University of Richmond Law Review

Volume 48
Issue 3 *Allen Chair Issue 2014*

Article 5

3-1-2014

Oil and Gas and Floods

Justin Pidot
University of Denver Sturm College of Law

OIL AND GAS AND FLOODS

Justin Pidot *

INTRODUCTION

On March 24, 1989, the *Exxon Valdez* oil tanker ran aground on Bligh Reef.[1] Over the next five hours, the incapacitated vessel spilled more than ten million gallons of crude oil into Alaska's Prince William Sound, and some of that oil remains in the environment to this day.[2]

Reaction to the *Exxon Valdez* disaster was swift. Congress convened its first hearing on the incident on April 6, 1989,[3] and passed the Oil Pollution Act of 1990 ("OPA") less than two years later with broad bipartisan support—the House of Representatives passed the bill 375 to 5 and the Senate passed the bill on a voice vote.[4] The federal government did not act alone. The State of Alaska promptly convened an oil spill commission to examine the *Exxon Valdez* spill, which published a lengthy report less than a

---

* Assistant Professor, University of Denver Sturm College of Law. I would like to thank Amanda Leiter, Nancy Leong, Lisa Grow Sun, and Annecoos Wiersema for their help with this article and the *University of Richmond Law Review* for inviting me to participate in the 2013 Allen Chair Symposium.

1. Stephen Raucher, *Raising the Stakes for Environmental Polluters: The* Exxon Valdez *Criminal Prosecution*, 19 ECOLOGY L.Q. 147, 147 (1992).

2. Amy J. Wildermuth, *The Legacy of the* Exxon Valdez*: How Do We Stop the Crisis?*, 7 U. ST. THOMAS L.J. 130, 130 (2009).

3. *Topics Concerning the* Exxon Valdez *Oil Spill into the Prince William Sound of Alaska: Hearing Before the Subcomm. on Coast Guard & Navigation of the H. Comm. on Merch. Marine & Fisheries*, 101st Cong. 1 (1989).

4. Oil Pollution Act of 1990, Pub. L. No. 101-380, 104 Stat. 484 (1990); Anne C. Mulkern, *How Long to Pass an Oil Spill Bill? Try 18 Months*, N.Y. TIMES (Aug. 13, 2010), http://www.nytimes.com/gwire/2010/08/12/12greenwire-how-long-to-pass-an-oil-spill-bill-try-18-mont-13939.html. The Oil Pollution Act of 1990 is not without its flaws, and some commentators view the duration of congressional debate as excessive. *See* Browne Lewis, *It's Been 4380 Days and Counting Since* Exxon Valdez*: Is It Time to Change the Oil Pollution Act of 1990?*, 15 TUL. ENVTL. L.J. 97, 107–09 (2001); Mulkern, *supra*; *see also* JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., RL33705, OIL SPILLS IN U.S. COASTAL WATERS: BACKGROUND, GOVERNANCE, AND ISSUES FOR CONGRESS 9–12 (2010) (discussing provisions of the Oil Pollution Act of 1990).

year later with numerous recommendations for reform.[5] Private parties also got into the act. Media personalities called for a boycott of Exxon.[6] Response to the disaster was also long-lasting. Even two decades later, scholars continue to study the causes and effects of the spill.[7]

Another spill of a similar magnitude took place almost twenty years after the *Exxon Valdez*, but that incident received very different treatment. On August 29, 2005, Hurricane Katrina buffeted the Gulf Coast.[8] The storms devastated communities along the coast and riveted the national attention.[9] Close to two thousand people died, a million more were displaced, and the damage from the storm measured over $100 billion.[10] Hurricane Katrina also wreaked havoc on the oil industry: it destroyed or damaged more than sixty oil platforms and one hundred pipelines, and affected nine major oil refineries.[11] All told, estimates are the hurricane caused releases of more than eight million gallons of oil in at least ten major spills.[12]

Hurricane Katrina captured the attention of policymakers and the public, but little of this attention focused on the massive oil spills resulting from the storm. Indeed, one of the few talking

---

5. *See* ALASKA OIL SPILL COMM'N, SPILL: THE WRECK OF THE *EXXON VALDEZ* 129–71 (1990), *available at* http://www.arlis.org/docs/vol1/B/33339870.pdf.

6. *Radio Hosts Urging Exxon Boycott*, N.Y. TIMES, Apr. 17, 1989, at D11.

7. The Alaska Sea Grant, for example, hosted a conference to examine the *Exxon Valdez* spill on its twentieth anniversary. *See* Exxon Valdez *Oil Spill 20th Anniversary: EVOS and Alaska Sea Grant—People, Process, and Progress*, ALASKA SEA GRANT (Mar. 2009), http://seagrant.uaf.edu/conferences/2009/evos-anniversary/; *see also, e.g.*, Zygmunt J.B. Plater, *Learning from Disasters: Twenty-One Years after the* Exxon Valdez *Oil Spill, Will Reactions to the Deepwater Horizon Blowout Finally Address the Systemic Flaws Revealed in Alaska?*, 40 ENVTL. L. REP. 104, 104 (2010).

8. Joseph B. Teaster & Kate Zernike, *Hurricane Slams into Gulf Coast; Dozens Are Dead*, N.Y. TIMES, Aug. 30, 2005, at A1.

9. *See, e.g.*, Lisa Grow Sun, *Disaster Mythology and the Law*, 96 CORNELL L. REV. 1131, 1140 (2011).

10. Andy Newman, *Comparing Hurricanes: Katrina v. Sandy*, N.Y. TIMES, Nov. 28, 2012, at A28.

11. ROBERT L. BAMBERGER & LAWRENCE KUMINS, CONG. RESEARCH SERV., RS22233, OIL AND GAS: SUPPLY ISSUES AFTER KATRINA 5–6 (2005); Press Release, Minerals Mgmt. Serv., Impact Assessment of Offshore Facilities from Hurricanes Katrina and Rita (Jan. 19, 2006), *available at* http://www.boem.gov/boem-newsroom/press-releases/2006/press0119.aspx. Many oil refineries that provide a significant share of the nation's refined petroleum were either shut down before the storm or temporarily shut down after. BAMBERGER & KUMINS, *supra*, at 1.

12. Betsy McKay, *Polluted Options: Katrina Oil Spill Clouds Future of Battered Suburb*, WALL ST. J., Jan. 3, 2006, at A1 (citing figures according to the United States Coast Guard).

points that emerged about oil and Hurricane Katrina was patently false. A series of politicians, including Kentucky Senator Mitch McConnell, Secretary of the Interior Dirk Kempthorne, and Louisiana Governor Bobby Jindal, supported expanding off-shore oil drilling with the claim that, as former Mississippi Senator Trent Lott put it, "We didn't have one drop of oil spilt when we had the biggest hurricane in, you know, recent history, Hurricane Katrina."[13] The *Wall Street Journal*'s editorial page echoed the claim: "Hurricanes Katrina and Rita flattened terminals across the Gulf of Mexico but didn't cause a single oil spill."[14] Reality belies these claims, and yet they passed with little fanfare.

The nation reacted to Hurricane Katrina and the *Exxon Valdez* oil spill, each releasing similar amounts of oil into the environment, in dramatically different fashions.[15] The *Exxon Valdez* oil spill, the largest experienced by the United States at that time, led to new federal law, swift state action, and public outcry. The Hurricane Katrina oil spill, the second largest experienced by the United States at that time, led to indifference. Part of the explanation is, of course, that Hurricane Katrina was dramatically multifaceted. News outlets had their hands full reporting on myriad issues, including living conditions within the New Orleans Superdome,[16] the incompetent response of the federal government,[17] the failure of government-constructed levees designed to

13. *See* David Morgan, *"Not One Drop of Oil Spilled"? Not Quite*, CBSNEWS.COM (July 19, 2008), http://www.cbsnews.com/news/not-one-drop-of-oil-spilled-not-quite/.

14. Editorial, *$4 Gasbags*, WALL ST. J., June 12, 2008, at A16; *see also* Frank Ahrens, *Oil Doesn't Want Focus on Big Profit; Companies Stepping Up Advertising*, WASH. POST, Oct. 26, 2005, at D1 (indicating that the president of the American Petroleum Institute claimed no oil spills from Hurricane Katrina or Rita).

15. If the oil released after Hurricane Katrina is considered in combination with that released after Hurricane Rita, which struck the Gulf Coast a month later, the amount of oil released into the environment exceeds that released by the *Exxon Valdez* spill. *See* RAMSEUR, *supra* note 4, at 1–2. The now-defunct Mineral Management Service estimated that the hurricanes led to the release of eight million gallons of oil from aboveground storage facilities, 600,000 gallons from oil platforms and pipelines, and 3.3 million gallons from a tank barge. *Id.* at 2.

16. *See, e.g.*, Ann Gerhart, *'And Now We Are in Hell'*, WASH. POST, Sept. 1, 2005, at A1.

17. *See, e.g.*, Elisabeth Bumiller, *Democrats and Others Criticize White House's Response to Disaster*, N.Y. TIMES, Sept. 2, 2005, at A16; Susan B. Glasser & Josh White, *Storm Exposed Disarray at the Top*, WASH. POST, Sept. 4, 2005, at A1.

protect New Orleans,[18] and complicated issues of race relations revealed by the nation's experience of the storm.[19]

I suspect, however, that more than the sheer number of issues raised by Hurricane Katrina contributed to the lack of public and political response to this dramatic release of oil into the environment. Building oil platforms, pipelines, refineries, storage tanks, and the like along a coastline consistently battered by hurricanes inevitably leads to oil spills. Indeed, just the year before Hurricane Katrina, Hurricane Ivan also caused oil spills, including one that continues to this day.[20] Yet to acknowledge that fact requires society to acknowledge the role that human behavior plays in creating natural disasters. In the words of Phil O'Keefe and his colleagues in a 1976 *Nature* article, "[w]ithout people there is no disaster."[21] That truth, however, is inconvenient because fully accepting its weight demands new thinking about development within natural hazard zones, something which society has long resisted.

This symposium article has three goals. First, it seeks to draw attention to the pressing risks that natural disasters pose to energy infrastructure. It focuses on one type of natural disaster—flooding—and one variety of energy infrastructure—oil and natural gas. Natural disasters do not, however, discriminate and also pose broad risks to energy systems of all stripes. Second, the article seeks to provide examples of existing federal and state legal regimes that address to some extent the dangers floods pose to the oil and gas industry. As we shall see, the regulatory regimes I address are sparse and hardly comprehensive. Third and finally, the article seeks to provide preliminary thoughts about the reasons that regulation of oil and gas development in flood-prone locales has historically favored development.

---

18. *See, e.g.*, Scott Shane & Eric Lipton, *Government Saw Flood Risk but Not Levee Failure*, N.Y. TIMES, Sept. 2, 2005, at A1.

19. *See, e.g.*, Jason DeParle, *Broken Levees, Unbroken Barriers*, N.Y. TIMES, Sept. 4, 2005, § 4, at 1; Lynne Duke & Teresa Wiltz, *A Nation's Castaways; Katrina Blew in, and Tossed up Reminders of a Tattered Racial Legacy*, WASH. POST, Sept. 4, 2005, at D1.

20. *See* Mark Schleifstein, *Taylor Energy Oil Platform, Destroyed in 2004 During Hurricane Ivan, Is Still Leaking in Gulf*, TIMES-PICAYUNE (July 1, 2013), http://www.nola.com/environment/index.ssf/2013/07/taylor_energy_oil_platform_des_1.html.

21. Phil O'Keefe, Ken Westgate & Ben Wisner, *Taking the Naturalness out of Natural Disasters*, 260 NATURE 566, 566 (1976).

To accomplish those tasks, this article proceeds in three parts. Part I first explains reasons that oil and gas infrastructure often occupy land close to water, land often in danger of flooding, and then describes three recent floods and the effects of those floods on the oil and gas industry. As will be revealed, flooding damages infrastructure, disrupts the energy economy, and leads to the release of oil and other chemicals into the environment.

Part II provides examples of how state and federal law approach the risks floods pose to oil and gas infrastructure. At the federal level, it discusses the regulation of oil and gas pipelines and federal law governing liability for oil spills. It also examines the standards that the Bureau of Land Management has imposed for gas development within one unit of federal land. At the state level, this part examines Colorado and Pennsylvania law. It reveals that Colorado law places no constraint on oil and gas development within floodplains. Pennsylvania law, on the other hand, places some limitations on such development.

Part III explains various obstacles to sensible disaster policy that I have developed elsewhere. Three categories of obstacles—symbolic, cognitive, and structural—obstruct disaster policy. This part then considers how these obstacles may play out in the context of regulation of the oil and gas industry.

