

AFTER THE STORM: THE IMPORTANCE OF ACKNOWLEDGING ENVIRONMENTAL JUSTICE IN SUSTAINABLE DEVELOPMENT AND DISASTER PREPAREDNESS

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The past decade has brought on some of the worst cases of flooding due to natural disasters and the resulting leaching of some of the most hazardous environmental contaminants back into nearby, often low-income, communities. Natural disasters are not “great equalizers” when it comes to recovery. Lower-income individuals are more likely to live in neighborhoods that are more susceptible to flooding and are near industrial areas and hazardous waste sites, leaving them more vulnerable to toxic leaks from storm damage. There is also a serious inequity when it comes to access to recovery based on average income levels of neighborhoods. More affluent people are relocating out of flood zones, while housing prices decline and poorer families move in. These trends will continue, all while federal resources are often not enough to sustain or even rebuild areas most in need and those in power are not doing enough to address disaster prevention.

We are experiencing stronger hurricanes on the Gulf Coast and Eastern Seaboard, which scientists have shown is due to climate change. In the past two years, we have seen storms that have created flooding of biblical proportion in Texas and North Carolina, yet these states continue to build in areas known to flood for the sake of economic development and tourism. And, they do so with little regard to the scientific consensus of the impending impact of hurricanes and flooding on coastal areas of the United States.

As cities assess modifications to zoning, land use, and real estate development, it is critical to acknowledge climate science, however

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inconvenient, and take measures to address disaster preparedness, aimed particularly at helping the most vulnerable communities. Instead of waiting for changes to federal environmental laws, this article argues that state legislators and city planners should be planning and executing rules that acknowledge climate data; actively engage community leaders and businesses to assist low-income communities; and enhance, not suspend, the oversight process of industries capable of leaching environmental contaminants during and after a hurricane.

INTRODUCTION

*If your science gives you a result you don't like,
pass a law saying the result is illegal . . . Problem solved.
-Stephen Colbert¹*

In 2012, scientists from North Carolina's state-appointed Coastal Resources Commission issued a climate change report, predicting a thirty nine-inch sea level rise by 2100, which would put over 2,000 square miles of coastal real estate market in danger.² North Carolina legislators responded by passing a law that would ban the use of the report.³ The new law required that the commission issue a new report, using only historical data, with an outlook of thirty years instead of 100, which showed a smaller increase in sea levels.⁴ The law also required the commission to balance the economic costs to the state if it began to limit real estate development in the coastal area based on the predicted sea-level rise.⁵ Since the bill was passed, a 2017 study by Valle-Levinson et al. has predicted that sea levels will rise even faster than expected – at a rate of about one inch per year.⁶ And, as far as economic costs are concerned, the sea-level rise flooding is expected to put 2.5 million homes and businesses at risk, while a recent study from the

1. Stephen Colbert, *The Colbert Report: The Word – Sink or Swim*, COMEDY CENTRAL (June 4, 2012), <http://www.cc.com/video-clips/w6itwj/the-colbert-report-the-word-sink-or-swim>.

2. See COASTAL RESOURCE COMMISSION, ADDENDUM TO THE NORTH CAROLINA SEA-LEVEL RISE ASSESSMENT REPORT (NCSLRAR) OF 2010 (2012); see also Abbie Bennett, *NC Banned a Study on Sea-Level Rise. Could It Mean More Hurricane Destruction?*, NEWS & OBSERVER (Sept. 24, 2018, 10:49 PM), <https://www.newsobserver.com/news/local/article/218287205.html>.

3. Coastal Management Policies, H.R. 819, 2011–12 Gen. Assemb., Reg. Sess. (N.C. 2012).

4. *Id.*

5. *Id.*

6. Valle-Levinson et al., *Spatial and Temporal Variability of Sea Level Rise Hot Spots over the Eastern United States*, 44 GEOPHYSICAL RES. LETTERS 7876 (2017), <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1002/2017GL073926>.

United States Geological Services, and U.S. Army Corps of Engineers reported that \$7.4 billion in home values have already been lost across the Carolinas, Virginia, Georgia and Florida due to flooding attributed to sea-level rise from 2005-2017.⁷ So, when North Carolina was warned of the rising seas, it chose to favor development over climate science.⁸ Five years later, Hurricane Florence, a 1,000-year rain event, blew through North Carolina, leaving an estimated \$22 billion in damages in its wake, flooding coal ash impoundments and industrial hog operations.⁹ The forty-six year old coal ash impoundment next to Duke Energy's L.V. Sutton power plant near Wilmington was continually inundated with water, sending coal ash pouring into the Cape Fear River, and as a result, concerning nearby residents about the levels of toxic heavy metals flowing into the river.¹⁰

Less than a year earlier, researchers had determined that when Hurricane Harvey flooded Houston in 2017, at least thirty-eight percent of the storm's record rainfall was due to global warming.¹¹ When Hurricane Harvey hit, it caused over \$125 billion in damage to Houston and flooded 800 wastewater treatment facilities and thirteen Superfund sites, spreading toxic chemicals and sewage across parts of the city.¹² A recent survey reported that twenty-seven percent of Hispanic Texans whose homes were damaged reported that the homes were still unsafe to live in, compared to twenty percent of blacks and eleven percent of the white population.¹³ Similar disparities were also

7. *Id.*

8. John Schwartz & Richard Fausset, *North Carolina, Warned of Rising Seas, Chose to Favor Development*, N.Y. TIMES (Sept. 12, 2018), <https://www.nytimes.com/2018/09/12/us/north-carolina-coast-hurricane.html>.

9. Umair Irfan, *Hurricane Florence Caused up to \$22 Billion in Damages. Climate Change Made the Storm Worse*, VOX (Oct. 3, 2018, 4:33 PM), <https://www.vox.com/energy-and-environment/2018/10/3/17925470/hurricane-florence-2018-devastation-climate-change-flood-sea-level-rise>.

10. Brady Dennis et al., *Dam Breach Sends Toxic Coal Ash Flowing into a Major North Carolina River*, WASH. POST (Sept. 22, 2018), https://www.washingtonpost.com/energy-environment/2018/09/21/dam-breach-reported-former-nc-coal-plant-raising-fears-that-toxic-coal-ash-may-pollute-cape-fear-river/?utm_term=.fe01d7719f87.

11. Irfan, *supra* note 9. Warmer water can cause existing hurricanes to intensify as they hit landfall. *Id.* Climate change has already increased ocean temperatures and increased the length of the warm seasons, making it more likely that storms that form will be more severe and last longer. *Id.*

12. Kimberly Amadeo, *Hurricane Harvey Facts, Damage and Costs: What Made Harvey So Devastating*, THE BALANCE (last updated Jan. 20, 2019), <https://www.thebalance.com/hurricane-harvey-facts-damage-costs-4150087>.

13. LIZ HAMEL ET AL., KAISER FAMILY FOUND. & EPISCOPAL HEALTH FOUND., ONE YEAR AFTER THE STORM: TEXAS GULF COAST RESIDENTS' VIEWS AND EXPERIENCES WITH HURRICANE HARVEY RECOVERY 13 (2018), <http://files.kff.org/attachment/Report-One-Year->

found by the survey with regard to income levels: fifty percent of lower-income residents reported that they were not receiving the help that they needed, as compared to thirty-two percent of those earning higher incomes.¹⁴ Another key finding of the survey indicated that those affected residents who are African-American, have lower incomes, or live in the Golden Triangle area in Houston,¹⁵ were more likely to say their lives were still disrupted and less likely to say they are getting the help they need with recovery.¹⁶ The Golden Triangle, also known as ‘The Cancer Belt,’ is home to the largest concentration of petrochemical refineries in the world.¹⁷ The refineries and other surrounding chemical and synthetic rubber plants located in the Golden Triangle have a history¹⁸ of using dangerous chemicals, some of which were released during and after Hurricane Harvey, all while the state of Texas suspended reporting regulations for these companies in the months following the hurricane.¹⁹

The combination of the lack of available resources to low-income individuals, leaching of chemicals, and the suspension of regulation are concerning during a normal day in Houston or Wilmington, but what about post-hurricane conditions and the resulting environmental issues in a hard-hit industrial area? Zoning issues, disparate treatment of poorer neighborhoods situated near industrial areas, and the much allowed “self-regulation”²⁰ by industries create notable and lingering

After-the-Storm-Texas-Gulf-Coast-Residents-Views-and-Experiences-with-Hurricane-Harvey-Recovery.

