WARMING UP TO A NOT-SO-RADICAL IDEA: TORT-BASED CLIMATE CHANGE LITIGATION

David A. Grossman*

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I. INTRODUCTION

Most discussions about how to address global climate change focus on politics, policies, and programs. The universe of ideas seems limited to topics like international negotiations, carbon dioxide emission trading regimes, carbon taxes, government-industry technological partnerships, and voluntary emission-reduction programs. Until very recently, the idea of climate change litigation has been virtually ignored.

In its recent Third Assessment Report (TAR), the Intergovernmental Panel on Climate Change (IPCC)[1] concluded that "[t]here is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."[2] Increased carbon dioxide (CO_2) concentrations are the

1. The IPCC was set up jointly by the United Nations Environmental Programme and the World Meteorological Organization in 1988 "to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation." *See* http://www.ipcc.ch.

2. WORKING GROUP I, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS 10 (2001) [hereinafter IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS]; *see also id.* ("The warming over the last 50 years due to anthropogenic greenhouse gases can be identified despite uncertainties in forcing due to anthropogenic sulphate aerosol and natural factors (volcanoes and solar irradiance)."). This conclusion represents a significant strengthening of the IPCC's conclusion in its Second Assessment Report in 1995 that "the balance of evidence suggests a discernable human influence on global climate." WORKING GROUP 1, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 1995: THE SCIENCE OF CLIMATE CHANGE 5 (J.T. Houghton et al. eds., 1996).

biggest factor in this warming.[3] About three-quarters of the anthropogenic emissions of carbon dioxide to the atmosphere during the past twenty years have been from fossil fuel burning; the rest have been predominantly due to land-use change, especially deforestation.[4] Given the increasing evidence connecting human use of fossil fuels to climate change, and perceiving a lack of meaningful political action to address global warming, environmental lawyers have begun exploring litigation strategies.[5] This article evaluates the feasibility of such litigation. It focuses on what some see as the most novel or radical idea, namely applying tort law to hold fossil fuel companies and some of their reliant industries liable for at least some of the harms caused by global warming.[6] In this article, I argue that tort-based climate change lawsuits based on products liability and public nuisance causes of action might prove to be legally viable.

A. Appropriateness of Applying a Tort Framework

In evaluating whether a tort suit is an appropriate vehicle for addressing climate change, one must consider the central concerns and goals of tort law. Many of climate change's costs are harms to property produced at least partially as a result of human actions. Harm caused by human activity is a central concern of tort law.[7] Further, because of the uneven nature and distribution of the effects of climate change, some localized groups (e.g., those living in coastal areas or at high latitudes) are bearing, and will continue to bear, the brunt of global warming's harms and costs. This existing allocation raises the question of whether we should leave these costs on the victims of climate change or should transfer them to those who arguably have contributed to creating the harm. Allocation of the costs of harms is another central tort concern.[8]

3. WORKING GROUP I, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS, TECHNICAL SUMMARY 39 (2001) [hereinafter IPCC, SCIENTIFIC BASIS, TECHNICAL SUMMARY].

4. IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 7.

5. *See* Katharine Q. Seelye, *Global Warming May Bring New Variety of Class Action*, N.Y. TIMES, Sept. 6, 2001, at A14; Stephen Mihm, *The Year in Ideas: A to Z: Global-Warming Lawsuits*, N.Y. TIMES, Dec. 9, 2001, § 6 (Magazine) at 76.

6. These tort actions are currently under active investigation. Telephone interview with Matthew F. Pawa, P.C. (Jan. 2, 2002).

7. *See* Eduardo M. Penalver, *Acts of God or Toxic Torts? Applying Tort Principles to the Problem of Climate Change*, 38 NAT. RESOURCES J. 563, 569 (1998).

8. *See id.*

In deciding who should bear the costs of global warming, it is helpful to look at two of tort law's basic goals: (1) reducing the costs of accidents, and (2) providing corrective justice.[9] Consider first which allocation of costs will best reduce the costs of climate change "accidents." Leaving the costs of climate change on its victims ensures that climate-changing activities occur at higher than optimal levels, resulting in higher "accident" costs.[10] This is true because victims and potential victims, for three principal reasons, cannot effectively organize to bargain with or to force producers of fossil fuels to reduce fossil fuel use. First, climate change has global effects, so in that regard, the transaction costs involved in organizing the vast numbers of potential victims are immense.[11] Second, as noted, the effects of climate change are unevenly distributed. While the transaction costs of organizing victims are lower in more localized areas, it is likely that any such local organization would have insufficient economic clout to bargain meaningfully with fossil fuel companies. Third, the lack of public knowledge about climate change, caused by the evolving and complicated science of climate change and compounded by some fossil fuel companies' efforts to encourage public uncertainty and inaction on global warming,[12] further hinders fruitful organization and collective action. Lack of organization and imperfect knowledge therefore enable producers to continue producing their climate-changing products at higher than optimal levels and to keep externalizing the costs of climate change. Fossil fuel prices thus do not accurately reflect climate change's costs when these costs are left on victims.[13]

Unlike the consumer public, fossil fuel companies and some of the principal industries reliant on them have large amounts of resources with which they can acquire the expertise needed to

9. *Id.* at 570–71 (citing GUIDO CALABRESI, THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS 24–31 (1970)).

10. *Id.* at 572–73.

11. *Id.* at 572.

12. *See* Ross Gelbspan, *Beyond Kyoto*, AMICUS J. 22, 24 (Winter 1998) ("To date, fossil fuel interests, with few exceptions, have been devoting enormous resources to confounding the public with an appalling public relations campaign of deception and disinformation . . . ."). For a detailed account of fossil fuel companies' efforts to move public debate in their favor, *see generally* ROSS GELBSPAN, THE HEAT IS ON: THE HIGH STAKES BATTLE OVER EARTH'S THREATENED CLIMATE (1997).

13. Penalver, *supra* note 7, at 572–73.

assess information about climate change and its costs.[14] With such information and resources, these entities are in a better position to carry out a cost-benefit analysis comparing increased consumption with the increased "accident costs" produced by that consumption, and then to act on that analysis by internalizing the costs of climate change into the price of fossil fuels.[15] Internalizing the costs of climate change would raise the price of fossil fuels, making alternative energy sources and more efficient consumption of fossil fuels more desirable, thereby reducing the level of greenhouse gas emissions.[16] Placing climate change "accident" costs on the fossil fuel companies would thus minimize these costs.

Consider now which allocation of the costs of climate change would best serve the principles of corrective justice. Some harms of climate change are more easily attributable and identifiable, such as damage caused by rising sea levels, while others may be harder to distinguish from background processes, such as damage due to more frequent and more severe storms. Either way, people are harmed by climate change who otherwise would not have been.[17] Conceptions of equity and corrective justice suggest that those who have been harmed by others' negligent or morally dubious actions should be compensated in some way.[18] Notions of corrective justice thus also seem to support shifting the costs of climate change onto these fossil fuel companies. Since these basic goals of tort law could potentially be satisfied, applying a tort framework to climate change could indeed be an appropriate endeavor.

B. Obstacles to Climate Change Litigation

While a tort framework might be appropriate, tort-based climate change litigation could face significant institutional, practical, and legal obstacles. The main institutional question is one of judicial

14. *Id.* at 573.

15. *Id.* Furthermore, in contrast to sporadic accidents, which generally result from lapses of attention, climate change and other mass-exposure torts appear to be the result of deliberate business policies tailoring safety investments to profit margins. The possibility of significant tort liability could alter this risk-taking analysis. *See* David Rosenberg, *The Causal Connection in Mass Exposure Cases: A "Public Law" Vision of the Tort System*, 97 HARV. L. REV. 849, 855 (1984).

16. Penalver, *supra* note 7, at 574.

17. *Id.* at 573–74.

18. *Id.* at 575; *see also* Jules L. Coleman, *Tort Law and the Demands of Corrective Justice*, 67 IND. L.J. 349, 357 (1992).

authority and competence to deal with this kind of problem. Courts generally focus on the particular plaintiffs and defendants in front of them; however, in this instance, the major issues of causation, multiple defendants and plaintiffs, the variety of remedies, and present and future harms all suggest a more comprehensive approach to climate change that might be better taken by a legislature or agency.[19] Although a tort approach to climate change might be possible, therefore, some would dispute its desirability, seeing global warming as something requiring a political rather than a legal solution. As noted, however, there is a widely perceived lack of meaningful political action in the United States to address global warming, potentially leaving litigation as the best tool for addressing climate change in the foreseeable future.

Two practical obstacles to climate change litigation could also arise. First, as in tobacco litigation, the extensive financial resources of potential defendants would likely facilitate their ability to challenge everything, including issues like general causation that appear to be well-established.[20] This reality could make a climate change suit quite expensive and time-consuming, potentially deterring many plaintiffs and attorneys from pursuing such litigation. Second, at least in public nuisance actions, the typical plaintiffs are state executives (e.g., attorneys general).[21] The reliance of some key coastal states' economies on fossil fuel extraction, however, could make it more difficult to find states willing to take on these industries in a climate change lawsuit.[22]

Finally, one must acknowledge the potential legal hurdles facing tort-based climate change litigation. For instance, the state of current scientific knowledge might not be sufficient to adequately prove specific causation in a court of law for some of climate change's current and future harms. Identifying potential defendants, tracing harms to their actions, and apportioning

19. *See* RESTATEMENT (SECOND) OF TORTS § 821B cmt. f (1979).

20. AMY HUGHES, ELBERT LIN, & ISAAC NESSER, IS THE CLIMATE RIGHT? CLIMATE CHANGE SCIENCE, LEGAL CAUSATION, AND THE FEASIBILITY OF A CLIMATE CHANGE LAWSUIT 45 (2001) (Yale Environmental Protection Clinic report, on file with the author).

21. *See* David Kairys, *The Governmental Handgun Cases and the Elements and Underlying Policies of Public Nuisance Law*, 32 CONN. L. REV. 1175 (2000); *see also infra* Section VI.B.

22. For example, the State of Alaska has a "permanent fund" in which royalties from oil drilling in the state are deposited and then distributed annually to every single resident of the state. *See* http://www.pfd.state.ak.us.

damages among them could also be a complicated and onerous task. Nevertheless, this article will demonstrate that these and other hurdles, such as standing requirements, damage recovery rules, and preemption, are not insurmountable barriers to all potential tort-based climate change lawsuits.

C. Scope and Content of this Article

Four important constraints on this article must be noted. First, although numerous other gases, such as methane (CH_4) and nitrous oxide (N_2O), contribute to global warming, this article focuses on the feasibility of tort-based litigation against carbon dioxide emitters,[23] since carbon dioxide is the primary factor in recent anthropogenic warming.[24]

Second, global warming is just that—global. Even though numerous international tribunals and causes of action may therefore exist that could potentially be involved in a climate change suit,[25] this article focuses only on those causes of action that can be brought in American courts. International tribunals such as the International Court of Justice currently have less established case law and less enforcement authority than American courts, and they can only hear cases if the parties (nations) submit to a tribunal's jurisdiction voluntarily. Since international law is thus not as fully developed as American law at this point in time, international law has less potential to provide meaningful relief to those harmed by climate change. Although this article also focuses primarily on American plaintiffs, it is worth remembering that international plaintiffs can sue in American courts.[26] Small island

23. This does not necessarily mean that suits based on emissions of other greenhouse gases are not viable. Moreover, some potential defendants in a carbon dioxide suit, like coal companies, also emit other greenhouse gases like methane. Even when focusing litigation on carbon dioxide emitters, therefore, plaintiffs could draw in other greenhouse gas emissions as well.

24. *See supra* text accompanying note 3.

25. *See* Mihm, *supra* note 5, at 76 (describing theories of Andrew Strauss, professor of law at Widener University).

26. U.S. courts have diversity jurisdiction over cases between foreign states (or their citizens) and citizens of the United States, as long as the amount in controversy exceeds $75,000. U.S. CONST. art. III, § 2, cl. 1; 28 U.S.C. § 1332(a)(2), (a)(4) (2001). Foreign plaintiffs also could access U.S. courts under the Alien Tort Claims Act, 28 U.S.C. § 1350 (2001), but that involves the law of nations and thus faces the same weaknesses as other international law claims.

states and other affected nations, therefore, might also be promising plaintiffs in a climate change lawsuit.

Third, an article analyzing every aspect of a potential climate change lawsuit would necessarily cover a great deal of legal, scientific, and political territory. For instance, entirely separate papers could be and have been written solely on issues of standing or causation in the climate change context.[27] A comprehensive review of how scientific evidence of climate change would be treated in a court of law could similarly be a paper unto itself. While all key aspects of potential climate change litigation will be addressed in this article, practical constraints ultimately preclude coverage of some of these issues in the exhaustive manner they deserve.

Fourth, this article covers the legal, and to a certain extent the factual, bases for tort-based climate change litigation. However, some factual information, such as the actual details and figures concerning the practices and knowledge of the potential defendants identified in this article, would likely call for a more detailed investigation of corporate records than falls within the scope of this paper. Very likely, much of that information would only be revealed through discovery. Where the existence of facts is presumed in this paper, that presumption will be noted.

I have structured this article as follows. Section II reviews the scientific consensus that has emerged about global warming and surveys some of the present effects of climate change in the United States. In particular, I focus on two groups of effects and concomitant plaintiffs: (1) sea-level rise damages in coastal U.S. states, counties, or communities, or in island states and nations; and (2) damages in the State of Alaska or Alaskan villages from increasing temperatures, thawing permafrost, and loss of sea ice. I then describe the various damages that these plaintiffs could allege in their tort claims and identify some rules that might restrict recovery for these damages.

Section III explores how a plaintiff in climate change litigation might establish generic, specific, and proximate causation. I then identify the potential types of defendants most likely to be named in such litigation and assess the extent to which such defendants

27. *See, e.g.*, David R. Hodas, *Standing and Climate Change: Can Anyone Complain About The Weather?*, 15 J. LAND USE & ENVTL. L. 451, 9 J. TRANSNAT'L L. & POL'Y 451 (2000) (Supplement Joint Issue) (standing); HUGHES, LIN, & NESSER, *supra* note 20 (causation).

could be held liable for the costs of climate change plaintiffs' harms.

Section IV analyzes whether the Clean Air Act preempts tort-based climate change suits. Ultimately, I conclude that most climate change tort claims could survive a preemption challenge.

Section V explores the applicability of products liability law to global warming. I first show that climate change plaintiffs could establish standing to bring a products liability claim. I then argue that a warning-defect theory seems like a poor fit, but that a design-defect claim against defendants like automobile manufacturers has a better chance of succeeding. Although a products liability claim is viable, I contend that the defenses available to defendants and the need to extend the manufacturers' duty of care beyond consumers ultimately make products liability a weaker tort claim for climate change plaintiffs than a public nuisance claim.

Section VI examines the applicability of public nuisance law to climate change. I explain some of the public rights that the potential defendants have arguably unreasonably infringed upon and establish that potential climate change plaintiffs have standing to sue for those interferences. I argue that these plaintiffs might be able to proceed with a public nuisance suit if they can demonstrate that defendants controlled the harm caused to plaintiffs and perhaps also engaged in other tortious behavior. I then describe the relief and damages available to plaintiffs under a public nuisance claim.

Finally, in Section VII, I review my findings and assess the relative merits of the two tort claims considered. I then suggest other legal steps that lawyers might take to pave the way for tort-based global warming claims.

II. PRESENT EFFECTS OF CLIMATE CHANGE AND POTENTIAL PLAINTIFFS

Any climate change lawsuit will be inextricably linked to the science of global warming. To successfully show current harms, reasonableness of precautionary measures, or causation,[28] a plaintiff must rely on the scientific evidence of climate change. Since the science of how global warming generally works is well-established and is described in detail elsewhere, I will not address it in this

28. Causation is dealt with *infra* in Section III.

article.[29] It is sufficient to note that despite the uncertainties that remain in climate science, the overwhelming scientific consensus (as manifested in the IPCC Third Assessment Report) is that anthropogenic global warming is occurring and that increased carbon dioxide concentrations are one of its major causes.[30] This Section describes some of the current global and domestic effects of climate change, highlights the parties currently most harmed by those effects, and explores the potential damage claims for which those parties could seek recovery in tort-based litigation.

A. Global Effects of Climate Change

In the Third Assessment Report (TAR), the IPCC made several observations about climate change's present global effects. The global average surface temperature increased over the twentieth century by 0.6 ± 0.2°C.[31] The IPCC indicated that globally, the 1990s were very likely the warmest decade, and 1998 the warmest year, in the instrumental record (since 1861); the same is likely true of the Northern Hemisphere.[32] Tide gauge data show that global average sea level rose between 0.1 and 0.2 meters during the

29. For descriptions of how climate change works, *see generally* IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2; *see also* NATIONAL ASSESSMENT SYNTHESIS TEAM (NAST), US GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS ON THE UNITED STATES: THE POTENTIAL CONSEQUENCES OF CLIMATE VARIABILITY AND CHANGE (2000).

30. *See supra* notes 1–4 and accompanying text (describing IPCC Third Assessment Report (TAR) findings). The IPCC's assessment reports are extensively and thoroughly peer reviewed. The Third Assessment Report had a total of 122 Coordinating Lead Authors and Lead Authors, 515 Contributing Authors, 21 Review Editors, and 337 Expert Reviewers. IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 2 n.2. The IPCC reports "can therefore be considered as authoritative statements of the contemporary views of the international scientific community." JOHN HOUGHTON, GLOBAL WARMING: THE COMPLETE BRIEFING 159 (1997) (John Houghton has been co-chairman of the Science Assessment Working Group of the IPCC since 1992.) The peer review and publication of the IPCC's findings make it probable that the IPCC reports would be accepted as scientific evidence in a court of law under the *Daubert* standard. Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 593–94 (1993) (noting that peer review, publication, and general acceptance are factors indicating scientific validity that trial judge should consider in ruling on admissibility of expert scientific testimony).

31. IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 2.

32. *Id.* The IPCC Scientific Summary for Policymakers uses the following to indicate judgmental estimates of confidence: *virtually certain* (greater than 99% chance that a result is true); *very likely* (90–99% chance); *likely* (66–90% chance); *medium likelihood* (33–66% chance); *unlikely* (10–33% chance); *very unlikely* (1–10% chance); *exceptionally unlikely* (less than 1% chance). *Id.* at 2 n.7.

twentieth century.[33] Some of the United States' foremost experts on sea-level rise have directly attributed this rise to global warming.[34] The IPCC similarly concluded that it is very likely that the past century's warming contributed significantly to the observed sea-level rise through thermal expansion of sea water and widespread loss of land ice.[35] Globally, this sea-level rise has contributed to erosion of sandy and gravel beaches and barriers, loss of coastal dunes and wetlands, and drainage problems in many low-lying, mid-latitude coastal areas.[36]

The IPCC also concluded in the TAR that available collective observational evidence indicates with high confidence that regional changes in climate, particularly increases in temperature, have already affected a diverse set of physical and biological systems in many parts of the world.[37] Examples of observed changes include:

> shrinkage of glaciers, thawing of permafrost, later freezing and earlier break-up of ice on rivers and lakes, lengthening of mid- to high-latitude growing seasons, poleward and altitudinal shifts of plant and animal ranges, declines of some plant and animal populations, and earlier flowering of trees, emergence of insects, and egg-laying in birds.[38]

The international scientific consensus is thus that global warming is having both global and sub-global effects.

B. Present Effects of Climate Change in the United States

Climate models, which scientists use to trace past climate change impacts and to predict future ones, are not yet refined enough to

33. *Id.* at 4.

34. BRUCE C. DOUGLAS ET AL., SEA LEVEL RISE: HISTORY AND CONSEQUENCES 218 (2000) ("Sea level rise is the most certain consequence of global warming, and the impacts are already evident along the world's coast."). Douglas et al. also maintain that the most comprehensive and accurate available data demonstrate that approximately 20 cm is the correct number. *Id.* at 181–82 ("Global sea-level has risen nearly 20 cm in the last century.").

35. IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 10. "Very likely" indicates a 90–99% confidence level. *See supra* note 32.

36. WORKING GROUP II, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2001: IMPACTS, ADAPTATION & VULNERABILITY, TECHNICAL SUMMARY 35 (2001).

37. WORKING GROUP II, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2001: IMPACTS, ADAPTATION & VULNERABILITY, SUMMARY FOR POLICYMAKERS 3 (2001) [hereinafter IPCC, IMPACTS, SUMMARY FOR POLICYMAKERS]. The IPCC impacts report has the following definitions for its confidence levels: *very high* (95% or greater), *high* (67–95%), *medium* (33–67%), *low* (5–33%), *very low* (5% or less). *Id.* at 4 n.6.

38. *Id.* at 3.

make detailed assessments of localized climate changes and their effects,[39] but such models are increasingly able to deal with changes and impacts at the regional level.[40] Although the consensus might not be as strong as on global impacts, significant evidence exists that climate change is having present effects in the United States.[41]

1. Sea-Level Rise

Rising sea levels, one of the most certain consequences of climate change, have already had significant impacts on American coastal areas. Between 1985 and 1995, southeastern states lost more than 32,000 acres of coastal salt marsh due to a combination of human development activities, sea-level rise, natural subsidence, and erosion.[42] While the precise amount of loss due to sea-level rise alone is difficult to quantify, sea-level rise is clearly a substantial factor. A recent study in the scientific journal *Eos* by sea-level rise experts asserts that the increasing temperatures in the twentieth century could be responsible for a significant portion (up to about half) of the observed global sea-level rise of nearly 20 cm during that century, due to thermal expansion of the oceans and melting of small glaciers.[43] The study's authors report that rising sea levels, caused at least in part by global climate change, are already contributing to a pattern of beach erosion along the U.S. East Coast that will likely accelerate in the future.[44] The authors note that the IPCC "projects a further global sea-level rise of 20 cm by

39. HUGHES, LIN, & NESSER, *supra* note 20, at 22.

40. NAST, *supra* note 29, at "About this Document" Preface.

41. The primary collector and synthesizer of such evidence is the National Assessment Synthesis Team (NAST), a committee of experts drawn from governments, universities, industry, and non-governmental organizations building on science conducted as part of the United States Global Change Research Program (USGCRP). Their Assessment Overview, *supra* note 29, synthesizes their findings and is the foundation for the assertions made in this section. The Overview was extensively peer reviewed by more than 300 scientific and technical experts, and the report was reviewed at each stage for technical accuracy by the agencies of the USGCRP. As such, it should also meet the *Daubert* admissibility standard described *supra*, note 30.

42. NAST, *supra* note 29, at 51. Projected impacts of sea-level rise in the future include the loss of barrier islands and wetlands that protect coastal communities and ecosystems from storm surges, reduced fisheries productivity, saltwater intrusion into surface and groundwater supplies, and destruction of coastal property. *Id.*

43. Recent Study Suggests Sea Level Rise Could Threaten Beaches Along U.S. East Coast, *at* http://www.epa.gov/owow/estuaries/coastlines/jun00/recentstudy.html (last revised Aug. 1, 2002) (referring to Stephen P. Leatherman et al., *Sea level rise and coastal erosion*, EOS (American Geophysical Union) (Feb. 2000)).

44. *Id.*

2050; combined with ongoing regional post-glacial subsidence, sea levels along the coasts of New Jersey, Delaware, and Maryland could potentially rise about 40 cm by that time."[45] The study's authors conclude that in these mid-Atlantic states, "[t]his projected rise will result in as much as 60 meters of erosion on average, about two times the average beach width."[46] This result is due in part to the fact that the slope of the Atlantic and Gulf Coast shorelines in the United States is so gentle that a small sea-level rise produces a large inland shift of the shoreline.[47] Estimates of the cumulative financial effect of a 0.5-meter rise in sea level on U.S. coastal property by 2100 range from roughly $20 billion to $150 billion.[48]

Sea-level rise also presently threatens American islands and small island nations. Along with global average sea level, relative sea level[49] is showing an upward trend (about 10 cm per 100 years) at sites monitored in the Caribbean and Gulf of Mexico.[50] Absolute sea level is also rising in the Pacific, although trends vary greatly from island to island because some islands are themselves rising.[51] Sea-level rise on these islands results in coastal erosion, inundation, and salt water intrusion into freshwater sources and coastal agricultural areas.[52] Low-level islands, particularly the sites thereon closest to sea level (such as much of the metropolitan area of San Juan in Puerto Rico), seemingly face the greatest threats from present and future sea-level rise.[53] In Honolulu, Nawiliwili, and

45. *Id.*

46. *Id.*

47. NAST, *supra* note 29, at 108. Encroaching shorelines have already necessitated relocation of some coastal structures in southeastern states. For instance, in 1999, the National Park Service moved the Cape Hatteras lighthouse in North Carolina back 2,900 feet to save it from the advancing seas, at a cost of $9.8 million. *See* THE H. JOHN HEINZ III CENTER FOR SCIENCE, ECONOMICS AND THE ENVIRONMENT, EVALUATION OF EROSION HAZARDS, SUMMARY 4 (2000) [hereinafter HEINZ CENTER, EVALUATION OF EROSION HAZARDS] (prepared for FEMA), *available at* http://www.heinzctr.org/publications.htm. As with the loss of coastal salt marsh, this cannot be wholly attributed to sea level rise induced by climate change.

48. HUGHES, LIN, & NESSER, *supra* note 20, at 23–24 (citing JAMES NEUMANN ET AL., PEW CENTER ON GLOBAL CLIMATE CHANGE, SEA LEVEL RISE & GLOBAL CLIMATE CHANGE: A REVIEW OF IMPACTS TO U.S. COASTS iv (2000), *available at* http://www.pewclimate.org/projects/env%5Fsealevel.cfm).

49. Relative sea level also takes into account natural and human-caused changes in land elevation such as tectonic uplifting and land subsidence. NAST, *supra* note 29, at 80–81.

50. *Id.*

51. *Id.*

52. *Id.*

53. *Id.* at 83.

Hilo, Hawaii, sea level is already rising by 6–14 inches per century and is predicted to rise another 17–25 inches by 2100.[54] Possible responses to sea-level rise include: building walls to hold back the sea, allowing the sea to advance and adapting to it, and raising the land (e.g., by replenishing beach sand or elevating houses and infrastructure). Each of these potential responses will be costly, either in actual expenses or in lost land and structures. For example, the cumulative cost of sand replenishment to protect the coast of Hawaii from a 20-inch sea-level rise by 2100 is estimated at $340 million to $6 billion.[55]

2. Melting Permafrost and Shrinking and Thinning Sea Ice

The IPCC has stated with high confidence that climate changes in polar regions have already taken place and are manifested in the decrease in extent and thickness of Arctic sea ice, permafrost thawing, coastal erosion, and changes in ice sheets and ice shelves.[56] Because of its polar proximity, Alaska has the dubious distinction of serving as the American frontier for profound climate change effects.

Annual average temperatures have increased by almost 4°F (2°C) in Alaska over the past century, compared with the national average increase of almost 1°F (0.6°C).[57] The rapid warming in Alaska is having substantial ecological and socioeconomic impacts.[58] The warming has been accompanied by extensive thawing of the permafrost that underlies most of the state, causing increased erosion, landslides, sinking of the ground surface, and disruption and damage to forests, buildings, and infrastructure.[59] In many areas of interior Alaska, the permafrost has warmed to within one degree of freezing.[60] Ironically, the melting permafrost has forced

54. OFFICE OF POLICY, U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA), EPA 236-F-98-007e, CLIMATE CHANGE AND HAWAII 3 (Sept. 1998), *available at* http://www.epa.gov/oppeoee1/globalwarming/publications/impacts/state/hi_impct.pdf.

55. *Id.*

56. IPCC, IMPACTS, SUMMARY FOR POLICYMAKERS, *supra* note 37, at 16 (Table SPM-2). "High" indicates 67–95% confidence. *See supra* note 37.

57. NAST, *supra* note 29, at 20, 74.

58. *Id.* at 74.

59. *Id.* at 76.

60. Ned Rozell, Geophysical Institute, University of Alaska Fairbanks, *Interior Alaska and Siberia Permafrost Thawing Together*, Article #1523, ALASKA SCI. F. (Jan. 3, 2001), *available at* http://www.gi.alaska.edu/ScienceForum/ASF15/1523.html.

even the Alyeska Pipeline Service Company to install new supports for the Trans-Alaska Pipeline.[61]

Sea ice off the Alaskan coast is retreating and thinning. The IPCC reported that Northern Hemisphere spring and summer sea-ice extent has decreased by about 10–15% since the 1950s.[62] The area of multi-year Arctic sea ice has decreased 14% since 1978, with the annual rate of loss apparently sharply increasing in the 1990s.[63] It is likely that Arctic sea-ice thickness during late summer to early autumn has declined by about 40%, thinning three to six feet since the 1960s, with a considerably slower decline in winter.[64] The retreating and thinning sea ice off the Alaskan coast has allowed larger storm surges to develop, increasing inundation and erosion on coasts already vulnerable from permafrost thawing.[65] This has had widespread effects on marine ecosystems, coastal climate, human settlements, and subsistence activities.[66] In some parts of the state, coastlines have retreated more than 1,500 feet due to erosion over the past few decades; several Alaskan coastal villages will soon have to be fortified or relocated.[67]

For instance, the village of Shishmaref, on a narrow barrier island off the Seward Peninsula, has lost several hundred feet of coastal land. Seawater is approaching the town's airport, main road, homes, utility lines, fuel tanks, and garbage dump. Storms now hit with unusually brutal wave activity, and the sea has demolished a succession of sea walls. Village leaders are hoping to build a stronger sea wall, a groin field, and some sort of protection for the runway.[68] In October 2001, Alaska Governor Tony Knowles authorized the state's Disaster Relief Fund to pay for at least 500 feet of the emergency sea wall that Shishmaref villagers were

61. Timothy Egan, *Alaska, No Longer So Frigid, Starts to Crack, Burn and Sag*, N.Y. TIMES, June 16, 2002, at A1.

62. IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 4.

63. NAST, *supra* note 29, at 76.

64. *Id*; *see also* IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 4. "Likely" indicates a 66–90% chance. *See supra* note 32.

65. NAST, *supra* note 29, at 76. Some scientists say the effects on sea ice are the inescapable result of a changing Arctic climate that has warmed significantly during the last half-century. Interview by Doug Schneider, Arctic Science Journeys Radio, with Gunter Weller, University of Alaska Fairbanks (June 8, 2001), *at* http://www.uaf.edu/seagrant/NewsMedia/01ASJ/06.08.01Alaska-heat.html.

66. NAST, *supra* note 29, at 76.

67. *Id.*

68. Kim Murphy, *Front-Row Exposure to Global Warming*, L.A. TIMES, July 8, 2001, at A1.

rapidly constructing; the village had already spent roughly $30,000 to erect about 370 feet of it.[69] It would cost $4–6 million to build a sea wall from shield rock that might last ten to fifteen years.[70] Eventually, the Inupiat villagers will have to find a new site for the village.[71] Current cost estimates for relocating exceed $50 million.[72]

C. Potential Claims for Damages

Coastal states, islands, the State of Alaska, and Alaskan villages all seem to be experiencing present harms from global warming. As such, they could be promising plaintiffs in any current climate change litigation. In such litigation, one of the first critical issues these plaintiffs would face is the often complicated issue of damages.

1. Sea-Level Rise Claims

Sea-level rise induced by global warming appears to be a substantial contributing factor in coastal erosion and inundation. Accordingly, climate change is at least partly responsible for damaging property on islands or in coastal states. Present property damages could include lost coastal land, buildings, structures, infrastructures, and agriculture. The bulk of damages incurred by these regions, however, might be less tied to land already lost and more related to efforts to prevent future property damage. In a tort suit, these islands and states might therefore seek further damages for preventative measures that have been or that need to be taken. Plaintiffs could also seek to recover for the harms of climate change that might occur in the future.

Both the preventative and the anticipatory damage claims are based on future harms. As a general matter, courts have been reluctant to award damages for future or latent injuries. In cases

69. Doug O'Harra, *Village Tries to Shore Up*, ANCHORAGE DAILY NEWS, Oct. 30, 2001, at B-1.

70. Don Callaway (Nat. Park Serv., Anchorage, Alaska) et al., *Effects of Climate Change on Subsistence Communities in Alaska*, *in* ASSESSING THE CONSEQUENCES OF CLIMATE CHANGE FOR ALASKA AND THE BERING SEA REGION: PROCEEDINGS OF A WORKSHOP AT THE UNIVERSITY OF ALASKA FAIRBANKS (Gunter Weller & Patricia A. Anderson eds., 1999), *available at* http://www.besis.uaf.edu/besis-oct98-report/besis-oct98-report.html.

71. *Id*; *see also* Robert Piggot, *Alaskans Face the Thaw*, BBC NEWS, Nov. 15, 2000, *at* http://news.bbc.co.uk/hi/english/world/americas/newsid_1024000/1024585.stm (describing Shishmaref as "one of only two American villages which must be sacrificed to the increasingly brutal climate").

72. Callaway et al., *supra* note 70.

involving asbestos, for instance, courts have hesitated to award damages for fear that the injuries may never actually occur;[73] the possibility always exists that the plaintiff will not actually develop the predicted illness, so damages are often viewed as too speculative or remote.[74] A few courts, however, have recognized enhanced-risk claims, which seek compensation for the anticipated harm, proportionately reduced to reflect the chance that it will not occur. A plaintiff in an enhanced-risk suit must prove that future consequences of an injury are reasonably probable, not just possible.[75] Courts recognizing enhanced-risk claims often require plaintiffs to first show present symptoms.[76] Assuming the confidence levels asserted in documents like the IPCC reports are accepted by the courts,[77] sea-level rise plaintiffs could likely show a greater than fifty-one percent probability that sea levels will continue to rise and threaten property. Given the already rising seas and encroaching shorelines, they might also be able to demonstrate present injuries or "symptoms." Since increased risk claims have not been widely recognized due to their speculative nature, however, sea-level rise plaintiffs' prospects of recovery for the anticipated harms of climate change appear questionable at best.

In contrast to claims seeking recovery for future damages, sea-level rise plaintiffs appear to have much stronger claims based on the *present* costs of *preventing* future harms. The general tort rule is that plaintiffs who are harmed by defendants are entitled to recover their reasonable expenditures needed to abate, mitigate, or prevent future recurrences of those harms.[78] For more than a century, for example, courts have held that plaintiffs can recover from defendants their reasonable expenditures for erecting walls to

73. *See, e.g.*, Lavelle v. Owens Corning Fiberglass Corp., 507 N.E.2d 476 (Ohio Ct. App. 1987); Mauro v. Raymark Indus., 561 A.2d 257 (N.J. 1989).

74. *Lavelle*, 507 N.E.2d at 479 ("[D]amages which are uncertain, speculative, or conjectural cannot be recovered.").

75. This requires at least a fifty percent probability. *See In re* Paoli R.R. Yard PCB Litig., 916 F.2d 829, 850 (3d Cir. 1990); Martin v. Johns-Manville Corp., 494 A.2d 1088 (Pa. 1985); *see also* HUGHES, LIN, & NESSER, *supra* note 20, at 48 (describing toxics-in-groundwater cases).

76. HUGHES, LIN, & NESSER, *supra* note 20, at 37 (describing DES cases), 64 (asbestos cases). *But see id.* at 48 (toxics-in-groundwater cases do not require present physical injury).

77. *See supra* note 30.

