most discussions of how to calculate damages or losses from climate change.

225. Farber, *supra* note 96, at 1646.

226. *Id.*

To the extent that private law does not allow future generations (or those who have not suffered any cognizable injury) to sue for harm, courts calculating compensatory awards for climate adaptation harms are likely to focus on the calculation of damages for more tangible and readily quantifiable forms of harm—not abstract harms, such as the harm warming will inflict upon future generations. In cases where the calculation of compensatory damages requires estimating future damages to present plaintiffs in addition to past damages, expert-managed compensatory awards that adjust over time may be one way to address this prediction challenge.[227]

Second, to the extent that courts treat the harms of climate adaptation under the precautionary principle, courts should consider recognizing the importance of climate monitoring claims in ensuring that private law develops new expectations for wrongfulness relating to adaptation. For example, just as courts in many jurisdictions have recognized medical monitoring claims for toxic exposure,[228] recognition of climate adaptation monitoring claims might force risk-vulnerable facilities to monitor natural conditions on an ongoing basis and to detect the need for proactive adaptation. Homeowners in areas vulnerable to wildfires, for example, might be left in harm's way if utilities fail to monitor and inspect vegetation around transmission lines that can contribute to wildfire risk. Likewise, homeowners in areas vulnerable to flooding or landslide risks could benefit from requiring those who manage roads or parks to monitor and inspect more frequently. If those in control of risks wrongfully fail to take action, recognition of a tort allowing compensation for the costs of monitoring would provide incentives for potential victims to take the initiative to document and study risks themselves.

Common-law doctrines regarding the apportionment of harms can potentially accommodate complex approaches to causation,

227. Keeping in mind, of course, that the administrative cost will only justify a future adjustment approach to calculating damages where compensatory damage awards are substantial. Outside of class actions, compensatory claims involving injury to a private individual can readily be adjudicated by courts and juries on the understanding that the calculation of an individual compensatory damages award is not a precise science but a form of resource that can provide rough justice and at least some form of deterrence for wrongful conduct.

228. In similar spirit, Dan Farber has suggested that reasonable climate change monitoring expenses should be compensable as torts. Farber, *supra* note 96, at 1647. Only a dozen or so states currently recognize these medical monitoring tort claims absent physical injury. ALI drafters have been debating recognition of medical monitoring claims as a newly emergent issue within the *Restatement (Third) of Torts*, but it is not clear whether the *Restatement (Third)* will recognize medical monitoring claims. *Restatement of the Law Third, Torts: Miscellaneous Provisions*, AM. L. INST., https://www.ali.org/projects/show/torts-miscellaneous-provisions/#_drafts (last visited Jan. 24, 2023) [https://perma.cc/DQE9-9JG6] (providing a status update regarding the draft section on medical monitoring as of March 2, 2022). For additional discussion of medical monitoring torts, see Goldberg & Zipursky, *supra* note 222, at 1701–15.

including climate attribution science. Importantly, however, unlike climate mitigation claims, causation and damages do not need courts to decide who has caused climate change. Rather, climate adaptation torts will present more modest, backward-looking causation questions: Has the defendant's failure to adapt, or the defendant's maladaptive behavior, caused harm to the plaintiff? And how so? Multiple defendant adaptation suits will certainly face layers of complexity that courts and juries are asked to sort through. Inadequate management of wildfire risks, for example, can implicate the conduct of multiple defendants.[229] Similarly, in many instances energy service interruptions associated with Texas Winter storm Uri did not have a single responsible cause but involved multiple private failures—including inadequate notice by utilities selling directly to customers, failure to maintain reliability by ERCOT, and even failures to prepare for winter conditions by upstream energy suppliers.[230] Ultimately, however, questions of causation and damages will hinge on the comparative causal contribution of a defendant's wrongful failure to adapt or maladaptation in response to changed climate conditions—not whether any particular defendant has caused climate change. Modern comparative fault principles coupled with the apportionment of liability based on causation are well suited to addressing the calculation of compensatory damages in such scenarios.[231]

2. Recognizing a Duty to Mitigate Adaptation Damages

The duty to mitigate damages—a recognition that full recovery of damages is only available where a plaintiff does not have a reasonable ability on its own to reduce the level of harm caused by the defendant's wrongful conduct—is a principle that transcends tort (where it is sometimes called "avoidable consequences"), property, and contract law.[232] A mitigation rule reduces the moral hazard created by

229. Many of these claims in California were brought against utilities, the insurer of last resort, under the inverse condemnation theories. Suits also were brought or pursued by other defendants too, including those who set initial fires, insurance companies, and the city and state itself.

