THE RISING TIDE OF CLIMATE CHANGE: WHAT AMERICA'S FLOOD CITIES CAN TEACH US ABOUT ENERGY POLICY, AND WHY WE SHOULD BE WORRIED

BY

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To provide a model for assessing the current and likely responses to climate change risks, this Article considers two of the worst flood disasters in American history and applies the same rationale to critical climate change issues facing the nation today. After providing a background on climate change and related policy initiatives, this Article first considers the flood of 1997 in Grand Forks, North Dakota, which caused more than 50,000 people to abandon their homes. The development of the flood preparations, the failures of the early warning systems, and the relief and mitigation efforts once the disaster struck played a significant role in the losses suffered. The Article then discusses Hurricane Katrina and its aftermath in New Orleans, reviews the safety plan in place before the Hurricane, and considers the failures in the responses following the breach of the levees. The Article then outlines the lessons (hopefully) learned following the Grand Forks flood of 1997 and in post-Katrina New Orleans and explains how the lessons apply to the present climate change discussions. The experiences of these disasters highlight the risks of failing to mitigate and (at least attempt to) reverse the effects of a looming natural disaster. Finally, the Article concludes that 1) the overall costs of acting are far less than the costs that are likely to follow under a business-as-usual approach, and 2) policies to address climate change issues are well worth the effort because of the potential gains in terms of national security and job creation, even if the predicted losses attributed primarily to climate change are "wrong."

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I. INTRODUCTION

> Climate is what you expect; weather is what you get.[1]
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> What part of "record flooding" did they not understand?[2]

Climate change is often considered the most compelling reason to seek cleaner energy supplies for electricity and transportation needs, yet it is almost always the most contentious rationale for seeking alternative energy sources. Despite the complex nature of climate change, and how to address its effects, the debate over climate change policy is often framed in very simple terms: You either believe or you don't.

This Article argues that the climate change debate is often improperly viewed as having a singular impact and focus, thus (to use an environmentally based analogy) missing the forest for the trees. From "greening the grid" to "freedom from foreign oil" to economic development, climate change policies are multifaceted and have multiple purposes. If the grid is to be greener (or the other myriad benefits flowing from climate change policies are to be achieved), there must be an understanding, first, of the risks posed by climate change, and second, of the successes and failures in other areas heavily impacted by environmental policies.

Although rather slow to catch on, most people in the United States finally appear to have adopted the near-consensus opinion of the scientific

[1] John Abatzoglou et al., *A Primer on Global Climate Change and Its Likely Impacts*, *in* CLIMATE CHANGE: WHAT IT MEANS FOR US, OUR CHILDREN, AND OUR GRANDCHILDREN 11, 13 (Joseph F.C. DiMento & Pamela Doughman eds., 2007) [hereinafter CLIMATE CHANGE] (quoting Mark Twain).

[2] ASHLEY SHELBY, RED RIVER RISING 9 (2003).

community that climate change is real.[3] Of course, contrary to the scientific community,[4] there are still significant questions among the general population whether climate change is caused by human activity.[5] Many of these questions are fueled by very public and very vociferous critics, such as United States Senator James Inhofe, who has referred to climate change as "the greatest hoax ever perpetrated on the American people."[6]

For purposes of this Article, "climate change" refers to the warming of the Earth's atmosphere caused by the combustion of fossil fuels, such as coal, oil, and natural gas, which contain carbon.[7] This carbon is released during the combustion process as the greenhouse gas (GHG) carbon dioxide.[8] GHGs essentially trap heat in the atmosphere, leading to increased temperatures.[9] As concentrations of GHGs increase, the potential for increased temperatures (i.e., a warming climate) rises.[10] Most climate change research (and many of the proposed solutions) focuses on managing carbon dioxide output because carbon dioxide is the most prevalent GHG in the atmosphere and fossil fuel combustion is the leading human cause of carbon

3 PEW RESEARCH CTR., GLOBAL WARMING: A DIVIDE ON CAUSES AND SOLUTIONS (2007), http://pewresearch.org/pubs/282/global-warming-a-divide-on-causes-and-solutions (last visited Nov. 15, 2009) ("The unusual weather affecting the nation this winter may have reinforced the widely held view that the phenomenon of rising temperatures is real (77% of Americans believe that) . . . .").

4 BRIAN FAGAN, THE GREAT WARMING, at xvii (2008) ("The prolonged debate over anthropogenic global warming is over, for the scientific evidence documenting our contributions to a much warmer world of the future is now beyond the stage of controversy."); *see also* Joseph F.C. DiMento & Pamela Doughman, *Introduction: Making Climate Change Understandable*, *in* CLIMATE CHANGE, *supra* note 1, at 1, 3 (explaining that one of the difficulties in understanding climate change is the public perception "that scientists lack consensus on the human contribution to climate change"). *But see Beware of False Gods in Rio*, WALL ST. J., June 1, 1992, at A12 (providing the Heidelberg Appeal, a document introduced at the 1992 Earth Summit in Rio de Janeiro and signed by 218 scientists, including 27 Nobel Prize winners) ("We are . . . worried, at the dawn of the twenty-first century, at the emergence of an irrational ideology which is opposed to scientific and industrial progress and impedes economic and social development." (quoting the Heidelberg Appeal)). Since that time, more than 4000 scientists have since signed on to the Heidelberg Appeal. Gerald Karey, *Regulation & the Environment*, OILGRAM NEWS, Apr. 10, 2006, at 3 (calling the Heidelberg Appeal "an obscure 1992 document" and noting that "[c]limate change skeptics don't simply dispute those on the other side of the issue; they do it wearing brass knuckles").

5 PEW RESEARCH CTR., *supra* note 3 ("Only about half (47%) of the public now says that human activity, such as the burning of fossil fuels, is mostly to blame for the earth getting warmer.").

6 Manya A. Brachear, *Religious Leaders Divided About Global Warming*, CHI. TRIB., June 15, 2007, http://archives.chicagotribune.com/2007/jun/15/news/chi-seekerbox_15jun15 (last visited Nov. 15, 2009); *see also* 149 CONG. REC. S10,021 (daily ed. July 28, 2003) (statement of Sen. Inhofe) ("There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gasses is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate." (quoting Frederick Seitz, Professor, Rockefeller University)).

7 FRED BOSSELMAN ET AL., ENERGY, ECONOMICS AND THE ENVIRONMENT 1244 (2d ed. 2006).

8 *Id.*

9 *Id.*

10 *Id.*

dioxide production.[11] As such, it is often assumed that the key to managing climate change is managing carbon dioxide emissions.[12]

Although climate change is understood, at least in concept, by most people, the concerns and risks of climate change are not widely accepted and understood by the vast majority of Americans.[13] In addition to the concerns about the scientific community's view of climate change, other challenges to public understanding include laypeople's difficulties in comprehending the process of scientific research, the complex nature of climate change policies, and the broad nature of climate change effects.[14] Even where climate change is recognized as a concern, the method or methods to address climate change are anything but uncontroversial.

As an environmental issue, modern climate change concerns were popularized by James Hansen in the late 1970s.[15] Hansen hypothesized that the consumption of fossil fuels was slowly and consistently warming the planet.[16] Of course, Hansen was not the first to advance such a theory. As early as the late 1800s, Swedish scientist Svante Arrhenius concluded that burning fossil fuels was and could be expected to continue to warm the Earth.[17] However, he thought that this warming trend, caused by increases in carbon dioxide production, would be good for the climate, warming some of the colder regions of the world.[18]

Climate change is often considered a problem for the planet; however, for the most part, there is a compelling argument that the Earth is fine.[19] That is, climate change is a problem for the planet's inhabitants, not the planet.[20] The direst consequences of climate change involve how changes in the Earth's atmosphere would impact people and animals.[21] In the starkest sense, though, the planet would continue on and rejuvenate itself. It would just do so without (or with an extremely reduced number of) people.

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11 *Id.*

12 *Id.*

13 *See* DiMento & Doughman, *supra* note 4, at 3–7.

14 *Id.*

15 *See* Abatzoglou et al., *supra* note 1, at 33–34.

16 *Id.*

17 *Id.* at 34–35.

18 *Id.* at 35–36 & box 2.6. Over time, Arrhenius's theory of climate change faded into obscurity until the modern form of the theory was resurrected in the mid-1950s. *Id.* at 36 box 2.6.

19 *See* Nick Coleman, *Washing Away Walls: The Red River Flood Swept Away Houses, Farms, Hopes and Dreams*, ST. PAUL PIONEER PRESS, May 11, 1997, at 1A, *available at* LEXIS ("Despite all the destruction and disruption of people and their cities, the planet was not overwhelmed by the [Red River of the North] flood of 1997. The river, the lake, the land and the wildlife adapt readily. Nature heals itself.").

20 *Cf.* Paul Krugman, *Betraying the Planet*, N.Y. TIMES, June 29, 2009, at A21 ("[W]e're facing a clear and present danger to our way of life, perhaps even to civilization itself. How can anyone justify failing to act?").

21 BOSSELMAN ET AL., *supra* note 7, at 1255 (stating that climate change would likely impact crop yields, the variety and types of pests that impact plants, and "diseases that threaten animals or human health").

Now that climate change has been embraced as an environmental risk with a certain sense of inevitability (barring significant action),[22] the question becomes how to address, and hopefully prevent, the consequences. The manner in which people have (or have not) dealt with environmental disasters in the past provides a good sense of how they will (or could) react in the future. As such, in assessing and predicting the possible responses to environmental risks of climate change, there is value in reviewing how similar environmental risks have been addressed in the past.

Perhaps the best analogy for climate change is the environmental challenge posed by flooding. Like climate change,[23] the risks posed by potential floods are best assessed in probabilities, not certainties.[24] In both cases, uncertainty causes difficulty for decision makers, especially critics, who want a specific timeline[25] or a specific prediction of the expected severity of the potential disaster.[26] Assessing the related risks at any given time is very difficult. Furthermore, there is often ample anecdotal (though not accurate) "evidence" that risks can be overcome or are not real.[27]

For those in or near a flood plain, without mitigation, severe flooding almost certainly will occur at some point; it is simply a matter of time. Similarly, climate change, without mitigation, is almost certain to cause significant problems for humans and animals. However, in both cases, determining when specifically the significant impact will occur is almost impossible.

Finally, the value of prevention is hard to assess until after the disaster. Many critics of legislation to address climate change worry about the costs and the impact on economic development.[28] Similarly, flood mitigation

22 Krugman, *supra* note 20 ("[R]esearchers at M.I.T., who were previously predicting a temperature rise of a little more than 4 degrees by the end of this century, are now predicting a rise of more than 9 degrees.").

23 Abatzoglou et al., *supra* note 1, at 42 ("[C]onclusions that scientists reach on future changes in climate are expressed in terms of probabilities."); DiMento & Doughman, *supra* note 4, at 6 ("Scientists work with probabilities, risks, ranges, uncertainties, and 'scenarios' — approaches that are foreign to many citizens.").

24 *See* SHELBY, *supra* note 2, at 178 (discussing the desire of hydrologists to provide "flood crest numbers as a range, a probability").

25 Massachusetts v. Envtl. Prot. Agency, 549 U.S. 497, 539 (2007) (Roberts, C.J., dissenting) (stating that the majority was incorrect in finding that the Environmental Protection Agency's failure to address greenhouse gas emissions posed an injury in fact for the state of Massachusetts, in part because the "very concept of global warming seems inconsistent with" the requirement of a particularized injury); Transcript of Oral Argument at 5, Massachusetts v. Envtl. Prot. Agency, 549 U.S. 497 (2007) (No. 05-1120) ("When? I mean, when is the predicted [climate change caused] cataclysm?").