I. OIL AND GAS INFRASTRUCTURE WITHIN THE FLOOD ZONE

The oil and gas industry often builds on land at risk of flooding. This occurs throughout the production cycle. Oil and gas wells lie next to rivers, oil pipelines run under their banks, and refineries and storage facilities abut rivers, bays, swamps, and the open ocean.

The proximity of this infrastructure to water occurs for at least two reasons. In some circumstances, floodplains are simply available. This may be particularly true for operations extracting oil and gas. Building codes and insurance requirements may, at least to some degree, discourage construction in high-flood hazard areas, although such development often occurs at more than socially optimal levels.[22] But low-lying land at risk of flooding may also be cheaper to purchase or lease. As one Colorado energy lawyer ex-

22. *See* Justin Pidot, *Deconstructing Disaster*, 2013 BYU L. REV. 213, 216–17 (2013).

plained, oil and gas well pads are often placed within floodplains to leave valuable agricultural land unoccupied.[23] Floodplains that overlie oil and gas resources may, therefore, prove appealing locations to energy companies seeking access to those resources.

Moreover, some legal frameworks may actively encourage energy development in floodplains. A Colorado statute provides that "[o]pen space activities such as agriculture, horticulture, floriculture, recreation, and mineral extraction shall be encouraged in the floodplains,"[24] and Colorado law generally treats oil and gas as a species of mineral.[25] Moreover, the Colorado Oil and Gas Conservation Commission ("COGCC"), which regulates oil and gas development within the state, does not require energy companies to maintain a minimum distance between wells and their supporting infrastructure and waterways.[26]

The relatively low value of land within floodplains is not the only reason energy companies may choose to build in those areas. Oil and gas infrastructure often relies on water. At the extraction stage, this reliance arises because drilling for oil and natural gas requires significant amounts of water.[27] This is particularly true where hydraulic fracturing, or fracking, is used to increase well production, a practice that accounts for about 30% of oil produced in the United States.[28] Depending on geology, fracking a single well can require between 50,000 and two million gallons of fracking fluid, which, by volume, is predominantly water.[29] Obtaining

---

23. Austin Rueschhoff, *Oil and Gas Operations and Colorado's Floods: The Colorado Oil and Gas Conservation Commission Tackles the Issues*, U. DENV. WATER L. REV. (Nov. 14, 2013), http://duwaterlawreview.com/oil-and-gas-operations-and-colorados-floods-the-colorado-oil-and-gas-conservation-commission-tackles-the-issues/.

24. COLO. REV. STAT. § 24-65.1-202(2)(a)(I)(A) (2013).

25. *See* McCormick v. Union Pac. R.R. Co., 983 P.2d 84, 86–88 (Colo. App. 1998) (collecting cases, statutes, and treatises indicating that the term mineral includes oil and gas).

26. *See* COLO. CODE REGS. § 404-1:603(a) (2014).

27. ERIK MIELKE ET AL., ENERGY TECH. INNOVATION POLICY RESEARCH GRP., WATER CONSUMPTION OF ENERGY RESOURCE EXTRACTION, PROCESSING AND CONVERSION 5–7 (2010), *available at* http://belfercenter.ksg.harvard.edu/files/ETIP-DP-2010-15-final-4.pdf.

28. Asjylyn Loder, *U.S. Shale-Oil Boom May Not Last as Fracking Wells Lack Staying Power*, BLOOMBERG BUSINESSWEEK (Oct. 10, 2013), http://www.businessweek.com/articles/2013-10-10/u-dot-s-dot-shale-oil-boom-may-not-last-as-fracking-wells-lack-staying-power.

29. COLO. OIL & GAS CONSERVATION COMM'N, FREQUENTLY ASKED QUESTIONS ABOUT HYDRAULIC FRACTURING, *available at* https://cogcc.state.co.us/Announcements/Hot_Topics/Hydraulic_Fracturing/Frequent_Questions_about_Hydraulic%20Fracturing.pdf (last visited Feb. 18, 2014).

this water can be controversial and difficult.[30] This high demand for water has driven debate in western states about water rights as they apply to oil and gas development.[31] Locating wells closer to sources of water, like streams and rivers, decreases production costs.

Refining and transportation facilities also need proximity to water. As Tom Kloza, an oil analyst explains, "[T]he very nature of the [oil & gas] storage business is that it has to be very close to shipping lanes and ship channels and that puts it close to sea level."[32] Pipelines that carry oil and gas throughout the country also cross rivers and streams by necessity. For example, fifty-five oil and gas pipelines cross the Missouri River.[33]

Similarly, oil refineries are located near the Gulf Coast because off-shore oil drilling produces significant quantities of oil and transporting that oil inland would increase production costs.[34] As Denny Ellerman, a senior lecturer at the Massachusetts Institute of Technology Sloan School of Management, put it: "Offshore facilities and refining facilities are located where they are because the oil is there, and there is good economic sense for locating a significant refining capacity in the Gulf Coast."[35]

Locating oil and gas wells, pipelines, storage facilities, and refineries near water, and often within floodplains, is not without its risks. The sections that follow provide two illustrations of recent floods and one illustration of a recent hurricane and the impact that they had on production, transportation, and refinement of oil and natural gas.

---

30. *See* Kate Galbraith, *As Fracking Increases, So Do Fears About Water Supply*, N.Y. TIMES, Mar. 8, 2013, at A21.

31. *See, e.g.*, Carolyn F. Burr et al., *Water: The Fuel for Colorado Energy*, 15 U. DENV. WATER L. REV. 275, 291–94 (2012); *see also* David Kashi, *Fracking Advance That Cuts Water Use May Appease Some Opposition to Controversial Practice*, INT'L BUS. TIMES (Sept. 30, 2013), http://www.ibtimes.com/fracking-advance-cuts-water-use-may-appease-some-opposition-controversial-practice-1412724.

32. Jeff Brady, *Fuel Supply System Fixes Pick Up Gas After Superstorm Sandy*, NAT'L PUB. RADIO (Oct. 29, 2013), http://www.npr.org/2013/10/29/241415235/fuel-supply-system-fixes-pick-up-gas-after-superstorm-sandy.

33. Jack Nicas, *Floods Put Pipelines at Risk: Records Suggest Erosion of Riverbeds Jeopardizes Oil and Gas Infrastructure*, WALL ST. J., Dec. 4, 2012, at A3.

34. *See Energy: A System at Risk*, MASS. INST. OF TECH. SLOAN SCH. OF MGMT., http://mitsloan.mit.edu/newsroom/indepth-disasters-energy.php (last visited Feb. 18, 2014); *see also Offshore Petroleum History*, AM. OIL & GAS HISTORICAL SOC'Y, http://aoghs.org/offshore-exploration/offshore-oil-history/ (last visited Feb. 18, 2014).

35. *Energy: A System at Risk*, *supra* note 34.

A. *Colorado Floods and Oil and Gas Drilling*

Colorado has long been a major producer of oil and natural gas and that production has significantly ramped up in recent years. Oil production doubled between 2005 and 2013 and natural gas development increased by 30% during that period.[36] More than 4000 new wells were drilled in both 2007 and 2008, and more than 2000 new wells were drilled in 2009, 2010, and 2011.[37] The state is now home to more than 50,000 active oil and natural gas wells.[38]

In September 2013, parts of Colorado were struck by severe flooding, with some regions of the state experiencing what the National Weather Service determined to be a one-in-a-thousand year flood.[39] Flood waters overtopped many of the rivers and streams along the Front Range—the front face of the Rocky Mountains that faces the great plains.[40] These flood waters exacted a tremendous toll on Colorado communities, causing an estimated $2 billion in property damage.[41] The floods also caused significant damage to oil and gas production wells, resulting in releases of oil and other chemicals into the environment and the disruption of energy supplies. In Weld County, the county with the highest density of operating oil and gas wells in the nation,

---

36. Amy Harder, *Fracking Foes Fight One Battle at a Time in Colorado*, NAT'L J. (Nov. 17, 2013), http://www.nationaljournal.com/new-energy-paradigm/fracking-foes-fight-one-battle-at-a-time-in-colorado-20131117.

37. COLO. OIL & GAS CONSERVATION COMM'N ET AL., WATER SOURCES AND DEMAND FOR THE HYDRAULIC FRACTURING OF OIL AND GAS WELLS IN COLORADO FROM 2010 THROUGH 2015, at 2, *available at* http://cogcc.state.co.us/Library/Oil_and_Gas_Water_Sources_Fact_Sheet.pdf (last visited Feb. 18, 2014).

38. COLO. OIL & GAS CONSERVATION COMM'N, COLORADO WEEKLY & MONTHLY OIL & GAS STATISTICS 11 (2014), *available at* http://cogcc.state.co.us/Library/Statistics/CoWklyMnthlyOGStats.pdf.

39. *Colorado Under Water*, CLEV. PLAIN DEALER, Sept. 20, 2013, at E6. The popular designation of a flood as hundred-year, five-hundred-year, or one-thousand-year has nothing to do with its frequency but rather, its probability. For an explanation of the math behind the terminology, see U.S. GEOLOGICAL SURVEY, 100-YEAR FLOOD: IT'S ALL ABOUT CHANGE (2010).

40. *See* Michon Scott, *Historic Rainfall and Floods in Colorado*, CLIMATE.GOV (Sept. 17, 2013), http://www.climate.gov/news-features/event-tracker/historic-rainfall-and-floods-colorado; *see also Death Toll from Colorado Floods Rises to Seven*, THE MALAY MAIL (Sept. 17, 2013), http://www.themalaymailonline.com/world/article/death-toll-from-colorado-floods-rises-to-seven.

41. *See* Andrea Rael, *Colorado Flood Damage: Property Loss Estimated Around $2 Billion*, HUFFINGTON POST (Sept. 23, 2013), http://www.huffingtonpost.com/2013/09/23/colorado-flood-damage_n_3976222.html.

more than 22,000 gallons of oil spilled into the South Platte River when debris propelled by flood waters damaged storage tanks.[42] All told, more than 1900 wells were shut down because of flooding,[43] and state officials estimated releases into the environment of approximately 62,000 gallons of oil and "production water"—water used in the process of fracking and containing an array of chemicals.[44]

B. *Superstorm Sandy and Transportation Infrastructure*

Hurricane Sandy swept through the northeastern United States on October 29, 2012, causing a record setting storm surge of up to thirteen feet.[45] Hurricane damage dominated the news cycle, particularly extensive damage that occurred in New York City.[46] Millions of residents lost power, some for extended periods of time.[47]

Along with the human tragedy engendered by the storm, Hurricane Sandy significantly disrupted distribution systems for fuel. The oil terminal in New York Harbor was "crippled from Hurricane Sandy,"[48] and normal operations in New York Harbor did not

---

42. Bruce Finley, *Colorado Confirms More Oil Spills but Flood Flows Complicate Clean-up*, DENV. POST (Sept. 20, 2013), http://www.denverpost.com/environment/ci_24141077/colorado-confirms-more-oil-spills-flooded-weld-county; Laura Pritchett, *Fracking Fluids in the Flood*, ONEARTH (Sept. 20, 2013), http://www.onearth.org/articles/2013/09/a-view-from-above-shows-how-the-colorado-superstorm-damaged-fracking-facilities.

43. Mark Jaffe, *Colorado Floods: 1,900 Oil and Gas Wells Shut as Crews Check Damage*, DENV. POST (Sept. 17, 2013), http://www.denverpost.com/breaking%20news/ci_24116404/oil-field-flood-tally-1-900-wells-shut.

44. Mark Jaffe, *Lessons from Colorado's Flooded Oil and Gas Fields*, DENV. POST: BALANCE SHEET BLOG (Oct. 7, 2013), http://blogs.denverpost.com/thebalancesheet/2013/10/07/oil-and-gas/11018/.

45. *E.g.*, Pidot, *supra* note 22, at 214; *Hurricane Sandy Fast Facts*, CNN.COM (July 13, 2013), http://www.cnn.com/2013/07/13/world/americas/hurricane-sandy-fast-facts/.

46. *See, e.g.*, Cara Buckley & William K. Rashbaum, *Power Failures and Furious Flooding Overwhelm Lower Manhattan and Red Hook*, N.Y. TIMES (Oct. 29, 2012), http://www.nytimes.com/2012/10/30/nyregion/red-hook-residents-defy-evacuation-warnings-drinks-in-hand.html?_r=0.

47. U.S. DEP'T OF ENERGY, OFFICE OF ELECTRICITY, DELIVERY & ENERGY RELIABILITY, HURRICANE SANDY SITUATION REPORT # 11, at 1, 4 (2012) [hereinafter DOE SITUATION REPORT], *available at* http://www.oe.netl.doe.gov/docs/2012_SitRep11_Sandy_11022012_300PM.pdf; Terry Shawn, *Fueling East Coast Relief*, LOGLINES, Jan.–Feb. 2013, at 8–9 (2013).