230. For discussion of these lawsuits, see Rossi & Panfil, *supra* note 77, at 1165–70.

231. *See* RESTATEMENT (THIRD) OF TORTS: APPORTIONMENT OF LIABILITY § 8 (factors for assigning shares of responsibility based on causation for risk-creating conduct); *id.* §§ 10–11 (discussing joint and several, and several, liability for indivisible injuries); *id.* § 26 (multiple tortfeasors with divisible harms).

232. *See, e.g.*, Eugene Kontorovich, Note, *The Mitigation of Emotional Distress Damages*, 68 U. CHI. L. REV. 491, 499–500 (2001) (discussing the duty to mitigate damages in tort law, also sometimes called "avoidable consequences"); Charles J. Goetz & Robert E. Scott, *The Mitigation Principle: Toward a General Theory of Contractual Obligation*, 69 VA. L. REV. 967, 969 (1983)

private provision of ex post compensation. Absent an obligation to mitigate damages, a plaintiff would face reduced incentives to take efficient postinjury care because the benefits of such care would accrue to the defendant, which private law often asks to serve as the plaintiff's insurer within the context of a private law cause of action.

For example, suppose that a developer of a new commercial shopping district fails to design its project to include reasonable precautions that would contain runoff from excessively severe rainfall. As a result, water from a heavy day of rain floods onto a neighbor's property, devastating her recently renovated basement. With flood damage, quick remediation and removal of debris can help to avert problems such as mold and mildew, but she decides to let the basement drain and dry out on its own and waits a year before repairing it. When she turns to repairing the basement, significant mold and mildew problems require her to remove and replace drywall and flooring that could have been saved if she had invested in reasonable postaccident remediation. Repairing the basement thus costs four times as much as it would have with a modest amount of remediation. Can she recover full compensation for the costs of these repairs?

At the very minimum, in calculating compensatory damages, private law should afford defendants an opportunity to present evidence of reasonable post-wrong mitigation measures, and it should also allow plaintiffs to seek damages for reasonable mitigation costs. Where the law otherwise allows recourse for a tort, breach of contract, or invasion of a property interest, courts should recognize a general duty to mitigate damages for reasonably foreseeable forms of climate adaptation harm.[233] Post-loss, victims of torts related to adaptation would seem uniquely situated to reasonably mitigate damages in situations where the primary harms are to property, and such an approach could help neighbors to proactively take measures to contain damages from flooding and other extreme weather events. A duty to mitigate also seems appropriate to those situations involving reciprocal commercial adaptation risks, such as the breach of an upstream supply contract where a purchaser can reduce consequential damages by taking some initiative to procure alternative suppliers. Recognizing such obligations is important given the reciprocal nature of many climate adaptation risks, and can help to minimize moral hazard. It also

(arguing that mitigation of damages following contractual breach serves as a joint cost minimization requirement).

233. Importantly, the duty to mitigate damages only applies post-wrong, so after a tort has occurred, after breach of contract, or following invasion of a property interest such as trespass. Pre-wrong obligations to mitigate are best addressed through countersuits or doctrines such as comparative fault, which would allow a defendant to recover for harm caused by the plaintiff.

would encourage potential victims to investigate ways of remediating adaptation harms and investing in remediation when it can help to reduce the total amount of harm attributed to climate adaptation.