78. *See generally* M.O. Regensteiner, Annotation, *Expense Incurred by Injured Party in Remedying Temporary Nuisance or in Preventing Injury as Element of Damages Recoverable*, 41 A.L.R. 2d 1064 (2001).

keep water off their property.[79] These cases seem analogous to the sea-level rise plaintiffs' preventative expenses. Building sea walls, relocating structures, and raising the land are all present measures taken and expenses incurred to mitigate future damages arguably caused at least in part by defendants' actions.[80] These preventative measures seem reasonable given the probability and scope of future sea-level rise, the gentle slopes of Atlantic and Gulf Coast shorelines, and the proximity to sea level of many island areas. The expenses for these preventative measures thus could properly be included in the scope of damages.[81]

2. Permafrost and Sea Ice Claims

The Alaskan property, buildings, and infrastructure harmed by thawing permafrost could constitute present damages. Alaska's Department of Transportation & Public Facilities, for instance, has incurred mounting expenditures for maintaining and repairing Alaska's roads.[82] North of Fairbanks, thawing permafrost has already caused roads to buckle and houses and telephone poles to tilt.[83] Expenses for preventative measures taken to support buildings and infrastructure appear to be recoverable under the same line of "prevention" cases described above.[84] These measures seem sensible given that the IPCC concluded with very high confidence that in developed areas of the Arctic, and where the

79. *See id.* (citing Comstock v. New York C. & H.R.R. Co., 48 Hun. 225 (N.Y. 1888) (holding building owner who constructed concrete wall to prevent water from broken pipe on defendant's premises from flowing into his cellar entitled to recover expense of constructing wall); Piedmont Cotton Mills, Inc. v. Gen. Warehouse, Inc., 149 S.E.2d 72 (Ga. 1966) (holding that where defendant's diversion of stream into artificial watercourse resulted in flooding to abutting property of plaintiff, cost of plaintiff's protective measures were properly element of damages).

80. The issue of causation will be addressed *infra* in the next Section.

81. *See also* RESTATEMENT (SECOND) OF TORTS § 930(3)(b) (1979) (allowing damages for past and prospective invasions of land to include compensation for reasonable cost to plaintiff of avoiding future invasions).

82. Doug O'Harra, *As Alaska Thaws, New Challenges Await Engineers,* ANCHORAGE DAILY NEWS, Jan. 9, 2003, at A1, A8 (quoting district manager for Alaska Department of Transportation and Public Facilities as saying, "The whole Alaska Highway from Northway to the border is coming apart. It's just exploding.").

83. Egan, *supra* note 61, at A1.

84. *See supra* notes 78–81 and accompanying text; *see also* City of Harrisonville v. W. S. Dickey Clay Mfg. Co., 61 F.2d 210, 213 (8th Cir. 1932), *rev'd on other grounds,* 289 U.S. 334 (1933) ("In some cases where continuing injury is threatened, it might be necessary to incur expense in abating the nuisance. In such cases, the reasonable cost of repairs, removal, or abatement might properly be recoverable as a part of the damages actually sustained.").

permafrost is ice-rich, special attention will be required to mitigate the detrimental impacts of thawing.[85]

Another damage claim that plaintiffs might assert is the need for a system to monitor and provide advance warning of the onset of harm to roads and buildings, which could make repairs significantly easier and less expensive.[86] Such a claim would be analogous to a medical monitoring claim, often asserted in cases involving exposure to a substance like asbestos.[87] The basic claim is that defendants' negligence in exposing plaintiffs to hazardous substances so increased the risk that adverse health consequences would occur that the defendants should be liable for the present, quantifiable costs to plaintiffs of being tested periodically for signs of the illness.[88] Some courts require present physical impacts or symptoms in order to make such a claim,[89] but many focus solely on whether the monitoring is reasonably necessary and will produce a real benefit.[90] Courts recognizing monitoring claims often do so to encourage early detection and mitigation of the harm.[91] A monitoring system for thawing permafrost, if such a system could be designed, would have real benefit by allowing early diagnosis and mitigation.[92] Potential plaintiffs might thus be able to recover expenses should they institute such a system.[93]

85. IPCC, IMPACTS, SUMMARY FOR POLICYMAKERS, *supra* note 37, at 13. "Very high" indicates greater than 95% confidence. *See supra* note 37.

86. HUGHES, LIN, & NESSER, *supra* note 20, at 82.

87. *See, e.g.*, Marine Asbestos Cases v. American Hawaiian Cruises, Inc., 265 F.3d 861 (9th Cir. 2001).

88. *See id.* at 866; *see also* Rosenberg, *supra* note 15, at 886. Even some courts that reject enhanced-risk claims accept the less-speculative medical monitoring claims. *See, e.g.*, Mauro v. Raymark Indus., Inc., 561 A.2d 257 (N.J. 1989); *In re* Paoli R.R. Yard PCB Litig., 916 F.2d 829, 850 (3d Cir. 1990).

89. *See* Mergenthaler v. Asbestos Corp. of Am., 480 A.2d 647 (Del. Super. Ct. 1984); Villari v. Terminix Int'l, Inc., 677 F. Supp. 330, 338 (E.D. Pa. 1987). "Symptoms" are discussed *supra* notes 76–77 and accompanying text.

90. *See, e.g., Paoli*, 916 F.2d at 851 ("[T]he appropriate inquiry is not whether it is reasonably probable that plaintiffs will suffer harm in the future, but rather whether medical monitoring is, to a reasonable degree of medical certainty, necessary in order to diagnose properly the warning signs of disease."); *see also Marine Asbestos Cases*, 265 F.3d at 865–66; *Mauro*, 561 A.2d at 257.

91. *See Paoli*, 916 F.2d at 852 (describing these as "conventional goals of the tort system"); *see also* Potter v. Firestone Tire & Rubber Co., 863 P.2d 795, 824 (Cal. 1993).

92. An imperfection in the analogy is that for medical monitoring claims, the damage is to the human body, whereas the harms from climate change are largely to property or other interests. Courts might view these damages to be less urgent than damages to a person and therefore less in need of legal innovation.

93. The closest analogy to medical monitoring in the sea-level rise context is probably the

Sea-ice plaintiffs like Shishmaref appear to have present damages as well, such as lost land and destroyed sea walls. The village and the State have also made significant outlays for mitigation efforts and could face even more expenses in the near future. The expenditures for these preventative measures would likely be recoverable under the same line of "prevention" cases that could allow sea-level rise plaintiffs to recover for their similar efforts.[94]

3. Restrictions on Damage Recovery

Although the damages above might be cognizable, states, islands, and villages might still be unable to recover for some of their harms. If the property damaged or for which preventative actions were taken is private property, the remoteness doctrine might preclude these potential plaintiffs from recovering their own costs. The doctrine of remoteness bars recovery in tort for indirect harm suffered as a result of injuries directly sustained by another person.[95] Expenditures by a state that are inescapably contingent on direct or speculative harm to state residents are sometimes deemed to be too derivative or remote to support a tort claim.[96] The damages to homes from sea-level rise, for instance, might prove too derivative for a state to assert.

If a state's harms can be seen as non-derivative, however, those harms could sustain a tort claim. For instance, if the damaged property was public land or property, as are many beaches, roads, and other infrastructure, then the government itself is harmed. Diminished property tax revenues and lower property values can also harm states apart from any harm to individuals.[97] Further, even if some of the states' injuries arise from harm to others, the remoteness doctrine in some states contains an exception in cases of a special relationship between the plaintiff and the injured third

cost of identifying, mapping, and disseminating information on coastal erosion hazards nationwide. This cost is estimated to be about $5 million per year. With this diagnostic information, areas most susceptible to sea-level rise and coastal erosion can be identified and precautionary measures taken. *See* HEINZ CENTER, EVALUATION OF EROSION HAZARDS, *supra* note 47, at 3.

94. *See supra* notes 78–81 and accompanying text.

95. *See* State v. Lead Indus. Ass'n., Inc., No. 99-5226, 2001 WL 345830, at *13 (R.I. Super. Apr. 2, 2001) (unpublished opinion).

96. *See, e.g., id.*

97. *See* City of Boston v. Smith & Wesson Corp., No. 199902590, 2000 WL 1473568, at *6 (Mass. Super., July 13, 2000) (memorandum of decision and order on defendants' motion to dismiss).

party, such as a parent-child relationship. At least one court has raised the possibility that governments might have just such a "special relationship" with their citizens, in which case none of the damage claims referred to above would seem to be too remote.[98]

The municipal cost recovery rule could pose another obstacle to recovery of some damages by climate change plaintiffs. Generally, a municipality may not recover the costs of providing public services.[99] "The cost of public services for protection from a safety hazard is to be borne by the public as a whole, not assessed against a tortfeasor whose negligence creates the need for the service."[100] What the cases barring recovery under the municipal cost recovery rule have in common is that the acts causing the damage were of the sort the municipality reasonably could expect to occur.[101] Courts have recognized, however, that governments can recover their expenses for abatement of unexpected public nuisances (such as clean-up of toxic wastes discharged into drinking water supplies) and for protection of the government's own property.[102] Which expenses are truly unexpected will largely be a question for the court.[103] For instance, whether the rule will bar the expenses incurred by the State of Alaska in repairing damaged roads might depend on whether the courts look at road maintenance costs in general (which are probably expected) or costs associated with rapidly thawing permafrost (which are probably unexpected). A similar inquiry would be involved in determining whether

98. *Id*; *see also* Georgia v. Tennessee Copper, 206 U.S. 230, 237 (1907) (Court viewed state as quasi-sovereign, with "an interest independent of and behind the titles of its citizens, in all the earth and air within its domain. It has the last word as to whether its mountains shall be stripped of their forests and its inhabitants shall breathe pure air. . . . The alleged damage to the state as a private owner is merely a makeweight, and we may lay on one side the dispute as to whether the destruction of forests has led to the gullying of its roads.").

99. City of Philadelphia v. Beretta U.S.A., Corp., 126 F. Supp. 2d 882, 894 (E.D. Pa. 2000); *City of Boston*, 2000 WL 1473568, at *7.

100. *City of Philadelphia*, 126 F. Supp. 2d at 894.

101. *City of Boston*, 2000 WL 1473568, at *8.

102. *See* City of Flagstaff v. Atchison, Topeka & Santa Fe Ry. Co., 719 F.2d 322, 324 (9th Cir. 1983); Town of East Troy v. Soo Line R.R. Co., 653 F.2d 1123 (7th Cir. 1980), *cert. denied*, 450 U.S. 922 (1981); United States v. Chesapeake & Ohio Ry. Co., 130 F.2d 308 (4th Cir. 1942). For more on public nuisance, see *infra* Section VI.

103. Courts can disagree on what are reasonably expected municipal costs. *Compare City of Philadelphia*, 126 F. Supp. 2d at 894–95 (noting that at least three courts—in Ohio, Florida, and Connecticut—have held that municipal cost recovery rule bars cities' suits against gun industry for recovery of expenses of policing cities), *with City of Boston*, 2000 WL 1473568, at *8 ("Plaintiffs allege wrongful acts [against the gun industry] which are . . . [not] of the sort a municipality can reasonably expect.").

relocating structures and building sea walls are part of the ordinary, expected costs of coastal communities.

III. CAUSATION, POTENTIAL DEFENDANTS, AND LIABILITY FOR DAMAGES

The State of Alaska, other coastal states, islands, and Alaskan villages all appear to be potential climate change plaintiffs, based on their possible claims for harms from rising sea levels, thawing permafrost, and melting and thinning sea ice. However, plaintiffs' burden is obviously not met merely by showing present harms. Plaintiffs must also show that those harms are traceable to the actions of certain parties. This Section analyzes the complicated issue of causation in the global warming context, identifies potential types of defendants in climate change litigation, and explores the extent to which these defendants could be held liable for plaintiffs' damages.

A. Generic and Specific Causation

In many toxic tort cases, as in a climate change case, the clear causal chains examined in first-year torts classes usually do not exist. Instead, plaintiffs must rely on more statistical or probabilistic means. In mass exposure cases such as Agent Orange, for instance, plaintiffs often had to rely on epidemiological studies to try to demonstrate the association between exposure to a substance and deleterious health effects.[104] These studies attempt to establish generic causation—whether it can be said that the substance, as a general proposition, causes the sort of injuries afflicting the plaintiffs.[105] In the climate change context, climate scientists use computer models to project the past and future course of Earth's climate and to demonstrate the probabilistic association between increased greenhouse gas emissions and climatic effects.[106] Despite the uncertainties that remain in climate

104. *See* HUGHES, LIN, & NESSER, *supra* note 20, at 22 (explaining Agent Orange litigation).

105. *See* JAMES HENDERSON & AARON TWERSKI, PRODUCTS LIABILITY: PROBLEMS AND PROCESS 143 (3d ed. 1997).

106. The basic idea of climate models is that parameters (such as temperature) describing the dynamics and physics of the climate model are specified on a grid covering the planet. Current technology limits the resolution of the grid, so that climatic effects are averaged over large geographical areas. HUGHES, LIN, & NESSER, *supra* note 20, at 22.

science, the studies and models such as those the IPCC relied upon provide a solid basis for arguing that a general causal link exists between greenhouse gas emissions, climate change, and effects such as sea-level rise, thawing permafrost, and melting sea ice—all probably beyond the "more likely than not" standard used in the legal arena.[107]

Generally speaking, courts have not considered statistical associations like those produced by epidemiological studies to be adequate proof of specific causation—whether it can be said that the substance caused plaintiffs' particular injuries.[108] This individual causation is often the most problematic for toxic tort plaintiffs. Determination of specific causation is complicated by the existence of background levels of the injuries and of other risk factors that may contribute to the victims' chances of developing the disease ("confounding factors").[109] These complications mean that even where it can be shown that the defendant is responsible for a significant proportion of the cases of a harm, no single plaintiff can prove that he or she is one of those cases.[110] Given these difficulties, plaintiffs in toxic tort cases have had to supplement epidemiological evidence with supporting scientific evidence, statistical evidence, expert testimony, or further epidemiological evidence that a causal link is *probable*.[111] Many courts and scholars have concluded that plaintiffs who rely on epidemiological evidence must show that, more probably than not, their individual injuries were caused by the risk factor in question, as opposed to any other cause.[112] This has sometimes been translated to a requirement of a relative risk of at least two.[113]

Climate models are faced with uncertainty due to the great complexity and interdependence of the climate system, regional variations, feedback loops, the nonlinear and partially chaotic nature of parts of the system, and the roles played by carbon sinks, deep ocean circulation, clouds, and aerosols. *Id.* at 11. Confidence in climate models has improved, however, due to their demonstrated performance on a range of space- and time-scales. IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 9; *see also* NAST, *supra* note 29, at 14–15.

107. *See supra* notes 29–38 and accompanying text.

108. HENDERSON & TWERSKI, *supra* note 105, at 143.

109. Penalver, *supra* note 7, at 580.

110. Tom Christoffel & Stephen P. Teret, *Epidemiology and the Law: Courts and Confidence Intervals*, 81 AM. J. PUB. HEALTH 1661 (1991).

111. *See e.g.*, West v. Johnson & Johnson Prod., Inc., 220 Cal. Rptr. 437 (Cal. Ct. App. 1985), *cert. denied*, 479 U.S. 824 (1986); *see also* JAMES T. O'REILLY & NANCY C. CODY, THE PRODUCTS LIABILITY RESOURCE MANUAL 32 (General Practice Section, American Bar Association 1993).

112. *See* Penalver, *supra* note 7, at 580–81; *see also In re* Agent Orange Prod. Liab. Litig.,

Showing specific causation in the climate change context could be particularly difficult. First, climate change's effects involve shifts in climatic activity, such as more intense and more frequent storms, not the creation of distinctive new phenomena, like the "signature diseases" of asbestosis in asbestos cases and clear cell adenocarcinoma in DES cases.[114] Unlike those cases, the complexity of the climate system means that several factors are involved in producing climatic phenomena, making it difficult to show the probability that defendants' contributions to anthropogenic climate change caused any particular phenomenon. Second, unlike cancer or other typical toxic tort effects, the natural phenomena affected by climate change are subject to natural fluctuations in frequency and severity.[115] The chaotic system underlying climatic effects makes it quite difficult to differentiate a particular pattern change in temperature or sea level caused by anthropogenic climate change from one caused by natural variability.[116]

The obstacle posed by specific causation is mitigated, however, when governments as opposed to individuals are the plaintiffs.[117] When states bring tort claims, the plaintiffs have almost infinite lifespans and cover large amounts of territory, allowing for an aggregation of effects over both space and time. The harms mentioned above—sea-level rise, temperature increases, thawing

611 F. Supp. 1223, 1253 (E.D.N.Y. 1985) (finding inadmissible expert opinions that do not show that Agent Orange was more likely than anything else to be cause of plaintiffs' harms). *But see* Heckman v. Federal Press Co., 587 F.2d 612, 617 (3d Cir. 1978) ("Expectancy or statistical data about a group do not establish concrete facts about an individual.").

113. Relative risk is the difference in risk of acquiring a given condition between exposed and unexposed populations. If a given action has doubled the risk of a harm occurring, then one can say that it is more probable than not that a particular incidence of that harm was caused by that action. *See* Penalver, *supra* note 7, at 582.

114. HUGHES, LIN, & NESSER, *supra* note 20, at 36. In not producing unique effects, climate change is quite similar to the majority of toxic tort cases, which often deal with effects like cancer. Asbestos and DES are exceptions.

115. Penalver, *supra* note 7, at 581.

116. Although the international scientific consensus is that a clear anthropogenic signal can be detected despite these natural variations and confounding factors, *see* IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 10, that reaffirms only generic causation. The variations and confounding factors mean that it is difficult to attribute to climate change any one manifestation of a harm generally linked to climate change, since natural fluxes or other factors could be the cause in that particular case. *See* Hodas, *supra* note 27, at 456.