26 *See* SHELBY, *supra* note 2, at 178 (stating that, with regard to flood-level predictions, "emergency managers, the mayors and the townspeople wanted 'single value, best estimate,'" not a range of probabilities).

27 *See* Ann Bostrom et al., *What do People Know About Global Climate Change?*, 14 RISK ANALYSIS 959, 967 (1994).

28 *See, e.g.*, Energy Citizens, The Climate Bill, http://energycitizens.org/issues/the-climate-bill (last visited Nov. 15, 2009).

efforts, such as dikes and levees, are also highly capital intensive,[29] and it is often hard to know to if the upfront costs are justified.

To provide a model for assessing the current and likely responses to climate change risks, this Article considers two of the worst flood disasters in American history. In Part II, this Article considers the flood of 1997 in Grand Forks, North Dakota, which caused more than 50,000 people to abandon their homes. This Part discusses the development of the flood preparations, the failures of the early warning systems, and the relief and mitigation efforts once the disaster struck. Part III of the Article discusses Hurricane Katrina and its aftermath in New Orleans. This Part reviews the safety plan in place before the Hurricane and the failures in the responses following the breach of the levees. Then, in Part IV, the Article discusses some of the lessons (hopefully) learned following the flood of 1997 and in post-Katrina New Orleans and how they apply to the present climate change discussions. The experiences of these disasters highlight the risks of failing to mitigate and (at least attempt to) reverse the effects of climate change. Finally, the Article concludes that the overall costs of acting are far less than the costs related to potential harms and that the costs of acting, even if the predicted climate change losses are "wrong," are well worth the effort.

II. THE GRAND FORKS FLOOD OF 1997: WHEN SCIENCE BRED COMPLACENCY

Floods are 'acts of God,' but flood losses are largely acts of man.[30]

A. Grand Forks Under Water

As in any community at risk for flooding, Grand Forks, North Dakota[31] always watches the spring thaw with a cautious eye.[32] The Red River of the North runs through Grand Forks, along the state line with Minnesota.[33] The river oddly runs south to north, up to Winnipeg and ultimately into the Hudson River, the result of a glacial lake (Lake Agassiz) that has since all but disappeared.[34]

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29 B. AFFELTRANGER, INT'L HYDROLOGICAL PROGRAMME, UNITED NATIONS EDUC., SCIENTIFIC & CULTURAL ORG., PUBLIC PARTICIPATION IN THE DESIGN OF LOCAL STRATEGIES FOR FLOOD MITIGATION AND CONTROL 10 (2001), *available at* http://unesdoc.unesco.org/images/0012/001228/122888Eo.pdf.

30 GILBERT FOWLER WHITE, HUMAN ADJUSTMENT TO FLOODS: A GEOGRAPHICAL APPROACH TO THE FLOOD PROBLEM IN THE UNITED STATES 2 (1945).

31 For purposes of analysis, this Article focuses primarily on Grand Forks as the location of the flood. This is in no way intended to discount the severe losses suffered by residents of East Grand Forks, Minnesota, and throughout the region on both sides of the Red River of the North.

32 *See* SHELBY, *supra* note 2, at 4 ("In Grand Forks, when the Red River swells during spring thaw, people worry little and sandbag a lot.").

33 *See* ELBERT WALTER FRIDAY, JR., NAT'L RESEARCH COUNCIL, COMMUNICATING UNCERTAINTIES IN WEATHER AND CLIMATE INFORMATION 5 (2003).

34 U.S. Geological Survey, U.S. Dep't of the Interior, Why Does the Red River Run North?, http://nd.water.usgs.gov/index/rrfaqs.html (last visited Nov. 15, 2009); *see also* SHELBY, *supra* note 2, at 23, 49.

Grand Forks was, and is, used to flood preparation.[35] In almost an annual ritual, the city created sandbag dikes to keep the Red River at bay.[36] In 1996, Grand Forks survived a near record flood, keeping back floodwaters reaching 45.8 feet.[37] In light of 1996's success, the town had a sense that it could handle the worst of the flooding.[38] And, after all, the Red River was historically "a relatively well-behaved river."[39]

Then came the winter of 1996–1997. The winter began and ended with blizzards—a total of eight—that led to a record snowfall in excess of 100 inches.[40] There was no doubt that the river would reach flood stage—the only question was how high it would go. As early as February 1997, the National Weather Service (NWS) predicted flooding of forty-nine feet, "which would [have been] a massive, dangerous flood, one that could test the limits of Grand Forks' levees and dikes, which could be fortified and topped to 52 feet."[41]

Although the NWS recognized that the flood could be even higher, their models allowed only for predictions up to the forty-nine foot point.[42] Despite warnings that the area should expect "record flooding" that was going to be "higher than ever before,"[43] the NWS flood forecast was interpreted several different ways.[44] For some of the key decision makers, the NWS prediction was a maximum or a worst-case scenario.[45] For others, it was an exact approximation—they expected a forty-nine foot crest.[46] Still others saw the prediction as an estimate, with a range of uncertainty between one and six feet.[47] Following the flood, it was clear that the process of communicating flood risk needed to be overhauled so that communities, decision makers, and forecasters were all on the same page.[48]

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35 *See* SHELBY, *supra* note 2, at 4.

36 *See id.*

37 *Id.* at 7. Before the Flood of 1997, the 1996 flood in Grand Forks was one of the city's five worst. *Id.* at 48.

38 *Id.* at 48 ("In Grand Forks in 1997, the complacency was widespread because the town had pushed back a brutal flood just the year before, and had done it well.").

39 *Id.* at 22.

40 Sheryl Oring, *Mopping Up in Grand Forks, Residents Find Flood Damage Even Worse than They Imagined*, S.F. CHRON., May 8, 1997, http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/1997/05/08/MN72463.DTL (last visited Nov. 15, 2009).

41 SHELBY, *supra* note 2, at 10.

42 *Id.* at 57.

43 *Id.* at 11.

44 William H. Hooke & Roger A. Pielke, Jr., *Short-Term Weather Prediction: An Orchestra in Need of a Conductor*, *in* PREDICTION: SCIENCE, DECISION MAKING, AND THE FUTURE OF NATURE 61, 74 (Daniel Sarewitz et al. eds., 2000).

45 *Id.*

46 *Id.*; *see also* Naomi Oreskes, *The Role of Quantitative Models in Science*, *in* MODELS IN ECOSYSTEM SCIENCE 13, 27 (Charles D. Canham et al. eds., 2003) ("Although the scientists involved surely understood the uncertainties in their forecasts, and the [National] Weather Service appended qualitative disclaimers, these uncertainties were not 'received' by local officials. Rather, they interpreted the outlooks as 'facts' . . . .").

47 Hooke & Pielke, *supra* note 44, at 74.

48 *Id.*

However, revising the flood forecasting systems is not as simple as it may seem. Flood predictions are not the same as those for other catastrophes, such as tornados, for example.[49] During tornados, a warning indicates that a threat is imminent, but the action required is generally relatively minimal (i.e., seek shelter).[50] In contrast, for floods, the costs of action are directly linked to the expected crest, and those costs can be significant. When towns rely on as-needed dike construction[51] (from sandbags and clay), a predicted flood crest that increases two or three feet can cost the town millions of dollars.[52] As such, a relatively minor overestimation in a flood crest can have long-lasting impacts, too.[53]

In 1997, overestimation was certainly not the problem. On April 18, 1997, the dikes in Grand Forks began to give way to the massive amounts of water flowing through the Red River.[54] Grand Forks Mayor Pat Owens ordered the residents off the dikes and issued a mandatory evacuation.[55] The dikes along the Red River, one by one, were breached.[56] By the time the river water stopped flowing over the dikes, Grand Forks, and its sister city of East Grand Forks, Minnesota, had suffered catastrophic damage; three neighborhoods were completely destroyed.[57] Flood-related evacuation displaced approximately 55,000 people, and the flood damaged almost 85% of the city's structures.[58]

Adding insult to injury, just hours after the evacuation order was issued and as the flood waters rose in Grand Forks, the heart of downtown burst

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49 This comparison relates solely to the processes of emergency preparedness and is in no way minimizing the risks related to tornadoes or other potentially catastrophic events.

50 THOMAS P. GRAZULIS, THE TORNADO 96–98 (2001) (explaining that a tornado warning is a "take-cover" message that usually lasts less than an hour and can provide as much as 30 minutes' warning and as little as a few seconds' warning).

51 Recognizing the need for construction of dikes all over the region, North Dakota Governor Edward Schafer issued an Executive Order on March 21, 1997, suspending all laws in the state that required permits for dike construction. N.D. Exec. Order No. 1997-07 (Mar. 21, 1997) (on file with author).

52 *See* SHELBY, *supra* note 2, at 7 ("The National Weather Service, then, is under immense pressure to produce accurate flood crest numbers that will neither underestimate nor overestimate the actual flood crest level.").

53 *Id.* (stating that inaccurate NWS predictions, whether they are high or low, can trigger blame for millions of dollars in losses).

54 DIV. OF HOMELAND SEC., N.D. DEP'T OF EMERGENCY SERVS., N.D. RESPONSE TO THE 1997 DISASTERS 7 (2007), *available at* http://www.fema.gov/pdf/hazard/archive/grandforks/report.pdf [hereinafter N.D. RESPONSE].

55 SHELBY, *supra* note 2, at 79. Gov. Schafer had authorized the evacuation of citizens throughout the state on April 17, 1997. N.D. Exec. Order No. 1997-11 (Apr. 17, 1997) (on file with author).

56 SHELBY, *supra* note 2, at 79–83; *see also* N.D. RESPONSE, *supra* note 54, at 6 (noting that on April 19th, "[e]arthen and sandbag dikes deteriorate[d] allowing floodwaters through to riverside neighborhoods and downtown areas").

57 *See* FRIDAY, *supra* note 33, at 5.

58 Paul E. Todhunter, *A Hydroclimatic Analysis of the 1997 Flood at Grand Forks, North Dakota (USA)*, *in* THE EXTREMES OF THE EXTREMES 87, 87 (Arni Snorrason et al. eds., 2002). Some estimates had almost 90% of the area under water. *See* FRIDAY, *supra* note 33, at 6 ("In a region of 5,000 homes, fewer than 20 escaped damage.").

into flames.[59] The water was so deep, firefighters could not get pumper trucks close enough to fight the blaze.[60] The fire fight continued via aerial assault; planes designed for fighting forest fires doused the buildings with chemicals and a helicopter with large bucket repeatedly scooped and dropped river water over the buildings.[61] Before the fires went out, the fire and water had claimed eleven buildings in downtown Grand Forks.[62]

In the aftermath, damages were estimated at around $4 billion, with about $3.6 billion of that amount in Grand Forks and East Grand Forks.[63] At the time, it was the most costly U.S. flood, per capita, for a metropolitan area.[64] In addition to the damages, the city would need a "massive dike system" to prevent future flood damage.[65] The Flood of 1997 was estimated to have a 210-year recurrence, but "an even more catastrophic flood disaster [was] physically possible in Grand Forks."[66] This reality framed the future of Grand Forks and the surrounding area as it looked toward recovery and reconstruction.

B. A City Exposed: Failure to Plan or Inability to Assess Risk?

Immediately following the flood, the focus was on getting Grand Forks functional again. Restoring drinking water[67] and electrical service, providing temporary housing, and beginning the clean-up process were paramount.[68] But beyond major initial recovery efforts, Grand Forks also had to begin the process of protecting the city from future disasters. The Flood of 1997 had moved on, but the city remained vulnerable. But why?

There were two major issues that left the people of Grand Forks so vulnerable, both before and after 1997. First, despite a well-understood risk of flooding and coordinated publicity campaigns just months before the flood, the vast majority of the city did not have flood insurance to help the

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59 Nick Coleman et al., *'We're Losing': Downtown Grand Forks Hit by Fire as Well as Flood*, ST. PAUL PIONEER PRESS, April 20, 1997, at 1A, *available at* LEXIS.

