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Property in the Anthropocene

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Human-induced climate change threatens perilous risks for our physical homes. It also poses a serious challenge to our legal institutions. Several scholars already have remarked on the disruption climate change has brought to specific legal areas, such as tort, standing, and national security. This essay argues that climate change will also disrupt fundamental ideas about real property. Prior work has explored the need for fresh approaches to land use regulation and a shift in regulatory takings law. This essay looks at the more fundamental assumptions and principles of property law. It maintains that the growing need for human management of dynamic natural forces, distorted by greenhouse gas emissions, will erode the foundations of physical stability and owner autonomy that shape basic doctrines of property law.

A firm scientific consensus holds that human-induced emissions of greenhouse gases, such as carbon dioxide and methane, into the atmosphere have been, and will continue, working unprecedented changes in our climate.[2] The effects of such emissions are apparent in phenomena such as global warming, rising sea levels, aggravated drought and wildfires, and more extreme storms and flooding.[3] Legislative efforts to reduce emissions and rationally address these threats have been stymied at the national level and in many states by a combination of entrenched interests, discounting of future risks, conceptual complexity, and existential fear. Nonetheless, some states and many local governments have begun planning and have even taken significant steps to reduce emissions and prepare for inevitable environmental changes.[4]

Courts, too, have begun to alter legal doctrines to address or accommodate the effects of climate change. The Supreme Court arguably expanded its approach to standing in order to allow a state to sue the Environmental Protection Agency ("EPA") for failing to regulate greenhouse gas emissions,[5] and a federal district court recently surely did the same by allowing a group of minors to sue the United States for failing to address climate change.[6] Legal scholars have noted that climate change has disrupted established doctrines in other areas of law. Douglas Kysar, for example, has written about tort law: "Built as it is on a paradigm of harm in which *A* wrongfully, directly, and exclusively injures *B*, tort law seems fundamentally ill-equipped to address the causes and impacts of climate change …. courts in

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[1] J. Hampton Baumgartner, Jr., Chair in Real Property Law, Georgetown University Law Center. This paper evolved from a talk given at the Brigham-Kanner Property Rights Conference in October 2016. Thanks to Lynda Butler for encouraging me to write.

[2] *See, e.g.,* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: SYNTHESIS REPORT (2014), http://www.ipcc.ch/report/ar5/syr/.

[3] *See, e.g.*, Svetlana Jevrejeva et al., *Coastal Sea Level Rise with Warming Above 2 °C*, 113 PROC. NAT'L ACAD. SCI. 13342 (2016), http://www.pnas.org/content/113/47/13342.abstract; John T. Abatzoglou et al., *Impact of Anthropogenic Climate Change on Wildfire Across Western US Forests*, 113 PROC. NAT'L ACAD. SCI. 11770 (2016), http://www.pnas.org/content/113/42/11770; Asiak Grinsted et al., *Projected Atlantic Hurricane Surge Threat from Rising Temperatures*, 110 PROC. NAT'L ACAD. SCI. 5369 (2013), http://www.pnas.org/content/110/14/5369.abstract.

[4] *See, e.g.*, S.B. 32, 2015–16 Leg., Reg. Sess. (Cal. 2016), *amending* CAL. HEALTH AND SAF. CODE § 38566 (2017). On the many efforts at adaptation see GEORGETOWN CLIMATE CENTER, ADAPTATION CLEARING HOUSE, http://www.adaptationclearinghouse.org/ (last visited Feb. 11, 2017).

[5] Massachusetts v. EPA, 549 U.S. 497 (2007).

[6] Juliana v. United States, No. 6:15-CV-01517-TC, 2016 WL 6661146 (D. Or. Nov. 10, 2016).

all likelihood will agree with commentators that nuisance and other traditional tort theories are overwhelmed by the magnitude and the complexity of the climate change conundrum."[7] Many statutory areas are straining to meet the challenges of climate change as well. [8]

It stands to reason that property law, which deals directly with the rights and duties of ownership of elements of the natural world, also will be disrupted by climate change.[9] This essay will focus on real property law, which historically has assumed stability in the physical world and the capacity of an owner to exercise effective dominion over land.[10] Climate change calls both these assumptions into question because many parcels of land will teeter on physical convulsions, and government help will more frequently be needed to keep such forces at bay. The essay considers three types of changes in property law principles: growth of publicly as opposed to privately owned land, greater scope for land use regulation, and government liability for management mistakes. The changes will not occur immediately; the effects of climate change have begun to show themselves, but more dramatic changes lie in the future. Property law is a conservative field, guarding reliance. But over time its tenets adapt to a changing physical and social environment.[11] This essay is, frankly, speculative, aiming to stimulate discussion and further research.