14. *Id.*

15. The Golden Triangle refers to a triangle of Houston suburbs of Beaumont, Port Arthur, and Orange, while the “golden” reference refers to the Spindletop oil strike near Beaumont in 1901. *Beaumont, Texas, United States*, ENCYCLOPEDIA BRITANNICA, <https://www.britannica.com/place/Beaumont-Texas> (last visited Feb. 11, 2019).

16. HAMEL ET AL., *supra* note 13, at 1.

17. Harry Hurt III, *The Cancer Belt*, TEXAS MONTHLY (May 1981), <https://www.texasmonthly.com/articles/the-cancer-belt/>.

18. *Id.* In the early 1940s, in response to the badly needed rubber for the war effort, Houston built the world’s largest synthetic rubber plant in the middle of the Golden Triangle. *Id.* Raw material utilized in rubber-making includes chemicals like styrene and butadiene, while benzene, a known carcinogen, was also present in large quantities. *Id.* The area is also known for a much higher lung-cancer death rate. *Id.* Brain cancer rates in Orange County tripled from the 1980s to early 2000s and a University of Texas Medical Branch (UTMB) at Galveston study found that residents in the area were three to six times more likely to complain of respiratory and skin illnesses. Jim Atkinson, *Bad Air Days*, TEXAS MONTHLY (Aug. 2003), <https://www.texasmonthly.com/articles/bad-air-days-2/>.

19. Corbin Hiar, *Among Storm Casualties: Texas Environmental Regulations*, E&E NEWS (Nov. 21, 2017), <https://www.eenews.net/stories/1060067093>.

20. An example of “self-regulation” is the allowed “flaring” by petrochemical refineries, one of the chief methods of releasing and burning off dangerous accumulations of vapors.

environmental hazards for residents who live in areas impacted by hurricanes. The question is whether city and state governments are accurately accounting for these impacts and are planning to prevent them in the future. While lip service is paid by many cities in terms like “sustainable development,” there is still a lack of accountability to citizens facing environmental hazards after the storm. Post-storm responses, including efforts to warn residents of impending environmental dangers and the temporary suspension of regulations, are slow-coming. This article seeks to examine what can be learned from recent post-hurricane responses, particularly following Hurricanes Harvey and Florence, in improving how we can ensure sustainable development in a way that truly protects environmental health.

I. THE TENSION BETWEEN DEVELOPMENT & ENVIRONMENTAL HEALTH OF VULNERABLE COMMUNITIES

As cities progress toward incorporating principles of sustainable development, there should be particular attention paid to the environmental health of their citizens – particularly in the wake of extreme natural hazards like the epic floods we have seen with Hurricane Harvey and, more recently, Hurricane Florence, which hit the Carolinas in September 2018.²¹ Where and how development occurs, whether it is in or out of the floodplain, can truly make a remarkable difference in the environmental risks that communities face after the storm.²² New development and even rebuilding after a storm, particularly along the Gulf Coast and the Southeastern Seaboard, should account more for the foreseeable risks of flooding in the future. For example, predictions which include updated floodplain mapping from hydrologists should be carefully heeded instead of being used as a “starting point” for negotiation for new real estate development in areas that are enveloped in the floodplain mapping.

Atkinson, *supra* note 18. While flaring can burn up to 99 percent of the vapors, if a refinery has to flare too often, burn a flare too long, or flare in windy conditions, a resulting “smoking flare” can occur, resulting in emissions like the one measured in Port Arthur in 2002, which released 1,700 tons of ozone-forming, volatile organic compounds (VOCs), including 150 tons of the carcinogens butadiene and benzene. *Id.*

21. See, e.g., Adam Wagner, *Top Stories of 2018, No. 1: Hurricane Florence*, STARNEWSONLINE (Dec. 30, 2018, 6:00 AM), <https://www.starnewsonline.com/news/20181230/top-stories-of-2018-no-1-hurricane-florence>.

22. George Diepenbrock, *Efficacy of Pre-Event Planning Will Be Key as Florence Hits, Urban Planner Says*, PHYS.ORG (Sept. 14, 2018), <https://phys.org/news/2018-09-efficacy-pre-event-key-florence-urban.html>.

Although updated mapping cannot always predict the severity, the timing, and the precise locale of the impact of flooding, cities can still implement better strategies to limit the severity of the flooding and the resulting environmental impacts.²³

There is an undeniable connection between economic development and the quality of the environment; both are dependent upon each other and both are major determinants of the health of the people living in a growing community.²⁴ Community health is often measured by “green initiatives” and the addition of bike or bus routes – all meant to improve the health and lives of citizens. However, environmental health issues that are tied to natural disasters have not traditionally been treated as a priority in developmental planning or policy making.²⁵ This is despite the hard evidence that flooding in urban and surrounding rural areas has caused measurable harm in its aftermath with the influx of water-borne pathogens and the leaching of environmental contaminants from known hazardous waste sites.²⁶

This harm often disproportionately affects the poorest people in communities that are much more likely to experience health effects from air pollution and impure water.²⁷ In addition to their toll on human health, polluted environments slow and block economic progress and development.²⁸ There is no question that economic development enriches the community, but often at the expense of the environment.²⁹ Industrialization contributes to increased air and water pollution, which directly increases disease.³⁰ And, communities of color and lower socio-economic status have historically been located much closer to these industrial areas.³¹ In fact, there are numerous examples of institutionalized discrimination in zoning laws and hazardous waste siting decisions made by public officials that have typified

23. See Denis Binder, *The Nature of Extreme Natural Risks in the Natural Environment*, 7 WASH. J. ENVTL. L. & POL'Y 340, 348–49 (2017) (discussing the difficulty of predicting the paths and landfalls of hurricanes).

24. MEGAN LANDON, ENVIRONMENT, HEALTH AND SUSTAINABLE DEVELOPMENT 3 (2006).

25. *Id.* at 3–4.

26. *Id.* at 4.

27. See generally *Global Environmental Health and Sustainable Development*, NAT'L INST. ENVTL. HEALTH, <https://www.niehs.nih.gov/health/topics/population/global/index.cfm> (last visited Feb. 11, 2019).

28. *Id.*

29. *Id.*

30. *Id.*

31. See generally Robert D. Bullard, *Solid Waste Sites and the Black Houston Community*, 53 SOC. INQUIRER 273 (1983).

environmental racism.³² The term “environmental racism” was first attributed to Benjamin Chavis, the head of United Church of Christ’s Commission on Racial Justice, when he protested the siting of a hazardous waste landfill in Warren County, North Carolina in 1982.³³ He defined environmental racism as:

“[R]acial discrimination in environmental policy-making and enforcement of regulations and laws, the deliberate targeting of communities of color for toxic waste facilities, the official sanctioning of the presence of life threatening poisons and pollutants for communities of color, and the history of excluding people of color from leadership of the environmental movement.”³⁴

Many of the current challenges that face city planners are a direct result of discriminatory land use planning and environmental racism from decades earlier.³⁵ For example, Dr. Robert Bullard’s 1983 study of the siting of solid waste sites by the City of Houston revealed that solid waste sites were not randomly scattered across Houston; rather, they were likely to be located in predominantly black neighborhoods near black schools.³⁶ His study concluded that “institutionalized discrimination in the housing market, lack of zoning, and decisions by public officials over the past fifty years are major factors that have contributed to Houston’s black neighborhoods becoming the “dumping ground” for the area’s solid waste.”³⁷ In 1994, President Clinton’s Executive Order 12898 sought to formally address the issue of environmental racism by directing governmental agencies to identify disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations and develop a plan for implementing environmental justice.³⁸ According to

32. See *id.* Environmental racism generally refers to the geographic association between pollution and low-income or minority communities. Ryan Holifield, *Defining Environmental Justice and Environmental Racism*, 22 URB. GEOGRAPHY 78, 85 (2013).

33. *Id.* at 83.

34. *Id.* (citing B.F. Chavis, Jr., *preface to UNEQUAL PROTECTION: ENVIRONMENTAL JUSTICE AND COMMUNITIES OF COLOR* xii (R.D. Bullard ed., 1994)).