60 *Id.*

61 *Id.*

62 FRIDAY, *supra* note 33, at 6.

63 *Id.*; Todhunter, *supra* note 58, at 87.

64 FRIDAY, *supra* note 33, at 6; Todhunter, *supra* note 58, at 87.

65 *See* SHELBY, *supra* note 2, at 140 ("Two cities needed to be rebuilt, and a massive dike system would have to be constructed.").

66 Todhunter, *supra* note 58, at 92.

67 Press Release, Fed. Emergency Mgmt. Agency, Three Years After the Flood Grand Forks Surviving and Rebuilding Better (Apr. 19, 2000), http://www.fema.gov/news/news release.fema?id=7439 (last visited Nov. 15, 2009) ("During and after the 1997 flood, the city was without drinkable water for 23 days after the plant's critical electrical and mechanical systems were inundated.").

68 *See Recovering from Hurricane Katrina: The Next Phase: Hearing Before the S. Comm. on Homeland Security and Governmental Affairs*, 109th Cong. 77 (Sept. 14, 2005) (prepared statement of Patricia A. Owens, Former Mayor, Grand Forks, North Dakota) ("We had no water, no sewage system, no electricity and very limited communication systems for several weeks. . . . Though we thought we had been through the worst of it, the city would now face its biggest challenge yet—rebuilding.").

rebuilding process when it became necessary.[69] Second, the city lacked a protective infrastructure to reduce or eliminate the danger of massive flooding.[70]

1. Flood Insurance, Who Needs Flood Insurance?

Despite warnings of possible record flooding in the Red River Valley months before the April thaw, only about 20% of Grand Forks residents had flood insurance when the devastating waters poured over the dikes.[71] Of those residents with flood insurance, 20% were required to do so by their mortgage lender.[72] Prior to the flood, the Federal Emergency Management Agency (FEMA) ran a media campaign asking residents to buy flood insurance to help minimize potential losses.[73] So why did so few people have flood insurance? Shortly after the flood, FEMA sought a study to answer that very question.[74]

It is not as though Grand Forks residents were unaware of flood insurance; 94% of the residents indicated that they knew flood insurance was available.[75] In fact, nearly 40% of the uninsured survey respondents inquired about purchasing flood insurance and decided against it.[76] Furthermore, for the vast majority of area residents, the cost of flood insurance was reasonable based on the median income levels of Grand Forks residents.[77] Flood insurance was reported to be less than $300 per year for about 75% of the area's residents.[78]

The study found three main reasons residents decided not to carry flood insurance.[79] First, was the "National Weather Service's conservative crest predictions."[80] Of course, the study was done after the fact, so it is hard to know if this was a primary reason for decisions made before the flood or if it was instead a post hoc rationalization justifying the failure to buy insurance.[81] There is little doubt that after the flood, blame was placed squarely

69 *See infra* Part II.B.1.

70 *See infra* Part II.B.2.

71 Ronald Pynn & Greta M. Ljung, *Flood Insurance: A Survey of Grand Forks, North Dakota, Homeowners*, 7 APPLIED BEHAV. SCI. REV. 171, 173 (1999).

72 *Id.*

73 *Id.* at 171.

74 SHELBY, *supra* note 2, at 111. The survey was administered by the University of North Dakota's Bureau of Governmental Affairs, with funding assistance from the North Dakota Insurance Department and the Institute for Business and Home Safety. Pynn & Ljung, *supra* note 71, at 180.

75 Pynn & Ljung, *supra* note 71, at 173.

76 *Id.* at 176.

77 *Id.* at 175.

78 *Id.*

79 *Id.* at 176.

80 *Id.*

81 *See generally* City of Lakewood v. Plain Dealer Publ'g Co., 486 U.S. 750, 758 (1988) (explaining the risks related to post hoc rationalization in the censorship context); Gose v. U.S. Postal Serv., 451 F.3d 831, 838–39 (Fed. Cir. 2006) ("We must ensure that the agency is not now masquerading a post hoc rationalization as a then-existing 'interpretation' . . . . [Interpretations by government agencies must] be legitimate *precursors* to an application of law to fact, rather than post hoc rationalizations.").

on NWS for their "failure," so it is possible that at least some of the survey respondents were merely echoing what they were hearing in their community.[82]

The second reason most often given for failing to obtain flood insurance was "the belief that dikes and flood control devices would provide adequate protection."[83] There was evidence to support this view. Despite the almost annual flood risk in Grand Forks, most residents had never seen homes suffer severe flood damage.[84] Many homeowners had not even had water in their basements in prior years, much less seen entire homes washed away by the flood.[85]

The third primary reason people said they did not buy flood insurance follows closely with the second: Most residents believed that the flood would not damage their home.[86] One might think that living near a dangerous flood area would make people especially sensitive to flood risk, but it appears the opposite was true. The longer people lived in Grand Forks, the less likely they were to have insurance.[87] One possible explanation was that older residents were less likely to have mortgages on their homes that required insurance.[88] Even without that group, though, longtime Grand Forks residents were less likely to have flood insurance.[89] It may be simply "that longer-term residents had adapted to occasional flooding of the Red River and were more risk tolerant from not having experienced significant losses in the past."[90]

It appears that a lack of experience with a prior flood (actual flooding, not flood risk) significantly impacted how people reacted to the risk in 1997. When asked about other efforts to mitigate potential flood losses, the survey indicated that 78% of those who had experienced a prior flood took action to minimize

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82 *See* Oreskes, *supra* note 46, at 27; *Grand Forks Blames Forecasters*, PLAIN DEALER, Apr. 24, 1997, at 14A, *available at* 1997 WLNR 6322276 ("City officials and flood-ravaged residents complained yesterday that Grand Forks could have been saved if forecasters had been right about how high the Red River would rise. 'I don't like to be critical, but we were told absolutely 49 feet by the weather service,' Mayor Pat Owens said two days after the river crested at 54.1 feet."); Peter J. Howe, *An Earlier Fix on Floods*, BOSTON GLOBE, Aug. 17, 1998, at C1, *available at* 1998 WLNR 2378116 ("The angry mayor of East Grand Forks, Lynn Stauss, told a crowd of evacuees: 'They missed it, and they not only missed it, they blew it big.' Stauss later backed off those harsh charges.").

83 Pynn & Ljung, *supra* note 71, at 176.

84 *Id.* at 179.

85 *See, e.g.*, Raymond W. Vodicka, *Class Activity: Pupils Collect 5,340 Books for Flooded Schools*, ST. LOUIS POST-DISPATCH, May 20, 1997, at 1, *available at* 1997 WLNR 855689 ("'In 33 years in the house, I've never seen water in the basement,' but the flood filled the basement up to a foot from the main floor." (quoting John Roche, East Grand Forks resident and school superintendent)); Cathy Kennedy, *Faces of the Flood*, ST. PAUL PIONEER PRESS, Apr. 26, 1997, *available at* LEXIS ("The water is about six inches from our basement ceiling. We are one of the few lucky ones. We have lived in our house, let's see, nine years since July. We never had water in our basement. We never had the sewer back up." (quoting Erin O'Leary, a Grand Forks resident)).

86 Pynn & Ljung, *supra* note 71, at 176 (referring to owners' "belief that the flood would not damage the home").

87 *Id.* at 176–77.

88 *See id.* at 177.

89 *Id.*

90 *Id.*

potential damages.[91] Here, again, a third of those who did not take any action stated that they did not believe that a flood would damage their homes.[92]

Age also played a role. Only 12% of those sixty years or older had flood insurance in place at the time of the flood, while the survey indicated that 23% of those under sixty years old were insured.[93] Cost may have played a role here—older residents are more likely to be on a fixed income, which could make the decision to buy flood insurance more difficult.[94] Then again, those on fixed incomes are even less able to rebound from uninsured losses.[95]

In Grand Forks in 1997, when it came to taking flood-mitigation actions that were not otherwise required, age and prior experience with flood damages were significant indicators of who would take some kind of action.[96] Overall, though, residents acted on their beliefs of whether "they were truly at risk for flood damage."[97] As this Article will explain, this personal perception of risk significantly impacts how people are likely to act (or fail to act) to avoid potential risks that apply to themselves and to larger groups of people.

2. An Ounce of Prevention Can Cost Millions, Rebuilding Costs Billions

Decisions to make expensive capital investments in the present are difficult when the potential future savings are uncertain in both timing and amount, even when the need for action is compelling. Expensive investments are always difficult because such decisions always mean that some other project will be delayed or eliminated completely.[98] Furthermore, preventative investments, such as dikes and levees, rarely lead to additional growth, at least not directly. Instead the investment requires a significant expenditure to keep what is already in hand, which in essence feels like a loss, especially if the perceived harm does not seem imminent.[99] What is

91 *Id.* at 179. Other damage-avoidance action included moving furniture to higher ground (68% of those who took action), moving belongings to another location (22%), sandbagging the home (27%), and purchasing a sump pump (65%). *Id.*

92 *Id.*

93 *See id.* at 177.

94 *See id.*; *see also* Michael Newsom, *Senate Hears Pleas of Poor*, SUN HERALD (Biloxi, Miss.), Mar. 5, 2008, at A2, *available at* 2008 WLNR 4344278 (reporting complaints about the state of Mississippi's decision, after Hurricane Katrina, to limit housing grants to homeowners who had purchased insurance because some of those without insurance "were on fixed incomes and . . . had to choose between food, medicine or insurance").

95 *See* Lisa K. Bates & Rebekah A. Green, *Housing Recovery in the Ninth Ward: Disparities in Policy, Process, and Prospects*, *in* RACE, PLACE, AND ENVIRONMENTAL JUSTICE AFTER HURRICANE KATRINA 229, 230 (Robert D. Bullard & Beverly Wright eds., 2009).

96 *See* Pynn & Ljung, *supra* note 71, at 177.

97 *See id.* at 179.

98 *See generally* ROGER G. KENNEDY, WILDFIRE AND AMERICANS: HOW TO SAVE LIVES, PROPERTY, AND YOUR TAX DOLLARS 250 (2006) (discussing reluctance to invest in planning to prevent wildfires because of prohibitive costs); Douglas A. Kysar, *It Might Have Been: Risk, Precaution and Opportunity Costs*, 22 J. LAND USE & ENVTL. L. 1, 12 (2006) (stating that every decision made leaves alternatives left unmade).

99 *See* Howard Kunreuther, *Disaster Mitigation and Insurance: Learning from Katrina*, 604 ANNALS AM. ACAD. POL. & SOC. SCI. 208, 212 (2006) ("In making decisions that involve cost

often missed is that the loss would be even more significant, and usually far more painful, without the up-front expenditure.

The Red River Valley itself has a proximate and particularly apt example of how difficult the process can be. In Winnipeg, Manitoba, 144 miles north of Grand Forks (and just across the border into Canada), efforts to control flooding of the Red River of the North in the 1960s led to significant ridicule.[100] Following massive flooding in 1950, which destroyed more than 10,000 homes, Manitoban Premier Duff Roblin required the construction of an enormous diversion system to reroute water around the city.[101] The expensive project was initially dubbed "Duff's Ditch" or "Duff's Folly," but since then, the construction has saved billions of government dollars[102] and "it is now accepted as a brilliant idea that has saved the City of Winnipeg from severe floods."[103]

Of course, no system is perfect, and follow-on impacts of any plan need to be considered. Although the diversion system has kept Winnipeg largely safe from flooding, areas to the north and south of the city are vulnerable to flooding that is caused, at least in part, by the raised gates of the diversion project.[104] As time passes and communities evolve, more and more is learned about the consequences of past actions. However, the fact that early measures to help mitigate a problem are not perfect—whether it is flooding in Winnipeg or climate change—does not mean that no action is the best option.