First, changes in property law will be brought about because sea-level rise, enhanced storms, and fire will physically destroy or degrade many parcels of land and their improvements. Some coastal areas will simply sink beneath the waves, engulfing the homes built upon them. More properties will be destroyed by intense storms, such as hurricanes strengthened by climate change—as happened in Hurricane Sandy—or by growing wild fires in the increasingly arid west. Market forces have not yet seriously guarded against these losses.[12] The National Flood Insurance Program, [13]although insolvent without the backing of the U.S. government,[14] continues to provide assistance where the premiums do not cover the risk. Developers build and sell new homes along the shore within shorter timeframes than the timeline for losses from climate change, perhaps even aggravating their incentives to develop

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[7] Douglas A. Kysar, *What Climate Change Can Do About Tort Law*, 41 ENV'T L. REP. 1, 3-4 (2011). Kysar went on to observe: "[T]he effort to fit the mother of all collective action problems into the traditional paradigm of tort reveals much about how that paradigm more generally needs to shift." *Id.* at 44.

[8] *See, e.g.*, J.B. Ruhl*, Climate Change Adaptation and the Structural Transformation of Environmental Law,* 40 ENV'T L. REP. 363, 401 (2010); Richard J. Lazarus*, Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153 (2009).

[9] *See* Holly Doremus, *Climate Change and the Evolution of Property Rules*, 1 U.C. IRVINE L. REV. 1091 (2011). Professor Doremus gives a thoughtful account of how property rules evolve and what forces can delay or prevent change. This essay takes the simple-minded view that courts will eventually change doctrines when physical, social, and economic changes make inherited legal approaches seem nonsensical. Also, it avoids the important question whether changes in property doctrine are better accomplished by courts or legislatures.

[10] Water law, another key element of property law, also will need to adapt because climate change will cause regional shortages. *See* Robin Kundis Craig, *Adapting Water Law to Public Necessity: Reframing Climate Change Adaptation as Emergency Response and Preparedness*, 11 VT. J. ENV'T L. 709, 724 (2010).

[11] *See, e.g.*, Joseph L. Sax, *Property Rights and the Economy of Nature: Understanding* Lucas v. South Carolina Coastal Council, 45 STAN. L. REV. 1433, 1446 (1993).

[12] *See* Neumann, J.E. et al.*, Joint Effects of Storm Surge and Sea-Level Rise on US Coasts: New Economic Estimates of Impacts, Adaptation, and Benefits of Mitigation Policy*, 129 CLIMATIC CHANGE 337 (2015).

[13] 42 U.S.C. § 4001 *et seq*.

[14] U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-15-290, HIGH RISK SERIES: FEBRUARY 2015 UPDATE 385–90 (2015), http://www.gao.gov/assets/670/668415.pdf.

coastal land in the fastest possible schedule. Sellers of existing coastal buildings and realtors compensated by a percentage of the sales price retain every incentive to remain silent about the risks of sea-level rise. Mortgage lenders who bundle and sell mortgage-debt packages to investors collect fees and retain no continued exposure to loss. The investors in bundled mortgage-debt instruments have their risks diluted by the scale of other mortgages making up their exposure. Local governments at the coast typically rely on real property taxes and probably hesitate to require warnings that could crash property values. Buyers should attend to risk but often are distracted by more immediate concerns such as securing mortgage funds or keeping insurance premiums low.[15] Thus, without strong regulatory intervention, much development could be destroyed, yet regulation has been slow to evolve.