117. David Kairys, *Legal Claims of Cities Against the Manufacturers of Handguns*, 71 TEMP. L. REV. 1, 12 (1998).

permafrost, and melting and thinning sea ice—are among the harms most clearly tied to climate change, asserted by the IPCC with high levels of confidence. The aggregation of these harms makes it easier to rule out confounding factors; one sinkhole in a road or one particular storm surge is more easily attributed to factors other than climate change than is a state full of damaged roads or with a lengthy and retreating shoreline.[118] Natural fluxes and confounding factors still exist, since some portion of the harms within the aggregation would not actually be caused by global warming, but aggregation allows plaintiffs to better establish that *some* present harms from climate change exist in the broader geographic and temporal range. Once these harms are established, the question is no longer whether defendants have caused harms. Rather, the pertinent question becomes whether the amount of their contributions is sufficient to find liability for damages.

B. Proximate Causation and the Substantiality Requirement

The entire global community can be said to be responsible for climate change to some degree; no group of defendants could be entirely responsible for global warming. Nevertheless, the law of torts does not predicate defendant liability on causing all of the plaintiffs' harms.

An actor's tortious conduct can be a legal cause of another's harm if the conduct is a "substantial factor" in bringing it about.[119] "Substantial" means that the defendant's conduct "has such an effect in producing the harm as to lead responsible men to regard it as a cause, using that word in the popular sense, in which there always lurks the idea of responsibility."[120] As such, "substantial

118. HUGHES, LIN, & NESSER, *supra* note 20, at 82.

119. RESTATEMENT (SECOND) OF TORTS § 431 (1965); *see also id.* § 834 ("One is subject to liability for a nuisance caused by an activity, not only when he carries on the activity but also when he participates to a substantial extent in carrying it on."); RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY § 16(a) (1998) ("When a product is defective at the time of commercial sale or other distribution and the defect is a substantial factor in increasing the plaintiff's harm beyond that which would have resulted from other causes, the product seller is subject to liability for the increased harm."); Shetterly v. Raymark Indus., 117 F.3d 776, 780 (4th Cir. 1997) ("In order to sustain an action against Raymark for asbestos related injuries, Plaintiffs must prove that Raymark products were a substantial causative factor in their injuries.") (internal quotation marks and citations omitted).

120. RESTATEMENT (SECOND) OF TORTS § 431 cmt. a (1965); *see also id.* § 433. The considerations in section 433 are relevant only to the degree they dilute or make

cause" is something of a fuzzy concept akin to "proximate cause," of which substantiality is a critical element;[121] inquiries into both concepts focus on similar issues of defendants' involvement in and control over plaintiffs' harms.[122]

In several recent cases dealing with municipal claims against handgun manufacturers and distributors, courts have grappled with proximate causation and the degree of defendants' control.[123] In general, the plaintiffs in these cases have alleged that the defendants should be held liable for creating and fostering illegal markets for handguns, which in turn allow guns to get into the hands of criminals, who then use them for illegal and often deadly purposes.[124] In one such case, the court found the causal chain involved to be "simply too attenuated to attribute sufficient control to the manufacturers" of handguns.[125] The main element that made the chain "attenuated" was that the manufacturers did not have an adequate degree of control over criminals and those who diverted guns to them, and thus were not in a position to prevent

insignificant the actor's conduct in a particular case. *Id.* at § 433 cmt. d. That a third party is also a substantial factor does not in itself protect the actor from liability. *Id.* at § 439.

121. *See* Laborers Local 17 Health & Benefit Fund v. Philip Morris, Inc., 191 F.3d 229, 235–36 (2d Cir. 1999), *cert. denied*, 528 U.S. 1080 (2000) (noting that critical elements of proximate cause are direct injury, defendant's acts being substantial cause of injury, and plaintiff's injury being reasonably foreseeable). Directness of injury was addressed *supra* notes 95–98 and accompanying text. *See also* Young v. Bryco Arms, 765 N.E.2d 1, 18 (Ill. App. Ct. 2001) ("Legal causation is essentially a question of foreseeability.").

122. *See* City of Bloomington, Ind. v. Westinghouse Elec. Corp., 891 F.2d 611, 614 (7th Cir. 1989) (holding Monsanto not to be liable for nuisance because "Westinghouse was in control of the product purchased and was solely responsible for the nuisance it created."). Others outside of defendant's control might contribute to the harm, but liability can still be found if the defendant also has some element of control by means of its tortious conduct and participation. *See In re* Methyl Tertiary Butyl Ether ("MTBE") Prod. Liab. Litig., MDL No. 1358, Master File No. 00 Civ. 1898 (SAS), 2001 U.S. Dist. LEXIS 12192, at *95–96 (S.D.N.Y. Aug. 20, 2001).

123. *Compare* Camden County Bd. of Chosen Freeholders v. Beretta, U.S.A. Corp., 273 F.3d 536, 541 (3d Cir. 2001), *and* City of Philadelphia v. Beretta U.S.A., Corp., 126 F. Supp. 2d 882, 910 (E.D. Pa. 2000) (finding lack of sufficient control), *with Young v. Bryco Arms*, 765 N.E.2d at 16 (finding control).

124. *See, e.g., Camden County Bd. of Chosen Freeholders*, 273 F.3d at 538–39.

125. *Id.* at 539, 541 ("(1) the manufacturers produce firearms at their places of business; (2) they sell the firearms to federally licensed distributors; (3) those distributors sell them to federally licensed dealers; (4) some of the firearms are later diverted by unnamed third parties into an illegal gun market, which spills into Camden County; (5) the diverted firearms are obtained by unnamed third parties who are not entitled to own or possess them; (6) these firearms are then used in criminal acts that kill and wound County residents; and (7) this harm causes the County to expend resources to prevent or respond to those crimes.").

the wrongs caused by handguns diverted to unauthorized owners and criminal use.[126] At least one handgun court, however, found the intervention reasonably foreseeable, thereby not interrupting the causal chain.[127]

The causal chain in climate change tort suits would likely look something like the following: (1) companies produce fuels, power, engines, and other products; (2) consumer use of these goods and products generates carbon dioxide emissions, which rise into the atmosphere; (3) the emissions combine with other greenhouse gas emissions to warm the Earth via the greenhouse effect; (4) this warming causes sea levels to rise, permafrost to thaw, and sea ice to melt and thin; and (5) these effects cause damage to plaintiffs' property. Arguably, this end result has been foreseeable for several years.[128] Further, the relevant companies' control does not appear to be lacking. The only intervening parties are consumers, whose intervention is quite foreseeable. Moreover, customers are not misusing the goods but rather are the intended owners using the goods in the intended way;[129] in fact, no misuse seems possible. Given this uninterrupted causal chain, climate change plaintiffs might thus be able to establish proximate causation if they join in tort litigation defendants who have "substantially" contributed to global warming.[130]

126. *Id.* at 541.

127. Young v. Bryco Arms, 765 N.E.2d 1, 18–19 (Ill. App. Ct. 2001). Where intervening third parties are involved, the issue of legal causation is whether the intervening cause is of the type that a reasonable person would foresee as a likely result of his conduct. RESTATEMENT (SECOND) OF TORTS § 442 (1965). *Young*'s holding presently appears to be the minority view.

128. The first IPCC report, for instance, was in 1990. *See* http://www.ipcc.ch/about/about.htm.

129. *See* RESTATEMENT (SECOND) OF TORTS § 442 (1965). For more on why producers are more logical defendants than consumers, *see infra* notes 131–34 and accompanying text.

130. It should be noted that at least one circuit recently held that proximate causation is not needed in public nuisance claims, though this does not appear to be the majority approach. Allegheny Gen. Hosp. v. Philip Morris, Inc., 228 F.3d 429, 446 (3d Cir. 2000) ("The Hospitals' remaining claims of public nuisance, aiding and abetting and civil conspiracy, restitution, unjust enrichment, quantum meruit, and indemnity do not require proximate cause.") (applying Pennsylvania law). *But cf.* Camden County Bd. of Chosen Freeholders v. Beretta, U.S.A. Corp., 273 F.3d 536, 541 (3d Cir. 2001) ("The County argues that proximate cause, remoteness, and control are not essential to a public nuisance claim. . . . But the relevant case law shows that, even if the requisite element is not always termed 'control,' the New Jersey courts in fact require a degree of control by the defendant over the source of the interference that is absent here.").

C. Potential Types of Defendants

Governments and other institutions often portray emissions of carbon dioxide solely in terms of consumption (e.g., the use of fossil fuels) rather than production.[131] After all, some argue, it is not car manufacturers per se but rather the millions of individual drivers who use their products that emit greenhouse gases. Several law and policy considerations, however, support holding producers of fossil fuels and some of their consumer industries, but not individual consumers, liable for the harms of climate change. First, individual consumers such as drivers and users of electricity do not contribute "substantially" to climate change; as such, their small individual contributions would not meet the standards for legal causation.[132] Second, the degree to which individual consumers maintain real "control" over the harms is debatable. Individual consumers have few meaningful alternatives to fossil fuels and the products that rely on them. Moreover, some fossil fuel companies' efforts to encourage public uncertainty about global warming have compromised the level of consumer knowledge about the risks posed by fossil fuel use.[133] Finally, tort law's goal of reducing the cost of accidents would not be furthered by placing the costs of climate change on individual consumers, but rather by holding liable producers who can incorporate the various costs of climate change into the prices of their products.[134]

One could reasonably argue that it is possible to identify defendants who have contributed substantially to climate change and its resulting effects. The primary contributors are fossil fuel companies, electric utilities, and automobile manufacturers. In 2000, roughly 98% of total U.S. carbon dioxide emissions and 81% of total U.S. greenhouse gas emissions were from fossil fuel combustion.[135] Emissions from the electric power industry as a whole made up 41% of the total U.S. energy-related carbon dioxide

131. NATURAL RESOURCES DEFENSE COUNCIL (NRDC) ET AL., KINGPINS OF CARBON: HOW FOSSIL FUEL PRODUCERS CONTRIBUTE TO GLOBAL WARMING, EXECUTIVE SUMMARY (1999) (comparing this portrayal to drug war focusing only on users and not on suppliers) *available at* http://www.nrdc.org/globalwarming/carbon/execsum.asp.

132. *See* RESTATEMENT (SECOND) OF TORTS § 834 cmt. d (1979).

133. *See supra* note 12 and accompanying text.

134. *See supra* notes 9–18 and accompanying text; *see also* Penalver, *supra* note 7, at 591.

135. ENERGY INFORMATION ADMINISTRATION (EIA), EMISSIONS OF GREENHOUSE GASES IN THE UNITED STATES 2000, viii, 19 (Nov. 2001) *available at* http://www.eia.doe.gov/oiaf/1605/ggrpt/download.html.

emissions in 2000; more than 80% of these emissions came from coal.[136] Electric utilities were responsible for consuming 29% of U.S. energy from fossil fuels and emitted 37% of the carbon dioxide from fossil fuel combustion in 1998.[137] Electric utilities rely on coal for over half of their total energy requirements and accounted for 88% of all coal consumed in the United States in 1998.[138] The U.S. electric industry accounts for 26% of worldwide carbon dioxide emissions from electricity and heat production, and almost 10% of total manmade carbon dioxide emissions worldwide.[139] Overall, the generation of electricity results in a larger portion (29%) of total U.S. greenhouse gas emissions than any other activity.[140]

Transportation activities are not far behind; transportation accounted for roughly 26% of total U.S. greenhouse gas emissions from 1990 to 1998.[141] These emissions were primarily carbon dioxide from fuel combustion, which increased 11% over that period.[142] Emissions from passenger cars and light trucks (including SUVs) accounted for 62% of the carbon dioxide emissions from the transportation sector, and almost 19% of overall U.S. carbon dioxide emissions, in 1998.[143] In 2000, gasoline consumption accounted for 59% of transportation sector emissions.[144]

There are a limited number of relevant companies in these sectors. In 1996, fifteen companies accounted for 91% of the American market for gasoline, the largest market in the world.[145] Ten oil companies controlled over 75% of the American market.[146] In 1999, the seven largest oil companies accounted for 43% of U.S.

136. *Id.* at 23, 25.

137. ENVIRONMENTAL PROTECTION AGENCY (EPA), INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–1998, EXECUTIVE SUMMARY 12 (2000).

138. *Id.* at 12–13. Coal contains the highest amount of carbon per unit of energy. *Id.* at 10.

139. NATURAL RESOURCES DEFENSE COUNCIL (NRDC) ET AL., BENCHMARKING AIR EMISSIONS OF THE 100 LARGEST ELECTRIC GENERATION OWNERS IN THE U.S.-2000 at 3 (2nd ed., March 2002) *available at* http://www.ceres.org/pdf/emissions/entire_report.pdf.

140. EPA, *supra* note 137, at 9.

141. *Id.* at 7.

142. *Id.*

143. *Id.* at 4, 8.

144. EIA, *supra* note 135, at x.

145. *See Mobil Edges Shell As Top Gasoline Marketer,* NAT'L PETROLEUM NEWS, Aug. 1996, at 136.

146. *Id.*

oil refinery runs and 25% globally.[147] Exxon-Mobil alone accounted for 4% of the world's oil production and 22% of the U.S. retail market.[148] Eleven coal companies accounted for over two-thirds of American output in 1996;[149] in 1997, just ten U.S. coal producers accounted for 61% of output.[150] In 1997, twenty of the world's petroleum and coal companies collectively accounted for roughly half of the world's carbon emissions.[151] There are also a limited number of major automobile manufacturers. For instance, the Alliance of Automobile Manufacturers is a trade association of thirteen car and light truck manufacturers that account for more than 90% of U.S. vehicle sales.[152] These companies could all, it seems, be potential defendants in a climate change suit.

Over 5,000 power plants generate electricity in the United States, and about 650 public and private entities owned some portion of that electric production in 2000.[153] About 70% of this electricity was generated from fossil fuels, 52% of it from coal.[154] Despite a recent trend toward consolidation, there are still hundreds of utility companies. While hundreds of companies are probably too many to be sued individually, suits could be filed against representative defendants in a defendant class of utilities.[155] In 2000, the 100 largest electric generation owners collectively owned more than 1,900 power plants in the United States, produced about 87% of the nation's electricity, and emitted 88% of the total reported electric industry emissions of carbon dioxide.[156] Eighteen of these owners accounted for 50% of the carbon dioxide emissions, and just six were responsible for 25%.[157] American

147. *Global Market, Not Single Company, Impacts U.S. Oil Industry*, OCTANE WK., Vol. 14, No. 15, Apr. 12, 1999.

148. *See Exxon, Mobil Set to Announce Deal Today*, NAT'L JOURNAL'S DAILY ENERGY BRIEFING, Dec. 1, 1998.

149. *See U.S. Coal Mining Analysed*, MINING J., July 12, 1996, at 29.

150. *See The U.S. Urge to Merge*, MINING MAG., July 1999, at 79.

151. NRDC ET AL., KINGPINS OF CARBON, *supra* note 131, at Part 1.

152. *See* Alliance of Automobile Manufacturers—About the Organization, *at* http://www.autoalliance.org/about.htm. (last visited Sept. 21, 2002). *See also* Harry Stoffer, *AAM Shift Shows 'Us vs. Them' is Over: Toyota Exec Heads Auto Trade Group*, AUTOMOTIVE NEWS, Dec. 4, 2000, at 3.

153. NRDC ET AL., BENCHMARKING AIR EMISSIONS, *supra* note 139, at 3, 8.

154. *Id.* at 8.

155. *See* FED. R. CIV. P. 23(a) (allowing one or more members of class to sue or be sued as representative parties).

156. NRDC ET AL., BENCHMARKING AIR EMISSIONS, *supra* note 139, at 3, 8.

157. *Id.* at 3.

Electric Power alone, which generated the most electricity in 2000, was the largest emitter of carbon dioxide, mercury (Hg), nitrogen oxides (NO_x), and sulfur dioxide (SO_2), accounting for 7–10% of industry emissions.[158] In addition to these entities, it is also possible that organizations like the Western Fuels Association, comprised of nineteen major electric utilities that burn coal, could be named as defendants in a potential climate change tort suit.[159]

D. Liability for and Apportionment of Damages

When multiple actors cause a harm, which appears to be the case with climate change plaintiffs' injuries, the critical question is the amount of damages for which the defendants collectively and individually should be held liable. If there is a reasonable basis for dividing the harm according to each defendant's contribution, each is liable only for that portion of the total harm that each has caused.[160] If the harm is an indivisible harm, all parties that are legal causes of the harm are jointly and severally liable for the entire harm.[161]

On their face, the harms from climate change appear to be indivisible. In *Michie v. Great Lakes Steel Division*,[162] several people residing near Ontario, Canada, sued three corporations operating seven plants immediately across the Detroit River in the United States, claiming that pollutants emitted by defendants' plants were a nuisance. Each plaintiff sought damages from all three corporate defendants jointly and severally. The Sixth Circuit held that "although there is no concert of action between tort-feasors, if the cumulative effects of their acts is a single indivisible injury which it cannot certainly be said would have resulted but for the concurrence of such acts, the actors are to be held liable as joint tort-feasors."[163] This joint liability exists and operates regardless of

158. *Id.* at 9.

159. *See* Western Fuels Association, *Welcome to Western Fuels* at http://www.westernfuels.org. The Association apparently would welcome climate change litigation. *See* Western Fuels Ass'n v. Turning Point Project, No. 00 CV-074 (D. Wyo. 2001) (claim of commercial defamation from allegedly false and misleading factual representations in global warming ad dismissed for improper venue).

160. RESTATEMENT (SECOND) OF TORTS § 881 (1979); *see also* RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY § 16(a), (b) (1998).

161. RESTATEMENT (SECOND) OF TORTS §§ 875, 879 (1979); *see also* RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY § 16(c) (1998).

162. 495 F.2d 213 (6th Cir. 1974).