35. See *id.* at 85–86.

36. Bullard, *supra* note 31. Dr. Robert Bullard, by all accounts, is known as the “Father of Environmental Justice.” DR. ROBERT BULLARD: FATHER OF ENVIRONMENTAL JUSTICE, <https://drobertbullard.com/> (last visited Jan. 1, 2019). His pioneering research and scholarship has shaped the environmental justice movement as we know it today. *Id.*

37. Bullard, *supra* note 31, at 285–86.

38. Exec. Order No. 12898, 59 Fed. Reg. 7629 (Feb. 16, 1994); see also EPA, *Laws and Regulations: Summary of Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, <https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice> (last visited Jan. 1, 2019) (explaining the significance of Executive Order No. 12898).

the EPA Office of Environmental Justice, “the goal of environmental justice is to ensure that all people, regardless of race, national origin, or income, are protected from disproportionate impacts of environmental hazards.”³⁹ Governmental agencies have promoted diverse conceptions of the term “environmental justice.”⁴⁰ For example, the U.S. Department of Housing and Urban Development addresses lead-based paint in inner city public housing projects, and the Federal Transit Administration must consider environmental justice measures that ensure that minority and low-income populations benefit proportionally from transportation projects.⁴¹ While this broad definition has allowed flexibility in its application, it has also been heavily criticized because empirical studies associated with environmental justice initiatives have typically failed to look beyond chemical releases from specific sites that are documented in the EPA databases.⁴²

The concept of environmental justice at the federal level has a history of failing communities because of the inability of state and local governments to acknowledge and implement this concept. Most notably, the recent drinking water crisis in Flint, Michigan highlighted how the local, state, and federal government failed to protect the residents from high levels of lead in the drinking water that was actually caused by the state-appointed city manager’s decision to change the city’s water source to save money.⁴³ For the next two years, local and state officials failed to acknowledge the resulting Legionnaire’s disease outbreak and high lead levels in the drinking water that, at times, rivaled those of a hazardous waste site.⁴⁴ Although there are federal regulations that set minimum standards for drinking water that local governments must adhere to, these laws were not

39. Holifield, *supra* note 32, at 80–81.

40. *Id.* at 81.

41. *Id.*

42. *Id.*

43. See generally, Brie D. Sherwin, *Pride and Prejudice and Administrative Zombies: How Economic Woes, Outdated Environmental Regulations, and State Exceptionalism Failed Flint, Michigan*, 88 COLO. L. REV. 653 (2017). In 2013, Ed Kurtz, the emergency manager appointed by Governor Snyder to run the finances for the City of Flint, Michigan, signed a contract to use the corrosive water from the Flint River as a drinking water source for the City of Flint that eventually led to major leaching from the lead pipes used to carry the drinking water to its citizens. *Id.* at 661.

44. *Id.* at 657. Specifically, a water sample tested at LeAnn Water’s home by EPA water specialist Miguel Del Toral revealed a lead concentration of 13,200 ppb. *Id.* at 664–65. The Centers for Disease Control has concluded that there is no safe level of lead, particularly for children. *Id.* at 672.

followed in Flint.⁴⁵ This failure resulted in an environmental crisis rife with environmental justice issues.⁴⁶ The City of Flint is not a wealthy suburb. The median income of a Flint resident is approximately \$24,000 per year – \$20,000 below Michigan’s state average.⁴⁷ Over forty percent of Flint’s residents, most of whom are African-American, live in poverty.⁴⁸ And most of the residents could no’t afford to move, even to nearby Detroit, where the cost of living would be higher.⁴⁹

We continue to see environmental racism playing out in cities due to the failure of local government to acknowledge the problem, or “through a possessive investment in whiteness,” where a primarily white community wishes to retain benefits that they believe they have “earned.”⁵⁰ These benefits can take the form of higher property values, better land use planning, and access to better schools and more resources.⁵¹ These benefits can be expressed in spatial arrangements in neighborhoods.⁵² The most obvious example of this type of spatial disparity that results in environmental racism is when a polluter decides to locate near a neighborhood primarily populated by people of color or lower socioeconomic status because the land is adjacent to another industrial zone and the land is cheaper.⁵³ Although the Supreme Court has been reluctant to recognize the quality of poverty as a suspect classification,⁵⁴ a siting process that is motivated by racial prejudice is unconstitutional.⁵⁵ Prior litigation has traditionally been focused on intent or the conscious decision to discriminate.⁵⁶ However,

45. *Id.* at 658. Specifically, the Lead and Copper Rule requires that the city take certain precautionary measures to prevent the leaching of lead from water pipes and inform its citizens when the lead level reaches and exceeds 15 ppb. *Id.* at 690.

46. *Id.* at 684.

47. *Id.* See also Lolita Brayman, *Why Haven’t Flint Residents Fled?*, WASH. POST: MONKEY CAGE, (Feb. 22, 2016), <https://perma.cc/E9AE-8M97>.

48. Brayman, *supra* note 47.

49. *Id.*

50. Laura Pulido, *Rethinking Environmental Racism: White Privilege and Urban Development in Southern California*, 90 ANNALS ASS’N. AM. GEOGRAPHERS 12, 16 (2000).

51. *Id.* at 17.

52. *Id.*

53. *Id.*

54. See, e.g., *San Antonio Indep. Sch. Dist. v. Rodriguez*, 411 U.S. 1 (1973). A suspect class is one which is usually “saddled with such disabilities, or subjected to such a history of purposeful unequal treatment, or relegated to such a position of political powerlessness as to command extraordinary protection from the majoritarian political process.” *Id.* at 28.

55. See, e.g., *Vill. of Arlington Heights v. Metro. Hous. Dev. Corp.*, 429 U.S. 252 (1977).

56. See Bradford C. Mank, *Is There a Private Cause of Action under EPA’s Title VI Regulations?: The Need to Empower Environmental Justice Plaintiffs*, 24 COLUM. J. ENVTL. L. 1, 10 (1999). See also *Arlington Heights*, 429 U.S. at 266.

the failure to fully grasp the discriminatory effect on neighborhoods due to socio-spatial processes and market dynamics will continue to impact a municipality's ability to truly protect the most vulnerable populations from the environmental consequences when these industrial sites are flooded or affected by natural disasters like hurricanes.

While many cities have begun to actively address the issue of environmental racism and include goals of ensuring environmental justice in sustainable development, many empirical studies have failed to account for siting of industrial waste sites as a discrete and conscious act that is almost impossible to undo.⁵⁷ Although this siting is acknowledged as an "issue," very little attention is paid to the socio-spatial processes that produced the spatial arrangements and arguably continue to dominate decision-making in urban planning and environmental disaster preparedness.⁵⁸ Researchers have grappled with distinguishing the issue of siting and intentionality when examining the disproportionate siting of waste in poor, minority neighborhoods in Houston, Texas. In 1994, Boerner and Lambert studied the distribution of landfills in the Houston area.⁵⁹ They concluded that "clearly, discriminatory siting is not the primary culprit behind these cases of 'environmental racism.' Instead, Houston's disproportionate distribution of landfills can properly be attributed to the dynamics of the housing market."⁶⁰ What their conclusions fail to account for is the resulting outcome of the market dynamics. Dr. Bullard's 1983 study illustrated that locally undesirable land uses (LULUs)⁶¹ in Houston were sited disproportionately in poor communities and communities of color.⁶² Over the years, after the sitings, the levels of poverty, and people of color living in the nearby neighborhoods increased, while the property values declined.⁶³ So, while the initial siting decision undoubtedly affected these

57. Pulido, *supra* note 50, at 17.

58. *Id.*

59. *Id.* at 18.

60. *Id.*

61. The siting of a LULU can negatively affect the host neighborhood by encouraging those who can afford to move to actually leave the neighborhood. Vicki Been, *Locally Undesirable Land Uses in Minority Neighborhoods: Disproportionate Siting or Market Dynamics?*, 103 YALE L. J. 1383, 1388-89 (1994). By making the neighborhood less desirable, it decreases property value, making the housing more available to lower income households and less desirable for those with higher incomes. *Id.*

62. *Id.* at 1395.