This reality will drive changes in property rules that may have made sense on the assumption that nature was stable but seem absurd in the dynamic context of climate change. Climate change will not amount to a move from one relatively stable state to another; change at a rate faster than historic norms will continue for the foreseeable future, regardless of when emissions of greenhouse gases can be significantly reduced. Moreover, even the rate of change will not be constant but probably will continue to accelerate, as scientists have observed in recent years.[16] Thus, rules about land use will exist in a state of physical flux, even though historically land law has assumed, even relied upon, perpetual stability. The entire edifice of estates in land, future interests, and perpetuities, for example, assumes practically that the land lasts forever as, to differing degrees, do the laws of mortgages, prescription, and conservation easements.

Some aspects of land law will not be able to survive the changes. One example is the significant but obscure principle that a property owner enjoys a right of access to the public highway system, and government action eliminating such access amounts to a taking requiring the payment of compensation for the reduction in value of the marooned land.[17] Recently, this rule has been found appropriate to support a takings action against a local government based upon its failure to maintain a road connecting a barrier island that had repeatedly flooded.[18] As seas rise and floods increase, however, the burden that such a rule places on the public fisc becomes irrational; no government constructs roads and bridges on the assumption that the facilities would have to be continually rebuilt to higher elevations and mounting costs. Also, the traditional rule creates perverse incentives for coastal homeowners who may rationally seek to recover the value of their flooding homes by bringing takings claims. While it may be that courts, appalled by the prospect of sea-level rise, may grow more rigid and formalistic in their application of this rule in the short run, they will need to revise it as cases and costs

[15] Ian Urbina, *Perils of Climate Change Could Swamp Coastal Real Estate*, N.Y. TIMES, Nov. 24, 2016, http://www.nytimes.com/2016/11/24/science/global-warming-coastal-real-estate.html?hp&action=click&pgtype=Homepage&clickSource=story-heading&module=second-column-region&region=top-news&WT.nav=top-news.

[16] *See* Chris Mooney, *U.S. Scientists Officially Declare 2016 the Hottest Year On Record. That Makes Three in a Row*, WASH. POST., Jan. 18, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/01/18/u-s-scientists-officially-declare-2016-the-hottest-year-on-record-that-makes-three-in-a-row/?utm_term=.f9305c433622.

[17] *See, e.g.*, Jordan v. Town of Canton, 265 A.2d 96 (Me. 1970).

[18] Jordan v. St. Johns Cty., 63 So. 3d 835 (Fla. Dist. Ct. App. 2011).

multiply with losses. Doctrinal change could be applied either to the easement of access or to the takings analysis.[19]

Not only will sea-level rise physically destroy or damage land and improvements, but private property rights themselves will be terminated. Pursuant to the public trust doctrine, the public owns the beds of tidelands seaward of the mean-high-tide line. As the tide line moves landward, the doctrine of accretion will transform private dry land into public subsurface, wetland, or tideland.[20] No taking requiring the payment of compensation is effected, because the transformation is considered to have been accomplished by nature not by the government.[21] Then, if the government steps in to restore the sunken land, as when the government rebuilds a beach with dredged sand, the restored beach usually is considered public property.[22] This result stems from the doctrine of avulsion, whereby a sudden change in the tide line, even if purposefully brought about by a government agency, does not change the boundary line—though a gradual change would under the doctrine of accretion. The justification for the result under avulsion, however, may be due to the public resources used to rebuild the beach. Pertinently, Professor Flourney has recently inquired whether sea-level rise should change the application of the accretion/avulsion approach. Historically, the justice of this rule was based upon the bidirectional and unpredictable movement of the tide line, but now sea-level rise will push the tide line inexorably inland.[23] Professor Flourney persuasively shows that both the physical assumptions and policy justifications for the traditional approach have changed significantly because of sea-level rise and argues generally for greater protection for free-access submerged and tidal lands subject to the public trust.