163. *Id.* at 216 (quoting Watts v. Smith, 134 N.W.2d 194 (Mich. 1965)).

the existence of "other corporations, persons and instrumentalities" that contributed to the air pollution "so as to make it impossible to prove whose emissions did what damage to plaintiffs' persons or homes."[164] If the judge or jury determines that it is not practicable to apportion the harm among the tortfeasors, "the entire liability may be imposed upon one (or several) tortfeasors subject, of course, to subsequent right of contribution among the joint offenders."[165] The *Michie* court thus shifted from the injured party to the defendants the burden of proof as to which defendant was responsible for the relevant harms, and to what degree.[166]

Holding the potential defendants described above[167] jointly and severally liable for the entire harm of climate change could understandably be seen as unfair. Because greenhouse gases have long lifespans in the atmosphere, past emissions are contributors to climate change. Accordingly, if damages are assigned to current companies, those companies would be held liable for past emissions to which they have no connection.[168] Furthermore, although those companies are arguably substantial contributors, there are still other parties who have contributed somewhat to climate change as well. To avoid such inequity, courts may require apportionment even where harms seem indivisible, if some means of fair and rational apportionment is possible without causing injustice to any of the parties.[169] In pollution cases, for instance, a seemingly indivisible harm can be treated as divisible and

164. *Id.* at 218.

165. *Id.* at 217; *see also* Martin v. Owens-Corning Fiberglas Corp., 528 A.2d 947 (Pa. 1987).

166. *Michie*, 495 F.2d at 218. The *Michie* holding has been replicated in other pollution contexts. *See, e.g.*, Landers v. East Tex. Salt Water Disposal Co., 248 S.W.2d 731 (Tex. 1952); Velsicol Chem. Corp. v. Rowe, 543 S.W.2d 337 (Tenn. 1976); Commonwealth of Pennsylvania v. PBS Coals, 534 A.2d 1130 (Pa. 1987). It has also been incorporated into the Restatement. *See* RESTATEMENT (SECOND) OF TORTS §§ 433A, 433B, 875, 879 (1965). A similar rule exists in products liability, in which a manufacturer is liable for the increased harm caused to plaintiffs by his product (beyond the harm that would have otherwise occurred). If the manufacturer cannot show what harm would have occurred absent the product defect, he can be liable for all of plaintiffs' harms. *See* RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY § 16 (1998).

167. *See supra* Section III.C.

168. *See* Christopher D. Stone, *Beyond Rio: "Insuring" Against Global Warming*, 86 AM. J. INT'L L. 445, 468 (1992). However, global carbon dioxide emissions skyrocketed in the twentieth century, particularly in the latter half, thus playing a much larger role in altering the atmospheric concentrations of carbon dioxide. *See* Penalver, *supra* note 7, at 592, 593.

169. *See* RESTATEMENT (SECOND) OF TORTS § 433A cmt. d (1965); *see also id.* § 433B cmt. e.

apportioned among defendants on the basis of evidence of their respective quantities of pollution discharged.[170] In the climate change context, this division could involve apportioning damages (appropriately reduced to account for past emissions) based on a combination of defendants' market-shares and the greenhouse gas emissions of their products, to correspond as much as possible to each defendant's contributions to global warming.[171]

IV. PREEMPTION

In addition to establishing present damages, demonstrating causation, and identifying defendants who have contributed substantially to their injuries, climate change plaintiffs seeking to press a common law tort claim like nuisance or products liability must address the issue of preemption.[172] The preemption standards and analyses for federal common law and state common law are different, since "[f]ederal courts, unlike state courts, are not general common-law courts and do not possess a general power to develop and apply their own rules of decision."[173]

A. Federal Common Law

The Supreme Court has recognized essentially two limited instances in which there is authority or a need for federal common law: (1) where Congress has given the courts power to develop substantive law, and (2) where a federal rule of decision is needed to protect "uniquely federal interests."[174] If either instance applies, and if not preempted by a federal statute, plaintiffs will be allowed to invoke federal common law. The first instance does not seem to be relevant in the climate change context, as Congress clearly has

170. *See id.* § 433A cmt. d (1965).

171. A similar system for apportioning damages was employed in the Agent Orange litigation settlement, which assessed damages with reference to a formula that balanced market-share and dioxin content. *See* HUGHES, LIN, & NESSER, *supra* note 20, at 55; *see also* Penalver, *supra* note 7, at 592.

172. Although many of the cases below deal with nuisance claims, the same ordinary preemption principles and analysis apply to products liability suits. *See, e.g.*, Geier v. American Honda Motor Co., Inc., 529 U.S. 861 (2000); Nathan Kimmel, Inc. v. DowElanco, 275 F.3d 1199 (9th Cir. 2002); Choate v. Champion Home Builders Co., 222 F.3d 788 (10th Cir. 2000).

173. City of Milwaukee v. Illinois, 451 U.S. 304, 312 (1981) (*Milwaukee II*); *see also* Erie R.R. Co. v. Tompkins, 304 U.S. 64, 78 (1938).

174. Texas Indus., Inc. v. Radcliff Materials, Inc., 451 U.S. 630, 640 (1980).

not given courts explicit authority to develop substantive law in the area. The second instance, however, could be relevant.

"Uniquely federal interests" exist only in particular narrow areas, such as disputes concerning "the rights and obligations of the United States" and "interstate and international disputes implicating the conflicting rights of States or our relations with foreign nations."[175] The Court recognizes federal common law in such disputes because it finds that "our federal system does not permit the controversy to be resolved under state law, either because the authority and duties of the United States as sovereign are intimately involved or because the interstate . . . nature of the controversy makes it inappropriate for state law to control."[176] In situations in which a state (as a state or under *parens patriae*) is suing sources outside of its own territory because they are causing air pollution within the state, the Court has thus been willing to recognize a federal common law tort claim.[177] Analogizing this idea to the climate change context, suits brought by Alaska, by a coastal state, or by an island state or nation could thus be based on federal common law, if they would be suing sources outside their territory for internal harms incurred.

Since these climate change plaintiffs could have a valid federal common law claim, the question turns to the potential existence of a preemptive federal statute. Plaintiffs' federal common law claims will be preempted if government statutes or regulations "fully authorized" defendants' behavior, established a "comprehensive set of legislative acts or administrative regulations governing the details of a particular kind of conduct," or "spoke directly to a

175. *Id.* at 641.

176. *Id.*

177. *See* Nat'l Audubon Soc'y v. Dep't of Water, 869 F.2d 1196, 1205 (9th Cir. 1988) (holding dispute at issue to be solely domestic and thus not properly asserted under federal common law, and referring to Illinois v. Milwaukee, 406 U.S. 91, 107 n.9 (1972) (*Milwaukee I*); Georgia v. Tennessee Copper Co., 206 U.S. 230, 237 (1907); and Missouri v. Illinois, 200 U.S. 496, 520–21 (1906)); *see also* Ouellette v. Int'l Paper Co., 666 F. Supp. 58, 61 (D. Vt. 1987) ("The *Milwaukee I*, *Wyandotte*, and *Milwaukee II* decisions are noncontrolling in this case because those decisions involved states which, when acting as states, filed actions under the Supreme Court's original jurisdiction to resort to the 'necessary expedient' of federal common law to obtain relief from interstate pollution. Because federalism concerns precluded the state sovereigns from resorting to state law claims, the Court applied federal common law in the *Milwaukee* dispute because it was 'concerned in that case that Illinois did not have any forum in which to protect its interests unless federal common law were created.' *Milwaukee II*, 451 U.S. at 325, citing *Milwaukee I*, 406 U.S. at 104, 107.").

question" at issue in the dispute.[178] The question of whether a federal statute preempts federal common law "involves an assessment of the scope of the legislation and whether the scheme established by Congress addresses the problem formerly governed by federal common law."[179]

The Court has held that federal common law "in the area of water pollution is entirely pre-empted by the more comprehensive scope of the [Clean Water Act (CWA)]."[180] The Clean Air Act (CAA), however, which seems to be the statute most likely applicable to climate change, is not as comprehensive as the CWA. While the CWA prohibits *every* point source discharge into navigable water without a permit, the CAA prohibits only unpermitted emissions of certain listed pollutants that have been found to threaten the air quality standards promulgated by the EPA.[181] The CAA, therefore, does not prohibit *every* emission into the air. Carbon dioxide, for instance, is not one of the pollutants covered under the CAA.[182]

Only two district courts have found the CAA to preempt federal common law in air pollution cases. In *United States v. Kin-Buc, Inc.*,[183] the United States sought damages against Kin-Buc (a landfill for municipal, industrial, and chemical wastes) under the federal common law of nuisance for air pollution (vaporized nitric acid and polyvinyl chloride). The court, while acknowledging the differences in comprehensiveness between the CWA and the CAA, applied the Supreme Court's water pollution preemption cases to

178. RESTATEMENT (SECOND) OF TORTS § 821B cmt. f (1979); *see also Milwaukee II*, 451 U.S. at 315, 319 n.14.

179. *Milwaukee II*, 451 U.S. at 315 n.8.

180. Middlesex County Sewerage Auth. v. Nat'l Sea Clammers Ass'n, 453 U.S. 1, 22 (1981).

181. New England Legal Found. v. Costle, 666 F.2d 30, 32 n.2 (2d Cir. 1981); Nat'l Audubon Soc'y v. Dep't of Water, 869 F.2d 1196, 1212 (9th Cir. 1988) (Reinhardt, J., dissenting); *see also In re* Methyl Tertiary Butyl Ether ("MTBE") Prod. Liab. Litig., MDL No. 1358, Master File No. 00 Civ. 1898 (SAS), 2001 U.S. Dist. LEXIS 12192, at *10 n.5 (S.D.N.Y. Aug. 20, 2001) (listing the six pollutants: carbon monoxide, lead, ozone, sulfur dioxide, nitrogen dioxide, and particulate matter).

182. It is true that "a federal decision to forgo regulation in a given area may imply an authoritative federal determination that the area is best left *un*regulated, and in that event would have as much pre-emptive force as a decision *to* regulate." Arkansas Elec. Coop. Corp. v. Arkansas Pub. Serv. Comm'n, 461 U.S. 375, 384 (1983). Congress, however, has not yet made a determination that carbon dioxide is not to be regulated. Although the Bush administration considered regulating carbon dioxide and then changed its mind, that was executive and not legislative action.

183. 532 F. Supp. 699 (D.N.J. 1982).

find that the CAA preempted federal common law.[184] The court found preemption of the nuisance suit for the unregulated pollutants because Congress had "occupie[d] the field" by establishing "a complete regulatory procedure whereby various pollutants are identified, air quality standards are set, and procedures for strict enforcement are created."[185] In *Reeger v. Mill Service, Inc.*,[186] the district court, without comparing comprehensiveness, also found that the CAA's regulatory scheme was similar to the CWA's and thus applied "the same principle of preemption."[187]

Although these cases found that the CAA preempted federal common law even for unregulated pollutants,[188] this conclusion would not necessarily be duplicated in climate change tort suits. First, great weight should not be placed on *Kin-Buc* and *Reeger*, since they appear to be the only courts to have found preemption of federal common law,[189] higher courts have explicitly not reached the issue,[190] and at least one Ninth Circuit judge would have ruled differently.[191] Second and more importantly, even if the CAA does preempt federal air pollution common law suits, the "scheme established by Congress" in the CAA does not "address[] the problem" of climate change.[192] The CAA focuses on air pollution, particularly pollutants that are in the ambient air, have a geographic confinement, and affect public health; ultimately, the Act is concerned with ensuring that air is healthy for people to breathe.[193] Global warming, in contrast, is about atmospheric

184. *Id.* at 702 (applying *Milwaukee II*, 451 U.S. at 315 n.8).

185. *Id.*

186. 593 F. Supp. 360 (W.D. Pa. 1984).

187. *Id.* at 363.

188. *Reeger* was not explicit about the pollutants at issue, but, as it too involved hazardous wastes, the pollutants were presumably similar to those in *Kin-Buc*.

189. Other courts have found preemption on much narrower grounds, such as specific authorization by EPA of the defendant's emissions. *See, e.g.*, New England Legal Found. v. Costle, 666 F.2d 30, 32 (2d Cir. 1981); Connecticut v. Long Island Lighting Co., 535 F. Supp. 546 (E.D.N.Y 1982).

190. *See* Nat'l Audubon Soc'y v. Dep't. of Water, 869 F.2d 1196, 1205 (9th Cir. 1988); *New England Legal Found.*, 666 F.2d at 32.

191. *Nat'l Audubon Soc'y*, 869 F.2d at 1212–14 (Reinhardt, J., dissenting).

192. City of Milwaukee v. Illinois, 451 U.S. 304, 315 n.8 (1981) (*Milwaukee II*).

193. One of the act's stated purposes is "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare." 42 U.S.C. § 7401(b)(1) (2001). *Kin-Buc* noted that when President Carter signed CAA Amendments in 1977, he stated that he "believe(d) that the Congress . . . ha(d) adopted a sound and comprehensive program for achieving and preserving healthy air in our Nation." United

concentrations of gases altering global climate, not about what people are breathing.[194] Not only are carbon dioxide emissions unregulated by the CAA, therefore, but climate change itself is outside the scope of the statute. As such, it does not seem that the CAA would preempt a federal common law climate change tort claim.

B. State Common Law

Unlike federal courts, state courts are general common law courts.[195] As such, federal law preempts state law (including state common law) only when: (1) it is the "clear and manifest purpose of Congress,"[196] (2) the federal law is "sufficiently comprehensive to make reasonable the inference that Congress 'left no room' for supplementary state regulation,"[197] or (3) a state law "actually conflicts with a . . . federal statute"[198] in that it "stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress."[199]

The Supreme Court found in *International Paper Co. v. Ouellette* that the nuisance law of a state affected by water pollution was preempted, since it stood as an obstacle to the CWA's comprehensive scheme regulating every point source discharge.[200] The Court, however, found that "nothing in the Act bars aggrieved individuals from bringing a nuisance claim pursuant to the law of the source State."[201] On remand in *Ouellette*, the district court found that "the same concerns that led the *Ouellette* Court to require application of the source state's law in interstate water

States v. Kin-Buc, 532 F. Supp. 699, 702 (D.N.J. 1982). The act establishes air quality control regions, 42 U.S.C. § 7407 (2001), highlighting the geographic confinement concept. The CAA's primary regulatory mechanism is the NAAQS (national ambient air quality standards), 42 U.S.C. § 7409 (2001), which are designed to protect the public from breathing unhealthy air.

194. The CAA calls for the EPA to designate air quality control regions, 42 U.S.C. § 7407 (2001), which would be useless for global warming, since global concentrations, not regional concentrations, are the main driver of climate change.

195. *Milwaukee II*, 451 U.S. at 312.

196. Rice v. Santa Fe Elevator Corp., 331 U.S. 218, 230 (1947).

197. Hillsborough County v. Automated Med. Lab., Inc., 471 U.S. 707, 713 (1985).

198. Ray v. Atlantic Richfield Co., 435 U.S. 151, 158 (1978).

199. *Hillsborough County*, 471 U.S. at 713.

200. 479 U.S. 481, 497 (1987).

201. *Id.*

disputes are equally applicable to [the CAA and to private party] plaintiffs' air claims."[202]

Given the above findings, therefore, it seems that the CAA would not preempt a climate change tort claim based on the common law of a source state—for instance, one in which many coal-fired electric utilities reside. The less comprehensive nature of the CAA might also permit the application of an *affected* state's tort law to survive a preemption challenge. When the CAA does not regulate the emission at issue, like carbon dioxide, it appears that the affected state's law is no longer preempted.[203] This is particularly the case with greenhouse gases as compared to other unregulated emissions; application of state common law to greenhouse gas emissions would not "stand[] as an obstacle" to Congress's purpose in enacting the CAA, since global warming is not encompassed by that statute's focus on air pollution.[204] It thus appears that if a party other than a state brings a climate change tort suit, or of course if a state sues sources within the state, the claim could be based on any relevant state's tort law without being preempted by the CAA.

It is possible, however, that the CAA might preempt both state and federal common law claims against automobile or gasoline manufacturers, since Congress did "speak directly to" the issue of automobile emissions and fuels. Under section 209 of the CAA, "[n]o State or any political subdivision thereof shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines."[205] The Supreme Court has held that "Congress has largely pre-empted the field with regard to 'emissions from new motor vehicles,' and motor vehicle fuels and fuel additives."[206] However, such preemption is not inevitable. To determine whether plaintiffs' claims fall within the scope of a preemption provision, courts must

202. Ouellette v. Int'l. Paper Co., 666 F. Supp. 58, 62 (D. Vt. 1987).

203. *See, e.g.*, Ashland Oil v. Kaufman, 384 S.E.2d 173 (W.Va. 1989); *see also* Scott C. Seiler, Comment, *Federal Preemption of State Law Environmental Remedies After International Paper Co. v. Ouellette*, 49 LA. L. REV. 193, 204 (1988) ("[T]he reasoning that preempts the affected state's law is inapplicable to pollutants that are unregulated by the CAA. The regulatory scheme is undisturbed by the imposition of common law liability for releases of unregulated pollutants. Only in the situation where the pollutants in question are regulated by the CAA is the law of the affected state preempted.").

204. *See supra* notes 192–94 and accompanying text.

205. 42 U.S.C. § 7543 (2001); *see also id.* § 7545(c)(4)(A).

206. Washington v. General Motors Corp., 406 U.S. 109, 114 (1972); *see also* American Auto. Mfrs. Ass'n v. Cahill, 152 F.3d 196, 198 (2d Cir. 1998).

look to the "congressional purpose," which is the "ultimate touchstone" of the inquiry.[207] It is worth noting that state-law litigation over MTBE, a fuel additive, has not been preempted because the plaintiffs' claims were about groundwater contamination, not emissions controls.[208] In that case, the contamination concern was not "intertwined" with the primary concern of the CAA, namely air pollution and "protection of our air resources."[209] Similarly, it seems that global warming, although more tied to emissions, is not intertwined with that primary CAA concern. Suits relating to automobile and gasoline manufacturers thus might survive a preemption challenge.