It will be important, though, that private law not approach the duty to mitigate damages as an absolute defense. Rather, in climate adaptation cases the doctrine should be used to make adjustments to loss sharing in the calculation of compensatory damages. As with the calculation of damages with multiple defendants, comparative causation principles may also be useful in addressing issues related to the duty to mitigate where there is a question about whether a victim's responsibilities might have avoided or mitigated a loss before a wrongful event occurs. The duty to mitigate can supplement these principles of shared responsibilities, allowing private law to provide useful guidance to private individuals and entities, not only before the harms from climate adaptation begin to occur but even after a failure to adapt or maladaptation begins to cause injury. In this sense, remedies can help to ensure that the forms of risk reduction promoted by private law are not one-sided and are responsive to new technologies and the complexity of various social interactions as we address climate adaptation.

CONCLUSION

As much as past changes in technologies, and perhaps as much as the Industrial Revolution itself, a new frontier of private climate adaptation claims is likely to pose a basic challenge to many settled common-law doctrines. Private law is up to the task of addressing these claims, and in many instances, its responses may even be preferable to collective public law solutions to climate adaptation. But how the common law responds to new climate adaptation disputes will be important. While we believe that existing doctrine has an impressive capacity to absorb claims under the new circumstances presented by climate change, private adaptation disputes are likely to present three significant pressure points for the common law.

First, the common law has an expansive and dynamic reach to address climate adaptation disputes. It is not, however, a one-way ratchet for courts to select societal adaptation investments, and it would be unfortunate if courts approached it in this manner. In applying private law doctrines, it is just as important that courts recognize maladaptation claims as it is that they recognize claims for failure to adapt to changed climate conditions. As in other common-law contexts, in adjudicating climate adaptation claims, we contend that some judicial humility is in order. For the vast majority of climate adaptation

claims, courts could reinforce the objectives of private law through traditional remedies, such as facilitating compensation, rather than ordering injunctive relief or engaging in judicial selection of adaptation responses.

Second, while many forms of climate adaptation are likely to present opportunities for reciprocal management of risk, in some instances that will simply not be possible. The degree of reciprocal management of climate adaptation risks will vary, depending on the access that private individuals and institutions may have to information, resources, and risk mitigation strategies including insurance. When there is a significant asymmetry between parties in these respects, the common law is likely to face the greatest pressure to move towards new doctrinal responses. This is most likely to occur in contexts where disadvantaged groups are likely to be victims of failure to adapt or suffer harms due to private maladaptation. We also anticipate that the common law's tendency to recognize bilateral risk control will face some limits in the context of catastrophic risks where one party has a clearer opportunity to control the response to a disaster that affects a large number of victims.

Third, private law's overarching foreseeability principle—which spans doctrines of tort, property, and contract law—will face the greatest challenge with climate adaptation disputes. We have suggested that common-law doctrine incorporate a presumption of "foreseeability of nonstationarity," but this is not an invitation for an expansion of strict liability, nor does it require normative commitment to a precautionary principle over other guideposts, such as efficiency. Instead, we see it as a simple application of the common law's long-standing commitment to foreseeability as defining responsibilities. As such, this presumption can be helpful in approaching the scope of obligations and addressing defenses, such as act of God. But ultimately, in assessing responsibilities, a fact-specific assessment of foreseeability will still need to be incorporated into private law's definition of wrongfulness.

Across different areas of private law, an appropriate approach would allow foreseeability to continue to play a useful role in providing guidance to private individuals. For example, in the context of a failure-to-adapt claim, a plaintiff would still need to prove that a defendant's failure to adapt to climate change is unreasonable. Nonstationarity should not presumptively disfavor liability, but in assessing wrongfulness, we still think it important for courts to allow a fact-based assessment of the degree of foreseeability of nonstationarity and feasible options for responding to it across various contexts. A business, such as an electric utility, that operates on a recurring basis in an

environment with changing climate conditions is likely to have greater abilities to anticipate the consequences of nonstationarity and a larger range of options for addressing it in planning and operations than an individual consumer or tort victim will—but this is the kind of factual issue that private law can readily adjudicate on a case-by-case basis.

Ultimately, courts adjudicating private climate adaptation claims will need to recognize that private law's role here is no different than in other contexts: In addition to providing a victim recourse, private law provides guidance and reasons for actions individuals and entities take in confronting new forms of risk. The common law will evolve with climate change, and sometimes even move in novel new directions (we have suggested just a few), but this core function will remain a constant in the no-analog future.