48. *Factbox: NY Harbor Oil Terminals, Refineries Crippled by Sandy*, REUTERS (Nov. 11, 2012), http://www.reuters.com/article/2012/11/11/us-storm-sandy-energy-idUSBRE8AA0IP20121111 [hereinafter *NY Harbor*].

resume for a week.[49] In total, thirty-nine petroleum terminals were affected by the storm.[50] The Colonial Pipeline, which supplies 15% of the East Coast's fuel, was closed for more than a week.[51] These disruptions occurred both because of direct damage from the storm and because many oil terminals were without electricity and could not operate.[52] This disruption caused significant fuel shortages; ten days after the hurricane, more than a quarter of the gas stations in the New York metropolitan area had no gasoline to sell, and New York City Mayor Michael Bloomberg ordered gasoline rationing.[53]

Refineries in New York and New Jersey were also affected. A Phillips 66 refinery ordinarily producing 238,000 barrels of fuel a day was closed for more than a month for repairs.[54] All told, Hurricane Sandy affected approximately 7% of the refining capacity in the United States.[55]

Damage from the storm also caused serious oil spills. Tidal surge damaged fuel tanks at an oil terminal operated by Motiva, a subsidiary of Shell Oil, causing the release of 378,000 gallons of diesel fuel, much of which entered local waters.[56] Storm surge also caused two other, smaller spills—one at an oil refinery, the second at another oil terminal—of about 10,000 gallons each.[57] As

---

49. TIFFANY C. SMYTHE, U.S. COAST GUARD ACAD., ASSESSING THE IMPACTS OF HURRICANE SANDY ON THE PORT OF NEW YORK AND NEW JERSEY'S MARITIME RESPONDERS AND RESPONSE INFRASTRUCTURE 7 (2013), *available at* http://www.colorado.edu/hazards/research/qr/submitted/smythe_2013.pdf.

50. DOE SITUATION REPORT, *supra* note 47, at 3.

51. *NY Harbor*, *supra* note 48.

52. *See* U.S. ENERGY INFO. ADMIN., NEW YORK/NEW JERSEY INTRA HARBOR PETROLEUM SUPPLIES FOLLOWING HURRICANE SANDY: SUMMARY OF IMPACTS THROUGH NOVEMBER 13, 2012, at 1 (2012), *available at* http://www.eia.gov/special/disruptions/hurricane/sandy/petroleum_terminal_survey.pdf.

53. *NY Harbor*, *supra* note 48.

54. *Id.*; *see also* DOE SITUATION REPORT, *supra* note 47, at 2.

55. *See* NAT'L ASS'N FOR CONVENIENCE & FUEL RETAILING, *How Hurricane Sandy Affected the Fuels Industry*, *in* 2013 RETAIL FUELS REPORT 63, 64 (2013), *available at* http://www.nacsonline.com/YourBusiness/FuelsReports/GasPrices_2013/Pages/How-Hurricane-Sandy-Affected-the-Fuels-Industry.aspx.

56. *See* Ryan Hutchins, *Rising Tide of Concern over Fuel Spills*, STAR-LEDGER (Newark, N.J.), Nov. 14, 2012, at A3; News Release, N.J. Dep't of Envtl. Prot., Major Progress Made in Containing and Cleaning up Arthur Kill Fuel Spill Caused by Sandy (Nov. 12, 2012), *available at* http://www.nj.gov/dep/newsrel/2012/12_0144.htm.

57. Ryan Hutchins, *Oil Spills, Other Hurricane Sandy Damage Present N.J. with Potential Pollution Headaches*, STAR-LEDGER (Newark, N.J.) (Nov. 14, 2012), www.nj.com/news/index.ssf/2012/11/hurricane_sandy_oil_spills.html; *see also* Press Release, Nat'l Oceanic & Atmospheric Admin., Office of Response & Restoration, Post Hurricane Sandy, NOAA

the National Oceanic and Atmospheric Administration ("NOAA") reported, in Hurricane Sandy's wake "[p]etroleum products, biodiesel, and other chemicals were leaking into the waters from pollution sources such as damaged coastal industries, ruptured petroleum storage tanks, and sunken and stranded vessels."[58]

The federal government, in cooperation with the New Jersey Department of Environmental Protection, developed a natural resource damage assessment and a plan for restoring the environment.[59] Six months after Hurricane Sandy, Motiva entered into a settlement with the agencies, agreeing to undertake restoration work.[60]

C. *Yellowstone River Flooding and the Silvertip Pipeline*

Spills from oil pipelines are a substantial source of environmental releases and such spills can occur when rivers flood and riverbeds erode. A report issued by the Department of Transportation found that over the course of two decades, flooding and erosion led to the release of 2.4 million gallons of crude oil and other hazardous liquids into waters within the United States.[61]

One recent incident of this type occurred along the Yellowstone River in Montana. During the summer of 2011, snowmelt from the Rocky Mountains caused flooding throughout much of the Missouri River watershed, including a flood along stretches of the Yellowstone River of a severity that the National Weather Service estimated likely to repeat once every twenty-five to fifty years.[62]

Aids Hazardous Spill Cleanup in New Jersey and New York (Nov. 15, 2012), *available at* http://www.nj.com/newsindex.ssf/2012/11/hurricane_sandy_oil_spills.html.

58. Press Release, Nat'l Oceanic & Atmospheric Admin., Office of Response & Restoration, Sandy, One Year Later: Where Are We Now? (Oct. 29, 2013), *available at* http://response.restoration.noaa.gov/about/media/sandy-one-year-later-where-are-we-now.html.

59. *Id.*

60. *Id.*

61. Matthew Brown, *Floods Blamed for 16 Pipeline Spills*, DENV. POST (Jan. 3, 2013), http://www.denverpost.com/environment/ci_22304446/apnewsbreak-floods-blamed-16-pipeline-spills.

62. YELLOWSTONE RIVER CONSERVATION DIST. COUNCIL, YELLOWSTONE RIVER PIPELINE RISK ASSESSMENT AND FLOODPLAIN RECLAMATION PLANNING PROJECT: FINAL REPORT 1 (2012) [hereinafter YRCDC FINAL REPORT], *available at* nris.mt.gov/Yellowstone/Yellowstone_Pipeline_Report_2012.pdf; Sandra Zellmer, *Wilderness, Water, and Climate Change*, 42 ENVTL. L. 313, 327 (2012).

The Yellowstone River is the longest dam-free river in the United States, meandering between Wyoming and Montana, through Yellowstone National Park, and eventually joining the Missouri River near Burford, North Dakota.[63] The Yellowstone, renowned for its scenic beauty and high quality aquatic habitat, is home to one of the few remaining populations of the sensitive Yellowstone cutthroat trout, and the endangered pallid sturgeon.[64]

More than 13,000 miles of pipeline transporting crude oil and natural gas traverse Montana.[65] One of these pipelines, the Silvertip Pipeline, is operated by ExxonMobil and traces parts of the Yellowstone River's course, carrying crude oil almost seventy miles from Elk Basin, Wyoming to an oil refinery in Billings, Montana.[66]

During the 2011 summer floods, the Silvertip Pipeline ruptured near Laurel, Montana. The velocity and volume of water in the Yellowstone did not directly damage the pipeline.[67] Rather, officials believe the floodwaters eroded the riverbed beneath which the pipeline was buried, and once exposed, debris carried along by the river's current damaged the pipe.[68] ExxonMobil shut off the pipeline and stopped the flow of crude oil within about an hour, but during that time, 1500 barrels—or approximately 47,000 gal-

63. *See Yellowstone River: Detailed Waterbody Report*, MONTANA FISH, WILDLIFE & PARKS, http://fwp.mt.gov/fishing/guide/waterbodyDetail.html?llid=1039825479787 (last visited Feb. 18, 2014).

64. *See, e.g., Hearing on Silvertip Pipeline Oil Spill in Yellowstone Cnty., Montana, Before the Subcomm. on R.R.s, Pipelines & Hazardous Materials of the H. Comm. on Transp. & Infrastructure*, 112th Cong. 29 (2011) [hereinafter *House Hearing*] (testimony of Douglas B. Inkley); YRCDC FINAL REPORT, *supra* note 62, at 1; Robert E. Gresswell, *Biology, Status and Management of the Yellowstone Cutthroat Trout*, 31 N. AM. J. FISHERIES MGMT. 782, 782 (2011); *Yellowstone River: Detailed Waterbody Report*, *supra* note 63.

65. *House Hearing*, *supra* note 64, at 15 (testimony of Sen. Jon Tester). All told, the United States has more than 2.5 million miles of pipeline. *See id.* at 17 (testimony of Cynthia L. Quarterman, Administrator, PHMSA).

66. Press Release, U.S. Dep't of Transp. Pipeline & Hazardous Materials Safety Admin., U.S. Department of Transportation Proposes $1.7 Million in Civil Penalties for ExxonMobil for Yellowstone River Pipeline Failure (Mar. 25, 2013) [hereinafter PHMSA Penalty Proposal], *available at* http://www.phmsa.dot.gov/portal/site/PHMSA/menuitem.ebdc7a8a7e39f2e55cf2031050248a0c/?vgnextoid=df3b5c7ea789d310VgnVCM100000d2c97898RCRD&.

67. *See* Matthew Brown & Garance Burke, *Yellowstone Oil Spill: Exxon Mobil Took Longer to Seal Pipeline than Publicly Disclosed*, HUFFINGTON POST (July 7, 2011), http://www.huffingtonpost.com/2011/07/06/yellowstone-river-oil-spill-exxon-mobil_n_891246.html.

68. *Id.*

lons—of crude oil spilled into the Yellowstone River.[69] In the aftermath of the flood, crude oil was found as far as 240 miles downstream of the rupture.[70]

The spill disrupted the lives of those living along the banks of the Yellowstone River. One resident explained that due to oil fumes emanating from the river, "the only way I can breathe is to have all the windows open."[71] The spill also disrupted public and private water supplies drawn from the Yellowstone River, including that of Billings, Montana.[72] And crude oil released from the pipeline "fouled nearby agricultural fields, pasture and lawns along the banks."[73]

The rupture of the Silvertip Pipeline did not come without warning.[74] A nearby natural gas pipeline had similarly been damaged due to erosion from floods in 2009 and local government officials had raised concerns with representatives from the oil industry about further spills.[75] In 2010 and 2011, local government officials and federal regulators each contacted ExxonMobil to express specific concerns about the Silvertip Pipeline.[76] And just

---

69. *See* U.S. DEP'T OF TRANSP., PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., NOTICE OF PROBABLE VIOLATION, PROPOSED CIVIL PENALTY, AND PROPOSED COMPLIANCE ORDER 1–2 (2013) [hereinafter PHMSA NOTICE], *available at* http://phmhqnwas062.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Enforcement%20Decisions%20Files/PCO_03252013.pdf; Memorandum of Agreement Between the Natural Res. Trustees & ExxonMobil Pipeline Co. Governing Cooperative Tasks Related to the July 1, 2011 Oil Spill on the Yellowstone River, Mont. (Oct. 3, 2011), *available at* http://www.blm.gov/pgdata/etc/medialib/blm/mt/blm_information/yellowstoneoilspill.Par.80864.File.dat/8%20FINNAL%20Executed%20MOA%20ExxonMobil8-9-2012.pdf; *see also* Michael Berger, *Drill, Spill, and Bill: ExxonMobil, A Well Oiled Machine*, 12 J. INT'L BUS. & L. 327, 330 (2012) (reviewing STEVE COLL, PRIVATE EMPIRE: EXXONMOBIL AND AMERICAN POWER (2012)); Cally Carswell, *Yellowstone Leak Highlights a Different Kind of Oil Spill*, HIGH COUNTRY NEWS (Aug. 8, 2011), www.hcn.org/issues/43.13/yellowstone-leak-highlights-a-different-kind-of-oil-spill. The federal safety board charged with investigating the leak found that ExxonMobil's employees failed to notice the initial alarm that should have alerted them to the leak. PHMSA NOTICE, *supra*, at 2. The concomitant delay accounted for approximately 1000 barrels of the spill. *See id.*; *see also House Hearing*, *supra* note 64, at 21.

70. *See House Hearing*, *supra* note 64, at viii.