To the contrary, once a serious problem is clearly recognized, action is warranted because the costs, financially and psychologically, become even more severe over time. Winnipeg's diversion canal cost about $63 million[105]—a "price tag . . . considered by some to be astronomical."[106] However, the cost of doing the same project today would be between, roughly, $390 and $990 million in today's dollars (depending on the type of comparison),[107] not including the "literally billions of dollars" saved over the years by the project.[108]

outlays, individuals are often myopic and hence only take into account the potential benefits from such investments over the next year or two.").

100 *See* SHELBY, *supra* note 2, at 49.

101 *Id.*

102 Steve Lambert, *Opponents to "Duff's Folly" Hard to Find Today*, GLOBE & MAIL (Toronto, Can.), Mar. 31, 2009, at A5, *available at* 2009 WLNR 6004662.

103 Joseph Scanlon, *A Perspective on North American Natural Disasters*, *in* INTERNATIONAL PERSPECTIVES ON NATURAL DISASTERS 323, 328 (Joseph P. Stoltman et al. eds., Advances in Natural and Technological Hazards Research vol. 21, 2004).

104 *See* Bruce Owen, *More Flood Defences Studied*, WINNIPEG FREE PRESS, July 10, 2009, http://www.winnipegfreepress.com/local/more-flood-defences-studied-50459227.html (last visited Nov. 15, 2009) ("[W]hen the [Winnipeg flood] gates are activated, water levels rise in the south towards St. Aldophe, causing some properties and roads to flood."). *See generally* Kevin Rollason & Jen Skerritt, *Scramble on to Keep Waters at Bay*, WINNIPEG FREE PRESS, Apr. 17, 2009, http://www.winnipegfreepress.com/local/scramble-on-to-keep-waters-at-bay-43165117.html (last visited Nov. 15, 2009) (reporting on flooding just north of the Winnipeg flood gates).

105 *See* SHELBY, *supra* note 2, at 49.

106 Lambert, *supra* note 102.

107 *See* SAMUEL H. WILLIAMSON, MEASURING WORTH, SIX WAYS TO COMPUTE THE RELATIVE VALUE OF A U.S. DOLLAR AMOUNT, 1774 TO PRESENT (2009), http://www.measuringworth.com/uscompare (last visited Nov. 15, 2009) ("Determining the *relative* value of an amount of money in one year

As Grand Forks learned in 1997, the ability to predict potential losses is of limited value if action is not taken. In Grand Forks there was "enormous lead time," yet the predictions were not able to avoid major losses.[109] The city's flood protection system eventually cost more than $400 million dollars,[110] and if implemented earlier would have saved billions of dollars. Instead, those millions were paid out on top of the billions washed away in the flood.

III. HURRICANE KATRINA: BLINDED BY THE BLIGHT?

As a city with many neighborhoods below sea level, New Orleans has long been known as a vulnerable location, to say the least.[111] From the early days, New Orleans was vulnerable to wind and water, and over the years much has been done to help "protect" the city.[112] Over time, each effort has failed in some way.

Unlike some other major disasters, New Orleans had advance and specific warning that a Katrina-like disaster was almost inevitable.[113] Other major disasters, such as the nuclear accident at Chernobyl or the tragic explosions of space shuttles Challenger and Columbia, had warnings of their possible respective threats, but "did not have major accidents to offer undeniable advance warnings."[114] New Orleans, on the other hand, was presented repeated warnings in the decades leading up to Hurricane Katrina.[115]

In 1927, when New Orleans was a thriving and growing city, the Mississippi River caused major flooding from north to south and nearly flooded New Orleans.[116] This threat led the federal government to construct, in the ensuing decades, a long system of levees and other protections around the city.[117]

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compared to another is more complicated than it seems at first. There is no single 'correct' measure, and economic historians use one or more different indicators depending on the context of the question.").

108 Lambert, *supra* note 102.

109 *See* Stanley A. Changnon, *Flood Prediction: Immersed in the Quagmire of National Flood Mitigation Strategy*, *in* PREDICTION: SCIENCE, DECISION MAKING, AND THE FUTURE OF NATURE, *supra* note 44, at 85, 98.

110 *See infra* Part IV.B.1 (discussing Grand Fork's rebuilding and implementation of a flood protection plan).

111 Although this Article focuses primarily on the damage Hurricane Katrina caused in New Orleans, this is for analysis purposes and is not intended to minimize the massive losses suffered throughout much of the Gulf Coast region, especially coastal Mississippi.

112 Joel K. Bourne, Jr., *New Orleans: A Perilous Future*, NAT'L GEOGRAPHIC, Aug. 2007, at 32, 42.

113 MARC GERSTEIN & MICHAEL ELLSBERG, FLIRTING WITH DISASTER: WHY ACCIDENTS ARE RARELY ACCIDENTAL 61–62 (2008).

114 *Id.* at 61. *But see* Donald A. Farber et al., *Reinventing Flood Control*, 81 TUL. L. REV. 1085, 1086–87 (2007) (stating that that the Challenger and Columbia space shuttle accidents were similar to Hurricanes Betsy and Katrina because "someone, somewhere, understood that organizational and system processes were as much the cause of an initial disaster as were engineering design, construction, and maintenance errors. . . . [but] this knowledge failed to prevent a *second* disaster from happening").

115 GERSTEIN & ELLSBERG, *supra* note 113, at 61–62.

116 Bourne, *supra* note 112, at 43.

117 *Id.*

Then, in 1965, Hurricane Betsy, a smaller storm than Hurricane Katrina, pounded New Orleans.[118] This triggered the United States Army Corps of Engineers to build the Lake Pontchartrain and Vicinity Hurricane Protection Project, a 125-mile long system of levees and gates around the city.[119] The costs associated with repairing the resulting damage were significant:

> What was supposed to be built in 13 years for 85 million dollars became a never ending 740-million-dollar project that was still ten years from completion when Katrina hit. The Government Accountability Office—the watchdog of Congress—had a field day, regularly criticizing the corps for cost overruns and delays.[120]

Other warnings followed. In August 1969, one of the most intense storms to hit land in the United States, Hurricane Camille, a Category Five storm, threatened to put New Orleans under water.[121] In 1992, Hurricane Andrew, which did not even hit a major city, caused severe damage and made clear the kind of devastation a Category Five storm could have on New Orleans, a city far more vulnerable than other areas devastated by the storm.[122] And finally, in 1995, six people were killed when a severe rainstorm dropped twenty inches of rain on New Orleans in half a day, making clear how dangerous a major storm could be for the city.[123]

A. The Anticipated Surprise: New Orleans Under Water

In addition to the years of warnings that the city was not prepared for a major hurricane strike, New Orleans was also on specific notice that Hurricane Katrina was a major threat. On the evening of August 25, 2005, Hurricane Katrina hit landfall for the first time in Florida.[124] The storm initially weakened while over land, then moved into the Gulf of Mexico,[125]

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118 GERSTEIN & ELLSBERG, *supra* note 113, at 61 (stating that 81 people died as a result of Hurricane Betsy and the financial damage was about $1 billion, or about $6.23 billion in today's dollars).

119 Bourne, *supra* note 112, at 43.

120 *Id.*

121 GERSTEIN & ELLSBERG, *supra* note 113, at 61–62.

122 *See id.* at 62; *see also* ED RAPPAPORT, NAT'L HURRICANE CTR., PRELIMINARY REPORT: HURRICANE ANDREW (1993), http://www.nhc.noaa.gov/1992andrew.html (last visited Nov. 15, 2009) ("Andrew was a small and ferocious Cape Verde hurricane that wrought unprecedented economic devastation along a path through the northwestern Bahamas, the southern Florida peninsula, and south-central Louisiana.").

123 GERSTEIN & ELLSBERG, *supra* note 113, at 62.

124 Joseph B. Treaster, *A Blast of Rain but Little Damage as Hurricane Hits South Florida*, N.Y. Times, Aug. 26, 2005, at A10; Jill Barton, *Katrina Kills Four, Darkens South Florida*, BUFFALO NEWS, Aug. 26, 2005, at A1, *available at* 2005 WLNR 13543380. *See generally* JED HORNE, BREACH OF FAITH: HURRICANE KATRINA AND THE NEAR DEATH OF A GREAT AMERICAN CITY 17 (2006) ("Katrina had taken on the trappings of a perfect storm, the Big One, an event long foreseen and dreaded and yet somehow impossible to fathom.").

125 Barton, *supra* note 124 ("Katrina weakened into a tropical storm over land but strengthened over the gulf's warm waters and became a hurricane again early today with top sustained winds of 75 mph.").

where it intensified quickly into a Category Five hurricane, the highest hurricane storm level, with wind speeds reaching as high as 160 miles per hour.[126]

By the following day, it was clear that Hurricane Katrina had the potential to become one of the worst storms in history.[127] Forecasters indicated that New Orleans was well within the range of Katrina's likely path, with the probability of a direct hit on the city rising to nearly thirty percent.[128] The primary concern was that Hurricane Katrina would trigger a storm surge that would pour over the city's levees.[129] At least initially, as the storm shifted and slowed slightly, it appeared that New Orleans had avoided the worst-case scenario—a direct "pounding from Hurricane Katrina."[130] Unfortunately, within a day it was clear that Hurricane Katrina had simply left its mark in a different way than was initially feared.[131]

The eye of Hurricane Katrina went past the eastern side of New Orleans, leaving the city relatively secure and dry.[132] Overnight, however, two levees gave way, allowing water to rush into the city.[133] As New Orleans Mayor Ray Nagin observed, the "second-worst-case scenario" had just occurred.[134] When the levees broke, more than 20,000 people were sheltered in the New Orleans Superdome with nowhere to go, and another 30,000 tourists were stuck in the city's hotels without power.[135]

After the waters rushed into the city, there were those who asserted that catastrophe was a surprise or somehow unexpected.[136] Despite clear indications that the White House knew the levees might fail, the "surprise alibi" was used to justify the horrific delays in bringing relief to those trapped in city.[137] For as many as six days, people at the Superdome were

126 *See* Willie Drye, *Hurricane Katrina Pulls Its Punches in New Orleans*, NAT'L GEOGRAPHIC NEWS, Aug. 29, 2005, http://news.nationalgeographic.com/news/2005/08/0829_050829_hurricane.html (last visited Nov. 15, 2009).

127 *See id.*

128 Nat'l Hurricane Ctr., Nat'l Weather Serv., Hurricane Katrina: Probabilities for Guidance in Hurricane Protection Planning by Government and Disaster Officials, http://www.nhc.noaa.gov/archive/2005/prb/al122005.prblty.021.shtml (last visited Nov. 15, 2009).

129 *See* Drye, *supra* note 126.

130 *Id.*

131 *See* Joseph B. Treaster & N.R. Kleinfield, *New Orleans Is Inundated As 2 Levees Fail; Much of Gulf Coast Is Crippled; Toll Rises*, N.Y. TIMES, Aug. 31, 2005, at A1.

132 *See id.*

133 *Id.*

134 *Id.*

135 *See* HORNE, *supra* note 124, at 59.

136 *See* Matthew Cooper, *Dipping His Toe into Disaster*, TIME, Sept. 12, 2005, at 51, 51 ("It isn't easy picking George Bush's worst moment last week. . . . Was it when he said that he didn't 'think anybody expected' the New Orleans levees to give way, though that very possibility had been forecast for years?").