V. PRODUCTS LIABILITY

Having explored the common elements of tort-based climate change claims, I analyze in this Section the applicability of one such possible claim, namely products liability, which involves products that are defective in a way that causes harm.[210]

The basic elements of a products liability claim are that a product has a defect that makes it unreasonably dangerous, this defect existed when the product left the defendant's control, and the defect proximately caused plaintiff's injuries.[211] Under either a strict liability or a negligence theory, three types of defects can result in an unreasonably dangerous product: warning defects, manufacturing defects, and design defects.[212] A warning defect occurs when there is reason to anticipate that danger may result from a product, but the manufacturer fails to warn users of that danger. The warning defect inquiry thus focuses more on how the manufacturer acted than on the physical state of the product.[213] A manufacturing defect occurs when a product is made in a way that

207. *In re* Methyl Tertiary Butyl Ether ("MTBE") Prod. Liab. Litig., MDL No. 1358, Master File No. 00 Civ. 1898 (SAS), 2001 U.S. Dist. LEXIS 12192, at *46 (S.D.N.Y. Aug. 20, 2001) (quoting Lorillard Tobacco Co. v. Reilly, 533 U.S. 525, 541 (2001)).

208. *Id.* at *48.

209. *Id.* at *51.

210. The applicability of public nuisance, a second such claim, will be analyzed *infra* in Section VI.

211. *See, e.g.*, Gebhardt v. Mentor Corp., 191 F.R.D. 180, 184 (D. Ariz. 1999) (citing Gosewisch v. American Honda Motor Co., 737 P.2d 376, 379 (Ariz. 1987)).

212. *See id.*

213. O'REILLY & CODY, *supra* note 111, at 5.

does not accord with its intended design.[214] A design defect occurs when the harm arises from the design of the product itself.[215] In both manufacturing and design defect cases, the focus of the inquiry is more product-oriented than conduct-oriented. Manufacturing defects do not appear to be relevant to the current inquiry, since the harms caused by products that have contributed to climate change do not stem from shoddy manufacture. As elaborated below, warning and design defects seem at least initially to be more applicable. I begin, though, by addressing the preliminary question of whether climate change plaintiffs would have legal standing to bring a products liability suit.

A. Standing

The Supreme Court recently restated the standards for establishing Article III standing in *Friends of the Earth v. Laidlaw*.[216] The Court reiterated that "to satisfy Article III's standing requirements, a plaintiff must show (1) it has suffered an injury in fact that is (a) concrete and particularized and (b) actual or imminent, not conjectural or hypothetical; (2) the injury is fairly traceable to the challenged action of the defendant; and (3) it is likely, as opposed to merely speculative, that the injury will be redressed by a favorable decision."[217]

Climate change plaintiffs should be able to satisfy these standing requirements. The harms described earlier, such as damage to a coastal state's infrastructure or property, are concrete.[218] These damage claims are for "actual and imminent" harms—for present damages and costs incurred. Furthermore, these plaintiffs are suffering early, severe, and unique harms from global warming, compared to other states and nations; no other state but Alaska, for instance, is experiencing thawing permafrost and melting sea ice. These potential plaintiffs' harms are also therefore particularized;

214. *Id.*

215. *Id.* at 6.

216. Friends of the Earth v. Laidlaw Envtl. Services (TOC), 528 U.S. 167 (2000).

217. *Id.* at 180–81 (citing Lujan v. Defenders of Wildlife, 504 U.S. 555, 560–61 (1992)). The general rule is that a plaintiff must show a particularized harm; if all citizens are affected in the same way, the assumption is that they should go to their legislature. *See, e.g.*, Florida Audubon Soc'y v. Bentsen, 94 F.3d 658, 667 n.4 (D.C. Cir. 1996) ("[T]he plaintiff must show that he is not simply injured as is everyone else, lest the injury be too general for court action.").

218. *See supra* Section II.B and II.C.

they should thus be able to satisfy the first prong of the *Laidlaw* test.[219] As explained earlier, climate change plaintiffs' harms could be traceable to the emissions caused by the potential defendants, thereby satisfying the second prong as well.[220]

The third standing prong requires that the plaintiffs' harms be redressable by favorable judicial decisions. Climate change plaintiffs' present costs and damages could be redressed by an award of damages, since those would compensate them for expenses that have been or need to be taken. If these potential plaintiffs seek injunctive relief to enjoin or reduce defendants' carbon dioxide emissions, the issue is more complicated.[221] Because of greenhouse gases' long lifespans in the atmosphere and the long time scales on which the deep ocean adjusts to climate change, the effects of global warming will continue even after greenhouse gas concentrations stabilize.[222] Sea levels and global average temperatures will continue to rise.[223] However, the lower the level at which atmospheric concentrations stabilize (the more current emissions can be reduced), the more likely it is that some of climate change's effects will be mitigated. Once stabilization occurs, for instance, global average surface temperatures would rise at a rate of only a few tenths of a degree per century rather than the several degrees per century otherwise projected for the twenty-first century.[224] Plaintiffs' injuries would thus be potentially abated, though not eliminated, thereby satisfying the redressability requirement of standing.[225] Since it appears that climate change

219. The fact that climate change somehow affects or will affect everyone on the globe does not alter this analysis. In *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 581 (1992) (concurring in part and concurring in the judgment), Justice Kennedy wrote that "[w]hile it does not matter how many persons have been injured by the challenged action, the party bringing suit must show that the action injures him in a concrete and personal way." The Supreme Court also held that "[t]o deny standing to persons who are in fact injured simply because many others are also injured, would mean that the most injurious and widespread . . . actions could be questioned by nobody." United States v. Students Challenging Regulatory Agency Procedures (SCRAP), 412 U.S. 669, 688 (1973); *see also* Warth v. Seldin, 422 U.S. 490, 501 (1975) (holding that plaintiff may be able to satisfy Article III standing requirements "even if it is an injury shared by a large class of other possible litigants").

220. *See supra* Section III.

221. In *Laidlaw*, the Supreme Court explained that the plaintiff must demonstrate standing for each form of relief sought. 528 U.S. at 185.

222. IPCC, SCIENTIFIC BASIS, SUMMARY FOR POLICYMAKERS, *supra* note 2, at 17.

223. *Id.*

224. *Id.*

225. *See* City of Los Angeles v. Nat'l Highway Traffic Safety Admin. (NHTSA), 912 F.2d

plaintiffs could satisfy all three requirements, they should be able to establish standing to bring a products liability suit based on either a warning or design defect theory.

B. Warning Defects

Generally, a product has a warning defect "when the foreseeable risks of harm posed by the product could have been reduced or avoided by the provision of reasonable instructions or warnings by the seller [or manufacturer] and the omission of the instructions or warnings renders the product not reasonably safe."[226] The user is warned about the risk so that he or she can avoid harm either by appropriate conduct during use or by choosing not to use the product.[227] Climate change plaintiffs might thus seek to bring a warning defect claim against defendants for failure to warn users of the climate-changing dangers of their products' carbon dioxide emissions. They could argue that if electric utilities and fossil fuel companies had warned about this climate-changing danger, consumers could have had the choice of whether to purchase energy from those sources or from cleaner ones such as solar power. Similarly, potential plaintiffs could argue that if car manufacturers had advertised fuel efficiency standards as early as they could have,[228] consumers could have chosen more fuel-efficient cars or other transportation alternatives.

Climate change plaintiffs are unlikely to prevail on a warning defect theory for at least three reasons. First, some state statutes provide that liability for a warning defect only attaches if the absence of the warning makes the product "not reasonably fit, suitable or safe for its intended purpose."[229] Failure to warn about climate-changing impacts in no way makes fuels, power, or cars unfit for their intended purposes. Second, other states have determined that warning defect liability attaches only if the manufacturer knew or should have known about the risk and failed

478, 483 (D.C. Cir. 1990) (D.H. Ginsburg, J., dissenting), *overruled by* Florida Audubon Soc'y v. Bentsen, 94 F.3d 658 (D.C. Cir. 1996) (adopting generally Ginsburg's views on standing).

226. RESTATEMENT (THIRD) OF PRODUCTS LIABILITY § 2(c) (1998).

227. *See id.* § 2 cmt. i; *see also* Borel v. Fibreboard Paper Prods. Co., 493 F.2d 1076, 1089 (5th Cir. 1973), *cert. denied*, 419 U.S. 869 (1974).

228. *See generally* JACK DOYLE, TAKEN FOR A RIDE: DETROIT'S BIG THREE AND THE POLITICS OF POLLUTION (2000) (explaining how automobile industry failed to do so).

229. *See, e.g.*, Dennis v. Pertec Computer Corp., 1996 U.S. Dist. LEXIS 18906, at *22 (D.N.J. Nov. 18, 1996) (N.J. law) (citing N.J. STAT. ANN. § 2A:58C-2).

to provide a warning that a manufacturer exercising reasonable care would have provided, in light of the likelihood that the product would cause harm of the plaintiff's type and in light of the likely severity of that harm.[230] Potential climate change defendants are likely to have been aware of the climate-changing risks posed by their products for at least the past several years,[231] and the likelihood and severity of harm is fairly high.[232] However, even reasonable manufacturers may not have seen the need to provide warnings, under the belief that they would not make a significant difference in consumers' practices with regard to the purchase and use of cars, power, and fuels.

This ties into the third weakness in a climate change warning defect claim, namely that a plaintiff must show that the failure to provide adequate warning was a proximate cause of the harm.[233] Even if warnings about the climate-changing carbon dioxide emissions of defendants' products had been provided, it is likely that most consumers' behavior would not have changed meaningfully. There would still be few viable alternatives to these products available to consumers. At best, a small percentage of consumers might have purchased, say, a slightly more fuel-efficient car, and such purchases in the aggregate might have marginally reduced or mitigated the foreseeable risks from increased greenhouse gas concentrations. Finding the preclusion of this small reduction (if it would have existed) to be a "substantial" element in causing plaintiffs' harms, as is required for a finding of proximate causation,[234] strains credibility.

Given these considerations, warning defect claims do not appear to be readily applicable to the climate change context. The essence of potential plaintiffs' products liability claim would have to be that defendants' products are defective because of their significant carbon dioxide emissions, not because consumers were not warned about those emissions.

230. *See, e.g.*, Hisrich v. Volvo Cars of N. Am., Inc., 226 F.3d 445, 450 (6th Cir. 2000) (Ohio law).

231. For instance, the first IPCC assessment report came out in 1990. All courts appear to be in agreement that manufacturers are held to the knowledge and skill of an expert, at a minimum keeping abreast of scientific knowledge, discoveries, and advances. *Borel*, 493 F.2d at 1089.

232. *See supra* Section II.

233. *See* Port Auth. v. Arcadian Corp., 189 F.3d 305, 320 (3d Cir. 1999); Gebhardt v. Mentor Corp., 191 F.R.D. 180, 185 (D. Ariz. 1999).

234. *See supra* note 121 and accompanying text.

C. Design Defects

As a general rule, a product is defective in design "when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design . . . and the omission of the alternative design renders the product not reasonably safe."[235] Inherent features of a product, such as a knife's sharp edge, are not design defects.[236] This would seem to rule out design defect suits against oil or coal companies, since there is no feasible way to burn their products without emitting carbon dioxide.[237] For a product such as an automobile, however, greenhouse gas emissions are not an "inherent" feature, since manufacturers can design cars and engines in ways to reduce or eliminate carbon dioxide emissions. Electric utilities, too, might be targeted under the design defect theory, since they can generate power in ways that are less reliant on fossil fuels. Accordingly, climate change plaintiffs might be able to sue car manufacturers and utilities in a design defect suit, arguing that the "defect" of the automotive and power generation designs is the unnecessary production of significant amounts of greenhouse gases, which lead to plaintiffs' harms from global warming.[238]

Some states apply the "consumer expectation test" in design defect cases. This test assesses whether the risk of harm from the product is greater than the ordinary consumer would have expected.[239] Climate change plaintiffs could argue that the

235. RESTATEMENT (THIRD) OF PRODUCTS LIABILITY § 2(b) (1998).

236. O'REILLY & CODY, *supra* note 111, at 7 (citing RESTATEMENT (SECOND) OF TORTS § 402A (1965)).

237. *See* DOYLE, *supra* note 228, at 238 (describing how reformulating gasoline might help air pollution but would have no effect on global warming, since any form of gasoline contains same amount of carbon as another).

238. The standard for legal causation is substantiality, and all actors that are substantial causes can be found jointly and severally liable for the harm, subject to apportionment if feasible. *See supra* Section III.B., III.D. In some well-known products liability cases, specific identification of which defendants caused which plaintiffs' injuries has been impossible, leading some courts to innovate various collective liability theories—such as alternative liability, enterprise liability, and market-share liability—as a basis for imposing liability upon all of the defendants. *See, e.g.*, George v. Celotex Corp., 914 F.2d 26 (2d Cir. 1990) (asbestos); *see also In re* Methyl Tertiary Butyl Ether ("MTBE") Prod. Liab. Litig., MDL No. 1358, Master File No. 00 Civ. 1898 (SAS), 2001 U.S. Dist. LEXIS 12192, at *67 (S.D.N.Y. Aug. 20, 2001). These theories are not relevant to a climate change case, since all defendants have ostensibly caused plaintiffs' harms, not just an unidentifiable one among many.

239. *See, e.g.*, Melton v. Deere & Co., 887 F.2d 1241 (5th Cir. 1989); Kelley v. Rival Mfg. Co., 704 F. Supp. 1039, 1045 (W.D. Okla. 1989).

substantial risk of harm to coastal and island states from the use of cars and power is greater than consumers would have expected; more accurately, though, consumers probably have no real expectations about this risk of harm.[240] Because consumers often do not know what to expect (since they do not know how safely the product could be made), other states look to whether a reasonably prudent manufacturer who knew the product's risks would have placed the product on the market.[241] Potential climate change plaintiffs might be able to argue that a producer of cars or power who was aware of its products' climate-changing impacts would not have marketed them. Given the prevalence of these products in the current market, however, this could be a difficult argument to make.

Most jurisdictions seem to use some variant of a risk-utility or risk-benefit test, balancing the severity and the likelihood of occurrence of the potential harm against the product's benefits and the burden that effective precautions would impose.[242] If the risk outweighs the utility, the product can be considered to have a design defect.[243] Climate change's present and potential impacts are quite severe, involving loss of land, buildings, infrastructure, and communities, and the likelihood of these harms occurring is fairly high.[244] The "foreseeable risk" is thus substantial.[245]

Undeniably, the benefits of cars and power are also quite high, but the existence of potential alternatives might very well detract from the weight of these benefits. To better evaluate the "benefit" side of the equation, most courts engaged in risk-benefit analysis

240. *See supra* note 12 and accompanying text. With more advanced designs, a judge may find that no real consumer expectations exist, so the design cannot be measured by this test. *See* O'REILLY & CODY, *supra* note 109, at 62.

241. *See, e.g.*, Nichols v. Union Underwear Co., 602 S.W.2d 429, 433 (Ky. 1980).

242. O'REILLY & CODY, *supra* note 111, at 64–66; *see also* Andrew J. McClurg, *The Tortious Marketing of Handguns*, 19 SETON HALL LEGIS. J. 777, 779 (1995) (citing Prentis v. Yale Mfg. Co., 365 N.W.2d 176, 183 (Mich. 1984)). Benefits of the product that may be considered include its cost, effectiveness for an intended function, utility for multiple uses, durability and strength, convenience of use, collateral safety (protecting against some other risks), and appearance and aesthetics. *Id.* at 66. The burden includes engineering costs to change the current design, since those costs might price the product out of the market. *See* Phillips v. Kimwood Machine Co., 525 P.2d 1033, 1038 (Or. 1974).

243. O'REILLY & CODY, *supra* note 111, at 64.

244. *See supra* Section II.

245. *See supra* note 231; *see also* Halphen v. Johns-Mansville Sales Corp., 484 So. 2d 110, 115 (La. 1986) (finding standard of knowledge, skill, and care in design defect cases is that of expert).

require plaintiffs to prove the existence of an alternative design that is feasible and that could have avoided the injury in question.[246] Courts often look to whether the alternative design is safer, is technologically and economically feasible, does not impair the usefulness of the product, and does not create other equal or greater risks.[247] For automobiles, such alternative designs do in fact exist; cars can be designed to use cleaner energy sources and to use fossil fuels more efficiently.[248] Alternative power sources are also available, though their past and current economic feasibility remains debatable.[249]

A court cannot judge past and alternative designs, however, by contemporary standards or expectations; a design defect must be measured against standards as of the time of marketing.[250] Some state courts have even held that alternative designs that "are feasible but not demanded or expected by consumers or external standards" at the time "are not retrospectively held to be necessary in the context of a later design defect trial."[251] Some of the alternative designs noted above, such as gas-electric hybrid or fuel cell cars, are recent or future developments. That these designs may not have been technologically or economically feasible until very recently may ultimately defeat a claim of defectiveness. Other designs, however, such as electric cars, multi-valve engines, and lighter automotive components, have been around for decades, were known by consumers, and were put into commercial production, if at all, later than they could have been.[252] The fact that car manufacturers are still producing fuel-inefficient vehicles like SUVs may also facilitate design defect suits targeting more recent vehicles.

246. O'REILLY & CODY, *supra* note 111, at 67. *See, e.g.*, Sexton v. Bell Helmets, 926 F.2d 331, 338 (4th Cir. 1991).

247. *See e.g.*, Barker v. Lull Eng'g Co., 573 P.2d 443, 455 (Cal. 1978); Wilson v. Piper Aircraft Corp., 577 P.2d 1322, 1326 (Or. 1978).