71. Brown & Burke, *supra* note 67 (internal quotation marks omitted).

72. *See House Hearing*, *supra* note 64, at viii. The EPA estimated that there were "hundreds of wells in the area." Press Release, U.S. Envtl. Prot. Agency, Update on Yellowstone River Oil Spill (Silvertip Pipeline) (July 10, 2011), *available at* http://yosemite.epa.gov/opa/admpress.nsf/20ed1dfa1751192c8525735900400c30/c14fbb2fe129ee16852578ca004b425b!OpenDocument.

73. PHMSA NOTICE, *supra* note 69, at 2.

74. *Id.* at 2–3.

75. *Id.* at 3.

76. *House Hearing*, *supra* note 64, at 4; PHMSA NOTICE, *supra* note 69, at 3. The administrator of the Pipeline and Hazardous Materials Safety Administration described the

weeks before the rupture, officials again alerted ExxonMobil of their concerns.[77] In response, on several occasions ExxonMobil "shut down the line for several hours to assess the situation but decided each time to resume operations."[78] As a result of these repeated warnings, the Federal Pipeline and Hazardous Materials Safety Administration ("PHMSA") alleged that "[t]he risk of flooding on the Yellowstone River was a known threat that could cause the pipe in the river to lose physical support and potentially rupture."[79]

In the wake of the spill, federal and state agencies cooperatively developed a corrective action plan and assessed natural resources damages pursuant to OPA and state law.[80] ExxonMobil spent an estimated $135 million carrying out the cleanup.[81] The federal government also proposed a $1.7 million civil penalty.[82] ExxonMobil has challenged the penalty, contending that the company took "reasonable precautions" to prevent the spill.[83]

II. OIL AND GAS REGULATION AND FLOOD RISK

This section describes a few of the legal regimes that address oil and gas development and explains how they affect activities

---

concerns thus: "I think the original concern was associated with the south river bank of the crossing, where there was a concern that there was erosion there. . . . We were concerned, not just with this particular pipeline, but with all the pipelines that were in flooded areas throughout the United States." *House Hearing*, *supra* note 64, at 20 (testimony of Cynthia L. Quarterman, Administrator, PHMSA).

77. *See* PHMSA NOTICE, *supra* note 69, at 3 (alleging officials from the city of Laurel approached the pipeline operators on June 24).

78. *Id.*

79. *Id.* at 5.

80. *See* U.S. BUREAU OF LAND MGMT., NOTICE OF INTENT TO CONDUCT RESTORATION PLANNING: JULY 1, 2011 YELLOWSTONE RIVER OIL SPILL 1 (2013), *available at* http://www.blm.gov/pgdata/etc/medialib/blm/mt/blm_information/yellowstoneoilspill.Par.5450.File.dat/10%20Notice%20of%20Intent%20to%20Conduct%20Restoration%20Planning.pdf; *see also* Violations of the Montana Water Quality Act by ExxonMobil Pipeline Company, at Silvertip Pipeline, No. WQA-12-08 (Mont. Dep't of Envtl. Quality Jan. 19, 2012) (order on consent), *available at* http://www.contractormisconduct.org/ass/contractors/23/cases/1740/2599/exxon-mobil-yellowstone-spill_state-settlement_order.pdf. Other documents related to the natural resources damages assessment are available at http://www.blm.gov/mt/st/en/info/yellowstonespill.html.

81. *Exxon Challenging $1.7M Penalty for Yellowstone River Pipeline Break*, MISSOULIAN (July 17, 2013), http://missoulian.com/news/state-and-regional/exxonchallenging-m-penalty-for-yellowstone-river-pipeline-break/article_ab2e1cb0-ef1c-11e2-a603-001a4bcf887a.html [hereinafter *Exxon Challenge*].

82. *See* PHMSA Penalty Proposal, *supra* note 66.

83. *Exxon Challenge*, *supra* note 81.

within floodplains. It is by no means comprehensive. Rather, these examples provide a sense of the approaches various state governments and the federal government have taken to address the issue. This section primarily focuses on regulations that directly address flood risks—such as restrictions on development activities within floodplains—although it also identifies some regulatory efforts that have incidental benefits for reducing vulnerability of oil and gas infrastructure to flood risks—such as rules requiring that oil and gas infrastructure be set back from water bodies.[84] As will be revealed, flood risk has not figured centrally into the regulation of oil and gas to date. Indeed, some states (like Colorado) impose no regulations on development within floodplains.

This section does not consider the considerable range of regulatory actions taken at the local level. Much land-use planning occurs through local zoning ordinances and other local laws. In recent years, a few local governments have aggressively regulated aspects of oil and gas development. For example, several Colorado towns have banned fracking within their borders.[85] Other local governments are slowly coming to the conclusion that they need new strategies to reduce vulnerability to natural hazards. In the wake of Hurricane Katrina, for example, Louisiana's Calcasieu Parish developed a multi-jurisdictional hazard mitigation plan in an effort to coordinate the regulatory activities of six communities within the parish.[86] The plan articulates its goal as "develop[ing] mitigation strategies that reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters."[87] Yet, notwithstanding encouragement from the federal government, local governments

84. Examples of rules with incidental benefits are rules requiring that infrastructure be set back from bodies of water. Such setback requirements do not directly address flood risks because the buffer requirement is measured from the banks of a stream or river, rather than from the floodplain. Moreover, the central focus of such rules tends to be concern that technological failures or accidents will release chemicals into the environment and that a setback will reduce the amount of those chemicals that will enter the waterbody.

85. Kristen Wyatt, *Three Front Range Cities Ban Hydraulic Fracturing*, DENV. POST (Nov. 6, 2013), http://www.denverpost.com/news/ci_24465840/3-front-range-cities-ban-hydraulic-fracturing.

86. CALCASIEU PARISH, OFFICE OF HOMELAND SEC. & EMERGENCY PREPAREDNESS, MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN 1 (2006), *available at* http://www.louisianaspeaks-parishplans.org/projectattachments/000740/Calca_DMA_0216-2006.pdf.

87. *Id.* at 2. The specific strategies for mitigating flooding included in the plan largely involve information generation, rather than adoption of new regulations. *Id.* at 123–24.

generally have done a poor job of deploying land-use laws to mitigate natural hazards.[88]

A. *Federal Law*

1. Oil Pollution Act of 1990

In the wake of the *Exxon Valdez* oil spill, Congress passed OPA to reduce the risk of spills from oil tankers and lessen barriers to imposing liability on entities responsible for such spills.[89] Much has been written about the advantages and foibles of OPA,[90] and Congress is considering modifications to the law to address issues that arose from the Deepwater Horizon oil spill.[91]

As relevant here, OPA imposes strict liability on those responsible for oil spills.[92] The law does not directly regulate oil and gas development in flood-prone locations. Rather, by imposing financial liability for spills, the law creates incentives for selecting locations, construction techniques, and operational procedures that minimize the risk of spills due to floods—at least to the extent that the risk-adjusted expected liability outweighs the cost of such locations, techniques, and procedures.[93] This liability will

---

88. *See* Pidot, *supra* note 22, at 216–18.

89. *See, e.g.*, 33 U.S.C. § 2702 (2006) (imposing strict liability on "each responsible party for a vessel or a facility from which oil is discharged"); 46 U.S.C. § 3703a (2006) (requiring double hulls for most oil tankers); *see also* Gabarick v. Laurin Mar. (America) Inc., 623 F. Supp. 2d 741, 744–45 (E.D. La. 2009) (outlining liability standards under OPA). OPA was not the first federal law addressing liability for oil spills. For a discussion of the history of such laws, see Kenneth M. Murchison, *Liability Under the Oil Pollution Act: Current Law and Needed Revisions*, 71 LA. L. REV. 917, 918–25 (2011). Other federal statutes, like the Clean Water Act, also prohibit discharge of oil into the environment. *See* 33 U.S.C. § 1321 (2006 & Supp. V 2012); 40 C.F.R. § 110.2 (2013); *see also* ENVTL. PROT. AGENCY OFFICE OF COMPLIANCE, PROFILE OF THE OIL AND GAS EXTRACTION INDUSTRY 81–98 (2000).

90. *See, e.g.*, Matthew P. Harrington, *Necessary and Proper, But Still Unconstitutional: The Oil Pollution Act's Delegation of Admiralty Power to the States*, 48 CASE W. RES. L. REV. 1 (1997); Lawrence I. Kiern, *Liability, Compensation, and Financial Responsibility Under the Oil Pollution Act of 1990: A Review of the Second Decade*, 36 TUL. MAR. L.J. 1 (2011); David H. Sump, *The Oil Pollution Act of 1990: A Glance in the Rearview Mirror*, 85 TUL. L. REV. 1101 (2011); Steven R. Swanson, *OPA 90 + 10: The Oil Pollution Act of 1990 After 10 Years*, 32 J. MAR. L. & COM. 135 (2001).

91. *See, e.g.*, Kiern, *supra* note 90, at 11–14.

92. 33 U.S.C. § 2702 (2006); *see also Gabarick*, 623 F. Supp. 2d at 744–45.

93. *See, e.g.*, Steven Shavell, *Liability for Harm Versus Regulation of Safety*, 13 J. LEGAL STUD. 357, 357 (1984). As Shavell explains, a strict liability rule will better lead to socially optimal levels of behavior. *Id.* at 359 (explaining that under a strict liability regime parties "are motivated to balance the true costs of reducing risks against the ex-

not, however, fully account for cleanup costs and natural resource damages caused by oil spills resulting from flooding or other natural disasters for at least three reasons.

First, OPA includes an "act of God" defense that eliminates liability where spills are caused by "unanticipated grave natural disaster or other natural phenomenon of an exceptional, inevitable, and irresistible character the effects of which could not have been prevented or avoided by the exercise of due care or foresight."[94] The contours of this defense are unclear, and courts have provided little guidance as to its application.[95] The Eastern District of Louisiana has, for example, suggested that "Hurricane Katrina may well be considered to have been an [a]ct of God,"[96] but that court also explained that a party seeking to invoke the act of God defense must demonstrate that it "took reasonable precautions under the circumstances as known or reasonably to be anticipated."[97] The executive branch of the United States government appears not to view Hurricane Katrina as necessarily triggering the act of God defense because the government has identified responsible parties for spills during the hurricane and initiated natural resource damage assessments.[98]

---

pected savings in losses caused").

94. 33 U.S.C. §§ 2701(1), 2703 (2006).

95. For a discussion of the act of God defense generally, see Jill M. Fraley, *Re-examining Acts of God*, 27 PACE ENVTL. L. REV. 669 (2010). The defense has rarely been considered in the context of OPA. In *Apex Oil Co. v. United States*, a United States district court affirmed an administrative determination that OPA's act of God defense did not apply where strong currents caused a barge to hit a bridge. 208 F. Supp. 2d 642, 646–47 (E.D. La. 2002). The administrative agency found that the currents—which resulted from flooding in the river—were not unanticipated, that the accident was preventable, and that the ship captain's decision to proceed with the voyage even knowing the conditions in the river constituted an independent cause of the accident. *Id.* In *United States v. J.R. Nelson Vessel, Inc.*, a United States district court found the owner of a vessel partially sunk during a "severe storm" liable under OPA. 1 F. Supp. 2d 172, 173–76 (E.D.N.Y. 1998). The court did not, however, accept the act of God defense because "[t]he defendants ma[de] no effort to establish that the storm was of such a magnitude" as required by OPA. *Id.* at 176 n.2. An unreported decision from the Eastern District of Pennsylvania suggests that an oil spill caused by a thunderstorm could potentially fall under the act of God defense. *See* Penn's Landing Marine Trade Ctr. Assocs. v. Coastal Eagle Point Oil Co., No. CIV.A.96-CV-2098, 1996 WL 547208 (E.D. Pa. Sept. 25, 1996) ("Because the spill occurred during a thunderstorm, litigation of the availability of an act of God defense could be a key factor in determining the outcome . . . .").

96. *In re* S. Scrap Material Co., 713 F. Supp. 2d 568, 578 (E.D. La. 2010).

97. *Id.* (quoting *In re* United States v. Steamship Joseph Lykes, 425 F.2d 991, 995 (5th Cir. 1970)) (internal quotation marks omitted).