137 *See* DOUGLAS BRINKLEY, THE GREAT DELUGE: HURRICANE KATRINA, NEW ORLEANS, AND THE MISSISSIPPI GULF COAST 453 (2006) ("There were only two possible ways to understand what was going on besides the 'surprise' alibi: (1) the U.S. government couldn't respond, being woefully weak and confused; (2) it didn't want to respond, being disinterested in the people and their plight.").

trapped in "squalid and inhumane conditions"[138] without adequate food and water, not to mention the lack of medical care, functioning toilets, or air conditioning in the stifling New Orleans heat.[139]

The surprise was not that New Orleans was under water—rather, it simply was a surprise that New Orleans did not end up under water a day earlier.[140] The National Weather Service (unlike the flood forecasts in Grand Forks)[141] "had operated at a peak of precision, accurately predicting the storm track within fifteen miles, as many as fifty-six hours before it made landfall."[142] In addition to predicting the wind speeds within ten miles per hour two days before Hurricane Katrina reached New Orleans, NWS also predicted that most of the region would be "uninhabitable for weeks" or longer and "bluntly predicted 'human suffering incredible by modern standards,' even without a breach [of the levees]."[143]

In the aftermath, hundreds of thousands of people left New Orleans, many for good. Much of the city was devastated, from the upper-class enclave of Lakeview to the working-class Ninth Ward.[144] The losses impacted everyone, without regard to race or class, but Hurricane Katrina was hardly an "equal opportunity destroyer."[145] Rich people lost their homes, and even died, along with the poor, but "[p]oor blacks did disproportionately more of the dying."[146] It will never be known exactly how many people died, but an estimated 1100 people died in the New Orleans area as a result of Hurricane Katrina.[147]

In addition to the human toll, the economic losses were also catastrophic. By most accounts, Hurricane Katrina was the most expensive natural disaster in U.S. history.[148] Private company insurance claims for the region exceeded $40 billion, and the total economic impact of the losses was estimated to exceed $100 billion.[149] Residential flooding in New Orleans

138 Robert D. Bullard et al., *Transportation Matters: Stranded on the Side of the Road Before and After Disasters Strike*, *in* RACE, PLACE, AND ENVIRONMENTAL JUSTICE AFTER HURRICANE KATRINA, *supra* note 95, at 63, 71.

139 BRINKLEY, *supra* note 137, at 329.

140 *Cf.* Treaster & Kleinfield, *supra* note 131 (stating New Orleans thought it had escaped the worst of Hurricane Katrina the day before the levees broke).

141 *See supra* notes 41–48 and accompanying text.

142 HORNE, *supra* note 124, at 102.

143 *Id.* (quoting Nat'l Weather Serv., Nat'l Oceanic & Atmospheric Admin., Extremely Dangerous Hurricane Katrina Continues to Approach the Mississippi River Delta, http://www.srh.noaa.gov/data/warn_archive/LIX/NPW/0828_214001.txt (last visited Nov. 15, 2009)).

144 Bourne, *supra* note 112, at 58–59.

145 HORNE, *supra* note 124, at xv.

146 *Id.*

147 *Id.* at 43; *see also* THE WHITE HOUSE, THE FEDERAL RESPONSE TO HURRICANE KATRINA: LESSONS LEARNED 8 (2006), *available at* http://library.stmarytx.edu/acadlib/edocs/katrinawh.pdf ("The vast majority of the fatalities—an estimated 80 percent—came from the New Orleans metropolitan area; Mississippi suffered greatly as well, with 231 fatalities."). This was hardly the end of the suffering. The Gulf Coast region reported 2096 people were still missing as of February 2006. *Id.*

148 Bourne, *supra* note 112, at 41.

149 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 377 box 7.4 (Martin Parry et al. eds., 2007).

caused between $8 and $10 billion in losses under the National Flood Insurance Program, with another $3 to $6 billion of uninsured losses estimated.[150]

B. Breached Levees/Breached Promises

> On purely financial grounds, the decision not to protect New Orleans was indefensible . . . .[151]

Protecting New Orleans was more feasible, and more financially sound, than it may seem. One analysis concludes that the present value cost of prevention—that is, building a system to protect New Orleans from a "crisis-level" storm—is approximately $1.5 billion.[152] The same analysis concluded that the cost of rebuilding New Orleans is $40 billion, making it "*twenty-five times more expensive to rebuild New Orleans than to protect it from a Category 4 or 5 storm*."[153] The risks posed by less intense storms (including those like the Category Three storm Hurricane Katrina) make the case for investing in prevention even more compelling.[154]

Of course, nothing is this simple. In addition to the difficulty of making proper calculations—both from a cost and engineering perspective—one also must assume that rebuilding costs are the only costs to analyze following a major storm. Robert Giegengack, a University of Pennsylvania geologist, has argued that, "We simply lack the capacity to protect New Orleans."[155] He asserts that relocating the port of New Orleans is essential, because it is his view that the cost-benefit analysis is negative.[156] He notes the additional environmental problems raised by additional protections for New Orleans: "Every dollar we spend protecting New Orleans has the consequence of advancing the date of the capture of the Mississippi [River]."[157]

Giegengack's solution: "[S]ell crucial cultural components of New Orleans to Walt Disney."[158] The plan would also include moving the port 150 miles upstream, allowing the French Quarter to continue drawing tourists, but ceasing New Orleans' role as the "nation's largest deepwater port."[159]

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150 *Id.*

151 GERSTEIN & ELLSBERG, *supra* note 113, at 61 (emphasis omitted).

152 *Id.* at 59.

153 *Id.* at 60.

154 *See id.*

155 Bourne, *supra* note 112, at 42.

156 ROBERT GUNTHER, NATIONAL SYMPOSIUM ON RISK & DISASTERS: REPORT OF CONFERENCE DISCUSSION 16 (2005), *available at* http://opim.wharton.upenn.edu/risk/downloads/WhitePaperRiskandDisasters.pdf.

157 *Id.* If not for "a series of control structures" put in place in 1962, the Atchafalaya River would have captured a number of tributaries, making the Atchafalaya River the primary channel of the Mississippi River. COMM. ON THE MISS. RIVER & THE CLEAN WATER ACT, NAT'L RESEARCH COUNCIL, MISSISSIPPI RIVER WATER QUALITY AND THE CLEAN WATER ACT: PROGRESS, CHALLENGES, AND OPPORTUNITIES 34 (2008).

158 GUNTHER, *supra* note 156, at 17.

159 *Id.* at 4, 17; *see also* Bourne, *supra* note 112, at 42 (stating the Giegengack's plan would mean "abandoning one of the most historic and culturally significant cities in the nation").

There is no indication that there was or is serious support for selling New Orleans to Disney, and rebuilding New Orleans is well underway, but there are limits to the rebuilding efforts. For example, Professor Kenneth R. Foster from the University of Pennsylvania's Department of Bioengineering said in 2005 that given the enormous costs of rebuilding New Orleans, "the default decision has been made" not to do so.[160] He explained, "We will rebuild the levees to some standard, but there should be some transparency. The public should be aware that this [flooding] could happen again."[161]

New Orleans is not back, from either a population or infrastructure perspective, to its pre-Katrina status, and perhaps never will be. However, significant progress has been made. Although not nearly as populous as it once was (New Orleans had 484,674 residents in 2000),[162] by March 2009, the city exceeded 300,000 residents for the first time since Hurricane Katrina hit in 2005.[163] The greater New Orleans area has grown back to 1.13 million people, from its pre-Katrina high of 1.3 million.[164]

And there are reasons for optimism. As a result of the city's resurgent tourism business and billions of dollars flowing into Louisiana to assist with rebuilding, New Orleans has largely avoided the recession impacting most of the country.[165] On the residential level, nearly 75% of the damaged homes have been renovated or rebuilt in the flooded areas of Orleans and St. Bernard parishes.[166] In addition, there is a budding small-business scene that some think could replicate the technology-driven Bay Area boom of the 1990s.[167] Regardless, though, of the New Orleans that can or might be following Hurricane Katrina, the costs, both social and economic, can never justify the failure to prepare and protect the city and its residents.

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160 GUNTHER, *supra* note 156, at 17.

161 *Id.* Professor Foster also noted that even if most of New Orleans were to be relocated, "the government may have the moral obligation to make the city as safe as possible in the short term, even if it cannot guarantee long-term safety." *Id.* at 16.

162 Michelle Krupa, *New Orleans Is the Fastest-Growing Big City; Population Increases 8.2 Percent in Year*, TIMES-PICAYUNE (New Orleans, La.), July 1, 2009, http://www.nola.com/news/index.ssf/2009/07/new orleans is the fastestgrow.html (last visited Nov. 15, 2009).

163 Matt Scallan, *Orleans Population Surpasses 300,000*, TIMES-PICAYUNE (New Orleans), Mar. 19, 2009, http://www.nola.com/news/t-p/frontpage/index.ssf?/base/news-12/1237440694220440.xml&coll=1 (last visited Nov. 15, 2009).

164 *Id.*

165 *See* Richard Fausset, *Above Water, for a Change*, L.A. TIMES, Apr. 3, 2009, http://8.12.42.31/2009/apr/03/nation/na-rebuilding-new-orleans3 (last visited Nov. 15, 2009).

166 John Pope, *More Homes Rebound from Katrina*, TIMES-PICAYUNE (New Orleans, La.), Aug. 1, 2009, http://www.nola.com/news/index.ssf/2009/07/more_homes_rebound_from_katrin.html (last visited Nov. 15, 2009) ("As the number of restored homes has risen, the report shows the number of unrepaired houses has dropped to 17 percent, from 27 percent last year and 57 percent in 2007.").

167 Abby Ellin, *Entrepreneurs Leverage New Orleans's Charm to Lure Small Businesses*, N.Y. TIMES, July 29, 2009, at B8.

IV. THE "FLOOD" WARNING OF CLIMATE CHANGE AND WHAT CAN BE LEARNED

Climate change, like flooding in Grand Forks and New Orleans, will not happen without warning. The issue is whether the warnings will be 1) understood, and 2) heeded in a timely manner. If the life-altering losses sustained in both cities, and the astronomical costs related to rebuilding efforts, are to be avoided on a much larger scale, climate change warnings must be recognized and addressed.

A. Being a Good Neighbor: If You Are Going to Be an Insurer, Act Like One

People tend to underestimate some risks related to decisions they make in their everyday lives, while overestimating risks in situations or circumstances where they have no control.[168] For example, most states require auto insurance because they deem the cost of allowing the uninsured to drive the roads to be too high in light of the potential harms.[169] Flood insurance, too, is required by mortgage providers who lend money for homes located in flood plains to help protect their losses.[170] As seen in both Grand Forks and New Orleans, homeowners have a tendency to underestimate their risk. In the case of both auto and flood insurance, an interested party steps in and compels insurance coverage to help avoid losses.

Climate change, which appears to cause gradual and seemingly incremental harm, poses a similar problem. Yet the potential losses from climate change are staggering, and as a society, we cannot afford to be uninsured. One leading insurance industry leader, Allianz Group, teamed up with the World Wildlife Fund (WWF) to produce a report designed to "understand and better manage the true risks of global warming."[171] The report stated that the projected economic impacts of a one degree (Celsius) increase in global temperatures could lead to $2 trillion in worldwide losses in 2050 and at least $300 billion per year leading up to 2050.[172]

The report concluded that one of the primary things insurance companies can do to help mitigate or eliminate climate change-related losses is to "send stronger signals of risk to the public."[173] Insurers need to work with government, where possible and appropriate, to send proper risk assessments and pricing signals to insured individuals in high-risk areas.[174]

168 *See* BRUCE SCHNEIER, BEYOND FEAR: THINKING SENSIBLY ABOUT SECURITY IN AN UNCERTAIN WORLD 26–28 (2003). As such, people are likely to underestimate risks when deciding to build a home in a flood-prone area, but overestimate the risk of their home being attacked by terrorists.

169 *Id.* at 28 ("[R]iding in a car is the riskiest discretionary activity the majority of Americans regularly undertake.").