63. *Id.* at 1387.

communities at the outset, market dynamics contribute even more to the uneven distribution in which LULUs become surrounded by people of color or the poor, and consequently, the environmental health of these neighborhoods is disproportionately worse than the surrounding communities.⁶⁴ Once these communities are then hit with extreme flooding, not only are houses destroyed, but there is an increased chance that those returning to the area will be exposed to an elevated concentration of toxic chemicals released or leached from neighboring sites. It is not uncommon for a majority of the neighborhood to return and want to rebuild, because it represents strength, defiance, and even culture.⁶⁵ Though the residents know of the risks, the return and rebuilding could be due to a number of attributable factors, including a lack of financial support to make the move and a deep cultural commitments to the community that may be a fundamental aspect of one's family and self-identity.⁶⁶

A further examination into the recent, devastating environmental consequences of Hurricane Harvey and Houston's response provide insight into the tension between accounting for environmental health in urban development. Is the new development sustainable in that it is accounting for historically disproportionate siting and is therefore preparing accordingly? Or, rather, is everything simply a matter of what is economically feasible? These questions and the story of Houston in the aftermath of Hurricane Harvey should be considered by municipalities as they incorporate sustainable development plans that account for how to best protect the environmental health of their communities in the wake of natural disasters like hurricanes.

II. HURRICANE HARVEY - HOUSTON (2017)

A. *After the Storm*

On average, the Houston and Galveston area receives about forty-five inches of rainfall each year.⁶⁷ During Hurricane Harvey in 2017, some areas received more than fifty inches of rain in less than a week.⁶⁸

64. *See id.*

65. *See* Alexander Lemann, *Stronger than the Storm: Disaster Law in a Defiant Age*, 78 LA. L. REV. 437, 455 (2018).

66. *Id.* at 457.

67. Stephanie Glenn et al., *Summarizing Hurricane Harvey's Environmental Impacts*, HOUSTON ADVANCED RESEARCH CENTER (HARC), <https://harcresearch.maps.arcgis.com/apps/MapSeries/index.html?appid=d6b0a3d762ec46ef8ea676f1008f7028/> (last visited Feb. 11, 2019) (interactive map detailing impacts of Hurricane Harvey).

68. *Id.*

The resulting flooding of the hurricane carried so much more than just water; it carried substantial amounts of sediment, debris, and hazardous pollutants directly into communities.⁶⁹ Sediments from shipping channels and bayous flowed into residential neighborhoods and parks, causing concerns about exposure to dangerous pollutants like lead and arsenic.⁷⁰ On top of that, Hurricane Harvey caused hazardous spills and toxic releases as water flooded refineries and Superfund sites.⁷¹ Residents needed no more visual proof than seeing drums with unknown materials washing up onto their driveways and lawns.⁷² The floodwater also mixed with millions of gallons of untreated sewage overflow, triggering reports of increase in skin infections and gastrointestinal issues as a result of contact with the water.⁷³

Health officials with the Baylor College of Medicine and Rice University tested water samples and found alarmingly high levels of *e. coli* – levels as much as 135 times than what was considered safe – in sediment from floodwaters that had invaded homes in the area.⁷⁴ The testing also revealed elevated levels of lead and arsenic within the homes.⁷⁵ At that time, the Texas Commission on Environmental Quality and the EPA had yet to release any testing results to the public.⁷⁶ Local public health officials expressed concern and anger, as did the citizens, about the dearth of information about what was actually in the water.⁷⁷ After the storm, residents began to show up to flooded homes with no warning about the dangers residing in the water or sediment.⁷⁸ Many developed staph infections from wading through the water and children, who had asthma, were reportedly having difficulty breathing as mold levels had also significantly increased in the damaged homes.⁷⁹

69. *Id.*

70. *Id.*

71. *Id.*

72. *Id.*

73. *Id.*

74. Sheila Kaplan & Jack Healy, *Houston's Floodwaters Are Tainted, Testing Shows*, N.Y. TIMES (Sept. 11, 2017), <https://www.nytimes.com/2017/09/11/health/houston-flood-contamination.html>.

75. *Id.*

76. *Id.*

77. *Id.*

78. *Id.*

79. *Id.*

The environmental impact was not just limited to water. During and after Hurricane Harvey, refineries and petrochemical facilities implemented storm-related shutdowns and startups, resulting in large amounts of VOCs, volatile organic compounds, in the air.⁸⁰ VOCs react with sunlight to produce an increase in ground-level ozone, a secondary pollutant known to cause shortness of breath and exacerbate asthma, especially in sensitive populations like children and the elderly.⁸¹ The VOCs themselves contain BTEX, an acronym for benzene, toluene, ethylene, and xylene, which is also known to cause breathing and health problems including cancer.⁸²

After Hurricane Harvey, concerns over lingering industrial pollution remained even as Governor Greg Abbott suspended over twelve environmental regulations.⁸³ Although the reasons for the suspension included the hope that it would encourage faster cleanup, the lack of monitoring for four months was also seen as incongruent with the public health goals of the state – particularly after an environmental disaster.⁸⁴ Three days after the storm, the Texas Commission on Environmental Quality asked Governor Abbott to suspend dozens of environmental rules that, among other things, required industries in the area to report their releases.⁸⁵ In total, the rule suspensions applied to over sixty counties, some of which were more than 100 miles from the Gulf Coast.⁸⁶ Of the eighty-eight lives claimed by Hurricane Harvey, twenty-six were caused by “unsafe or unhealthy conditions.”⁸⁷ The initial idea behind waiving the regulations was to prevent a slowdown to the emergency response phase.⁸⁸ However, it is hard to justify the suspension four months after the event. During this time, residents wanted to move back in to their flooded homes. They subjected themselves to mold, sewage-

80. Glenn, *supra* note 67.

81. *Id.*

82. *Id.* Benzene, a natural product of crude oil used to make a variety of products from detergents and pesticides to plastic, is a known carcinogen. AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY, DIVISION OF TOXICOLOGY AND HUMAN HEALTH SCIENCES, CAS # 71-43-2, TOXFAQS, <https://www.atsdr.cdc.gov/toxfaqs/tfacts3.pdf>. It evaporates quickly into the air and its sweet-smelling vapors can cause headaches, rapid heart rate, and confusion. *Id.* Long-term exposure causes harmful effects on bone marrow and red blood cells, causing leukemia and acute myelogenous leukemia, in particular. *Id.*

83. Hiar, *supra* note 19.

84. *Id.*

85. *Id.*

86. *Id.*

87. *Id.*

88. *Id.*

contaminated water, and unknown chemical debris attached to sediment throughout their homes.⁸⁹ They endured it because many have roots in their neighborhood or just have nowhere else to go.

B. Obstacles to Redevelopment

There is one problematic obstacle to reducing risk in flood-prone areas. Despite the consensus view of scientific communities of the dangers associated with living in these areas, nobody wants to leave.⁹⁰ It is typical for flood victims to express a willful and defiant desire to rebuild despite the known dangers.⁹¹ Even after the flooding, Houston, the nation's fourth largest city, continues to rebuild communities and create new ones in flood-prone areas by pouring more cement over flood-prone areas, digging up grasslands and replacing them with more cement and new residential developments.⁹² Golf courses and rural grasslands that once acted as sponges for floodwaters are being paved over.⁹³ While "green areas" are disappearing in Houston, it is attempting to compensate for the updated flood-plain mapping, with regulations that require that any new construction in flood zones must be two feet above previous floodplain levels.⁹⁴ Experts say that level would have saved eighty-four percent of the homes that were flooded by Hurricane Harvey based on the latest scientific data.⁹⁵

The science behind the changing weather patterns for Houston is undeniable. The National Oceanic and Atmospheric Administration (NOAA) recently revised its rainfall totals for Houston that once defined a "100-year storm" as one with the odds of a one percent chance of happening any given year.⁹⁶ The analysis by NOAA, which looked at Harvey and then examined rainfall data stretching back

89. Juanita Constible, *The Emerging Public Health Consequences of Hurricane Harvey*, National Resources Defense Council (expert blog) Aug. 29, 2018, <https://www.nrdc.org/experts/juanita-constible/emerging-public-health-consequences-hurricane-harvey>.

90. Lemann, *supra* note 65, at 442.

91. *Id.*

92. Scott Wilson, *Fresh from Hurricane Harvey's Flooding, Houston Starts To Build Anew — In the Flood Plain*, WASH. POST (May 22, 2018), https://www.washingtonpost.com/national/fresh-from-hurricane-harveys-flooding-houston-starts-to-build-anew-in-the-flood-plain/2018/05/22/2c5ccb8-53b6-11e8-a551-5b648abe29ef_story.html?noredirect=on&utm_term=.37261767a588.