98. *See* Mark Schleifstein, *Extent of Oil Spills from Hurricanes Katrina and Rita Is Still Being Assessed*, TIMES-PICAYUNE (Aug. 19, 2010), http://www.nola.com/katrina/in

Second, OPA caps total liability at $350 million for any "onshore facility" or "deepwater port."[99] The cap may be sufficiently high to cover many oil spills caused by flooding. But probably not all. For example, ExxonMobil spent $135 million in response to the 45,000 gallons of oil spilled as a result of the Silvertip Pipeline rupture.[100] This suggests that the costs of responding to the most severe spills, and repairing the resulting environmental damage, could easily exceed the caps. The potential gap between the total harm—environmental and economic—caused by a spill and the liability cap has stirred some controversy in recent years, and in response to the Deepwater Horizon oil spill, President Obama has suggested raising—but not eliminating—the liability caps.[101] These caps limit the expected liability faced by an oil and gas company, and thereby provide it with an inadequate incentive to use measures to avoid or mitigate flood risks that would otherwise be cost-justified. As Kenneth Murchison suggests, OPA's liability caps also raise equity concerns. "By immunizing companies engaged in producing and transporting oil against full liability for the losses associated with their activities," he writes, "[OPA] unfairly shifts the loss from the party benefitting from highly profitable economic activities to innocent individuals and property owners."[102]

Third, even the most technologically advanced response to an oil spill will leave significant amounts of oil in the environment, and even once that oil dissipates, the environmental consequences will persist for years.[103] That is why two decades after the *Exxon Valdez* spill, the environment had still not fully recovered.[104]

---

dex.ssf/2010/08/extent_of_oil_spills_from_2005_hurricanes_is_still_being_assessed.html.

99. 33 U.S.C. § 2704; *see* Murchison, *supra* note 89, at 931; *see also* Kiern, *supra* note 90, at 14.

100. *See The American Energy Initiative, Part 11: The Pipeline Infrastructure and Community Protection Act of 2011: Hearing Before the Subcomm. on Energy & Power of the H. Comm. on Energy & Commerce*, 112th Cong. 48 (2011) (statement of Rep. Henry A. Waxman, Member, Subcomm. on Energy & Power); David Jay, *ExxonMobil Expects MT Oil Spill to Cost Company* $135M, KPAX.COM (Nov. 4, 2011), http://www.ktvq.com/news/exxonmobil-expects-oilspill-to-cost-company-135-million/.

101. *See* Press Release, White House, Fact Sheet: Deepwater Horizon Oil Spill Legislative Package (May 12, 2010), *available at* http://www.whitehouse.gov/the-press-office/fact-sheet-deepwater-horizon-oil-spill-legislative-package.

102. Murchison, *supra* note 89, at 937.

103. *See, e.g.*, JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., R41531, DEEPWATER HORIZON OIL SPILL: THE FATE OF THE OIL 8–11 (2010).

104. *See* William Yardley, *Community's Recovery Still Incomplete After* Exxon Valdez *Spill*, N.Y. TIMES, May 6, 2010, at A27.

Moreover, some spills almost certainly go undetected, allowing responsible parties to avoid liability altogether. And finally, as demonstrated by the federal government's failure to yet complete its assessment for Hurricane Katrina-related spills, the OPA process can be prolonged and in some cases inconclusive. For these reasons, OPA liability creates only a muffled financial incentive for the oil and gas industry to consider the full risks associated with development decisions in flood-prone areas.

Because liability under OPA will, on average, fall below the cost of fully remediating environmental damage caused by oil spills, the industry will rationally decline to take some preventative measures where the benefits of those measures would exceed their costs. Such decisions against prevention will lead to more frequent and more severe oil spills, and the concomitant damage to human health, the economy, and the environment. OPA, then, is not a complete solution.

2. Federal Pipeline Safety Regulation

After pipeline accidents in 2010 and 2011, Congress passed the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011, to reauthorize PHMSA, the federal regulatory agency that oversees oil and gas pipelines, and to provide that agency with enhanced authority.[105] Paradoxically, the law also requires PHMSA to delay issuing any new regulation of pipelines for at least two years, undercutting the agency's ability to respond to recent spills.[106]

PHMSA promulgates regulations that set standards for oil and gas pipelines. These standards do not primarily impose requirements related to natural hazards. The regulations do require a pipeline operator to take unspecified action if the "operator determines that outside force [including floods] is a threat to the integrity of" the pipeline,[107] and also impose specific requirements when pipes cross rivers—which affects the likelihood of damage

105. *See* Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011, Pub. L. No. 112-90, 125 Stat. 1904, 1904 (2012); Susan A. Olenchuk et al., *Potential Impact of New Pipeline Safety Laws on PHMSA's Regulatory Initiatives*, PIPELINE & GAS J. (Apr. 2012), http://www.pipelineandgasjournal.com/potential-impact-new-pipeline-safety-laws-phmsa%E2%80%99s-regulatory-initiatives.

106. *See* Olenchuk, *supra* note 105.

107. 49 C.F.R. § 192.935(b)(2) (2012).

to pipes during flood events. The current regulatory requirement is that "all pipe installed in a navigable river, stream, or harbor" must be buried at least four feet below the river bottom, although this requirement has come under fire as inadequate to protect against rupture.[108] The regulations also require operators to monitor pipelines for leakage and report any spills that occur.[109] Finally, they require operators to install automatic or remote control valves to shut off pipelines if "an operator determines, based on a risk analysis" that such valves "would be an efficient means of adding protection to a high consequence area."[110]

As indicated by the regulations and illustrated by the discussion of the Silvertip Pipeline spill above, PHMSA relies heavily on operators to determine safe design practices and to monitor and address problems. Even after the 2013 reauthorization, the head of PHMSA's division charged with pipeline safety described the pipeline regulation as "kind of dying" and explained that the agency has "very few tools to work with."[111]

3. Federal Management in the Pinedale Anticline

The United States Bureau of Land Management ("BLM") manages oil and gas leasing and development within 700 million acres of federally owned mineral estate.[112] This accounts for a tremen-

---

108. *Id.* § 192.327(e); Nicas, *supra* note 33, at A3. The regulations permit a pipe to lie only two feet below the river bottom if it is covered in "consolidated rock." 49 C.F.R. § 197.327(e).

109. 49 C.F.R. § 191.23(a)(6) (requiring reporting of leaks); *id.* § 192.517(a)(7) (requiring recordkeeping of leaks); *id.* § 192.706 (requiring transmission line surveys for leaks).

110. *Id.* § 192.935(c).

111. Marcus Stern & Sebastian Jones, *Pipeline Safety Chief Says His Regulatory Process Is 'Kind of Dying'*, INSIDE CLIMATE NEWS (Sept. 11, 2013), http://insideclimatenews.org/news/20130911/exclusive-pipeline-safety-chief-says-his-regulatory-process-kind-dying.

112. The BLM administers the leasing of minerals found beneath the 258 million surface acres managed by the Bureau, 57 million surface acres where the minerals are Federally owned but the surface is non-Federal (mostly private) ownership, as well as another 385 million acres whose surface is managed by other Federal agencies.

Leasing of Onshore Federal Oil and Gas Resources, BUREAU OF LAND MGMT., U.S. DEPT. OF THE INTERIOR (Oct. 20, 2009), www.blm.gov/wo/st/en/prog/energy/oil_and_gas/leasing_of_onshore.html; *see also* 30 U.S.C. § 226(h) (2006) ("The Secretary of the Interior may not issue any lease on National Forest System Lands reserved from the public domain over the objection of the Secretary of Agriculture."); Wyo. Outdoor Council v. U.S. Forest Serv., 165 F.3d 43, 45 (D.C. Cir. 1999) ("The [Federal Onshore Oil and Gas Leasing Reform] Act divides responsibility and authority for the issuing of [oil and gas] leases be-

dous amount of oil and gas development. In 2012, BLM managed almost 50,000 leases, upon which more than 3000 new oil or gas wells were drilled.[113] BLM typically develops management plans for each unit under its control and those plans include plans for oil and gas development.[114] In fashioning these plans, the BLM is directed to "use and observe the principles of multiple use and sustained yield."[115]

In 2008, BLM revised one such plan that governs its management of the Pinedale Anticline, an area of almost 200,000 acres in western Wyoming that "is now considered the third-largest natural gas field in the United States."[116] The Green and New Fork Rivers, three perennial streams, and numerous ephemeral streams flow above the oil and gas resources contained within the Pinedale Anticline.[117] Prior to adoption of the 2008 revised plan, there were over 600 federally regulated wells producing oil and gas, some of which were drilled within one-hundred-year flood plains.[118] The revised plan envisions drilling more than 4000 wells within the area.[119]

Recognizing that the waterways that cross the Pinedale Anticline could flood, and that floods could impact natural gas wells and supporting infrastructure, BLM acknowledged as a foreseeable environmental consequences of its plan that "physical damage during flood events" constituted one of the "principal risks of pipeline operations that could lead to leaks/releases."[120] To reduce

---

tween the Secretary of Interior, acting through the Bureau of Land Management . . . and the Secretary of Agriculture, acting through the Forest Service.").

113. BUREAU OF LAND MGMT., SUMMARY OF ONSHORE OIL & GAS STATISTICS (2012), *available at* http://www.blm.gov/wo/st/en/prog/energy/oil-and-gas/statistics.html.

114. *See* 43 U.S.C. § 1712 (2006).

115. *Id.* § 1712(c)(1); *see* Theodore Roosevelt Conservation P'ship v. Salazar, 661 F.3d 66, 69 (D.C. Cir. 2011).

116. *Roosevelt P'ship*, 661 F.3d at 69; *see also* BUREAU OF LAND MGMT., REVISED DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PINEDALE ANTICLINE OIL AND GAS EXPLORATION AND DEVELOPMENT PROJECT 1-5 (2007) [hereinafter BLM SEIS DRAFT], *available at* http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/antidine/rd-seis.Par.87718.File.dat/00rd-seis.pdf.

117. BLM SEIS DRAFT, *supra* note 116, at 3-85 to 3-86.

118. *Id.* at 1-9, 3-109.

119. BUREAU OF LAND MGMT., RECORD OF DECISION, FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PINEDALE ANTICLINE OIL AND GAS EXPLORATION AND DEVELOPMENT PROJECT SUBLETTE COUNTY, WYOMING 4 (2008) [hereinafter BLM SEIS FINAL ROD], *available at* http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/anticline/rod.Par.50775.File.dat/00ROD.pdf.

120. BLM SEIS DRAFT, *supra* note 116, at 4-108 to 4-109. The plan suggests that peri-

this risk, as part of its management restrictions BLM provided that "federally-managed 100-year floodplains will have no permanent structures constructed within their boundaries unless it can be demonstrated on a case-by-case basis that there is no physically practical alternative. In cases where floodplain construction is approved, additional constraints could be applied."[121] It is unclear the extent to which BLM will grant such exceptions.

The rules BLM places on gas development within floodplains are not a perfect solution. They allow physical infrastructure within floodplains in some circumstances, and provide no protection against floods more severe than those expected to occur once every hundred years. That latter limitation may be of particular concern if climate change-induced perturbations in precipitation patterns lead to more frequent and more severe flooding in the Pinedale area. But BLM acknowledges concerns about flooding and has undertaken a modest effort to address the risks that flooding poses to oil and gas development.

B. *State Law*

1. Pennsylvania Law

Between 2008 and 2013, natural gas production in the Marcellus Shale, which underlies parts of Pennsylvania and West Virginia, became the single largest source of dry shale natural gas in the country.[122] In response to this boom in natural gas development, the Pennsylvania General Assembly adopted Act 13,[123] which creates state-wide regulation of drilling activities that imposes regulatory standards on development and simultaneously preempts zoning laws promulgated by local governments.[124] In December 2013, the Pennsylvania Supreme Court ruled that Act 13 unconstitutionally displaced local zoning efforts,[125] but the standard set under the law remains relevant, particularly be-

odic monitoring would "correct problems before failures occur." *Id.* at 4-109.

121. BLM SEIS FINAL ROD, *supra* note 119, at A-12.

122. *See* Press Release, U.S. Energy Info. Admin., Natural Gas Weekly Update (Jan. 9, 2014), *available at* http://www.eia.gov/naturalgas/weekly/archive/2014/01_09/index.cfm.

123. Act 13, 2012 Pa. Laws 87 (codified at 58 PA. CONS. STAT. §§ 2301–3504 (West Cum. Supp. 2013)).

124. *Id.*; *see* Andrew Maykuth, *What Pa. Court's Ruling on Gas-Drilling Law Means*, PHILA. INQUIRER, Dec. 22, 2013, at A1.