170 DONALD HYNDMAN & DAVID HYNDMAN, NATURAL HAZARDS AND DISASTERS 293 (2006) (stating that since 2002 "virtually all" mortgage lenders require flood insurance for properties located in a flood plain).

171 ALLIANZ GROUP & WORLD WILDLIFE FUND, CLIMATE CHANGE AND INSURANCE: AN AGENDA FOR ACTION IN THE UNITED STATES 3 (2006), *available at* http://www.climateneeds.umd.edu/pdf/AllianzWWFreport.pdf.

172 *Id.* at 9.

173 *Id.* at 7.

174 *Id.*

Companies, of course, have the option to cease offering insurance in areas where the rates do not (or cannot) adequately cover the risks.[175] Government, on the other hand, almost always retains at least some risk of loss.

As seen following the Grand Forks flood or Hurricane Katrina, as well as in the government bailouts of the financial industry, government often acts as a de facto insurer when it comes to financial or natural disasters.[176] As such, where risks of loss are clearly understood, the federal government should take the advice of other more traditional insurers: Send proper signals to the market.[177] This can and should include taking steps to reduce the risks of loss wherever possible—in this case, climate change.

Some large insurers are already stepping into the void to provide global insurance options related to climate conditions.[178] In some of the world's poorest economies from Africa to Latin American, insurers are providing products to help mitigate losses from "increasingly unpredictable weather."[179] There is hope that the insurance "premiums could also be a powerful way to get poor people to adapt to climate change by encouraging them to invest in measures like drought-resistant crops." [180] In addition, large insurers have started pressuring governments to reduce greenhouse gas emissions and are providing incentives to their customers to do so, as well.[181]

Government does not, and should not, operate strictly like a private insurance company, so simply deciding not to assist in the face of a disaster is not an option. However, government can, as noted above, require people to carry insurance if they live in a particular area or engage in certain kinds of conduct. However, government also has broader powers and authorities than a private insurer and can thus act to mitigate potential harms in ways beyond insurance-related pricing incentives.

Government can also act to mitigate potential climate change losses by providing pricing incentives to reduce risk-causing behavior (e.g., raising fossil fuel taxes, providing tax credits for renewable energy) or restricting behavior directly (e.g., limiting emissions, corporate average fuel economy (CAFE) standards). Following a disaster, state and federal governments often act as the "insurer of last resort,"[182] regardless of whether they are required to do so.

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175 *Id.* ("Insurers only exit markets as a last resort; however if governments and regulators do not allow for more pricing flexibility, exiting markets become[s] the last option.").

176 *See* RAWLE O. KING, CONG. RESEARCH SERV., FINANCING RECOVERY FROM LARGE-SCALE NATURAL DISASTERS (2009), *available at* http://www.iris.edu/hq/files/about_iris/governance/ds/docs/RL34749_20090209.pdf; Robert E. Litan, *Sharing and Reducing the Financial Risks of Future "Mega-Catastrophes,"* ISSUES ECON. POL'Y, Mar. 2006, at 1, 7, *available at* http://www3.brookings.edu/views/papers/200603_iiep_litan.pdf.

177 *See* ALLIANZ GROUP & WORLD WILDLIFE FUND, *supra* note 171, at 31.

178 Catherine Brahic, *A Premium Plan for the Neediest*, NEW SCIENTIST, July 4, 2009, at 8, 8.

179 *Id.*

180 *Id.*

181 *Id.*

182 Amy Borrus et al., *Up to His Neck in the Risk Pool: Uncle Sam Is the Insurer-of-Last-Resort for a Mind-Boggling Array of Catastrophes*, BUS. WK., June 6, 2005, at 109, 111 (reporting that the federal government "is the insurer-of-last-resort for a mind-boggling array of

The problems associated with the government acting as the insurer of last resort have been called the Samaritan's Dilemma.[183] When individuals and organizations assume that the government will cover a significant portion of their losses following a disaster, those in "hazard-prone areas" are not (or are insufficiently) motivated to reduce risks or purchase sufficient insurance coverage to compensate for their potential losses.[184] With the clear message of the potential losses related to climate change, government should take steps—including sending proper pricing signals to those at risk—to prepare for, mitigate, and avoid climate change-related losses, just as a private insurer would.

As always, there are no easy answers. Case in point: In early 2009, Florida's legislature considered freezing rates for the state-created, not-for-profit insurer, Citizens Property Insurance Corporation, although no action was taken.[185] On the one hand, raising rates on customers, especially during a recession, is always difficult.[186] However, as Florida Insurance Consumer Advocate Sean Shaw explained,

> Citizens [Property Insurance Corporation] simply can't be the insurer of last resort if it is cheaper than everybody else . . . . There are people on the coast that ought to be paying more, but we as a state continue to subsidize them. Freezing Citizens' rates again is a dangerous step.[187]

Ultimately, the insurer of last resort has to be certain it can cover losses. That is accomplished either by setting aside billions of dollars to compensate for losses[188] or by reducing the potential exposure to loss.[189] With losses from climate change expected to reach trillions of dollars,[190] reducing exposure is the best course of action.

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catastrophes" and that the federal government "stepped in to pay" about one-third of the $32 billion in insured losses caused by the September 11th attacks).

183 Ronald J. Daniels et al., *Introduction* to ON RISK AND DISASTER: LESSONS FROM HURRICANE KATRINA 1, 10 (Ronald J. Daniels et al. eds., 2006).

184 *Id.*

185 S. 862, 111th Leg., Reg. Sess. (Fla. 2009); Fla. Senate, Senate 862: Relating to Insurance, http://www.flsenate.gov/session/index.cfm?BI_Mode=ViewBillInfo&Mode=Bills&ElementID=JumpToBox&SubMenu=1&Year=2009&billnum=862 (last visited Nov. 15, 2009) (noting that Senate Bill 862 was indefinitely postponed and withdrawn from consideration).

186 Christopher Boyd, *Hurricane Insurance Reform Debate Takes Shape*, ORLANDO BUS. J., Mar. 6–12, 2009, at 12 ("'Sen. Fasano feels that with people losing their jobs and paying higher utility bills, they shouldn't be faced with a big increase in insurance rates' . . . ." (quoting Greg Giordano, chief legislative aide to the bill's sponsor, Sen. Mike Fasano)).

187 *Id.* (quoting Sean Shaw, Insurance Consumer Advocate, Fla.).

188 *Cf.* Borrus et al., *supra* note 182, at 109 (explaining that Congress is not putting away enough money to cover potential losses).

189 *See* Daniels et al., *supra* note 183, at 3 (explaining that the private sector needs to complement "government risk mitigation and risk insurance objectives by, for example, enforcing building codes").

190 Nina Chestney, *Preparation Key to Cut Climate Insurance Cost*, REUTERS, Sept. 9, 2009, http://www.reuters.com/article/idUSTRE5884DG20090909 (last visited Nov. 15, 2009).

B. The Direct Link: What Can Be Learned About Limiting Climate Change Losses from Rebuilding Grand Forks and New Orleans

Past disasters can, and must, be more than just tragic memories. They can provide tremendous opportunities for learning about what went wrong and how mistakes can be avoided in the future. Hurricane Katrina, for example, "revealed a large gap between the capacity of our policies and institutions and our needs, as individuals and as a society."[191] By analyzing the problems (and the subsequent recoveries) related to major disasters, we can develop strategies to address future disasters when they occur, and avoid others altogether.

This goes beyond merely learning how to avoid the specific disaster. Losses in major disasters are rarely, if ever, singular in their cause. They are multifaceted and intertwined, which makes the issue more complex, but also provides opportunities for greater understanding. This, hopefully, will lead to a better ability to reduce potential future losses and aid recovery efforts where crisis could not be averted.

Therefore, what can be learned from the flooding in Grand Forks is more than just how to avoid massive flood losses. The process of rebuilding and protecting the city can also give insight into ways to help mitigate climate change losses. Similarly, the ongoing rebuilding process in New Orleans could help provide methods for protecting against (or reducing) losses in other cities vulnerable to massive weather events, many of which could be made worse by climate change.

1. Lessons Learned: Rebuilding Grand Forks

Following the devastating floods of 1997, Grand Forks (and East Grand Forks, Minnesota, on the other side of the Red River of the North), built a $417 million flood protection system, which included a dike system combining grass-covered levees with both permanent and removable flood walls.[192] The city acted aggressively to buy out an entire neighborhood that was located in a highly vulnerable part of the river's floodplain.[193] This land was used to move the dike away from the river's edge, giving the river more opportunity to swell over its banks as it would naturally, without risking harm to people and property.[194] Although it was a painful process, and one that was hardly universally accepted,[195] no significant flood damage has occurred in the city since 1997.[196]

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191 Daniels et al., *supra* note 183, at 12.

192 *See* NAT'L WILDLIFE FED'N, INCREASED FLOODING RISK: GLOBAL WARMING'S WAKE-UP CALL FOR RIVERFRONT COMMUNITIES 7 (2009), *available at* http://www.nwf.org/extremeweather/pdfs/NWF_FloodReport_optimized.pdf.

193 *Id.*

194 *Id.*

195 *See* SHELBY, *supra* note 2, at 185–93 (discussing the process and difficulties of developing the Grand Forks flood protection plan).

196 NAT'L WILDLIFE FED'N, *supra* note 192, at 7.

Grand Forks' flood-mitigation efforts have been called a "shining example" of how to protect against the increased risks of heavy rains and flooding posed by climate change.[197] The 2200-acre greenway created as part of the dike system provides protection to the city, as well reduced flood insurance cost and year-round outdoor recreational space.[198] As precipitation increases, in no small part due to climate change, flood-prone areas need to follow Grand Forks' lead in reversing development by turning high-risk areas back into green space that allows water to flow more naturally (and cause less damage).[199]

2. Lessons to Be Learned: Rebuilding New Orleans

As discussed above, there are many who believe that rebuilding New Orleans does not make sense. However, there are those who believe that New Orleans offers an opportunity to learn how to address problems that will eventually affect many other cities. For example, Professor Torbjörn Törnqvist, a Tulane University coastal geologist, believes that New Orleans is not merely a vulnerable city that probably should not exist as a major population center; instead, he sees New Orleans as an opportunity to model processes for dealing with climate change issues.[200]

Professor Törnqvist advocates restoring wetlands, installing state-of-the-art floodgates, and creating a "cleaner, greener, denser city."[201] He explains, "The situation [in New Orleans] is a huge opportunity for the city and the nation . . . . If we walk away, we'll miss a fantastic opportunity to learn things that will be useful in Miami, or Boston, or New York in 50 years."[202] There is little doubt this vision is a tall order, and one that will require unprecedented levels of cooperation and commitment. Nonetheless, as New Orleans' future is considered, the climate change implications—including the risks posed for the city and the opportunities as a test case for other cities—must be part of the discussion.

C. Communicating Risk: Uncertain Doesn't Mean Unlikely

As noted in Part II.A above, uncertainty surrounded the forecasts of the Grand Forks flood in 1997. The NWS views communicated a single forecast number, one that did not, at least as reported, communicate the uncertainty

197 Brad Dokken, *Scientists Praise GF for Flood-Mitigation Efforts: Report: Riverfront Communities Must Confront the Impact of Global Warming*, GRAND FORKS HERALD, July 9, 2009, *available at* 2009 WLNR 13120974 (quoting David Conrad, Senior Resource Specialist, National Wildlife Federation).

198 Rebecca Wodder, *Fighting Water with Water: A Vision for 21st-Century Flood Management*, PRAIRIE FIRE NEWSPAPER (Lincoln, Neb.), May 2009, http://www.prairiefirenewspaper.com/2009/05/fighting-water-with-water (last visited Nov. 15, 2009).

199 *See* Dokken, *supra* note 197 (reporting the comments of Will Gosnold, Chairman, University of North Dakota's Department of Geology and Geological Engineering).