93. *Id.*

94. *Id.*

95. *Id.*

96. *Id.*; see also Mihir Zaveri, *NOAA Study Finds Houston's 100-Year Floods Have Been Underestimated*, HOUSTON CHRON. (Nov. 27, 2017), <https://www.houstonchronicle.com/news/politics/houston/article/NOAA-study-could-redefine-100-year-storm-for-12387348.php>.

decades, stated that instead of expecting 12 to 14 inches in a day during a 100-year storm, Houston residents should expect 15 to 18 inches.⁹⁷ These new estimates based on more data, undoubtedly reflect climate change at a state level.⁹⁸ NOAA's study signifies that the zones on Houston's previous local floodplain maps were not large enough and the development regulations were not strict enough to compensate for Harvey.⁹⁹

The rainfall analysis by NOAA promises to have significant impacts on development; despite the data, developers have still been battling the proposed revisions.¹⁰⁰ The City of Houston approved new building regulations in April 2018 to account for new floodplain maps.¹⁰¹ The expansion of floodplains and the addition of more structures to the floodplain through new construction will mean that more people will be required to buy flood insurance.¹⁰² Additionally, federally subsidized flood insurance continues to attract people to flood-prone areas.¹⁰³ By the middle of the twentieth century, private insurers had basically ceased issuing flood insurance because flood risk was so costly and difficult to measure.¹⁰⁴ In response the federal government subsidized the industry, creating the National Flood Insurance Program ("NFIP"), which provides flood insurance and requires building codes that increase a community's resistance to flooding and flood damage.¹⁰⁵ This, in turn, creates an incentive for residents to remain in and continue to build in floodplains due to the artificially cheap insurance.¹⁰⁶ Additionally, the federal government has encouraged development in flood-prone areas through massive aid packages like the Stafford Act, which allows state governors to ask the President to issue a "major disaster" declaration, allowing the Federal Emergency Management Agency ("FEMA") to provide federal assistance through its Disaster Relief Fund.¹⁰⁷ Despite this funding,

97. ERIC BLAKE & DAVID ZELINSKY, NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT: HURRICANE HARVEY 7 (2018), https://www.nhc.noaa.gov/data/tcr/AL092017_Harvey.pdf.

98. Zaveri, *supra* note 96.

99. *Id.*

100. *Id.*

101. *Id.*; Wilson, *supra* note 92.

102. Wilson, *supra* note 92.

103. Lemann, *supra* note 65, at 445.

104. DIANE P. HORN & BAIRD WEBEL, CONG. RES. SERV., PRIVATE FLOOD INSURANCE AND THE NATIONAL FLOOD INSURANCE PROGRAM (2018).

105. *Id.*

106. *Id.* at 446.

107. *Id.* at 447.

many of the residents were unable to afford flood insurance and received minimal federal funding to rebuild. The story of what happened in Houston illustrates how overdevelopment in flood-prone areas, lack of resources for low-income communities, and the lax response in regulating environmental releases further jeopardized the health of its citizens after the storm.

About a year later, North Carolina experienced devastating flooding as a result of Hurricane Florence. Many residents who lived in low-income communities were also put at risk by unnecessary environmental harms. Like Houston, there is a history of disparate environmental siting near vulnerable communities. When these areas are flooded, the residents not only must deal with property damage, but the concern that their water is contaminated with pollutants like coal ash waste.

III. HURRICANE FLORENCE - NORTH CAROLINA (2018)

A. The Waste Before the Storm

Years before Hurricane Florence hit North Carolina, Linda Jamison, a resident of Semora, a majority black community located near the Roxboro Power Plant and its four coal-fired units, had been complaining about the the effects of the plant on her community.¹⁰⁸ After the plants were built in 1966, the plant let off steam with ash, covering the houses, gardens, and farms.¹⁰⁹ A notice was posted, limiting the amount of fish that could be eaten from the nearby waterways.¹¹⁰ After her father died from cancer, she moved away, but then returned in 2012.¹¹¹ She noticed changes in the water in her parents' home.¹¹² "It smelled bad, you couldn't drink it or anything. I just installed a filtration system in our house because of the smell, but no one said anything about the well water being contaminated."¹¹³ After the Dan River spill in early 2014, residents in Semora started asking more questions about coal ash and drinking water.¹¹⁴ After the

108. Jeremy Richardson, *This Is What It's Like to Live Near a Coal Plant in North Carolina*, UNION OF CONCERNED SCIENTISTS BLOG (Oct. 10, 2017), <https://blog.ucsusa.org/jeremy-richardson/roxboro-coal-plant>.

109. *Id.*

110. *Id.*

111. *Id.*

112. *Id.*

113. *Id.*

114. *Id.* The Dan River spill was one of the largest leaks of toxic coal ash in U.S. history. Michael Wines & Timothy Williams, *Huge Leak of Coal Ash Slows at North Carolina Power*

North Carolina Department of Environmental Quality (NCDEQ) started testing some of the resident's water wells, they told them not to cook with it or drink it.¹¹⁵ They were supplied with bottled water as an alternative.¹¹⁶ The North Carolina legislature, partially in response to the outcry over the Dan River spill and the increasing concern from residents over the nearby unlined coal ash waste ponds, passed HB 630.¹¹⁷ The legislation required Duke Energy to replace the resident's wells with public water systems or filtration systems, although as of 2017 some residents were still paying for their own systems.¹¹⁸ Linda and other residents asked the County Commissioners to support hooking them up to the public water system, but the board voted it down 3-2, with one of the board members, a Duke Energy employee, casting the deciding "no" vote.¹¹⁹ Duke Energy responded that there were no medical problems because of their coal ash, yet had asked residents to sign paperwork releasing Duke Energy from all liability associated with future medical claims if the residents agreed to accept the \$5,000 payment for a new water filtration system.¹²⁰

B. The Toxicity of Coal Ash Waste

Alternative sources for energy production such as natural gas and solar power have recently increased in North Carolina, but coal-fired electrical power plants remain one of the primary sources of energy for the state.¹²¹ Generation of energy from the fourteen coal-fired power

Plant, N.Y. TIMES (Feb. 6, 2014), <https://www.nytimes.com/2014/02/07/us/huge-leak-of-coal-ash-slows-at-north-carolina-power-plant.html>. Between 50,000 and 82,000 tons of coal-ash slurry flowed into the Dan River after the collapse of a metal drainpipe that was located a few feet below a large 27-acre impoundment of coal ash. *Id.* 27 million gallons of contaminated water also leaked into the river. *Id.* In a subsequent settlement with the E.P.A., Duke Energy agreed to plead guilty to nine Clean Water Act violations and pay \$102 million in fines and restitution for illegally discharging from its North Carolina coal ash impoundments. *Florence's Rains: Coal Ash Landfill Collapses in Carolinas*, NBC NEWS (Sept. 16, 2018), <https://www.nbcnews.com/news/us-news/florence-s-rains-coal-ash-landfill-collapses-carolinas-n910046>. The company is currently in the process of closing all of its coal ash impoundments by 2029, as mandated by current North Carolina law. *Id.*

115. Richardson, *supra* note 108.

116. *Id.*

117. Drinking Water Protection/Coal Ash Cleanup Act, H.B. 630, (N.C. 2016), <https://www.ncleg.gov/BillLookup/2015/h630>.

118. Richardson, *supra* note 108.

119. *Id.*

120. Elizabeth Ouzts, *Duke Energy's Coal Ash Offer Causing Confusion, Concern*, ENERGY NEWS NETWORK (Feb. 16, 2017), <https://energynews.us/2017/02/16/southeast/duke-energys-coal-ash-offer-causing-confusion-concern/>.