Second, large scale government investments in protecting private property from the effects of climate change likely will increase the scope and weight of the public interest, justifying regulation of private land use. Sea-level rise again provides the clearest instance of this. There are three categories of regulatory responses to adapt to sea-level rise: fight, accommodate, and retreat.[24] Fighting involves the public or private construction of physical barriers or drains to keep sea waters away from private property. Thus, sea walls, levees, dune and wetland construction, pumps, and drains can forestall inundation or storm surges (up to a point).[25] This approach has obvious attractions, especially if the public will pay for the new infrastructure, because it preserves the current boundaries of the lot and extant buildings and generally allows established land uses to continue. Public infrastructure has an additional crucial advantage over private efforts because it can be constructed across property lines

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[19] There are internal complexities in the law of abandonment of public access, such as whether a private easement of access survives public renunciation. *See, e.g.*, Luf v. Town of Southbury, 449 A.2d 1001, 1006 (Conn. 1982).

[20] *See* Joseph L. Sax, *The Accretion/Avulsion Puzzle: Its Past Revealed, Its Future Proposed*, 23 TUL. ENV'T L.J. 305 (2010).

[21] J. Peter Byrne, *The Cathedral Engulfed: Sea Level Rise, Property Rights, and Time*, 73 LA. L. REV. 69, 80 (2012).

[22] *See* Stop the Beach Renourishment, Inc. v. Fla. Dep't of Env't Prot., 560 U.S. 702 (2010); City of Long Branch v. Jui Yung Liu, 4 A.3d 542 (N.J. 2010).

[23] Alyson C. Flourney, *Beach Law Clean-Up: How Sea-Level Rise Has Displaced the Accretion/Erosion/Avulsion Framework* (Dec. 30, 2016) (unpublished working paper) (on file with author).

[24] *See* J. Peter Byrne & Jessica Grannis, *Coastal Retreat Measures*, *in* THE LAW OF ADAPTATION TO CLIMATE CHANGE 267, 269 (Michael B. Gerrard & Katrina Fischer Kuh eds., 2012).

[25] *See* Robert R.M. Verchick & Joel D. Scheraga, *Protecting the Coast*, *in* THE LAW OF ADAPTATION TO CLIMATE CHANGE 235, 24–44 (Michael B. Gerrard & Katrina Fischer Kuh eds., 2012). Recent legislation strives to make such new infrastructure as cost effective and environmentally friendly as possible.

according to the physical characteristics of the site. But there are engineering, environmental, and economic limits to the capacity of government to build such protections.[26]

Such large-scale public investments, both of money and expertise, must expand the scope of regulatory power that government may exercise over the protected private property. When government has built sophisticated infrastructure at public expense to protect private property, its interest in that property must grow. One cannot consider the private owner as enjoying "sole and despotic dominion"[27] when her property would be destroyed without public expenditure and management. One might argue that from an economic perspective, the public has put equity into the protected property to preserve its market value. Moreover, to the extent that government has prevented the tide line from moving landward, it has suspended its future ownership rights over the private land it is now protecting. The public's right to regulate the use of protected private land for environmental benefits or to mandate forms of public access surely will grow. Of course, it always has been the case that government action has been necessary to secure property rights through judicial and executive enforcement of such rights, but the financing, construction, and maintenance of physical barriers to natural destruction of private property go far beyond any "night watchman" type of state action and toward a persistent "control of nature."[28]

Some indication of how courts may reshape property doctrines may be gleaned from the unanimous post–Hurricane Sandy decision of the New Jersey Supreme Court in *Borough of Harvey Cedars v. Karan*.[29] The Borough condemned a perpetual easement over a portion of the Karan's shorefront lot for the U.S. Army Corps of Engineers to construct, largely at federal expense, a dune barrier to storms and erosions. In calculating the compensation to be paid, the trial court permitted the jury to consider the obstruction of the view from the house but not the benefit accruing from increased storm and erosion protection, on the ground that such protection was general to many protected properties. The New Jersey Supreme Court reversed this decision and held that any "reasonably calculable benefits—regardless of whether those benefits are enjoyed to some lesser or greater degree by others in the community—that increase the value of property at the time of the taking should be discounted from the condemnation award."[30] The court rejected as outdated the traditional distinction between specific benefits to the retained property, which can be considered, and benefits general to the community, which cannot.[31]

Harvey Cedars found absurd the traditional approach, which considers offsetting benefits in compensation calculations, when faced with a large government project to protect private homes from the sea. The Court did not abandon protection of private property; it presumed the right of the owners to compensation for the easement and affirmed the propriety of compensation for impairment of their ocean view. But mandating consideration of off benefits may practically eliminate and certainly will