200 Bourne, *supra* note 112, at 60.

201 *Id.*

202 *Id.*

inherent in the potential flood crest prediction.[203] In dealing with climate change, a similar challenge is posed for scientists and policymakers: how to communicate the risk of loss as related to the uncertainty of when and how that loss might occur.

All weather and climate predictions are "inherently uncertain and effective communication of uncertainty information in weather, seasonal climate, and hydrological forecasts benefits users' decisions."[204] Yet most forecasts do not provide complete "information about the certainty or likelihood of a particular event."[205] When information is confusing or misleading, as often occurs in specific predictions like flood crest forecasts, poor decisions and undesirable consequences are likely to follow.[206] In the flood setting, then, forecasters must provide decision makers with clear explanations of the uncertainties contained in the forecasts provided.[207]

In one sense, it seems these lessons are being followed in the climate change setting. That is, the risks associated with climate change are fairly well publicized, as is the "uncertain" nature of climate change predictions.[208] However, what is not as well explained is that climate change uncertainties have more to do with *when* the results will occur (assuming a business-as-usual approach), not *if*. Thus, the climate change discussion (at the policy level, not the scientific level) often misses the point.

As seen in Grand Forks and New Orleans, immediately before the disasters struck, the question was how high would the water get or how fast would the wind blow.[209] However, climate change concerns apply to long-term planning—planning that should have occurred long ago in Grand Forks and New Orleans, much the way it did in Winnipeg when the diversion ditch was built in the 1960s.[210] Like climate change, leaders in Grand Forks and New Orleans had every reason to believe the "big one" could hit, and probably would. But rather than investing in mitigation programs earlier, the cities decided to wait.[211]

The decision was disastrous for both cities, and if climate change policies follow the same wait-and-see approach, the losses in the Northern Plains and Gulf Coast will seem tame in comparison. Climate change concerns must be addressed early and aggressively—through environmental planning, reduced and reversed development in high-risk areas, and efforts to reduce greenhouse gas emissions—if massive losses are to be avoided or, at least, contained. This will require better communication of the risks

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203 *See* SHELBY, *supra* note 2, at 10.

204 COMM. ON ESTIMATING & COMMUNICATING UNCERTAINTY IN WEATHER & CLIMATE FORECASTS, NAT'L RESEARCH COUNCIL, COMPLETING THE FORECAST: CHARACTERIZING AND COMMUNICATING UNCERTAINTY FOR BETTER DECISIONS USING WEATHER AND CLIMATE FORECASTS 1 (2006) (footnote omitted).

205 *Id.*

206 *Id.* at 98.

207 *Id.*

208 *See, e.g.*, FRIDAY, *supra* note 33, at 33–38.

209 *See supra* Parts II.A, III.A.

210 *See supra* Part II.B.2.

211 *See supra* Parts II.B, III.

posed, including likelihood and range of magnitude, as well as the nature of any other uncertainties in the predictions.

After the flooding in Grand Forks in 1997, it took years to put a plan in place to construct a dike system to help protect the city from future flooding; it took until 2007 for the plan to be fully implemented.[212] Thus, even after the risk was assessed and there was agreement that action was needed, the city remained vulnerable for nearly a decade. In New Orleans, while the debate continues about how to best protect against hurricanes, the city remains vulnerable, and will remain so for years.

The same is true with regard to climate change. The nation and the world are increasingly vulnerable to climate change losses, and that vulnerability increases each year as the world population (and fossil fuel consumption) grows. Political leaders and policymakers must communicate that uncertainty about timing does not make something unlikely. No one buys health insurance knowing they will get sick; they buy insurance to protect against their exposure should they get sick. Political leaders must listen to scientists (the forecasters in the climate change arena) about the risks posed and act accordingly. If they do not, Grand Forks and New Orleans are prime lessons in what can happen.

D. The Hurricane Highway and the Law of Unintended Consequences

Another critical lesson for policymakers is that they must be aware of the law of unintended consequences. This "law" is essentially that nothing occurs in isolation—everything is connected to everything else.[213] Along the Mississippi River, this means that disrupting a major waterway, such as building massive flood levees along the lower part of the river, will have impacts on the entire area.[214] Around New Orleans, "the Law of Unintended Consequences dictates that you subtract a Manhattan-size area of land from the coast every ten months and you invite the Gulf of Mexico well into the interior of America."[215]

The value of coastal barriers and wetlands in helping to mitigate or prevent hurricane damage has long been recognized.[216] For example, two miles of marsh can help suppress storm surge by as much as six inches or more.[217] New Orleans once enjoyed as much as fifty miles of marsh between the city and the Gulf, all of which was gone when Hurricane Katrina came calling.[218]

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212 CITY OF GRAND FORKS, MILESTONES 1997–2007 (2007), *available at* http://www.grandforksgov.com/Flood/Milestones.pdf.

213 MIKE TIDWELL, THE RAVAGING TIDE: STRANGE WEATHER, FUTURE KATRINAS, AND THE COMING DEATH OF AMERICA'S COASTAL CITIES 17–18 (2006) (stating that the law of unintended consequences can also be explained "as the 'Sorry, we didn't mean to' postulate").

214 *Id.* at 18.

215 *Id.*

216 Oliver A. Houck, *Retaking the Exam: How Environmental Law Failed New Orleans and the Gulf Coast South and How It Might Yet Succeed*, 81 TUL. L. REV. 1059, 1065 (2007).

217 *Id.*

218 *Id.* at 1065–66.

As one might expect, several parties sought to hold the U.S. government accountable for failing to protect their homes and businesses.[219] The United States is generally immune from lawsuits "for any damage from or by floods or flood waters at any place."[220] However, the United States does not have "complete immunity from liability for the negligent and wrongful acts of its employees *unconnected with flood control projects*."[221]

One of the major projects that helped facilitate Hurricane Katrina's access to the city was the Mississippi River Gulf Outlet, also know as MR-GO (pronounced "Mister Go").[222] Completed in 1968, MR-GO is a seventy-six mile long channel that runs directly from New Orleans to the Gulf of Mexico.[223] Scientists and activists critical of MR-GO began calling it a "hurricane highway," warning that it would funnel hurricanes into the center of New Orleans.[224]

The question is whether any damage that resulted from the existence of MR-GO is related to a "flood control project" because federal liability cannot flow from such projects.[225] The U.S. Army Corps of Engineers has already been ruled immune from liability for the direct failure of levees and floodwalls during Hurricane Katrina.[226] Following the storm, a group of plaintiffs (the Robinson Group)[227] sued the United States and the U.S. Army Corps of Engineers for the "negligent design, construction, maintenance, and operation of the Mississippi River Gulf Outlet," alleging that Hurricane "Katrina would have been an endurable event in New Orleans' history rather than the obliterating force that destroyed lives and businesses," but for the construction of MR-GO.[228] In this case, the plaintiffs, the Robinson Group, are

> not seeking damages for the failure of the levees or flood projects. [Instead,] [p]laintiffs contend that MRGO has absolutely nothing to do with a flood control project. Plaintiffs are seeking damages for the effects of the waters in the MRGO with respect to the decimation of the wetlands over a long period of time which in turn created the hazard which resulted in flooding which plaintiffs maintain could not have been controlled by any flood control project.[229]

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219 *See, e.g.*, *In re* Katrina Canal Breaches Consol. Litig., 471 F. Supp. 2d 684, 687 (E.D. La. 2007).

220 Mississippi River Flood Control Act, 33 U.S.C. § 702c (2006).

221 Graci v. United States, 456 F.2d 20, 26 (5th Cir. 1971).

222 *See* Houck, *supra* note 216, at 1066.

223 John Schwartz, *Weighing Canal's Role in Damage from Storm: Civil Case Opens in New Orleans*, N.Y. TIMES, Apr. 21, 2009, at A12.

224 Melissa Samet, *Bankside Federal*, *in* RIVERTOWN: RETHINKING URBAN RIVERS 143, 152 (Paul Stanton Kibel ed., 2007).

225 *See Graci*, 456 F.2d at 27–28.

226 *In re* Katrina Canal Breaches Consol. Litig., 533 F. Supp. 2d 615, 637 (E.D. La. 2008).

227 Schwartz, *supra* note 223 ("If they win, the plaintiffs—a local newscaster, Norman Robinson, and five others whose homes or businesses were destroyed by the 2005 storm—could receive hundreds of thousands of dollars each as compensation for their losses.").

228 Complaint at 1–2, *In re* Katrina Canal Breaches Consol. Litig., 471 F. Supp. 2d 684 (E.D. La. 2007) (No. 06-2268).

229 *In re* Katrina Canal Breaches Consol. Litig., 471 F. Supp. 2d at 694.

The case will be difficult and will feature a battle of experts for the parties, and the impacts of the case will reach far beyond the Robinson Group. If the plaintiffs win, it may open the door for a class action lawsuit related to more than 400,000 filed claims.[230] The government already considered the possible financial ramifications, concluding that there is a "reasonable possibility" government losses could range from $10 billion to $100 billion.[231]

The unintended consequences for MR-GO and other Gulf Region projects are broad and far reaching. The intent of MR-GO and the levee systems was not to make New Orleans more vulnerable or to expose the federal government to billions of dollars of liability beyond the costs already absorbed for Katrina relief and repair. Given the chance, it is possible MR-GO would not have been built, at least not without additional flood mitigation measures. Given the benefits (both real and perceived), the high cost of other options, and the unpredictable nature of "when" disasters will happen, it is more concerning that nothing would have changed in the planning process. If so, there is even more to worry about with regard to climate change.

V. CONCLUSION: CLIMATE CHANGE POLICIES ARE ABOUT MORE THAN CLIMATE CHANGE

> We're trying to communicate that climate change is very, very serious, but hey, by the way, this is an incredible economic opportunity.[232]

One of the most difficult things about addressing climate change, and motivating people to embrace related policies, is that the risks posed by climate change overlap with risks posed by other issues. It is not easy to identify when something was "caused" by climate change or some other independent event.[233] However, this is also the most compelling reason to take action to avoid climate change-related losses because, even if climate change losses are not "real or imminent," most of the steps to reduce or avoid the effects of climate change have other benefits that make the investment of resources worthwhile.

A. Shifting from Oil as the Primary Fuel Source

The first major initiative in most climate change plans is to reduce or eliminate the use of oil. Although new oil reserves in the United States may make this less of a priority, it should not. Oil use and demand is not going to go away immediately. However, a program designed to reduce U.S.

230 Schwartz, *supra* note 223.

231 *Id.*

232 Michael Grunwald, *The Political Scientist*, TIME, Aug. 24, 2009, at 30, 30 (quoting Steven Chu, U.S. Secretary of Energy).

233 *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 149, at 83–84.

consumption could allow the United States to move away from massive oil imports. By drastically reducing oil consumption, it may be possible to use only fossil fuels derived from the United States and other "friendly" sources.[234] As of now, U.S. oil production is too low to have a significant impact on world oil markets.[235]

Although reducing fossil fuel consumption is important in addressing climate change, it is not the only reason to support a shift away from oil as a primary fuel source. The role of oil in U.S. national security remains a real concern, and reducing the use of foreign energy sources has garnered significant bipartisan support.[236] From James Woolsey, the former Director of the Central Intelligence Agency, to Frank Gaffney, the president of the Center for Security Policy, several "leading neoconservatives who pushed hard for the Iraq war are going green."[237] They are doing so not for environmental reasons, but because they view reducing foreign fuel imports as "a national security imperative."[238]

By combining and embracing the desire for a similar outcome—reduced consumption of foreign oil—those concerned about the environment and those concerned about national security can provide justifications for action beyond just climate change. Those promoting climate change policy need to appeal to various constituencies by providing multiple reasons to support the same goal. And leaders in those various constituencies need to recognize the value of working across methods, perhaps with former political enemies, to achieve the same goals.