248. In 2000, for instance, both Toyota and Honda introduced gas-electric hybrids with greatly improved fuel efficiency. Other car manufacturers are now planning to follow suit. *See* Keith Bradsher, *Ford Plans to Give Explorers' Engines an Electric Assist*, N.Y. TIMES, Jan. 9, 2001, at C1.

249. *See, e.g.*, *Publications Review: Alternative Energy Study by Linz University*, FT ENERGY NEWSL.—POWER EUR., May 3, 1996, at 13. *But see BioOil Gaining in Canada, U.S., Brazil*, OILWEEK, Nov. 19, 2001, at 5.

250. *See* Cover v. Cohen, 461 N.E.2d 864 (N.Y. 1984); McKee v. Miles Labs, Inc., 675 F. Supp. 1060 (E.D. Ky. 1987).

251. O'REILLY & CODY, *supra* note 111, at 72.

252. *See generally* DOYLE, *supra* note 228.

D. Negligence and Strict Liability

In products liability, plaintiffs can sue under either a strict liability or negligence theory. A manufacturer will be held strictly liable in tort when it places a product on the market, knowing that it is to be used without inspection for defects, and the product proves to have a defect that causes injury to a person.[253] The plaintiff is not required to show that the defendant did anything wrong.[254] Various defenses focusing on the reasonableness of the manufacturer's actions thus theoretically do not arise in strict liability cases because it is irrelevant whether the manufacturer took due care.[255] If the risks of a design outweigh its utility, pure strict liability would impose liability without regard to whether the manufacturer knew or should have known about those risks. Most courts have eschewed this approach, however, often looking at reasonableness even in ostensible strict liability cases.[256] Thus, the practical differences between negligence and strict liability claims are quite unclear, and sometimes seem to disappear.[257] As such, and because most if not all of climate change plaintiffs' alleged injuries would be for property as opposed to personal damages, the standards for establishing a products liability negligence claim must also be evaluated.

To establish a traditional prima facie negligence case, plaintiffs must prove: (1) a duty of care owed to the plaintiff by the defendants; (2) breach of that duty by the defendants; (3) defendants' breach as a proximate cause of plaintiffs' damages; and

253. Greenman v. Yuba Power Prod., Inc., 377 P.2d 897, 900 (Cal. 1962); *see also* Kennedy v. S. Cal. Edison Co., 268 F.3d 763 (9th Cir. 2001).

254. O'REILLY & CODY, *supra* note 111, at 137.

255. *Id.* at 163 (contributory negligence). *But see id.* at 164 (comparative fault policies).

256. *See, e.g.*, Nichols v. Union Underwear Co., 602 S.W.2d 429, 433 (Ky. 1980); *see also* McClurg, *supra* note 242, at 801 (different states treat strict liability claims differently, in accordance with their respective tort laws, although analyses vary even within same state). *Compare* Beshada v. Johns-Manville Prod. Corp., 447 A.2d 539, 546 (N.J. 1982) (explaining that state-of-the-art is essentially negligence defense, but in strict liability cases, culpability is irrelevant), *with* Feldman v. Lederle Labs, 479 A.2d 374, 386 (N.J. 1984) (considering knowledge available at time of manufacture to be relevant factor in measuring reasonableness of defendants' conduct in warning defect cases, even though reasonableness of conduct is not supposed to be element of strict liability claim).

257. *See, e.g.*, Port Auth. v. Arcadian Corp., 189 F.3d 305, 313 (3d Cir. 1999) ("[U]nder New York law, theories of negligence and strict liability for design and warning defects are functionally equivalent. A plaintiff can recover nothing in negligence on his products claims that he cannot first recover under his strict liability claims asserting product, design, and warning defects.") (internal citations omitted).

(4) cognizable injury or harm to the plaintiffs.[258] Since I have already discussed climate change plaintiffs' cognizable harms in some detail,[259] only the first three elements of a negligence claim by climate change plaintiffs will be examined here.

As to the first requirement, reasonable foresight and knowledge of a product's potential risks usually define the scope of a manufacturer's duty in product design.[260] At the level of expert knowledge, potential climate change defendants have likely known of the climate-changing risks of their products for quite some time.[261] Manufacturers' duties are usually restricted to those who foreseeably would consume or use their products.[262] When the products in question are automobiles, power, or fuels, it seems fair to say that virtually everyone is a foreseeable user.[263]

Climate change plaintiffs, however, are not harmed in their capacity as users or consumers of fossil fuels, power, or cars. Nevertheless, two recent cases indicate that these plaintiffs might still be able to demonstrate a duty on the part of defendants. In a case involving the contamination of plaintiffs' wells by MTBE in gasoline, the court found that the defendant oil companies owed the plaintiffs a duty to warn.[264] The court acknowledged that some courts have extended the duty to warn to "third persons exposed to a foreseeable and unreasonable risk of harm by the failure to

258. O'REILLY & CODY, *supra* note 111, at 135. Learned Hand considered a party to be negligent if the expected costs of accidents, discounted by the likelihood that the accident will occur, are greater than the costs of avoiding those accidents. *See* Penalver, *supra* note 7, at 576–77. This is essentially a risk-balancing test. As noted, the costs of climate change are and will be enormous, and the likelihood of destructive effects is fairly high. *See supra* Section II.B. The costs to defendants of avoiding or minimizing these harms, while potentially large, are likely to be less than the costs of climate change. The climate change defendants would thus likely be deemed negligent under Learned Hand's approach.

259. *See supra* Section II.B and II.C.

260. O'REILLY & CODY, *supra* note 111, at 30; *see also* McClurg, *supra* note 242, at 796. Manufacturers' knowledge of risks is usually a matter of expert testimony. *Id.* (citing Boatland of Houston v. Bailey, 609 S.W.2d 743 (Tex. 1980)). In some states, the ultimate determination of the existence of a duty is more "a question of fairness and public policy" than of foreseeability, though foreseeability is still important. *See Arcadian*, 189 F.3d 305 at 315 (citing Kuzmicz v. Ivy Hill Park Apartments, Inc., 688 A.2d 1018, 1020 (N.J. 1997)).

261. *See supra* note 231.

262. *See, e.g.*, Morris v. Chrysler Corp., 303 N.W.2d 500, 503 (Neb. 1981); *See also* McClurg, *supra* note 242, at 796.

263. *In re* Methyl Tertiary Butyl Ether ("MTBE") Prod. Liab. Litig., MDL No. 1358, Master File No. 00 Civ. 1898 (SAS), 2001 U.S. Dist. LEXIS 12192, at *87–88 (S.D.N.Y. Aug. 20, 2001) (*MTBE Litigation*).

264. *Id.* at *88.

warn."[265] The court then found that despite the fact that the contamination "was [not] the direct result of [plaintiffs'] own use of gasoline containing MTBE, . . . the harm suffered by the plaintiffs was a foreseeable result of defendants' placement of gasoline containing MTBE in the marketplace."[266] Although climate change plaintiffs probably will not pursue a duty-to-warn claim, the logic of extending defendants' duty to all those foreseeably exposed to risk seems equally applicable to design defect claims.

Extension of this duty-to-warn logic is supported by a recent handgun case, in which the court found that defendants owe a duty of care to all people "to whom injury may reasonably be anticipated."[267] The court thus held it to be a question for the jury whether a gun manufacturer "should have anticipated an injury to the Plaintiffs [Cleveland residents] as a probable result of manufacturing, marketing, and distributing a product with an alleged negligent design."[268] Since potential climate change plaintiffs' harms are arguably a foreseeable result of placement of defendants' products in the marketplace, defendants might thus owe plaintiffs a duty of care.[269]

Plaintiffs' second requirement in establishing a negligence claim is to prove a breach of the relevant duty of care. In the products liability context, breach occurs when a product is defective; the tests described above, such as risk-benefit, are thus also tests for breach.[270] Since negligence, unlike strict liability, is concerned with reasonableness, however, defendants in a negligence suit can assert that their actions were reasonable and thus preclude a finding of breach. The most important such defense in products liability is that the defendants took due care by meeting the "state of the art."[271] To proffer the "state of the art" defense, manufacturers do

265. *Id.* at *87 (citing McLaughlin v. Mine Safety Appliances Co., 181 N.E.2d 430 (N.Y. 1962)). For a duty to warn third parties in another realm of tort law, *see* Tarasoff v. Regents of Univ. of Cal., 551 P.2d 334 (Cal. 1976) (holding that therapist could be liable for failing to take adequate steps to protect known intended victim of his patient).

266. *MTBE Litigation*, at *87.

267. White v. Smith & Wesson, 97 F. Supp. 2d 816, 828 (N.D. Ohio 2000) (citing Gedeon v. East Ohio Gas Co., 190 N.E. 924, 926 (Ohio 1934)).

268. *Id.* at 829.

269. *MTBE Litigation*, at *88.

270. *See supra* notes 239–52 and accompanying text.

271. Some states have established statutory presumptions that a product is not defective if its design conforms to the "state of the art." O'REILLY & CODY, *supra* note 111, at 72.

not have to be operating at the forefront of technology; the term is sometimes used to refer to economic feasibility, the existence of generally recognized industry practices, or the existence of industry or government design standards.[272]

As previously noted, climate change plaintiffs could have trouble showing that alternative power sources were economically feasible.[273] The government standards in Title II of the CAA[274] might also bolster industry claims of meeting the state of the art in automotive emissions and fuel efficiency. Some basic technologies, though, were adopted by foreign manufacturers well before U.S. manufacturers, resulting in marked differences in fuel efficiency.[275] This fact might help defeat any claims of an "industry practice." Furthermore, even if alternative designs are not adopted by any manufacturer or considered for commercial use, a plaintiff can still introduce expert testimony to show that a reasonable alternative design could have been practically adopted.[276] For instance, potential climate change plaintiffs might be able to show the existence of such an alternative design for the current production of fuel-inefficient SUVs.

The third step in climate change plaintiffs' negligence claim is to establish proximate causation. This issue was addressed earlier.[277] Defendants in a negligence suit, though, can offer evidence of plaintiffs' conduct to defeat or to mitigate a finding that defendants were the proximate cause of plaintiffs' injuries. These defenses fall into two general categories: (1) contributory negligence or comparative fault; and (2) assumption of risk.[278]

272. *Id.* at 154. A scientifically sound alternative design thus may be rejected because its expense would prevent it from being commercially viable or because government or formal private standards could be said to express the state of the art of safe design. *Id*; *see also* RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY § 2 cmt. d (1998).

273. *See supra* note 249 and accompanying text.

274. 42 U.S.C. §§ 7521-7590 (2001).

275. *See, e.g.*, DOYLE, *supra* note 228, at 253 (noting difference in Toyota and Ford fuel efficiencies in 1988, largely due to Toyota's adoption of multi-valve engines); *id.* at 255, 261 (noting high miles per gallon (MPG) achieved by French Citroens AX-10 and by Honda Civics sold in America in 1990, compared to declining MPGs of U.S.-manufactured cars); *see also supra* note 248.

276. *See* RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY § 2 cmt. d (1998).

277. *See supra* Sections III.B and III.C.

278. Contributory negligence, comparative fault, and assumption of risk can also be applied to strict liability cases, but only if plaintiff's conduct is voluntary and unreasonable. *See* Borel v. Fibreboard Paper Prods. Corp., 493 F.2d 1076, 1098 (5th Cir. 1973), *cert. denied*, 419 U.S. 869 (1974); *see also* O'REILLY & CODY, *supra* note 111, at 164.

Contributory negligence means that plaintiffs were negligent in a way that contributed to their injuries. Historically, and currently in a few jurisdictions, contributory negligence defeats any liability for defendants.[279] Most jurisdictions, however, utilize "comparative fault," in which the defendants' liability is reduced proportionately to the plaintiffs' degree of fault.[280] "Assumption of risk" means that the plaintiffs are barred from recovery because they were aware of the product's danger but nevertheless unreasonably proceeded to use the product.[281]

At first glance, defendants' claims of contributory negligence, comparative fault, or assumption of risk may appear to have merit in a climate change suit. Defendants could argue that plaintiffs have been well aware that cars, fossil fuels, and power usage produce emissions that aggravate climate change, yet plaintiffs, their agents, and their citizens have continued to use those products with that knowledge. Climate change plaintiffs have strong rebuttals to these defenses, however. First, as already explained, citizens' awareness of the risks posed by use of fossil fuels is debatable.[282] Second, even assuming that citizens are aware of the risks, it would be difficult for defendants to show that plaintiffs acted unreasonably, especially given the few practical alternatives to using these manufacturers' products. Third, even assuming that plaintiffs are negligent to some degree, a significant gap would remain between plaintiffs' and defendants' relative contributions to climate change,[283] thereby minimizing any reduction in defendants' liability.

All things considered, therefore, climate change plaintiffs' strongest products liability claim appears to be a design defect suit. Three caveats bear repeating, however. First, recognition of manufacturers' duties to warn climate change victims outside of their capacity as users or consumers of products that emit carbon

279. O'REILLY & CODY, *supra* note 111, at 28.

280. *Id.* About two-thirds of states have comparative fault legislation or decisions. *Id.* at 164.

281. RESTATEMENT (SECOND) OF TORTS § 402A cmt. n (1965). This is a defense often used by cigarette manufacturers in tobacco lawsuits brought by smokers, though the defense clearly would not be available to them in suits brought over secondhand smoke.

282. *See supra* note 12 and accompanying text; *see also* Penalver, *supra* note 7, at 576 n.71 ("The public campaigns carried out by fossil fuel companies have made it very difficult for the average consumer to accurately weigh the risks involved in continued use of fossil fuels.").

283. *See supra* Sections III.B, III.C.

dioxide is by no means certain. Second, potential defendants might be able to present strong "state of the art" defenses. Third, as noted earlier, the CAA could potentially preempt claims against automobile manufacturers.[284] While a products liability claim might be viable, therefore, the above caveats indicate that this might not be climate change plaintiffs' most promising tort claim.

VI. PUBLIC NUISANCE

Nuisance law provides a much more promising tort-based claim for climate change plaintiffs than does products liability law. Rather than focusing on unreasonable conduct or unsafe products, liability in nuisance is predicated upon unreasonable injury.[285] Products liability defenses such as "state of the art," therefore, play no role in nuisance. For this and other reasons, nuisance suits have been used for decades to prevent pollution.[286] The application of nuisance law to the problem of global warming thus does not appear to be so novel an extension.[287]

Nuisances can be either private or public. A private nuisance occurs when one uses one's property in a manner that harms the property interests of others. The paradigmatic case of a private nuisance is one neighbor bothering another.[288] Theoretically, if a company used its property in a way that harmed others' property interests by contributing to global warming, it could be held liable under private nuisance.[289] Climate change, however, is a broad problem that has less to do with defendants' use of their property and that involves much less direct "annoyance" with "neighbors." As such, private nuisance does not seem like a good fit for a climate change lawsuit.[290] As explained below, public nuisance fits the facts of climate change much better.

284. *See supra* notes 205–09 and accompanying text.

285. Wood v. Picillo, 443 A.2d 1244, 1247 (R.I. 1982).

286. *See, e.g.*, Georgia v. Tennessee Copper Co., 206 U.S. 230 (1907) (air pollution).

287. *See* Cox v. City of Dallas, Tex., 256 F.3d 281, 291 (5th Cir. 2001) ("The theory of nuisance lends itself naturally to combating the harms created by environmental problems.").

288. *See, e.g.*, St. Helen's Smelting Co. v. Tipping, 11 H.L.C. 642 (1865) (owner of smelting operation was liable for creating private nuisance when operation destroyed value of neighbor's land).

289. *See* Bruce Ledewitz & Robert D. Taylor, *Law and the Coming Environmental Catastrophe*, 21 WM. & MARY ENVTL. L. & POL'Y REV. 599, 614 (1997).

290. Furthermore, an individual bringing a private nuisance suit for damage to his property from global warming would find it much more difficult, if not impossible, to prove

A. Basics of Public Nuisance

The basic elements of a public nuisance claim are quite uniform throughout the country, since most states follow the approach embodied in the Restatement (Second) of Torts. To be liable for a public nuisance, defendants must carry on, or participate to a substantial extent in carrying on, activities that create "an unreasonable interference with a right common to the general public."[291] Unlike products liability, in which producers typically owe a duty only to users of their products,[292] public nuisance law therefore creates duties to the broader "public" by prohibiting unreasonable interferences with public rights.

The first critical element of the definition of public nuisance is "a right common to the general public." Such a right is collective, not like the right each individual has not to be assaulted. Thus, if stream pollution deprives 100 landowners of the use of the water for purposes connected with their land, that alone would not constitute a public nuisance. If, however, pollution prevents the use of a public beach or kills the fish in a navigable stream and thus potentially affects all members of the community, it impinges on a public right and can be characterized as a public nuisance.[293] The enjoyment of the natural environment would seem to constitute such a public right.[294]

Climate change plaintiffs' particular harms implicate public rights. To the extent that these harms affect Alaska's roads or coastal states' beaches, interference with the public highways and beaches are paradigmatic cases of interference with a public right.[295] The extensive thawing of the permafrost that underlies most of Alaska, leading to increased erosion, landslides, sinking of ground surface, and disruption and damage to forests, buildings,

causation. *See supra* text accompanying notes 116–17.

291. RESTATEMENT (SECOND) OF TORTS §§ 821B(1), 834 (1979); *see also supra* note 119.

292. *See supra* note 262 and accompanying text.

293. RESTATEMENT (SECOND) OF TORTS § 821B cmt. g (1979). Some states have statutes defining a public nuisance to be an interference with "any considerable number of persons," under which no public right as such need be involved. *Id.*

294. Ledewitz & Taylor, *supra* note 289, at 615; *see also* Illinois v. Milwaukee, 406 U.S. 91, 104–05 (1972).

295. RESTATEMENT (SECOND) OF TORTS § 821B cmt. b (1979).

and infrastructure, seems to infringe on several public rights.[296] The damages to the structures, infrastructures, and existence of Shishmaref also seem to affect public rights. Climate change plaintiffs could thus make a strong case for defendants' interferences with public rights.