[26] *See, e.g.*, Elizabeth Kolbert, *The Siege of Miami*, NEW YORKER, Dec. 21 & 28, 2015.
[27] 2 WILLIAM BLACKSTONE, COMMENTARIES *2 (facsimile ed., 1979).
[28] The phrase comes from JOHN MCPHEE, THE CONTROL OF NATURE (1989).
[29] Borough of Harvey Cedars v. Karan, 70 A.3d 524 (2013).
[30] *Id.* at 543.
[31] Bianca Iozzia, *Putting a Price Tag on an Ocean View: The Impact of* Borough of Harvey Cedars v. Karan *on Partial-Taking Valuations*, 25 VILL. ENVT'L L.J. 501, 521 (2014).

radically reduce payment of compensation for such a project.[32] The State of New Jersey is aggressively using *Harvey Cedars* as a point in negotiating the donation of easements for dune construction. The increase in sea-level rise caused by climate change will greatly increase the risk to shorefront property and the pressure for protective public works, while rendering less persuasive the claims of property owners' recognition of the niceties of their rights. None of this means that New Jersey's dune construction project or any particular government property protection scheme is a sensible or fair response to climate risks. But the logic of such public protection will be to make property more amenable to public control.

There are many things that may be required of protected property owners: public access on dry sand beaches, public access for maintenance of works, owner maintenance of habitats or wetlands, water management, protection of viewsheds, and the like. At a minimum, government's physical protection of private property against sea-level rise should, as a constitutional matter, authorize any regulation or public access reasonably necessary to realize public benefits from managing sea-level rise.

Government regulations to require property-owner accommodations to climate change could lead to extensive additions to building codes and site plans, but they do not seem constitutionally or conceptually difficult. New houses on lots threatened by sea-level rise may be required to be elevated or placed upon high ground; landscaping or water engineering may be mandated for those threatened by wildfires.[33] While these may increase costs, courts are unlikely to take seriously due process or regulatory takings challenges to a wide range of accommodation regulations.

More problematic are regulations requiring retreat. From an environmental perspective, the best response to sea-level rise, drought, and fire threat would be to simply prohibit new development in the areas most at risk. The reasons to mandate retreat from areas at risk from climate change include protection of residents from harm, avoidance of dangerous and expensive rescue efforts, coordination of cessations of public services, and minimization of damage to ecosystem services.[34] But the economic effects of such bans could be devastating for investors and even for local government finances. More immediately, they risk triggering the per se rule of *Lucas v. South Carolina Coastal Council*, that land use regulations that eliminate all the economic value of a parcel constitute regulatory takings.[35] The peculiar threat of *Lucas* is that it requires compensation unless the use of the land would constitute a nuisance at common law. In the case of sea-level rise or other environmental threats, however, traditional nuisance law is inapplicable. According to the Restatement, a nuisance arises from an owner's unreasonable use of his land that causes harm to another landowner or to the public at large.[36] Nuisance law can (imperfectly) address environmental harm when the defendant is polluting neighbors from his own land.

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[32] The Karans eventually settled for $! in compensation, and subsequently a jury awarded another couple three hundred dollars for a similar taking to construct a protective dune. Press Release, N.J. Att'y Gen., Acting Attorney General Hoffman Announces Legal Victory for Beachfront Easement Acquisition Efforts in Harvey Cedars: Owner Sought Hundreds of Thousands of Dollars; Jury Awards $300 (June 30, 2014), http://nj.gov/oag/newsreleases14/pr20140630b.html.

[33] On building codes requiring freeboard and other measures to accommodate to sea-level rise, see *Adaptation Toolkit: Sea Level Rise and Coastal Land Use*, GEO. CLIMATE CTR., (Feb. 11, 2016), http://www.georgetownclimate.org/adaptation/toolkits/adaptation-tool-kit-sea-level-rise-and-coastal-land-use/building-codes.html.

[34] *See* Byrne & Grannis, *supra* note 24, at 268–70.

[35] Lucas v. South Carolina Coastal Council, 505 U.S. 1003 (1992).