125. Maykuth, *supra* note 124, at A1.

cause the oil and gas industry has agreed to voluntarily abide by certain regulatory standards.[126]

Act 13 was widely viewed as a win for the oil and gas industry, which supported its passage.[127] The law standardized environmental requirements for drilling activities, but in so doing displaced any more protective local zoning rules.[128]

Aspects of Act 13 directly address flood risks, specifically regulating floodplains as delineated by the federal government as part of the National Flood Insurance Program.[129] Under the Act's provisions, wells may not be drilled within floodplains if the well site will include impoundments or storage tanks for produced water or other liquids associated with the drilling activity.[130] Act 13 allows the Pennsylvania Department of Environmental Protection to waive this restriction if it approves a plan to address flood risks that is supported by a commitment by the well operator to comply with best practices identified by the department.[131] Act 13 directs state environmental regulators to consider a variety of factors when reviewing and approving a well operator's water management plan.[132]

Other environmental standards included in Act 13 also offer some mitigation of the risks that floods pose to well pads. This occurs because the Act imposes buffer zones around certain environmentally sensitive areas. Wells may not be drilled within 1000 feet of water supply wells, and ordinarily may not be drilled within three hundred feet of streams and springs.[133] Such standards do not address flood risk directly, because depending on local to-

126. Timothy Puko, *Pennsylvania's Oil and Gas Drillers to Honor Act 13 Buffers*, PITT. TRIB.-REV. (Jan. 7, 2014), http://triblive.com/business/headlines/5370227-74/corbett-gas-oil?printerfriendly=true#axzz2rcO5sY2s.

127. *See* Bill Reed, *Major Parts of Pa.'s Natural-Gas Law Ruled Unconstitutional*, PHILA. INQUIRER, July 27, 2012, at A1. The President of the Marcellus Shale Coalition explained that organization's support for the law: "Lack of uniformity has long been an Achilles' heel for Pennsylvania and must be resolved if the commonwealth is to remain a leader in responsible American natural-gas development . . . ." *Id.* (internal quotation marks omitted).

128. 58 PA. CONS. STAT. §§ 2301–3504 (West Cum. Supp. 2013).

129. *Id.* § 3215(f). Where national flood maps do not exist, the Act defines the floodplain as up to 100 linear feet from the banks of a perennial stream and fifty linear feet from the banks of an intermittent stream. *Id.* § 3215(f)(5).

130. *Id.* § 3215(f)(1)(i)–(ii).

131. *Id.* § 3215(f)(3)–(4).

132. *Id.* § 3211(m)(2).

133. *Id.* § 3215(a)–(b)(1).

pography, these buffers may not track floodplains. The buffers do provide some benefit in this regard, however, because areas closest to streams and rivers are more likely to be subject to an increased risk of flooding.

Act 13 garnered the ire of the environmentalist community, and concerns about flooding animate one aspect of this concern. In an amicus brief filed before the Pennsylvania Supreme Court, Trout Unlimited, Inc. argued that the preemption provisions of Act 13 "eliminate a municipality's ability to protect natural resources under [the Pennsylvania Constitution], by usurping a municipality's local authority to regulate floodplain activities and by attempting to occupy the entire field of environmental regulation."[134] Trout Unlimited, Inc., specifically identified more protective floodplain regulations adopted by Pine Township as casualties of Act 13.[135] Supporters of Act 13 argued that it afforded more protection state-wide than the preexisting legal regime.[136]

As mentioned, the Pennsylvania Supreme Court invalidated parts of Act 13 as contrary to the Pennsylvania Constitution. The state has asked the court to reconsider its decision.[137]

2. Colorado Law

The State of Colorado imposes few restrictions on oil and gas development within floodplains. To the contrary, a statute addressing development within floodplains provides that "[o]pen space activities such as agriculture, horticulture, floriculture, recreation, and mineral extraction shall be encouraged in the floodplains,"[138] and as previously noted, Colorado law generally treats oil and gas as a species of mineral.[139] In other words, Colorado law

134. Brief for Trout Unlimited, Inc. as Amicus Curiae at 7, Robinson Twp. v. Commonwealth, 52 A.3d 463 (Pa. 2012) (No. 284 M.D. 2012), 2012 WL 8685071; *see also Update: Where PA Stands with Act 13*, PA. CAMPAIGN FOR CLEAN WATER (Dec. 3, 2012), http://www.pacleanwatercampaign.org/gasdrilling/update-where-pa-stands-with-act-13/.

135. Brief for Trout Unlimited, Inc., *supra* note 134, at 3–4.

136. *See, e.g.*, Reed, *supra* note 127; Dave Spigelmyer, Letter to the Editor, *Limiting Benefits*, PHILA. INQUIRER, Jan. 1, 2014, at A19; *see also* PA. CAMPAIGN FOR CLEAN WATER, *supra* note 134.

137. *See* Don Hopey, *Corbett Administration Asks Justices to Reconsider Act 13*, PITT. POST-GAZETTE, Jan. 2, 2014, at B1.

138. *Supra* note 23 and accompanying text.

139. *Supra* note 24 and accompanying text.

suggests that oil and gas development is a preferred use of floodplains.

In 2012, COGCC, which is the primary state agency charged with regulating oil and gas development, adopted new "setback rules" that prohibit the drilling of oil and gas wells within certain distances from dwellings and certain other buildings.[140] Notably, the rules do not require operators to distance well pads and their supporting infrastructure from rivers or streams. They do, however, require that "[a]ll equipment at drilling and production sites in . . . floodplain areas shall be anchored to the extent necessary to resist flotation, collapse, lateral movement, or subsidence."[141]

In the wake of flooding in September 2013, COGCC has issued "recommended practices" for reconstruction of oil and gas wells and their supporting infrastructure within floodplains.[142] These practices are voluntary, and do not discourage development within floodplains. Rather, the guidelines identify construction techniques and materials that COGCC identified as holding up well during the flood event.

III. OBSTACLES TO DISASTER POLICY

The preceding sections provide examples of the threat that floodwaters pose to the infrastructure necessary to extract, transport, refine, and store oil and gas, and also of existing state and federal policies that serve to mitigate, at least marginally, that threat. If, as we have seen, oil spills caused by flooding are among the most serious that occur, why do political leaders lavish attention on these events in formulating public policy, while vir-

140. *See* Final Setback Rules, Cause No. IR, Docket No. 1211-RM-04, Colo. Oil & Gas Conservation Comm'n (codified in scattered sections of COLO. CODE REGS. §§ 404-1:100, -1:300, -1:600, -1:800), *available at* http://cogcc.state.co.us/RR_HF2012/Setbacks/FinalRules/Final_SetbackRules.pdf.

141. *Id.* at § 603.g.

142. *See generally* COLO. OIL & GAS CONSERVATION COMM'N, RECOMMENDED PRACTICES FOR FLOOD IMPACT ZONE RECONSTRUCTION (2013), *available at* http://cogcc.state.co.us/Announcements/Hot_Topics/Flood2013/RecommendedPracticesFlood%20Impact%20Zone-20131021.pdf.

tually ignoring spills that involve natural forces?[143] This section attempts to provide some insight into that question.

A. *Symbolic, Cognitive, and Structural Dimensions of Disaster Policy*

In a previous work, I developed a theoretical framework explaining existing deficits in public policy governing development in areas subject to natural hazards.[144] I identified three categories of obstacles to sound disaster policy: symbolic obstacles, cognitive obstacles, and structural obstacles.[145] These obstacles interact and reinforce each other, impairing the ability of government decision-makers to craft public policy to address the problems posed by natural disasters.[146] Here, I briefly recount this theoretical framework before considering the particular dimensions of the oil and gas industry.

Symbolic obstacles to disaster policy emerge out of the way that natural disasters are conceived of in the national consciousness. Natural disasters are commonly framed as "acts of God" or "acts of nature," imbuing the forces themselves with perceived agency.[147] This framing occurs in part through media accounts of natural disasters, which often depict areas struck by natural disasters as war zones and natural forces as an invading enemy.[148] Political leaders and advocacy groups similarly deploy the language of

143. *See, e.g.*, Kiern, *supra* note 90, at 8–10. Lawrence Kiern, a retired captain in the United States Coast Guard, contrasted the spill from the *Cosco Busan* oil tanker in San Francisco Bay and the Silvertip Pipeline rupture along the Yellowstone River explaining that the former "captured extensive media attention, prompted congressional hearings, and resulted in criminal convictions for both the vessel-operating company and the pilot," while the Silvertip Pipeline spill "attracted only modest media attention and appeared to be handled as a routine response by both the responsible party and government officials." *Id.* at 1, 8–9.

144. Pidot, *supra* note 22, at 213.

145. *Id.* at 218.

146. *Id.* at 218–19.

147. *Id.* at 227, 230.

148. *See, e.g.*, *Deadly Joplin Tornado Was One Year Ago*, MILWAUKEE J. SENTINEL, May 22, 2012, at C8 (describing the site of the tornado as "a bombed-out city in a war zone"); Calvin Adkins, *Town Un-Common*, DAILY SOUTHERNER (Tarboro, N.C.) (Aug. 31, 2011), http://www.dailysoutherner.com/x803539061/TOWN-UN-COMMON (stating that the site of the hurricane "looked like a war zone"); Ron Scherer, *After the Snowstorm: Power Outages Mean No Heat, No Trick-or-Treating*, CHRISTIAN SCI. MONITOR (Oct. 31, 2011), http://www.csmonitor.com/USA/2011/1031/After-the-snowstorm-Power-outages-mean-no-heat-no-trick-or-treating (stating that the site of the blizzard "resembles a war zone").

armed conflict to discuss natural disasters.[149] While there are superficial similarities between areas enmeshed in armed conflict and those suffering the aftereffects of a natural disaster, the metaphor is rather inapt. As I have explained: "Nature does not attack strategically or with malice like human foes, and responsibility for the damage caused by natural events lies in no small part with individuals that build in areas subject to natural hazards and the policymakers that facilitate this activity."[150]

Reliance on the metaphor of armed conflict to describe and understand natural disasters has real world consequences. Within that metaphor, anything short of reconstructing that which has been lost or damaged amounts to surrender. In other words, to secure victory when disaster strikes, society responds with a "knee-jerk reaction . . . to rebuild the same roads and bridges that existed before and bigger, more expensive homes."[151] The symbolism of armed conflict and social resistance to disaster incites people to rebuild in the path of hurricanes, floods, and other disasters rather than retreat[152]—and encourages the government to implicitly support such activity through policy[153]—even when such activities are likely not the best course of action.

Cognitive obstacles likewise impede sound disaster policy. The basic architecture of the human brain shapes perceptions of risk.[154] Scientists have uncovered numerous mental shortcuts—often referred to as heuristics—that influence thinking.[155] Several

149. *See* Pidot, *supra* note 22, at 232–33; *see also* John Schwartz & Campbell Robertson, *Hurricane Gains Power and Hits Louisiana Coast*, N.Y. TIMES, Aug. 29, 2012, at A1 (quoting New Orleans Mayor Mitch Landrieu as Hurricane Isaac approached New Orleans as saying "[w]e are officially into the fight, and the city of New Orleans is now on the front lines") (internal quotation marks omitted); *Advertisement*, N.Y. TIMES, Aug. 29, 2011, at A11 (advertisement in support of federal disaster insurance program describing "Mother Nature" as a terrorist).

150. Pidot, *supra* note 22, at 225; *see also* Richard J. Lazarus, *Environmental Law After Katrina: Reforming Environmental Law by Reforming Environmental Lawmaking*, 81 TUL. L. REV. 1019, 1021 (2007) ("Mother Nature is not humankind's enemy. Nor is Mother Nature invariably our friend. . . . Mother Nature simply 'is.'").

151. Kate Spinner, *Girding Nation for Weather Extremes*, SARASOTA HERALD-TRIB., Jan. 27, 2012, at BN1.

152. *See, e.g.*, J. Peter Byrne & Jessica Grannis, *Coastal Retreat Measures*, *in* THE LAW OF ADAPTATION TO CLIMATE CHANGE 267, 270 (Michael B. Gerrard & Katrina F. Kuh eds., 2012).

153. *See generally* Sun, *supra* note 9.

154. *See* Pidot, *supra* note 22, at 235–36.

155. For general treatments of heuristics, see HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT (Thomas Gilovich et al. eds., 2002); Amos Tversky &

such shortcuts occlude thinking about natural disasters and the risks they pose. First, people often perceive low-probability events as essentially impossible—even low-probability events with objectively severe consequences like floods or hurricanes—which consequently leads individuals not to plan for them.[156] Second, the "gambler's fallacy"—that is, the belief that a recent unlikely event is even less likely to recur in the near future[157]—leads individuals and government entities to over-invest in reconstruction in the wake of a disaster based on a mistaken assumption that a period of repose and relative safety will follow. Third, the "availability heuristic"—which causes individuals to estimate the likelihood of an event transpiring based on the ease with which examples of similar events come to mind[158]—may also cause individuals and policymakers to discount disaster risks. As the memories of a disaster recede in time, they become more difficult to recall, and as a result, individuals will perceive the risks to be lessened. Another variant of the availability heuristic may also lead people to tailor their behavior to that of those around them. When people see others living and working in areas susceptible to disaster, they may themselves underestimate concerns regarding safety,[159] and their complacency may undermotivate government officials to institute sufficiently responsive policies. Fourth, the "affect heuristic" causes individuals to conflate the risks posed by a decision with the emotional desirability of that decision.[160] In other words, if a particular course of action—buying a house on the beach, for

---

Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCI. 1124 (1974).

