TOO MUCH TO LOSE:
OFFSHORE DRILLING & HURRICANES
IN THE SOUTHEAST
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Drilling infrastructure in a marsh wetland.
Bryce Hill, age 9, of Lockport, Louisiana looks on as workers clean up after an oil spill.
EXECUTIVE SUMMARY

Offshore oil and gas extraction involves much more than the distant deep sea oil rigs most people picture. Supply services and downstream processing—including refineries, storage tanks and distribution networks—create a far larger infrastructure footprint, onshore and off, than many realize. Much of this infrastructure—oil rigs, ports, waste disposal sites, refineries, pipelines, and storage sites—is vulnerable to damage during hurricanes from high winds, rough seas and flooding.

As the current administration continues to push for opening the entire Atlantic coast to offshore drilling for oil and gas, it is important to consider how associated infrastructure will become vulnerable to this threat. This report attempts to illuminate that vulnerability by examining incidents in the Gulf of Mexico, where offshore drilling has been well-established for decades—and where monstrous hurricanes hit regularly and devastating consequences have been felt.

Offshore, hurricane-force winds and waves bombard well platforms, rigs, and tankers. Onshore, catastrophic flooding and storm surge wrecks pipelines, refineries, and storage facilities. The consequences are ongoing. In this report, you’ll read about the impact of Ivan, which damaged a cluster of wells that are still leaking thousands of gallons of oil into the ocean every day. You’ll read about the millions of gallons of crude oil spilled into the Gulf when Katrina and Rita struck Louisiana barely a month apart, and how Katrina resulted in the largest release of oil into a U.S. metropolitan area on record. You’ll read about how Ike destroyed dozens of offshore oil platforms while its strong winds pushed the thousands of gallons of crude oil released onshore, contaminating residences in Texas and Louisiana. We’ll describe the impact of Isaac on refineries and other production facilities in Louisiana. And we’ll discuss the incredible flooding in Houston caused by Harvey and the pollution released as refineries braced for the impact.

The Southeast coast\(^1\) is particularly prone to hurricane strikes, with some cities in the region experiencing a return period of 1-2 years for tropical storm strikes. During the past two hurricane seasons, Hurricanes Florence, Michael, and Dorian have dealt a devastating blow to the southeastern states. Furthermore, data show that the Atlantic Ocean is increasingly experiencing more intense hurricanes as a result of climate change. We hope this report will help put focus on the dire risks of the decision by the federal government and the oil and gas industry to continue to pursue and promote offshore drilling, despite their own findings showcasing this impending threat. The U.S. Government Accountability Office (GAO) has stated that our nation’s energy infrastructure is becoming increasingly vulnerable to severe weather driven by climate change. Similarly, a study commissioned by the U.S. Department of Energy (DOE) found that extensive amounts of U.S. energy infrastructure are currently exposed to damage from storm surge. Further, they even warned against investing in new energy infrastructure in hurricane-prone areas. Even oil and gas industry representatives themselves have openly recognized this problem.

The experience of residents along the Gulf Coast should be an important lesson for the East Coast—and for the Trump administration and the oil and gas industry that appear to be intent on repeating the mistakes made there and further threatening a region already imperiled by hurricanes.
What is required for offshore drilling to occur?

Offshore drilling occurs in three phases: exploration, development, and production. Beyond these phases, supply services and downstream processing are also integral to the process of extracting and distributing offshore oil and gas. Offshore extraction begins with exploratory drilling to locate hydrocarbon deposits. Once a viable deposit is found, one or more production wells are installed. The resources generated at these wells are held temporarily in storage tanks, then transported onshore via pipeline or tanker, where they are processed for distribution in refineries. The fossil fuels are then sold to distribution networks such as power plants. These activities are supported by a fleet of vessels, helicopters, and trains throughout this process. The waste products generated from these processes are dealt with in a number of ways at waste disposal centers.