[36] RESTATEMENT (SECOND) OF TORTS § 826 (1979).

But it would seem not to address situations where the risk stems from changes in nature that are caused by human activity throughout the industrialized world. In *Lucas*, where a taking was found from a prohibition of building within a flood zone, Justice Scalia noted derisively that construction of a single family house does not constitute a nuisance.[37] In practice, retreat has been limited to generous voluntary buyouts of homes after destruction from floods or fires. [38]

So to mandate retreat through legislation, the *Lucas* facts must be avoided, the doctrine must bend, or nuisance law must expand. In a prior article, I discussed avoiding the factual premise of *Lucas* through rolling-development restrictions, which permit development for time but then prohibit it when the sea rises to within a certain distance of a dwelling or building site.[39] In another article, I have described climate exactions, which might permit such development but at a price that reflects the environmental or public costs it generates.[40] Here, I briefly want to suggest that at some point maintaining a house in the face of sea-level rise or other increasing climate risks may be considered a public nuisance.

A public nuisance would be the unreasonable use of property that imposes significant harm on the public generally.[41] In the era before comprehensive land use regulation, local governments enacted ordinances identifying certain uses in certain locations as public nuisances; public authorities such as attorney generals or corporation councils would bring actions to enforce such ordinances through injunctions.[42] In some cases, land uses thought reasonable at one time came to be seen as nuisances when the environs around them had changed. For example, a cement plant in Los Angeles was unobjectionable when settlement was sparse but was deemed a nuisance when a neighborhood of houses grew up around it.[43] People building or living in houses could come to be considered nuisances when the risk of inundation, storm surges, or fire reaches a threshold where disaster assistance would become too dangerous or costly, when they threaten failure of septic or sewer systems, or when construction prevents migration inland of environmental systems providing the community with important ecological services. Of course, the actual factual circumstances and the normative meanings that the public attaches to nuisances in the future would be determinative, but climate change could so change which land uses are considered reasonable that such "essential uses" as building a house could become nuisances in many locations. [44]

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[37] "It seems unlikely that common-law principles would have prevented the erection of any habitable or productive improvements on petitioner's land; they rarely support prohibition of the 'essential use' of land." *Lucas*, 505 U.S. at 1033 (quoting Curtin v. Benson, 222 U.S. 78, 82 (1911)).

[38] GOVERNOR'S OFFICE OF STORM RECOVERY ET AL., NY RISING BUYOUT AND ACQUISITION PROGRAM POLICY MANUAL 15 (2015).

[39] Byrne, *The Cathedral Engulfed, supra* note 21, at 109–12.

[40] J. Peter Byrne & Kathryn A. Zyla, *Climate Exactions*, 75 MD. L. REV. 758 (2016).

[41] RESTATEMENT (SECOND) OF TORTS § 821 (1979).

[42] *See* John E. Bryson & Angus McBeth, *Public Nuisance, the Restatement (Second) of Torts, and Environmental Law*, 2 ECOLOGY L.Q. 241 (1972).

[43] Hadacheck v. Sebastian, 239 U.S. 394 (1915).

[44] The plausibility of this prediction may be enhanced when one recalls that the essential use of land protected against regulation in the case cited by Justice Scalia in *Lucas*, was the driving of cattle over roads through Yosemite National Park and grazing them on a private enclosure within the park. *See* Curtin v. Benson, 222 U.S. 78, 86 (1911) ("The right of appellant to pasture his cattle upon his land, and the right of access to it, are of the very essence of his proprietorship."). No one could doubt that the National Park Service today has authority to prohibit driving cattle through and grazing them on private land within a national park. .

The third category of property law change to be expected from climate change would be an increase in government liability for losses resulting from its environmental management. Currently losses from extreme natural events, such as hurricanes, generally are considered "acts of God," for which no entity is primarily responsible. If government has no authority and makes no effort to control the forces of nature, there is no legal basis to hold it accountable for natural disasters.[45] But when government comes to manage the effects of climate change, through construction of levees, for example, courts may come to hold the government responsible for its mistakes or inadequate precautions. Thus, if reconstructed sand dunes erode faster than estimated and a storm surge destroys houses in the locality, or forests thinned of overgrown or dead vegetation still host raging wildfires that consume homes, the government may be blamed. Lawyers for private owners bearing such losses may seek to hold the government liable.