156. *See, e.g.*, Howard Kunreuther & Mark Pauly, *Neglecting Disaster: Why Don't People Insure Against Large Losses?*, 28 J. RISK & UNCERTAINTY 5, 5 (2004); Howard Kunreuther et al., *Making Low Probabilities Useful*, 23 J. RISK & UNCERTAINTY 103, 104 (2001); Paul Slovic et al., *Preference for Insuring Against Probable Small Losses: Insurance Implications*, 44 J. RISK & INS. 237, 254–55 (1977). *But see* Susan Laury et al., *Insurance Decisions for Low-Probability Losses*, 39 J. RISK & UNCERTAINTY 17, 18 (2009) (presenting data from an experiment indicating that "individuals are more likely to purchase insurance for the higher-consequence, lower-probability events").

157. *See* Stephen P. Stich & Richard E. Nisbett, *Justification and the Psychology of Human Reasoning*, 47 PHIL. OF SCI. 188, 192–93 (1980) (explaining gambler's fallacy); *see also* Tristram McPherson, *Moorean Arguments and Moral Revisionism*, 3 J. ETHICS & SOC. PHIL. 1, 20 (2009) ("Ordinary reasoners display robust endorsement of irrational inference patterns such as the gambler's fallacy . . . .").

158. *See* Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1477 (1998) (explaining availability heuristic).

159. *See* Timur Kuran & Cass R. Sunstein, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683, 711–13 (1999) (discussing social framing of risk perception).

160. *See* Melissa L. Finucane et al., *The Affect Heuristic in Judgments of Risks and Benefits*, 13 J. BEHAV. DECISION MAKING 1, 2 (2000).

example—is emotionally appealing, that course of action will be perceived as safe. And fifth, people over-estimate the danger posed by human-caused risks in contrast to risks perceived as natural.[161] In other words, all things being equal, an individual is likely to believe that the risks of an oil tanker running aground exceed the risks associated with flooding.

These various cognitive errors "influence policymakers individually and also shape the public's appetite for regulation."[162] As a result of their operation, natural disaster risk may seem less urgent and less necessary to address than other problems facing the government. This leads to a regulatory environment that favors development in hazard-prone areas notwithstanding that such development is itself in harm's way and, in certain circumstances, developing areas subject to natural hazards magnifies risks to nearby property.[163]

Finally, structural obstacles prevent the effectuation of sound disaster policy.[164] Such barriers arise out of the institutional arrangements that make up American government. One such obstacle lies in the vertical relationship between local, state, and federal governments and the resulting imbalance in incentives between these governmental entities' respective responsibilities for disaster policy.[165] Local governments primarily regulate land uses within their boundaries, and therefore serve as the primary regulator of development in areas subject to natural hazards.[166]

---

161. Kuran & Sunstein, *supra* note 159, at 687–88, 709.

162. Pidot, *supra* note 22, at 241.

163. *Id.* at 243.

164. *Id.* at 222.

165. *Id.*; *see also, e.g.*, Ben Depoorter, *Horizontal Political Externalities: The Supply and Demand of Disaster Management*, 56 DUKE L.J. 101, 104 (2006). Dispersal of authority across federal, state, and local governments also has substantial ramifications for rescue efforts, law enforcement, and humanitarian response in the wake of a natural disaster. *See generally* Stephen M. Griffin, *Stop Federalism Before It Kills Again: Reflections on Hurricane Katrina*, 21 ST. JOHN'S J. LEGAL COMMENT. 527 (2007) (discussing local, state, and federal responses to Hurricane Katrina).

166. Raymond J. Burby, *Hurricane Katrina and the Paradoxes of Government Disaster Policy: Bringing About Wise Governmental Decisions for Hazardous Areas*, 604 ANNALS AM. ACAD. POL. & SOC. SCI. 171, 178–81 (2006); Pidot, *supra* note 22, at 244–47. The federal government influences local regulatory decisions with respect to floodplains through the minimum standards it sets for a community to be eligible for coverage by the National Flood Insurance Program. *See* 44 C.F.R. § 60.3(c) (2011) (requiring certain regulatory restrictions in designated floodplains); *see also* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-10-631T NATIONAL FLOOD INSURANCE PROGRAM: CONTINUED ACTIONS NEEDED TO ADDRESS FINANCIAL AND OPERATIONAL ISSUES 4 (2010), *available at* http://www.gao.gov/new.items/d10631t.pdf (providing background on the National Flood Insurance Program).

Local governments, however, also have significant financial incentives to maximize development within their borders because of the tax revenue and fees such development generates.[167] The federal government, on the other hand, picks up much of the tab when natural disasters occur. Following a federal disaster declaration, payments under the Stafford Act reimburse state and local governments for 75% or more of the cost of rebuilding public infrastructure and the Act also provides substantial financial assistance to affected individuals and businesses.[168] In other words, local governments reap benefits from allowing risky development to proceed but incur few costs when such development is damaged or destroyed by natural disasters.

Another structural dimension of disaster policy arises out of the horizontal relationship among local governments. "Because natural boundaries often span political boundaries, the benefits and costs of one jurisdiction's development policies may be displaced onto neighboring jurisdictions."[169] This occurs because over-development of floodplains, for example, enhances flood risks downstream. For example, development decisions of Canadian towns along the headwaters of the Columbia River influence flood risks experienced downstream in Washington and Oregon.[170]

The problems created by both vertical and horizontal relationships between government entities may be exacerbated by government capture. As discussed in a previous work:

> That is because the cost of bad policy is both broadly distributed (to federal taxpayers, for example) and unpredictable, while the benefits of bad policy are highly concentrated in a few highly organized and well-funded industries. Public choice theory suggests that in such circumstances, policymakers disproportionately favor the interests of the few, even if doing so undermines social welfare. This means that even where ample information about disaster risk exists, there may be "no politically powerful constituency ready to support legislators

167. *See* Pidot, *supra* note 22, at 246–47.

168. *See* 42 U.S.C. §§ 5121–5207 (2006); *see also* Thomas Frank, *'Disasters' Strain FEMA's Resources: Rising Use of Federal Relief Depletes Funds for Damage from Large Storms*, USA TODAY, Oct. 24, 2011, at 1A.

169. Pidot, *supra* note 22, at 250.

170. International rivers like the Columbia have spawned complex treaties to deal with management issues. *See, e.g.*, Barbara Cosens, *Resilience and Law as a Theoretical Backdrop for Natural Resource Management: Flood Management in the Columbia River Basin*, 42 ENVTL. L. 241, 243 (2012).

and agency officials" advocating for policies to reduce disaster vulnerability.[171]

These three categories of obstacles interact and amplify one another, further impeding policymaking, and the history of disaster policy suggests that efforts to respond to any one obstacle will likely fail.[172] Understanding both the individual and cumulative effects of these obstacles is necessary to improve the practical effects of any public policy. The next section considers how these obstacles may play out in the context of development of oil and gas infrastructure.

B. *Obstacles to Sensible Disaster Policy for Oil and Gas Infrastructure*

Symbolic, cognitive, and structural obstacles lead to too little regulation of and too much development within hazard-prone areas like floodplains. These same dynamics infect public policy surrounding location, design, and operations of oil and gas infrastructure, including that infrastructure necessary for production, transportation, and refining. This section considers unique dimensions of this economic sector that may bear on the application of the general theory of overdevelopment explained above.

Symbolic obstacles may influence perceptions of oil and gas spills caused by flooding, and thereby, the appropriate policy responses to such events. This may occur, in part, because oil and gas companies may try to situate themselves within the prevailing cultural understanding of natural disasters as the consequence of nature's actions to shift blame away from themselves. For example, in the wake of Hurricane Katrina and a one million gallon spill at one of its refineries in Louisiana, Murphy Oil claimed that the incident was an act of God to avoid blame, and

171. Pidot, *supra* note 22, at 252 (footnotes omitted); *see also* ROBERT R. M. VERCHICK, FACING CATASTROPHE: ENVIRONMENTAL ACTION FOR A POST-KATRINA WORLD 54–56 (2010); Depoorter, *supra* note 165, at 108–09; Lazarus, *supra* note 150, at 1045.

172. The National Flood Insurance Program, for example, can be viewed as an effort to correct misperceptions of risk due to cognitive errors because pricing risk can debias risk perception. The program has, however, failed to deter development in flood-prone areas and has a history of systematically mispricing insurance policies. *See, e.g.*, JESSICA GRANNIS, GEO. CLIMATE CTR., ANALYSIS OF HOW THE FLOOD INSURANCE REFORM ACT OF 2012 (H.R. 4348) MAY AFFECT STATE AND LOCAL ADAPTATION EFFORTS 4–5 (2012), *available at* http://www.georgetownclimate.org/sites/default/files/Analysis%20ofo/o20the%20Flood%20Insurance%20Reform%20Act%20ofo/o202012.pdf.

some local government officials also expressed that sentiment.[173] Similarly, after the 2013 Colorado floods, Tisha Schuller, the President of the Colorado Oil and Gas Association defended the oil and gas industry against charges that it was inadequately prepared for flooding by contending "[i]t was chaos . . . [y]ou can't plan for that. You just have to be flexible and responsive."[174] In so doing, Schuller did not expressly invoke the metaphor of armed conflict or imbue nature with independent agency. But her remarks distance the industry from any responsibility and do so in the context where the symbolism of natural disasters was already present in the public consciousness.[175] Regulators have noted a significant difference in public attention paid to oil spills caused by accidents and those caused by natural disasters, and this difference in attention may result from more general perceptions of natural disasters. In the wake of Hurricane Sandy, for example, a spokesperson for the New Jersey Department of Environmental Protection commented that the agency was dealing with "a major spill . . . [and] [o]n a normal basis, we would have had quite a bit of uproar and media attention."[176] Because the spill occurred during a severe storm, the public and the media largely neglected the spill.

Symbolic obstacles to sensible regulation of oil and gas infrastructure in flood zones may operate with additional force because energy production is viewed as an important matter of national security.[177] Enemies of the United States have recognized

---

173. John M. Biers, *St. Bernard Questions the Costs of Being a Refinery Town*, DOW JONES NEWSWIRES (Dec. 28, 2005), http://global.factiva.com/hp/printsavews.aspx?pp=Print&hc=All.

174. Mark Jaffe, *State to Look at Spill Efforts*, DENV. POST, Oct. 6, 2013, at 7K.

175. *See, e.g.*, Charlie Brennan & John Aguilar, *Eight Days, 1,000-Year Rain, 100-Year Flood*, BOULDER DAILY CAMERA (Sept. 22, 2013), http://www.dailycamera.com/news/boulder-flood/ci_24148258/boulder-county-colorado-flood-2013-survival-100-rain-100-year-flood (explaining that Boulder residents tried to sleep through the night of the flood "while Mother Nature raged outside"); Bruce Finley, *Colorado Flooding: Evacuations, Broken Oil Pipeline in Weld County*, DENV. POST (Sept. 14, 2013), http://www.denverpost.com/environment/ci_24095949/colorado-flood-evacuations-broken-oil-pipeline-weld-county (quoting Weld County Commissioner Barbara Kirkmeyer as saying "[w]e are in round three of Team Weld County versus mother nature"); John M. Glionna & Jenny Deam, *3 Die in Colorado Flooding: Torrential Rain Swells Rivers, Shuts Highways; Governor Declares Disaster*, CHI. TRIB., Sept. 13, 2013, at C12 (describing images of the Colorado floods as "show[ing] a state at the mercy of Mother Nature.").

176. Hutchins, *supra* note 57.

177. *See, e.g.*, Senator Barack Obama, Remarks at the Governor's Ethanol Coalition, Energy Security Is National Security (Feb. 28, 2006), *available at* http://obamaspeeches.com/054-Energy-Security-is-National-Security-Governors-Ethanol-Coalition-Obama-Speec

the vital importance of energy and targeted it as a result.[178] For example, Osama bin Laden urged his followers to disrupt the United States' oil supply because, he claimed, that would "cause [the United States] to die off."[179] Because energy infrastructure lies in the crosshairs of actual armed enemies of the United States, it becomes easy to conflate natural disasters that disrupt energy supply with terrorism.[180]

At the same time, the power of symbolic obstacles may be lessened in some circumstances when natural disasters damage or disrupt oil and gas infrastructure. Society expects more foresight from large, highly sophisticated economic actors, and may be particularly willing to assign culpability to energy companies where risks are recognized. Consider, for example, the rupture of ExxonMobil's Silvertip Pipeline along the Yellowstone River.[181] The rupture occurred during a significant flood event, but nonetheless responsibility was largely assigned to the company, no doubt in part because local government officials had expressed concern about risks on numerous previous occasions.[182] As a result, the Silvertip Pipeline spill appears to have been viewed primarily as an oil spill rather than a flood event.[183]

Oil companies may also have sufficiently deep pockets to attract litigation by those harmed by oil spills, or natural disasters more generally, undercutting claims that spills are solely attributable to nature.[184] Despite Murphy Oil's attempts to frame oil spills during Katrina as an act of God, several lawsuits were filed

---

h.htm.