The second critical element of a public nuisance claim is that the defendants' interference with the public right is unreasonable. Three independent and sufficient grounds for establishing unreasonableness are recognized: (1) defendants' conduct significantly interferes with the public safety, health, peace, comfort, or convenience; (2) it is continuing conduct, or has produced a permanent or long-lasting effect, and defendants know or have reason to know that it has a significant effect upon the public right; or (3) defendants' conduct is unlawful.[297] The first and second grounds listed above seem readily applicable to the climate change context. The emissions caused by the potential defendants, by contributing to climate change and its resulting effects, threaten public safety, health, comfort, and convenience. Climate change is also a "permanent or long-lasting effect" that defendants could have foreseen would interfere with these public rights.[298] Furthermore, some courts have shown a tendency to treat as unreasonable significant interferences with recognized aesthetic values or established principles of conservation of natural resources; this approach certainly seems capable of extension to the climate change context.[299] Defendants' interferences with public rights could thus be deemed "unreasonable" on any or all of the foregoing grounds.

A third element is also sometimes considered, namely that the defendants failed "to take reasonable actions within their control that would eliminate, ameliorate, or minimize the harm."[300] It is not clear whether this element is required, so long as defendants' conduct creates or contributes to the nuisance.[301] Nevertheless, as

296. NAST, *supra* note 29, at 74; *see also* OFFICE OF POLICY, U.S. EPA, EPA 236-F-98-007b, CLIMATE CHANGE AND ALASKA 4 (Sept. 1998) *available at* http://www.epa.gov/globalwarming/publications/impacts/state/ak_impct.pdf.

297. RESTATEMENT (SECOND) OF TORTS § 821B(2) (1979) Liability for a public nuisance may arise even though a party complies in good faith with laws and regulations. *See* City of Boston v. Smith & Wesson Corp., 2000 WL 1473568, at *14 (Mass. Super. July 13, 2000).

298. *See supra* note 231.

299. RESTATEMENT (SECOND) OF TORTS § 821B cmt. e (1979).

300. Kairys, *The Governmental Handgun Cases*, *supra* note 21, at 1177.

301. *Id.*, at n.7.

already noted, it is clear that defendants have failed to take meaningful mitigating action, and that some in fact acted to prevent public pressure for such mitigation.[302] Defendants' actions thus appear to meet all the elements of a public nuisance.

B. Standing

The underlying basis for public nuisance is "to protect the public from lawful and even productive activities that are substantially incompatible with the public's common rights. Public nuisance is the only tort designed and equipped to protect the public from activities or conduct that is incompatible with public health, safety, or peace."[303] Given this underlying public basis, the typical plaintiff in a public nuisance action is a governmental entity or official seeking to protect the public.[304] Governmental entities with appropriate executive power have traditional standing, often recognized in state constitutions or statutes;[305] where standing is not so conferred, courts have generally recognized such standing as a common law power.[306] Traditional public nuisance plaintiffs include mayors and other city executive officials, county executive officials, governors, and state attorneys general.[307] The potential climate change plaintiffs described earlier would thus seem to have traditional standing, as they are among the paradigmatic public nuisance plaintiffs.[308] Further, under the identical analysis done under products liability, public nuisance climate change plaintiffs could also meet the usual requirements of Article III standing.[309]

302. *See, e.g., supra* note 12.

303. Kairys, *The Governmental Handgun Cases, supra* note 21, at 1178.

304. *See id.* at 1175; *see also id.* at 1176 ("A public nuisance claim is the vehicle provided by civil law for executive-branch officials to seek immediate relief to stop and remedy conduct that is endangering the public.").

305. *Id.* at 1177 n.9.

306. *See, e.g.*, City of Chicago v. Festival Theatre Corp., 438 N.E.2d 159, 162 (Ill. 1982) ("[E]quitable jurisdiction to abate public nuisances is said to be of 'ancient origin,' and it exists even where not conferred by statute . . . .").

307. *See* Kairys, *The Governmental Handgun Cases, supra* note 21, at 1177 n.9; *see also* State v. Lead Indus. Ass'n., Inc., 2001 WL 345830, at *6 (R.I. Super. Apr. 2, 2001). *But cf.* Ganim v. Smith & Wesson Corp., 780 A.2d 98 (Conn. 2001) (finding city of Bridgeport and its mayor not to have standing in public nuisance handgun suit because plaintiffs claimed harms only to themselves, not on behalf of residents of Bridgeport, as *parens patriae*, or in some other similar representative capacity, and harms alleged were derivative and remote).

308. *See supra* Section II.B.

309. *See supra* Section V.A. Citizens can also bring public nuisance actions, although it is rare. The Restatement limited the class of private plaintiffs who could recover damages to

C. Applicability of Public Nuisance to Products and Manufacturers

Although climate change plaintiffs could likely establish standing, they might be required to introduce additional evidence of tortious conduct and control by defendants in order to proceed with a public nuisance claim. Some courts, particularly in recent handgun decisions, have held that public nuisance is inapplicable in the context of products, whether they are defective or not.[310] These courts have highlighted the idea that nuisance law is at heart about a wrongful use of property, as distinguished from an improper condition of property.[311] Other handgun courts, however, have rejected the idea that public nuisances must arise from activities on or related to property and have allowed public nuisance claims to proceed concurrently with negligent marketing and design defect claims.[312]

Courts rejecting the applicability of public nuisance law to products have seemed primarily concerned, as with proximate causation, about the issue of control.[313] Those handgun cases

those who had "suffered harm of a kind different from that suffered by other members of the public exercising the right common to the general public that was the subject of the interference." RESTATEMENT (SECOND) OF TORTS § 821C(1) (1979). Without such a particularized injury, the remedy for a public nuisance generally has to be sought through the public authorities. *See* Connerty v. Metro. Dist. Comm'n, 495 N.E.2d 840, 845 (Mass. 1986). *But see* Akau v. Olohana Corp., 652 P.2d 1130, 1134 (Haw. 1982) (holding that member of public without special injury has standing to sue to enforce rights of public if can show injury-in-fact and satisfy court that concerns of multiplicity of suits will be satisfied by any means, including class action). Even if they could establish such particularized injury, however, citizen plaintiffs in a climate change suit would have a hard time showing causation. *See supra* note 290.

310. *See, e.g.*, Camden County Bd. of Chosen Freeholders v. Beretta, U.S.A. Corp., 273 F.3d 536, 539 (3d Cir. 2001) (finding handgun manufacturers not to have created actionable public nuisance); Tioga Pub. Sch. Dist. v. U.S. Gypsum Co., 984 F.2d 915, 920 (8th Cir. 1993) (finding public nuisance charge to have been improperly given to jury); City of Philadelphia v. Beretta U.S.A., Corp., 126 F. Supp. 2d 882, 909–10 (E.D. Pa. 2000) (finding manufacturers not liable for public nuisance for distribution practices of their legal, non-defective products which caused harm to plaintiffs after leaving manufacturers' control); *see also* Kairys, *The Governmental Handgun Cases*, *supra* note 21, at 1182.

311. *City of Philadelphia*, 126 F. Supp. 2d at 910 (citing Detroit Bd. of Educ. v. Celotex Corp., 493 N.W.2d 513, 521 (Mich. Ct. App. 1992) (asbestos)).

312. *See* City of Boston v. Smith & Wesson Corp., 2000 WL 1473568, at *14 (Mass. Super., July 13, 2000) (memorandum of decision and order on defendants' motion to dismiss).

313. *See* Young v. Bryco Arms, 765 N.E.2d 1, 15 (Ill. App. Ct. 2001) (noting "correlation between the degree of mental culpability associated with a defendant's ([handgun] manufacturer, distributor or dealer) alleged conduct and whether a public nuisance claim is permitted to proceed"); *see also Camden County Bd. of Chosen Freeholders*, 273 F.3d at 541

allowing public nuisance actions to proceed required a showing of intentional creation or propagation of an illegal handgun market, rather than just the manufacture and distribution of the product, to satisfactorily demonstrate the requisite level of control.[314] Similarly, in the MTBE litigation, a public nuisance claim was permitted to proceed because plaintiffs alleged that the oil companies had knowledge of the dangers of MTBE, marketed and distributed the gasoline without warning of these dangers, and actively misrepresented and conspired to conceal the threat caused by MTBE.[315]

As demonstrated earlier with respect to proximate causation, climate change plaintiffs could likely establish that the potential defendants retained control at all steps of the causal chain.[316] Also, as with MTBE, potential climate change defendants arguably have attempted to misrepresent the threats posed by their products.[317] Climate change plaintiffs could further attempt to show evidence that, as with MTBE, "defendants intentionally created a market where everybody, including plaintiffs, would be foreseeable users of" their products, by restricting the number of viable alternatives on the market.[318] Given the existing evidence of defendant control, and with potential evidence of further tortious conduct such as active misrepresentation and intentional creation of dangerous markets, climate change plaintiffs might very well be able to proceed with a public nuisance cause of action.

("[T]he limited ability of a defendant to exercise control beyond its sphere of immediate activity may explain why public nuisance law has traditionally been confined to real property and violations of public rights."); *City of Philadelphia*, 126 F. Supp. 2d at 910 (citing City of Bloomington v. Westinghouse Elec. Corp., 891 F.2d 611, 614 (7th Cir. 1989) for support because that case found that manufacturer's lack of control over sold chemical when it entered environment precluded public nuisance liability); *id.* at 910–911 (noting that harms are from intervening third party criminals over whom defendants exercise no control).

314. *See Young*, 765 N.E.2d at 15.

315. *In re* Methyl Tertiary Butyl Ether ("MTBE") Prod. Liab. Litig., MDL No. 1358, Master File No. 00 Civ. 1898 (SAS), 2001 U.S. Dist. LEXIS 12192, at *93-96 (S.D.N.Y. Aug. 20, 2001) (*MTBE Litigation*).

316. *See supra* Section III.B.

317. *See, e.g., supra* note 12; DOYLE, *supra* note 228, at 256–257 (describing deceptive and misleading advertising by car manufacturers about fuel efficiency of vehicles).

318. *MTBE Litigation*, at *87.

D. Damages and Injunctions in Nuisance Suits

If climate change plaintiffs can establish that defendants unreasonably interfered with public rights and had sufficient control, these plaintiffs could then pursue the two basic remedies available in nuisance actions—damages and injunctions.[319] In determining whether to award damages in a public nuisance suit, "the court's task is to decide whether it is unreasonable [for the defendants] to engage in the conduct without paying for the harm done."[320] To be compensated with a damage award, climate change plaintiffs must have actually incurred significant harm,[321] which they arguably have in the form of property damage and expenses for preventative measures.[322] The sole question then becomes the unreasonableness of allowing defendants to continue their behavior without providing compensatory damages to the plaintiffs. Climate change plaintiffs could contend that even if potential defendants' activities are of great utility to society, as could reasonably be argued, it could still be unreasonable to inflict the harm on plaintiffs without compensating them for it.[323] Plaintiffs might also be able to argue that it would be unreasonable to allow defendants to continue their climate-changing conduct without compensation, as doing so would run contrary to the basic goals of tort law.[324] Climate change plaintiffs thus might be able to establish the basis for a damage award in a public nuisance suit.

In a public nuisance action for injunctive relief, the question is whether the defendants' activity itself is so unreasonable that it must be stopped. Harm need only be threatened and need not actually have been incurred yet.[325] Potential climate change plaintiffs' harms arguably have already been incurred, and are at the very least threatened. Injunctions are often granted "when damages are inadequate, such as with ongoing nuisances in which

319. Cox v. City of Dallas, 256 F.3d 281, 291 (5th Cir. 2001).

320. RESTATEMENT (SECOND) OF TORTS § 821B cmt. i (1979).

321. *Id.*

322. *See supra* Section II.C. Diminished tax revenues and lower property values are among the harms "typically suffered by municipalities due to public nuisances." City of Boston v. Smith & Wesson Corp., 2000 WL 1473568, at *6 (Mass. Super., July 13, 2000).

323. RESTATEMENT (SECOND) OF TORTS § 821B cmt. i (1979).

324. *See supra* notes 9–18 and accompanying text.

325. RESTATEMENT (SECOND) OF TORTS § 821B cmt. i (1979).

numerous suits or future damage awards would be required."[326] Future suits and damage awards will be likely during the continued progress of global warming, raising the prospects of injunctive relief. It would be unreasonable and unwise, however, for a court to enjoin all emissions from defendants, since that would destroy those companies. Instead, should a court determine that defendants' sizable carbon dioxide emissions are unreasonable, injunctive relief can arguably be focused directly on the source of plaintiffs' harms by enjoining defendants from continuing carbon dioxide emissions at their current levels. Injunctions might also theoretically mandate conservation and efficiency measures or improvement and updating of technology and equipment, if a court thought such drastic intervention through its equity powers was warranted.

VII. CONCLUSION

Tort-based climate change litigation strikes many people as a radical idea at first. Basic tort principles, however, combined with the overwhelming scientific consensus that global warming is occurring and the evidence that it is having present detrimental effects, may provide a basis for claims of some liability against fossil fuel companies, electric utilities, and car manufacturers for some of climate change's effects. Coastal states, island states and nations, the State of Alaska, and Alaskan villages could all be promising plaintiffs in light of their present climate change damages and preventative costs, and as such could likely recover for harms that they could not reasonably have expected to incur. State plaintiffs in particular, due to their ability to aggregate harms over time and space, might be able to demonstrate sufficient specific causation of their harms and to identify various parties that have proximately caused those harms by means of their substantial contributions to global warming. These potential defendants could be held liable for the portion of plaintiffs' harms for which they are likely responsible, as estimated perhaps by a market-share/carbon-content means of apportionment. Since carbon dioxide emissions and global warming both appear to be outside of the CAA's regulatory scope, federal common law tort claims would likely

326. Cox v. City of Dallas, 256 F.3d 281, 291 (5th Cir. 2001) (citing *Developments in the Law—Injunctions*, 78 HARV. L.REV. 994, 1001 (1965)).

remain available to state plaintiffs suing out-of-state sources, as would state common law tort claims for non-state plaintiffs or for states suing internal sources. The CAA could potentially preempt suits against automobile and gasoline manufacturers, though this is by no means a certainty.

Products liability suits represent one potential litigation avenue, though probably not the most promising, for climate change plaintiffs pursuing relief. Warning defect claims seem likely to fail, since warnings on cars, fuels, or power would be unlikely to effect meaningful change in consumer behavior, and since the warnings would in no way affect the suitability of those products for their intended purposes. Design defect claims against automobile manufacturers are potentially stronger, particularly in regard to recent vehicles and failure to implement existing technologies. The strong state-of-the-art defense accorded by governmental regulation of motor vehicles, the necessity of extending the duty of care, and the possibility of CAA preemption, however, indicate that the products liability framework is not ideally suited for climate change litigation.

With its broader scope of defendant duty and its narrower range of defendant defenses, public nuisance law is a more promising cause of action for climate change plaintiffs. The potential plaintiffs identified in this article can make strong claims that the potential defendants unreasonably interfered with rights common to the general public. These interferences with public rights include interference with public access to roads, beaches, buildings, and infrastructure. Since the potential defendants have arguably retained an important degree of control over the harm, and with the possible introduction of evidence of further tortious conduct, plaintiffs could likely seek damages and injunctive relief from defendants under public nuisance law. Since the potential plaintiffs have incurred significant harms, damages could be available if a court deems it unreasonable for defendants to continue their activities without compensating plaintiffs. Injunctive relief could also be available if a court determines that defendants' carbon dioxide emissions are unreasonable.

While tort-based climate change litigation might currently be feasible, such suits might fare better if some preliminary suits and steps paved the way by getting discussions of climate change into the courts. These suits could be based on federal statutes, such as

challenges under the National Environmental Policy Act (NEPA) against agencies that do not adequately consider the effects of their actions on climate change.[327] The suits might also be based on state statutes, such as unfair trade practice acts. Another possible avenue would be to seek a declaratory judgment from a state, or even an advisory opinion from the International Court of Justice.[328] If a state had a constitutional or a statutory guarantee of a clean environment,[329] plus a declaratory judgment law,[330] one could make use of these provisions to seek a declaratory judgment that global warming was depriving state citizens of their constitutional right to environmental health or safety. Although such a judgment would be merely a broad declaration, it would get the concept of climate change harms into the courts and would start to bolster their comfort level and familiarity with the idea.

With these suits laying the basis, and probably even without them, some tort-based climate change suits have strong legal merits and may be capable of succeeding. It is also possible that further research could reveal other viable tort claims; this article in no way attempts to exhaust the gamut of tort-based cases that could be brought for harms resulting from climate change. This article demonstrates only that tort-based suits are legally feasible. It thus introduces a new frontier in thinking about climate change. The legal community should start grappling with the idea of applying tort law to climate change, as such suits could soon make the leap from theory to reality.

327. 42 U.S.C. §§ 4321–4347 (2001). Greenpeace U.S.A., Friends of the Earth, and the City of Boulder, CO, have recently filed a climate change NEPA suit against the Overseas Private Investment Corporation (OPIC) and the Export-Import Bank (Ex-Im) of the United States. *See* Global Warming Victims Sue the United States for Illegally Funding Fossil Fuel Projects, *at* http://www.climatelawsuit.org. (last visited Aug. 27, 2002).

328. *See* Mihm, *supra* note 5, at 76.

329. *See, e.g.*, MONT. CONST. art. II, § 3 ("All persons are born free and have certain inalienable rights. They include the right to a clean and healthful environment. . . ."); *id.* art. IX, § 1(1) ("The state and each person shall maintain and improve a clean and healthful environment in Montana for present and future generations.").

330. *See, e.g.*, ALA. CODE § 6-6-222 (1993).