This tendency is evident in recent court decisions using the Takings Clause to facilitate liability on the United States for its management of flooding on the Mississippi River. Since the 1920s the US Army Corps of Engineers has been tasked with reducing flooding as well as aiding navigation on the river. The legislation authorizing their flood control efforts also contained a statutory exemption from government tort liability arising from such efforts.[46] But flooding of private land near the river still results from the enormity of the task, whether from inadequate water management or from agency choices among competing constituents. In recent years, courts have expanded the basis upon which the Corps can be held liable for flooding under the Takings Clause, which cannot be limited by statute. In *Arkansas Fish and Game*, the Supreme Court departed from prior law in holding that a takings claim can be based upon a single or finite series of flooding events.[47] Subsequently, the U.S. Claims Court held that the Corps effected a taking by its construction and negligent management of the Mississippi River Gulf Outlet, which enhanced the flooding in St. Bernard Parish from Hurricane Katrina.[48]

Of course, the government has never managed coastlines with the thoroughness that the Corps has managed the Mississippi River. But the vulnerability of coastal property to sea-level rise suggests that government may play a much larger role in defending against rising seas to preserve private property values. In doing so, it would seem to take on a duty to perform its many protective functions without negligence. Because the government would be choosing structures to prevent the risks foreseen by sophisticated scientific analyses, it seems inevitable that sometimes the government would be wrong in its predictions or would engineer inadequately based on mistakes, inadequate findings, or the sheer difficulty of the task. To be sure, government can find some defense in the discretionary function immunity to the Federal Tort Claims Act, but generally speaking this immunity extends only to intentional and not negligent acts of government employees.[49]

Government will also be threatened with liability for its intentional decisions about protection from climate effects through takings claims. The scale of climate effects and the immensity of affected

[45] Government does provide assistance to affected persons and businesses under disaster relief statutes and through ad hoc legislation. The Stafford Act provides the statutory authority for most Federal disaster response. 42 U.S.C. 5121 *et seq* (2016).
[46] 33 U.S.C §§ 701–709b (2016).
[47] Ark. Fish & Game Comm'n v. United States, 133 S. Ct. 511 (2012).
[48] St. Bernard Parish Gov't v. United States, 121 Fed. Cl. 687 (2015).
[49] Amy M. Hackman, *The Discretionary Function Exception to the Federal Tort Claims Act: How Much is Enough?,* 19 CAMPBELL L. REV. 411, 413 (1997).

areas means that government will protect some areas and not others.[50] Choices will need to be made about limited resources and know-how, and likely will be based on the value of protecting different places.[51] For example, urban areas are more likely to be protected than rural. Physical characteristics of some places, such as land subsidence or porous bedrock, may make some places much more difficult or expensive to protect. Politics also inevitably will play a role. Thus, government will make imperfect and unpopular decisions about which localities will be protected from flooding, which will be allowed to flood, and which the government will intentionally flood in order to divert flood waters. . Losers will seek compensation. Such cases will be brought as takings because the decisions to flood or not protect from flooding will be characterized as intentional implementations of policies.

The structure of such a problem can be seen in the *Quebedeaux* case.[52] There the Corps estimated that high water descending from the Mississippi would overflow levees in Baton Rouge and New Orleans, so it opened the Morganza Spillway, diverting floodwaters into the Atchafalya River basin and destroying numerous farms, homes, and businesses. Affected landowners sued, claiming a taking. The Court of Federal Claims denied the government's motion to dismiss for failure to state a claim. Judge Allegra relied on the recent decision in *Arkansas Fish and Game*[53] to hold that a single instance of intentional flooding could be found to be a taking and also rejected the government's argument that a flooding victim who benefited from a flood control project could not recover unless he showed that the cost of the flooding exceeded the benefits from the project as a whole.[54] Thus, flood victims who would have had to bear their own losses if the government had taken no action could obtain compensation if the government chose to flood them in order to avoid a greater disaster downstream.