178. *See id.* (citing Al Qaeda and Osama Bin Laden as examples of enemies of America targeting energy supply).

179. *Id.*

180. *See Venezuela Bolsters Oil Security After Threat*, NBC NEWS (Feb. 15, 2007), http://www.nbcnews.com/id/17149034/#.UuF9HWQo41J.

181. *See supra* Part I.C.

182. The investigating federal agency concluded that "[t]he risk of flooding on the Yellowstone River was a known threat that could cause the pipe in the river to lose physical support and potentially rupture." PHMSA NOTICE, *supra* note 69, at 5.

183. *Cf.* Kiern, *supra* note 90, at 9 (noting that the Silvertip Pipeline spill "attracted only modest media attention and appeared to be handled as a routine response by both the responsible party and government officials").

184. For example, in the wake of Hurricane Katrina, one lawsuit alleged that oil companies and others contributed to global warming, thereby magnifying the storm and rendering the companies liable for the damage it caused. *See* Comer v. Murphy Oil USA, 585 F.3d 855, 859 (5th Cir. 2009).

against it and other oil companies.[185] One of the plaintiffs' lawyers explained that oil companies were responsible because

> [t]heir years of negligence and callous indifference to the marshland ecology led to Katrina's disastrous consequence. These companies together destroyed over 100 miles of terra firma . . . and [it's] time now for a just reckoning of the devastating outcome of their quest for profits over the safety of the people and destruction of property.[186]

The lawyer's comments are, of course, driven by his interest in succeeding in the underlying lawsuit. Nonetheless, they indicate a willingness to blame large oil companies for the consequences of natural disasters that is starkly different than society's ordinary orientation to the events.

In addition to symbolic obstacles, cognitive obstacles may be at play, although they may affect the decision-making of large energy companies less than that of individuals deciding where to live or operate a small business. The energy sector is dominated by large, repeat players,[187] and each individual company has a broader set of experiences to draw from in assessing risk than individuals and local government officials. This experience may, to some extent, counteract cognitive biases that would otherwise result in skewed perceptions of risk. To put that in the language of cognitive psychology, a broad set of experiences may dampen the effects of the availability heuristic because examples will more easily come to mind.

Where, however, oil and gas companies lease the land of private individuals to drill wells, those individual landowners may lack adequate information or experience to counteract cognitive processes that discount unlikely, high severity risks.[188] This may lead individual landowners to make economically irrational deci-

---

185. *See, e.g., id.*; Turner v. Murphy Oil USA, Inc., 234 F.R.D. 597, 601 (E.D. La. 2006); *see also* Fritz Esker, *Hurricane Katrina Fallout Sparks Class-Action Lawsuit Craze*, NEW ORLEANS CITYBUSINESS, Nov. 28, 2005, at 22.

186. *Hurricane Katrina Class Action Lawsuit Filed Against Major Oil Companies*, SUSTAINABLEBUSINESS.COM (Sept. 23, 2005), http://www.sustainablebusiness.com/index.Cfm/go/news.display/id/7253.

187. *See* Christopher Helman, *The World's Biggest Oil Companies, 2013*, FORBES (Nov. 17, 2013), http://www.forbes.com/sites/christopherhelman/2013/11/17/the-worlds-biggest-oil-companies-2013/.

188. In some circumstances, state law may provide oil and gas companies with tools to essentially force private owners to enter into leases through pooling rules. *See* Mark Jaffe, *Colorado Property Owners Faced with Possibility of Being Forced into Drilling Plans*, DENV. POST (Aug. 14, 2011), http://www.denverpost.com/ci_18678240.

sions to lease land and also resist regulatory efforts that might disrupt such arrangements. This dynamic is particularly troubling because in the event of an oil or gas spill, the individual landowner may face more of the consequences than the oil or gas developer, particularly if the spill results in reduction in the value of the property.[189]

Finally, structural obstacles operate in this context in much the way they do with respect to disaster policy generally. Local governments remain relatively insulated from the costs of recovering from natural disasters, and the potential to become the next oil and gas boomtown may encourage lax regulatory standards.[190] That is not to say that local governments will always embrace oil and gas development. In recent years, cities and counties across the country have debated the risks of allowing fracking within their borders.[191] These debates, however, rarely focus on risks from natural disasters, but rather, revolve around concern that fracking technology can itself lead to environmental contamination.[192] In this way, the debate over fracking tracks research that demonstrates that people typically perceive technological risks as more dangerous than natural risks.[193]

One difference between the structural dimensions of regulation of the oil and gas industry and that of other sectors of the economy is that the federal government regulates more extensively in this arena and could, therefore, play a bigger role in preventing or

189. Terms in the lease may require the oil and gas operator to compensate the landowner for any damage caused to the surface. *See* JOHN B. MCFARLAND, CHECKLIST FOR NEGOTIATING AN OIL AND GAS LEASE 17–18, *available at* http://www.gdhm.com/images/pdf/jbm-ogleasechecklist.pdf (warning that companies "try to get the surface owner to sign a release, and the release may relieve the oil company from liability for damages that go beyond those reasonable and necessary for the development of the leased premises") (last visited Feb. 18, 2014).

190. *See* Kevin Begos, *Fracking for Natural Gas Still Controversial, but Bringing Windfall of Revenue to Some Rural Areas*, OREGONLIVE (Jan. 12, 2014), http://www.oregonlive.com/business/index.ssf/2014/01/fracking_for_natural_gas_still.html.

191. Andrea Iglar, *South Fayette Drilling Hearing Postponed*, PITT. POST-GAZETTE (Jan. 16, 2014), http://www.post-gazette.com/local/west/2014/01/16/Drilling-hearing-postponed.print; Kristen Wyatt, *3 Front Range Cities Ban Hydraulic Fracturing*, DENV. POST (Nov. 6, 2013), http://www.denverpost.com/news/ci_24465840/3-front-%20range-cities-ban-hydraulic-fracturing.

192. *See* Valerie Richardson, *California's Patagonia Jumps into Campaign for Colorado Fracking Ban*, COLO. OBSERVER (Dec. 12, 2013), http://thecoloradoobserver.com/2013/12/californias-patagonia-jumps-into-campaign-for-statewide-fracking-ban/.

193. GISELA WACHNIGER & ORTWIN RENN, RISK PERCEPTION AND NATURAL HAZARDS 16–18 (2010), *available at* http://caphaz-net.org/outcomes-results/capHaz-Net_wp3_risk_perception2.pdf.

controlling development in floodplains. Federal regulations already include standards for oil and gas pipelines traversing rivers—albeit standards that are the subject of criticism for being insufficiently protective.[194] Nonetheless, most decisions about the location of oil and gas infrastructure are made at the state or local level.

Contrasting federal and state rules for locating oil and gas infrastructure provides some evidence of the importance of structural obstacles. In the Pinedale Anticline, BLM prohibits development within floodplains barring a site-specific determination that "no physically practical alternative" exists.[195] In contrast, Colorado law identifies oil and gas development as an appropriate use for floodplains and the state regulatory agency has adopted no restrictions on such development.[196] This pattern conforms to expectations: the federal government faces more of the financial burden of natural disasters than the state government and, therefore, would be expected to regulate more protectively. Pennsylvania's Act 13 demonstrates, however, that states may be willing to limit development in floodplains in some circumstances, particularly where industry groups support state regulation as a means of preempting local zoning control.

The size and economic power of oil and gas companies also present the potential for government capture, similar to that observed in other contexts, particularly because the potential consequences of oil spills caused by natural disasters may be diffuse.[197] In some circumstances, capture is even more likely because regulatory agencies are charged with both regulating oil and gas development and promoting it.[198] While not specifically addressing disaster risk, this conflict of interest may skew a regulatory agency's incentives to develop appropriate regulation of oil and gas development.

---

194. Nicas, *supra* note 33. The federal standard requiring at least four feet of cover between a pipeline and a river bottom is strikingly small in light of evidence that a single year of flooding along the Missouri River deepened the river by up to forty-one feet. *Id.*

195. BLM SEIS FINAL ROD, *supra* note 119, app. at 4–13.

196. *See* COLO. REV. STAT. § 24-65.1-202(2)(a)(I)(A) (2013).

197. *See* Pidot, *supra* note 22, at 222, 251–252.

198. *See, e.g.*, James MacPherson, *Why Does North Dakota Law Require Top Oil Regulator to Also Promote It?*, HUFFINGTON POST (Jan. 15, 2014), http://www.huffingtonpost.com/2014/01/15/north-dakota-oil-regulator_n_4603720.html.

Even government agencies that exercise independent judgment must rely heavily on industry actors to generate information, implement regulatory rules, and respond to spills. The Silvertip Pipeline spill exemplifies these dynamics. In the wake of the spill, the administrator for PHMSA explained that "it is incumbent upon the operators of [] pipelines to keep vigilant about the amount of cover that is above their pipeline."[199] The administrator further explained that the agency had asked ExxonMobil itself to investigate the geology of the river and that the agency would consider that data in approving replacement pipe.[200] This demonstrates the significant degree to which regulators rely on industry itself in generating information and complying with regulations—a reliance that itself may foster the type of close association between regulated entity and regulator that proves susceptible to agency capture.

The Silvertip Pipeline example also underscores the challenge that government officials face to regulate against a backdrop of insufficient information. Although local government officials commissioned a study of the incident and potential risks along the river, the report could not characterize the risks to specific pipelines from inadequate cover. As the study explains, "[t]he report does not address [that issue] because detailed information on location, geometry, depth, method of installation, and condition of pipelines was limited or unavailable."[201] This lack of analysis and information is particularly troubling because the same report acknowledges that the limited information available on the condition of actual pipelines "indicates that many of the pipelines are buried less than eight feet below the channel bottom. . . . [and] [t]hese pipelines are at risk of exposure during flood events."[202] In other words, the report significantly underestimates the risk of future spills because it did not fully characterize or consider an important risk factor. Government regulators relying on the report would, then, have skewed—or at least incomplete—information about risks.

---

199. *House Hearing*, *supra* note 64, at 20. The administrator further noted that "the operator has an ongoing obligation to continually reassess and assess the risks associated with its pipline . . . ." *Id.*; *see also* Nicas, *supra* note 33.

200. *House Hearing*, *supra* note 64, at 19.

201. YRCDC FINAL REPORT, *supra* note 62, at 53.

202. *Id.*

CONCLUSION

Disaster law is an emerging field of study,[203] and this article suggests that important issues arise at the intersection of regulations designed to address disaster risk and those that manage energy development. To be clear, I do not suggest that oil and gas development should never occur within floodplains (or other areas subject to natural hazards). Appropriate building techniques and technology may reduce risks to acceptable levels—and the energy industry may have better resources to invest in necessary infrastructure than some other sectors of the economy. Moreover, some phases of oil and gas development may require a smaller footprint than other uses. A significant problem with developing within floodplains is that such development increases flood risks elsewhere, and therefore, dedicating floodplains to oil and gas may be less destructive than using those areas in other ways. An oil or gas well site may leave more of the floodplain undisturbed than, for example, building a parking lot or housing development.[204]

But the consequences of natural disasters disrupting energy infrastructure are high. Natural disasters can cause energy prices to spike and create fuel shortages. Disruptions from natural disasters can last lengthy periods of time. Where infrastructure is damaged, natural disasters risk releasing large quantities of hazardous chemicals into the environment. In other words, when natural disasters strike energy infrastructure, the resulting damage can well exceed that caused by the destruction of commercial businesses or residential homes. Paying attention to cognitive, symbolic, and structural obstacles to effective governance of flood risks—and natural disaster risks generally—can help illuminate effective public policy interventions to reduce vulnerability and avoid environmental and economic harm.

---

203. *See* DANIEL A. FARBER ET AL., DISASTER LAW & POLICY 3 (2d ed. 2010).

204. The construction of a parking lot in an area subject to flooding was at issue in the Supreme Court's famous case *Dolan v. City of Tigard*, 512 U.S. 374, 379 (1994).