121. Julia Kravchenko & H. Kim Lyerly, *The Impact of Coal-Powered Electrical Plants and Coal Ash Impoundments on the Health of Residential Communities*, 79 N.C. MED. J. 289, 289

plants in North Carolina results in the annual waste accumulation of 19.3 billion gallons of coal ash waste.¹²² The combustion of coal creates air pollution through the emission of particulate matter and gaseous sulfur dioxide (SO₂), which have been undeniably linked with higher asthma hospitalization rates¹²³ and increased risk of cardiovascular and respiratory deaths¹²⁴ for its surrounding residents.¹²⁵ The problems associated with burning coal are not limited to air pollution. Water and soil contamination have been linked to coal ash impoundments, some of which remain unlined.¹²⁶ These impoundments hold fly ash, a by-product of coal combustion, which can contain four to ten times higher concentrations of heavy metals than the parent coal.¹²⁷ Along with heavy metals like arsenic, mercury, lead, cadmium, chromium, and zinc, coal ash can also contain radioactive contaminants and polycyclic aromatic hydrocarbons (PAHs), all of which have been associated with neurotoxic, carcinogenic, teratogenic, and mutagenic effects on wildlife and humans.¹²⁸

The majority of coal ash that is generated is stored in landfills and impoundment (or slurry) ponds, located in close range to residential communities, often those of low incomes.¹²⁹ In 2012, a group of environmental researchers studied the impact of coal combustion residue on the water sources in North Carolina by testing over 300

(2018), <http://www.ncmedicaljournal.com/content/79/5/289.full.pdf+html>. In 2017, 4,363 thousand megawatts (MWh) were generated from coal-fired sources, much greater than the second (nuclear power at 3,811 MWh) and gas-fired plants (3,650 MW). *Id.*

122. *Id.* Coal ash waste, also known as coal combustion products or coal combustion residuals (CCR) are a product of coal combustion. Brie D. Sherwin, *Regulating Coal Ash Waste in the Trump Era*, 37 STAN. ENVTL. L. J. 75, 83 (2017). The residuals are known to contain elevated levels of arsenic, mercury, lead and other heavy metals. *Id.*

123. EPA, *Integrated Science Assessment for Sulfur Oxides (Health Criteria)* (Sept. 2008), <https://www.epa.gov/isa/integrated-science-assessment-isa-sulfur-oxides-health-criteria> (last visited Feb. 15, 2019).

124. *Id.*

125. Kravchenko and Lyerly, *supra* note 121, at 291.

126. *Id.* at 292.

127. *Id.*

128. Laura Ruhl et al., *The Impact of Coal Combustion Residue Effluent on Water Resources: A North Carolina Example*, 46 ENVTL. SCI. & TECH. 12226, 12228 (2012); see also PROGRESS ENERGY, MAYO STEAM ELECTRIC PLANT, 2010 ENVIRONMENTAL MONITORING REPORT (NPDES permit NC 0038377) (2011). The 2010 Mayo Lake report showed deformities in fish, including an extended lower jaw and spinal curvature, both of which are indicators of ingestion of high levels of selenium, a toxic heavy metal. Ruhl, *supra* note 128, at 12231. Teratogenic effects are those which are physical or functional abnormalities in the embryo or fetus. Science Direct, *Teratogens*, <https://www.sciencedirect.com/topics/neuroscience/teratogens> (last visited Mar. 2, 2019).

129. See Ruhl, *supra* note 128, at 12226.

water samples from surface water in lakes and rivers and water extracted from sediment; they found high levels of contaminants like arsenic, selenium, and cadmium, some of which greatly exceeded the EPA's drinking water standards.¹³⁰ Their paper concluded that despite the NCDEQ's and EPA's efforts to reduce the levels of contaminants through National Pollutant Discharge Elimination System (NPDES) permitting and use of settling ponds, among other methods, the data clearly showed high contaminant levels that suggest the need for enhanced removal/wastewater treatment.¹³¹ The study also addressed the impact of the effluent discharged from the NPDES outfalls on downstream waterways.

Therefore, the concentrations were dependent on the flow rate to the river and lake, meaning that dilution can occur depending on where the samples are collected and that the samples may not completely represent the true concentrations of the contaminants.¹³² The study concluded that despite environmental regulations: (1) the coal ash waste storage facilities "continuously generate contaminants via leaching and transport to hydrological systems," (2) many coal ash waste ponds and landfills are not lined and "in many instances, are neither adequately monitored, nor regulated with respect to their effects on groundwater and surface waters," and finally (3) there is a "rigorous need for monitoring and clear regulations for limiting the coal ash contaminants that are being discharged into U.S. waterways."¹³³

C. *The Statistics and the Aftermath*

The release of coal ash became a problem in September 2018 when historic flooding pushed its way into North Carolina as a result of Hurricane Florence.¹³⁴ The hurricane was slow-moving and dropped between twenty-three and thirty inches of rain across the state over a period of four days.¹³⁵ Florence, initially forecasted to hit North

130. See Ruhl, *supra* note 128, at 12228. For example, the summer 2011 samples taken at the Asheville and Riverbend Plant outfalls contained arsenic at concentrations of 44.5 ug/L and 92 ug/L, well above the 10ug/L drinking water standard set by the EPA. *Id.*

131. *Id.* at 12229.

132. *Id.* For example, the outfall on the French Broad River from the Asheville plant had effluents with high concentrations of contaminants, but because of a high river discharge flow, the downstream water was significantly diluted. *Id.* at 12231.

133. *Id.* at 12232.

134. See Wagner, *supra* note 21 (noting concerns that coal ash has leaked into the Cape Fear River).

135. *Id.*

Carolina's coast as a Category 3 or 4 hurricane, made landfall on September 13 as a Category 1 storm.¹³⁶ Despite its downgrading, for days and months after, the hurricane took a significant toll on communities from electricity to roads and access to food and clean water.¹³⁷ Flooding reached historic levels with the Cape Fear River cresting at 25.57 feet, surpassing the flooding caused by Hurricane Floyd by over three feet.¹³⁸ Thousands of people who attempted to evacuate were stranded, cut off by floodwaters on Interstate 40 and U.S. 17.¹³⁹ Aside from the damage estimated at over \$261 million for flooded homes, the historic flooding affected Duke Energy's L.V. Sutton plant and caused its associated coal ash pond to leak into the Cape Fear River. Residents were worried that toxic substances were now leaking into the river.¹⁴⁰

After the event, Duke Energy issued a statement that coal ash waste did, in fact, wash out of an inactive coal basin and into the river.¹⁴¹ Photos released by Duke Energy showed a substantial breach from its Sutton cooling lake dam, as wide as 100-200 feet across, directly into the Cape Fear River.¹⁴² Water quality tests of the area confirmed elevated levels of arsenic and heavy metals downstream from the breach.¹⁴³ While Duke Energy reports that its Sutton coal-fired unit was removed or decommissioned by 2017, two unlined coal ash waste ponds, which were in the process of "being excavated," remained.¹⁴⁴ These decades-old ponds contained a combined 2.1 million cubic yards of coal ash, enough to fill a large sports stadium.¹⁴⁵ The response by a

136. *Id.*

137. *See, e.g., id.*

138. *Id.*

139. *Id.*

140. *Id.*

141. Alyssa Danigelis, *Florence Flooding Prompts Duke Energy Plant Shutdown, Coal Ash Concerns*, ENERGY MANAGER TODAY (Sept. 24, 2018), <https://www.energymanagertoday.com/florence-duke-energy-coal-ash-0179067/>.

142. John Murawski, *Coal Ash Could Be Spilling into Cape Fear River as Duke Energy and Regulators Watch*, NEWS & OBSERVER (Sept. 21, 2018), <https://www.newsobserver.com/news/business/article218791660.html>.

143. Waterkeeper Alliance, *Analysis Finds Toxic Levels of Arsenic in Neuse River Water Following H.F. Lee Coal Ash Spill*, WATERKEEPER ALLIANCE (Sep. 28, 2018), <https://waterkeeper.org/analysis-finds-toxic-levels-of-arsenic-in-neuse-river-water-following-h-f-lee-coal-ash-spill/>.

144. *Id.* Duke Energy spokeswoman, Paige Sheehan, said the ash basin was about fifty percent excavated before Florence dropped more than thirty inches of rain into it. *Id.* This excavation is part of Duke Energy's effort to comply with a 2014 legislative mandate, by providing better storage for toxic waste to protect public drinking water. *Id.*

145. Glenn Thrush & Kendra Pierre-Louis, *Florence's Floodwaters Breach Defenses at Duke*

Duke Energy spokesperson was that there was no visible coal ash in the lake or river.¹⁴⁶ However, Duke Energy later estimated that the storm had washed away more than 2,000 cubic yards of coal ash waste – the equivalent of 150 dump trucks.¹⁴⁷ At the time, the NCDEQ had responded by dispatching several teams to the Sutton facility and by using drones to monitor the conditions.¹⁴⁸ Later, in an email, a spokeswoman for the agency said that “while the state is currently in emergency response mode, a thorough investigation of events will soon follow to ensure that Duke Energy is held responsible for any environmental impacts caused at their coal ash waste facilities.”¹⁴⁹

Local environmental groups like the Waterkeeper Alliance reported that water from Lake Sutton was “pouring out” into the river and members saw plumes of water containing coal ash particles for miles.¹⁵⁰ A few weeks later, the NCDEQ reported that its “test results show all metals below state water quality standards with the exception of dissolved copper.”¹⁵¹ The tests were conducted from September 25th to 27th, four days after the initial breach, about a mile downstream.¹⁵² These results differed from the tests conducted by the Waterkeeper Alliance and Earthjustice on September 21, finding that arsenic levels were 71 times higher than the state standard for water quality.¹⁵³ Just six months earlier, the NCDEQ released proposed rules for future coal ash landfills built in North Carolina and faced backlash from its citizens, many of whom own land adjacent to coal impoundments and are concerned about water contamination.¹⁵⁴ In 2016, North Carolina

Energy Plant, Sending Toxic Coal Ash Into River, N.Y. TIMES (Sept. 21, 2018), <https://www.nytimes.com/2018/09/21/climate/florences-floodwaters-breach-defenses-at-power-plant-prompting-shutdown.html>.