Government engineering may never reach the level of control over coastal flooding that the Corps has reached on the Mississippi, but one can easily imagine that government choices over which areas it will protect against ocean storm surges may result in similar takings claims—for example, government construction or permitting of a seawall to protect residences in one location along the Gulf Coast, knowing that such a seawall may increase the likelihood of erosion or flooding on nearby farmland. There may be subtle issues of causation raised regarding the extent to which the government or nature caused the loss,[55] but the breadth of government control we can anticipate to protect owners from the effects of climate change suggests that at some point losses may be attributed to the government. Professor Serkin has put this scenario at the center of his theory of passive takings:

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[50] The public needs to have the authority to regulate or prohibit the private construction of sea walls to protect neighboring properties as well as tidelands. Byrne, *The Cathedral Engulfed, supra* note 21, at 100-04. A common law rule, already weakened, that sea-level rise should eliminate is the "common enemy" rule permitting landowners to fend off flood waters in any direction without liability to neighbors injured by the redirected waters. *See generally* Daniel H. Cole, *Liability Rules for Surface Water Drainage: A Simple Economic Analysis*, 12 GEO. MASON L. REV. 35 (1990).

[51] *See* JOHN MCPHEE, THE CONTROL OF NATURE (1989).

[52] Quebedeaux v. United States, 112 Fed. Cl. 317 (2013).

[53] Id., at 324-25 (discussing Arkansas Fish & Game Comm'n v. United States, 133 S. Ct. 511 (2012)).

[54] Id., at 321.

[55] *See* Teagarden v. United States, 42 Fed. Cl. 252 (1998) (rejecting takings claim on the ground that the forest fire caused destruction of the plaintiffs' trees rather than the United States Forest Service's choice to not protect the plaintiffs' property).

"Whether the government prohibits or builds sea walls, its near-total control over the allocation of the inevitable harm serves as a doctrinal hook for passive takings liability."[56]

Thus, we can anticipate that government will be entrusted with the choice over which private property will be protected at great government expense and which will be flooded. Several property doctrines may protect the government from takings liability in such circumstances. In *Miller v. Schoene*, the Supreme Court held that a Virginia statute mandating the destruction of cedar trees to protect the state's apple trees from a contagious plant disease did not amount to a taking because the government had to act to prevent harm in circumstances where the failure to act would have caused more harm.[57] From one view, the decision increases the probability that government failure to protect an owner could amount to a taking because the Court seems to treat government action and inaction as equal policy choices that can cause harm. But more fundamentally, the Court expressly stated that "it is obvious that there may be, and that here there is, a preponderant public interest in the preservation of one interest over the other." Thus even in cases where government action causes harm, as when opening a floodgate, the government may escape takings liability when not doing so could cause a greater harm to the public. The vitality of *Miler v. Schoene* in modern takings law, however, is questionable, as it relies on a deference to the police power that the Supreme Court has moved away from.[58]

This essay has considered ways that climate change may push changes in property law. Sea-level rise, flooding, fire, and drought undermine the stability of improvements to land and, indeed, of land itself. Managing these increased risks will lead to greater government construction and management of protective infrastructure. Paradoxically, greater public physical protections will both expand the regulatory reach of government and expose government to increased liability for property damage from events historically considered "natural" but that will become seen as the results of government choice or negligence. This fundamental change in the relationship between government and private property owners will bring significant change to the property law in some ways suggested here and in other ways not yet anticipated.

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[56] Christopher Serkin, *Passive Takings: The State's Affirmative Duty to Protect Property*, 113 MICH. L. REV. 345, 394 (2014).

[57] Miller v. Schoene, 276 U.S. 272 (1928).

[58] *See* Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1022–23 (1992) ("The 'harmful or noxious uses' principle was the Court's early attempt to describe in theoretical terms why government may, consistent with the Takings Clause, affect property values by regulation without incurring an obligation to compensate—a reality we nowadays acknowledge explicitly with respect to the full scope of the State's police power."). Another obscure corner of takings law that will come into play when the government assumes control of nature are cases of actual necessity, such as when government blows up buildings to prevent the spread of fire. *See, e.g.*, Bowditch v. Boston, 101 U.S. 16 (1880). This exception to takings liability is narrow and has not been revisited in many years.