B. Green Jobs = Jobs

Assuming "Peak Oil" is real, and there is little debate that the world's oil is a finite resource,[239] the question about transition to a new fuel source is not if, it is when. That means that all those working in the oil industry will all need new jobs at some point. This is not to advocate immediate cessation of

234 Of course, this would have climate change consequences in the market, at least in the short term. A dramatic reduction in U.S. oil consumption would drive the price of oil down, almost certainly increasing consumption in other countries. However, over the long term, a dramatic reduction in U.S. oil consumption should lead to a reduction in the cost of other technologies, hopefully making fossil fuels less appealing in the global market.

235 *See, e.g.*, Luis E. Cuervo, *OPEC from Myth to Reality*, 30 HOUS. J. INT'L L. 433, 507–08 (2008) (stating that only Saudi Arabia, Iran, and Iraq have enough oil reserves and production to influence oil prices).

236 *See* Brad Knickerbocker, *US Energy Proposal Pushes Toward Center*, CHRISTIAN SCI. MONITOR (Boston, Mass.), Dec. 10, 2004, at 2 (stating that recommendations issued by the bipartisan National Commission on Energy Policy "are laced with incentives as well as regulations that in total are unlikely to completely please anyone—smokestack apologist or solar-powered activist").

237 Robert Bryce, *As Green as a Neocon*, SLATE, Jan. 25, 2005, http://slate.msn.com/id/2112608 (last visited Nov. 15, 2009).

238 *Id.*

239 *See generally* Shirley V. Scott, *Climate Change and Peak Oil As Threats to International Peace and Security: Is It Time for the Security Council to Legislate?*, 9 MELB. J. INT'L L. 495, 497–98 (2008).

oil use or production; instead, it is simply arguing that the process of using alternative fuel sources should be phased in more rapidly than is being done now. Although reduced demand today could mean losses for some oil-industry workers, if done correctly, the net lost jobs would be lower, and would smooth the inevitable transition to new fuels.

Further, as technology catches up, green resources will be in demand from a cost perspective, as well as an environmental one. Once another major country takes the lead in the category—from a technological and a labor perspective—it is hard to catch up.[240] The United States and its workers need to stake a claim now in green technologies. This is most clear in the electricity sector.

China has not taken major steps to curb GHG emissions, and fossil fuel consumption, from coal to oil, has dramatically increased in China over the past several years.[241] China's unwillingness to commit to emissions targets was a key reason the United States did not commit to the Kyoto Protocol's mandates.[242] However, despite an unwillingness to curb their country's own emissions, China has recognized the commercial potential of green energy technologies.[243] China, in part through significant government assistance, has moved to become a leader in solar and wind energy, employing protectionist policies to attempt to secure their place as the industry leader.[244]

As discussed throughout this Article, climate change risks are enough to warrant the pursuit of cleaner energy supplies. However, the recent loss of U.S. manufacturing jobs and the failure of two of the former Big Three automakers underscores the need for new sources of jobs, many of which can come from new sources of cleaner energy.[245] Given the current state of the economy, perhaps the most important reason to pursue climate change policies is the potential for economic development and job creation. The Union of Concerned Scientists (UCS) determined that by implementing a 20% renewable portfolio standard (RPS) in the United States, more than 355,000 jobs would be created.[246] An RPS requires that covered electric utilities procure the stated percentage of electricity sold from renewable energy sources.[247] To meet the 20% standard, the study found, new jobs would be created in all areas, from manufacturing to construction to operation and maintenance.[248] This is nearly twice the number of jobs

240 Stephen G. Brooks & William C. Wohlforth, *American Primacy in Perspective*, FOREIGN AFF., July–Aug. 2002, at 20, 22.

241 *See* Keith Bradsher, *China to Pass U.S. in 2009 in Emissions*, N.Y. TIMES, Nov. 7, 2006, at C1.

242 *See id.*

243 Keith Bradsher, *Drawing Critics, China Seeks to Dominate in Renewable Energy*, N.Y. TIMES, July 14, 2009, at B1.

244 *See id.*

245 OFFICE OF AEROSPACE & AUTO. INDUS., U.S. DEP'T OF COMMERCE, U.S. AUTOMOTIVE INDUSTRY EMPLOYMENT TRENDS (2005), *available at* http://www.trade.gov/static/auto_reports_jobloss.pdf.

246 Letter from Alan Nogee, Dir., Clean Energy Program, Union of Concerned Scientists, to Rep. John Dingell & Rep. Rick Boucher 10 (June 15, 2007), *available at* http://www.ucsusa.org/assets/documents/clean_energy/ucs-response-to-dingell-boucher-rps.pdf.

247 *See, e.g.*, Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 806, 121 Stat. 1492, 1722–73 (2007).

248 Letter from Alan Nogee to Rep. John Dingell & Rep. Rick Boucher, *supra* note 246, at 10.

currently created by the use of fossil fuels, meaning a net increase of more than 157,000 jobs.[249] UCS also found that the 20% RPS would add to the U.S. economy $8.2 billion in income and $10.2 billion in gross domestic product by the year 2020.[250]

A report created by the Renewable Energy Policy Project (REPP) is just as promising. The report considered the potential impact of a major increase in the number of wind energy installations, most likely driven by national RPS legislation, on U.S. manufacturing jobs.[251] This level of increase would mean adding 50,000 megawatts of wind power, which would require an estimated capital investment of $50 billion.[252] Of particular interest, especially in the wake of layoffs and the recent failures of major manufacturing companies like General Motors and Chrysler, the report found that a review of "the demographics of the top 20 states benefiting from wind manufacturing indicates that investment in wind will particularly target the most populous regions of the country, and will especially benefit regions that are most in need of new manufacturing jobs."[253]

The report indicates also that benefits from increased wind energy installations would have nationwide impact.[254] REPP determined that companies in all fifty states have the technical potential to enter the growing market for wind turbine manufacturing—more than 16,000 firms in all.[255] Furthermore, the twenty states that would "receive the most investment and most new manufacturing jobs from investment in wind account for 75% of the total U.S. population, and 76% of the manufacturing jobs lost in the last 3 1/2 years."[256]

Policies designed to increase wind energy would almost certainly help address climate change issues.[257] Perhaps most important, though, is that policies to increase use of renewable energy have the potential to have a net-positive impact on the job market.[258] This gives good green policy the opportunity to be good economic policy, regardless of how one feels about climate change.

C. A Glimmer of Hope, a Greener Grid, a Safer Planet

There is some hope that the costs of long-term harms are being recognized early enough to have at least a chance to avoid or mitigate the

249 *Id.*

250 *Id.*

251 GEORGE STERZINGER & MATT SVRCEK, RENEWABLE ENERGY POLICY PROJECT, WIND TURBINE DEVELOPMENT: LOCATION OF MANUFACTURING ACTIVITY 46–47 (2004), *available at* http://www.repp.org/articles/static/1/binaries/WindLocator.pdf.

252 *Id.* at 46.

253 *Id.* at 5.

254 *Id.* at 63–64 & tbl.4.7.

255 *Id.* at 4.

256 *Id.*

257 Alan Nogee et al., *The Projected Impacts of a National Renewable Portfolio Standard*, ELECTRICITY J., May 2007, at 33, 44.

258 *Id.* at 34.

harms posed by earlier development decisions. Take, for example, Fargo, North Dakota, which is also in the Red River Valley and just eighty miles to the south of Grand Forks.[259] Fargo has long been prone to flooding, just as was Grand Forks.[260] To date, however, Fargo has (narrowly) avoided the major catastrophic flooding that impacted the Grand Forks area in 1997.[261] In 2009, Fargo, a city without a dike or other diversion plan to protect from floods, came very close to a major flood disaster of its own.[262] The city of Fargo survived a record flood crest of 40.8 feet, and the dikes held on to protect most of the city from a second crest of 34 feet.[263]

Following the flood, there has been significant talk about a flood management plan for the area—with costs ranging from $800 million to $2 billion—to help protect the area from future flooding.[264] The flood clearly served as a wake-up call, reminding the region of the dangers posed by the river. The most promising action taken after the flood was nearly unanimous support for a tax in Fargo to help fund protection efforts; more than ninety percent of voters supported a half-cent sales tax increase to help fund a flood-protection program.[265] The tax is designed to raise $200 million over the next twenty years.[266]

The Army Corps of Engineers is reviewing a $1 billion diversion project and a $625 million levee system to control flooding in the region.[267] Of course, early support for some kind of plan does not mean support exists for a particular plan, and the debate is certain to be contentious.[268] However, state and local financial support, in addition to the success of the Grand Forks mitigation program, all bode well for the area.[269]

A glimmer of hope remains on the national level, as well. On June 26, 2009, the U.S. House of Representatives passed the American Clean Energy and Security Act of 2009 (ACESA), which includes both a cap-and-trade program (that would place a cap on the permitted amount of U.S. greenhouse gas emissions) and an RPS.[270] Although the ACESA faces an

259 *A River Runs Through It, Again*, ECONOMIST, Apr. 4–10, 2009, at 39, 39.

260 U.S. GEOLOGICAL SURVEY, U.S. DEP'T OF THE INTERIOR, A HISTORY OF FLOODING IN THE RED RIVER BASIN (2007), *available at* http://pubs.usgs.gov/gip/2007/55/pdf/finalWebGIP55.pdf.

261 Douglas C. Friez & Kathleen Donahue, *North Dakota After Action Report: A Historical Perspective*, 2 GREAT PLAINS NAT. RESOURCES J. 193, 210 (describing 1997 flooding of Grand Forks area and relatively minor damage experienced by Fargo).

262 *A River Runs Through It, Again*, *supra* note 259, at 39.

263 Ken Thomas, *North Dakota and Minnesota Officials Discuss Flood Preparations*, BISMARCK TRIB., May 5, 2009, http://www.bismarcktribune.com/news/state-andregional/article_eee242a1-2f61-5c39-acac-01cf88684065.html (last visited Nov. 15, 2009).

264 *Id.*

265 *Fargo Flood Vote Good News for Mayor*, BISMARCK TRIB., July 2, 2009, at B1, *available at* 2009 WLNR 12637422 (reporting that Fargo mayor Dennis Walaker believed that if voters did not support the tax, the city would have needed a new leader).

266 *Id.*

267 *Two Flood-Control Options Proposed*, ST. PAUL PIONEER PRESS, May 21, 2009, at B2, *available at* 2009 WLNR 9748916.

268 *See* Ryan Bakken, *Fargo Confronts Politics of Flood Protection*, GRAND FORKS HERALD, Apr. 4, 2009, *available at* 2009 WLNR 6376649.

269 *See id.*

270 H.R. 2454, 111th Cong. §§ 101, 301, 311 (2009) (as passed by House, June 26, 2009).

uphill battle,[271] it still signals that climate change legislation is as close to passing as it has ever been.

Lawmakers and other political leaders, as well as business leaders and everyday Americans, must make some hard decisions now if we are to protect against future climate change losses. Like "Duff's Folly," some may ridicule those most willing to take the lead, but the payoff for making the difficult decisions will be billions of dollars saved through avoided or mitigated climate change losses, not to mention the potential avoidance of human loss and suffering. In addition, possibly billions of dollars (and thousands of jobs) could be made through new industries, while drastically reducing our reliance on others for our energy needs and making the country safer and more self-sufficient.[272]

The time to address climate change, through calculated but aggressive action, is now. Dabbling in modest emissions reductions and slightly reduced fossil fuel use are not sufficient. Absent a more concerted commitment to address climate change concerns, we'll simply be building a thirty-foot levee in the face of a fifty-foot flood crest.

271 *See* Grunwald, *supra* note 232, at 30.

272 *See supra* Part V.A–B.