146. Waterkeeper Alliance, *supra* note 143.

147. Dennis, *supra* note 10.

148. *Id.*

149. *Id.*

150. *Id.*

151. John Murawski, *Coal Ash Flooding Didn't Harm Cape Fear River, NC Regulators Say*, THE NEWS & OBSERVER (Oct. 4, 2018), <https://www.newsobserver.com/news/business/article/219494535.html>.

152. *Id.*

153. *Id.* Tests for water sampling normally will be much higher in water samples taken at or near a flooded coal ash pond. *Id.* Water sampled downstream at a “high flood stage” is usually extremely diluted and produces low readings for heavy metals. *Id.* Downstream testing also leaves open the possibility of contaminants from other sources. *Id.*

154. See, e.g., Catherine Clabby, *Fate of Most Duke Energy Coal Ash Still Uncertain*, N.C. HEALTH NEWS (Feb. 18, 2018), <https://www.northcarolinahealthnews.org/2018/02/18/fate-most-duke-energy-coal-ash-uncertain/>.

changed its Coal Ash Management Act¹⁵⁵ to allow Duke Energy to gain “low-risk”¹⁵⁶ designations for all but one of its coal ash impoundments.¹⁵⁷ The ponds hold a majority of the 110 million tons of coal ash waste collected over decades.¹⁵⁸ The Act also required Duke Energy to provide new or improved water systems to residents who lived within a half mile of the impoundments and depended on potentially impacted well water for their water source.¹⁵⁹ The situation in Semora, near the Roxboro plant, is not unlike other communities like those near the L.V. Sutton plant, which experienced a flooding due to Hurricane Florence. The resulting risks to the waterways and communities are disputed, thereby leaving an impasse on what to do to address a possible impending disaster, should another flood occur. The dispute over concentration amounts is not unlike the dispute over the validity of climate science. Disputes lead to an impasse and often inaction on assessing ongoing risk to communities in the wake of hurricanes and flooding.

IV. ENVIRONMENTAL RISK REDUCTION MEASURES IN PLANNING

A. *Limits on Risk Reduction Measures*

While every coastal city faces its own unique set of challenges, which is often met by budget restrictions, disaster preparation and development plans can encompass various measures that can not only do a better job of identifying the populations most at risk, but also reduce the risk to all communities. Cities should consider advocating for revised land use restrictions based on the latest floodplain data.¹⁶⁰ This seemingly simple approach might also be the most severe one, as it could involve displacing low income communities, not to mention that the city could face Fifth Amendment challenges.¹⁶¹ In *Armstrong*

155. 2016 N.C. Laws Ch. 95 (H.B. 630).

156. *Id.* The “low-risk” designation is fairly vague as written in the law. *Id.* at 15. Classification is granted if, when the Department conducts its annual inspection, the dam is “sufficiently strong” and “does not pose a danger to life or property.” *Id.*

157. Rose Hoban, *New Council Will Work to Improve Child Welfare System*, N.C. HEALTH NEWS (Mar. 14, 2019), <https://www.northcarolinahealthnews.org/2019/03/14/new-council-will-work-to-improve-child-welfare-system/>; Catherine Clabby, *Fast of Most Duke Energy Coal Ash Still Uncertain*, N.C. HEALTH NEWS (Feb. 18, 2018), <https://www.northcarolinahealthnews.org/2018/02/18/fate-most-duke-energy-coal-ash-uncertain/>.

158. *Id.*

159. Clabby, *supra* note 157.

160. *See Binder, supra* note 23, at 363 (noting that extreme flooding is preventable in most circumstances).

161. *See id.* at 366 (noting that the Fifth Amendment limits government officials’ ability to

v. United States,¹⁶² the Supreme Court stated that the Fifth Amendment was “designed to bar Government from forcing some people alone to bear public burdens, which in all fairness and justice, should be borne by the public as a whole.”¹⁶³ This runs in direct conflict with the ability of a government to protect the public and the environmental health of the public through its “police power.”¹⁶⁴ In *Penn Central Transportation Co. v. City of New York*,¹⁶⁵ the Supreme Court also recognized that it is difficult for a government to achieve ‘justice and fairness’ while properly compensating individuals for its taking.¹⁶⁶ Attempts by the government to completely restrict development in a floodplains along a coastal zone were later struck down by the Supreme Court in *Lucas v. South Carolina Coastal Commission*.¹⁶⁷ In the place of complete restrictions, cities could utilize amendable conservation easements or term easements to allow flexibility for landowners and the government to adjust accordingly in the future.¹⁶⁸ Better planning, coupled with an active, detailed emergency action plan can prevent flooding if city officials are willing to educate the community about the plan.

B. Create A Better Emergency Action Plan (EAP)

Coastal cities and surrounding communities at risk of flooding should also have the responsibility of creating a comprehensive emergency action plan.¹⁶⁹ Each entity ideally should continually update its emergency action plan (EAP) to minimize future risks and facilitate

ban development in areas subject to extreme natural hazards) . The Takings Clause of the Fifth Amendment provides “[N]or shall private property be taken for public use, without just compensation.” U.S. CONST. amend. V.

162. 364 U.S. 40 (1960).

163. *Id.* at 49.

164. *See Binder, supra* note 23, at 366.

165. 438 U.S. 104 (1978).

166. *Id.* at 124.

167. 505 U.S. 1003 (1992). The Supreme Court in *Lucas* did suggest one possible solution to a taking by the state, which is rooted in the public trust doctrine, treating public rights to land as inherent as any private title to it. J. Peter Byrne & Jessica Grannis, *Coastal Retreat Measures, in THE LAW OF ADAPTION TO CLIMATE CHANGE* 267, 268 (Michael B. Gerard & Katrina Fischer Kuh eds., 2012).

168. Zachary Bray, *Reconciling Development and Natural Beauty: The Promise and Dilemma of Conservation Easements*, 34 HARV. ENVTL. L. REV. 119, 144-45 (2010). A term easement allows for an expiration date and would ease landowner frustrations when the surrounding land conditions have changed. *Id.* at 145.

169. *See Binder, supra* note 23, at 372 (explaining the significance of Emergency Action Plans and the elements that make them successful).

speedier recovery after flooding.¹⁷⁰ The EAP should be site-specific and tailored to the risks associated with various communities, as well as the unique sets of challenges that a particular suburb may face, particularly for those who live near areas known to be contaminated like industrial parks or Superfund sites.

The EAP should include periodic training, not only for city personnel, but also for emergency responders and emergency managers of all facilities or sites with known, harmful contaminants.¹⁷¹ The worst possible outcome for the EAP is that a city creates one for the sake of creating it, but then stores it on a shelf, not referencing it until an impending storm is in sight.

C. Carefully Tailor Environmental Oversight

Both socioeconomic status and race are often interconnected with environmental and flood-related risks, which can create a disproportionate health impact on vulnerable populations.¹⁷² And, socioeconomic status is the primary economic consideration in whether people have the ability to move.¹⁷³ In fact, the percentage of the population living in poverty in particular areas is a direct measure of that community's ability to evacuate and locate alternate or new housing after a hurricane.¹⁷⁴ A community's inability to relocate is also exacerbated as the supply of affordable housing outside of a flood zone or further away from industrial sites continues to diminish.¹⁷⁵ In addition to the loss of affordable housing, there is a very real risk of loss of employment for these families in both rural and urban areas.¹⁷⁶ The bottom line is that most of the residents of the hardest hit areas will be hard-pressed to leave or move. This, in turn, requires state authorities to carefully consider whether a blanket suspension of all environmental regulations after the storm serves the public health of its residents – particularly those who are most vulnerable. Arguably, a blanket measure that is extended for months after the event could give

170. *Id.*

171. *Id.*

172. Christopher Dalbom et al., COMMUNITY RESETTLEMENT PROSPECTS IN SOUTHEAST LOUISIANA: A MULTIDISCIPLINARY EXPLORATION OF LEGAL, CULTURAL, AND DEMOGRAPHIC ASPECTS OF MOVING INDIVIDUALS AND COMMUNITIES 25 (Sept. 2014), https://thewaterinstitute.org/assets/docs/publications/9_23_2014_Community-Resettlement-Prospects-in-Southeast-Louisiana.pdf.

173. *Id.*

174. *Id.*

175. *Id.*

176. *Id.*

industry a “blank check” to pollute and then later use the government suspension as a defense. Months of not being able to monitor for environmental contaminants then present challenges for state and federal environmental agencies, making it almost impossible to adequately characterize or quantify any contamination that occurred during that time. State officials should carefully consider the breadth and amount of time as parameter for a suspension. They should also consider reviewing disaster plans with industries with known histories of environmental pollution and collaborate on more effective notification to residents as well as immediate point source testing that would accurately capture the escape of pollutants into a waterway.

D. Move Away From Plans That Do Not Work

One lingering question for city planners and policy makers is whether revised planning, when fully implemented, will actually have any impact on flood insurance rates that property owners pay.¹⁷⁷ If the insurance rates continue to increase, this could be the overriding factor that forces residents in flood prone areas to leave, regardless of the flood mitigation plans that a city may enact.¹⁷⁸ And for those who cannot pay for flood insurance, relocation assistance, while costly, may be the only way that low-income families who reside in high-risk zones for flooding may be able to relocate.¹⁷⁹

Over 80% of Harvey’s victims did not have flood insurance because they could not afford it.¹⁸⁰ Aside from insurance, Hurricane Harvey once again demonstrated that delivery of federal money to those who need it most does not work. A recent investigation found that numerous low-income families in Houston were denied funding from the Federal Emergency Management Agency (FEMA) because they lacked the legally required flood insurance. These families were disproportionately impacted because many of the poorer neighborhoods were located in a flood zone.¹⁸¹ Many of these same families also experience language barriers and lack any experience

177. See Dalbom, *supra* note 172 at 39.

178. *Id.*

179. *Id.* at 45.

180. Mike DeBonis, *Federal Flood Insurance Program in Limbo on Capitol Hill as Harvey’s Toll Mounts*, WASH. POST (Aug. 29, 2017), https://www.washingtonpost.com/powerpost/federal-flood-insurance-program-in-limbo-on-capitol-hill-as-harveys-toll-mounts/2017/08/29/e9dd65d0-8cc8-11e7-8df5-c2e5cf46c1e2_story.html?utm_term=.90aa64b8858c.

181. Danny Vinik, *‘People Just Give Up’: Low-income Hurricane Victims Slam Federal Relief Programs*, POLITICO (May 29, 2018), <https://www.politico.com/story/2018/05/29/houston-hurricane-harvey-fema-597912>.

dealing with a federal bureaucracy.¹⁸² Those who were eligible for FEMA payouts received an average of \$4,300 – too small of an amount for even modest repairs.¹⁸³

There is no question that the rebuilding process should change, but low-income neighborhoods are often politically powerless.¹⁸⁴ And, in some cases, classism, or the idea that poverty is a result of “character flaws” can still influence policymakers, reduce the focus on need for emergency management in low-income communities, and allow decision-making to be driven by concerns of business and more affluent constituents.¹⁸⁵ Because of the ineffective federal response and the currently broken insurance system, preparedness must take place at a more local level through community groups and leaders.¹⁸⁶ MDC, a non-profit organization in North Carolina, suggests that neighborhood organizations like churches could become more involved in promoting educational messages about emergency preparedness and collaborate with the private sector to secure donations and human resources to prepare for another disaster.¹⁸⁷

In creating relocation plans and coordinating with community leaders, local and state governments should consider the adverse impacts on the communities most at risk to flooding and the resulting environmental assaults that follow.¹⁸⁸ These communities can be located in both urban and rural areas near industrial hog operations or coal ash waste impoundments in North Carolina. For each region, planners and policymakers should consider both the geography and cultural needs of the community as well as the risks to agricultural productivity and rural livelihoods of the residents employed at nearby industrial operations.¹⁸⁹

A resettlement or relocation project can only be successful if it involves the perspective of the community in the decision-making process from the beginning; however, acquiescing to this type of plan is asking citizens to give up homes that have been in their families for

182. *Id.*

183. *Id.*

184. *Id.*

185. MDC, WHEN DISASTER STRIKES: PROMISING PRACTICES IN EMERGENCY AND DISASTER RESPONSES 1 (2017), <https://www.mdcinc.org/wp-content/uploads/2017/08/When-Disaster-Strikes-Promising-Practices-Low-Income-Families-and-Communities.pdf>.

186. *Id.*

187. *Id.* at 2.

188. Dalbom, *supra* note 172, at 48.

189. *Id.*

generations.¹⁹⁰ Additionally, there is an inherent distrust of government programs to determine the needs of individuals in the community and efficiently distribute the necessary funding in a timely manner.¹⁹¹

E. Utilize Science and Cost-Benefit Analysis to Effect Real Change

We should discourage local and state governments from denying climate change or altering science to suit business and policymakers. Statements like “this is a result of climate change” or “there is nothing we can do” are ignorant, dismissive, and ultimately, can be destructive. Acknowledging the link between climate change, flooding, and environmental health can actually mitigate future disaster because it sets in motion seriously needed planning and preparation.¹⁹² Even if we adopt more stringent emissions reductions, further warming and stronger storms are coming and carry risks.¹⁹³ When considering coastal and urban planning, we should embrace these risks and policymakers should not be swayed by short-term economic interests; rather, if an economic discussion takes place, the billions of dollars in damage from the most recent hurricanes are relevant in a cost-benefit analysis.¹⁹⁴

True market forces can also lead to a monumental shift in where people decide to live after a storm. Currently, the National Flood Insurance Program (NFIP) is billions of dollars in debt and desperately in need of reform.¹⁹⁵ Because of the subsidies, its premiums do not really reflect a true risk to homeowners who decide to live in a flood-prone area or rebuild. Where we build (and rebuild) our homes, construct our roads, locate our industries, and site and store our industrial waste can foster reliance instead of having us brace for impending disaster.¹⁹⁶ For example, as Houston continues to rebuild, will city planners consider where the floodwaters can flow once they arrive – will it be into a paved-over grassland with clogged

190. *Id.* at 49.

191. *Id.*

192. Katharine Mach & Myuki Hino, *What Climate Scientists Want You to See in the Floodwaters*, N.Y. TIMES (Sept. 2, 2017), <https://www.nytimes.com/2017/09/02/opinion/climate-hurricanes-flooding-harvey.html>.

193. *Id.*

194. *Id.*

195. *Id.*

196. *See id.* (“We should as a society embrace the fact that how and where we build our homes, plant our crops, construct our roads and bridges, and locate our schools and industries can provide resilience and safety rather than invite calamity.”).

drainage?”¹⁹⁷ During Hurricane Harvey, the Texas Medical Center was able to care for its patients thanks to its own preparatory measures including floodgates and aboveground generators, but surrounding streets were completely flooded, making the hospital almost completely inaccessible. This is a good example of why governments should consider continuing to purchase properties for a fair value and restore larger blocks to “green areas” to create sponges capable of absorbing more floodwater.¹⁹⁸ There has to be a place for the water to go.

V. CONCLUSION

In conclusion, these solutions could be considered a step in the right direction, but still do not account for low-income communities that are often hit hardest by the flooding and resulting environmental contamination after a storm. Communities can only problem-solve when their leaders recognize that there is a problem. Continual rebuilding and development in flood-prone areas in spite of current scientific data indicating the dangers associated with doing so will continue to put communities at risk and endanger the lives of its most vulnerable residents. We must carefully study the consequences of our most recent hurricanes and learn how to better implement risk reduction measures. It is not too late to turn the tide.

197. *Id.*

198. *Id.*