Given the long-standing industry presence in the Gulf, the current extent of drilling infrastructure required to support the oil and gas industry there is significant. In 2014, there were 4,000 active offshore drilling platforms and over 27,000 miles of subsea pipeline in the Gulf of Mexico.\(^2,3\) In Louisiana alone, more than 57,000 shallow-water wells have been drilled in just 10 of the state’s coastal parishes since 1900, according to 2018 data.\(^4\) Onshore, more than 125,000 miles of pipeline zig-zag across Louisiana, enough to wrap around the Earth five times.\(^5\) There were almost 300 oil and natural gas refineries in the four Gulf States in 2014, about one per county in Texas alone.\(^6\) There are hundreds of storage facilities, ports, and transport terminals.

The government has concluded that in order to bring drilling to the Atlantic, the industry would need to either expand or develop the following facilities on land: ports, waste disposal sites, refineries, pipelines, and storage sites.\(^7\) Offshore, exploratory and production wells would need to be drilled, and transporting those energy resources would require tankers, subsea pipelines, and storage equipment. However, predicting the specific areas where offshore drilling infrastructure would exist is extremely difficult given many uncertainties, such as how much oil and gas exists in the Atlantic outer continental shelf (OCS) and which areas would be leased. Based on the Trump administration’s January proposal to open 90% of the country’s offshore areas to oil and natural gas drilling, we can expect that infrastructure would be needed for both resources.\(^8\)

What happens to infrastructure towards the end of its life cycle?

It is important to note that not all oil and gas infrastructure in the Gulf is currently in use. The infrastructure required for oil and gas development doesn’t disappear after the end of its life cycle—it sticks around after oil companies move on. As a result, about 36,000 abandoned wells pepper the shallow waters of the Gulf of Mexico, many with residual oil still in them.\(^9\) In many cases, this infrastructure is now more than 40 years old, and has repeatedly broken and been repaired again.\(^10\) Also, by this point, ownership has been passed on to multiple subcontractors and subsidiaries of the original oil companies that built the infrastructure.\(^11\)

This issue can be attributed to systematic problems with how the oil industry is regulated. For example, the only requirement for purchasing an offshore oil lease is to be the highest bidder. Oil companies aren’t required to prove they are fit to take care of the infrastructure for the entire life cycle of the drilling process—including safely closing a well.\(^12\) Further, the current administration has overturned and weakened rules that required oil companies to ensure that they would safely and properly decommission and abandon offshore structures.\(^13\) This approach breeds a poor safety culture within the entire industry.
This plethora of infrastructure in the Gulf becomes problematic when strong hurricanes strike. Damage to energy infrastructure from hurricanes is one of the leading causes of oil spills.\textsuperscript{14} A 2014 GAO assessment stated, “U.S. energy infrastructure is increasingly vulnerable to a range of climate change impacts—particularly ... in areas prone to severe weather.”\textsuperscript{15} Similarly, DOE experts recently found that an “extensive amount” of U.S. energy infrastructure is currently exposed to hurricane damage.\textsuperscript{16} They further emphasized the importance of “limiting investments in new critical infrastructure in areas currently exposed to [hurricanes].”\textsuperscript{17} Even oil and gas industry representatives predict that this threat could be significant enough to impact growth and reinvestment trajectories.\textsuperscript{18} This risk poses serious questions for what growth of energy infrastructure could mean for the Southeast coast.

**What are the environmental impacts of oil spills?**

In a natural environment untouched by humans, oil leaks are an ordinary occurrence. Anywhere there is an oil deposit underground, petroleum slowly seeps up through the seafloor. Organisms that live over these seeps have evolved to thrive in these conditions, even helping to break down the oil.\textsuperscript{19} The rest of ocean life, however, can suffer dramatically from leaking oil, especially given that human-caused oil spills release hundreds of times more oil than the environment can handle.

The ocean is full of air-breathing animals such as whales, dolphins, sea turtles, and seabirds that rely on clean surface waters for oxygen. The chemical components of oil are poisonous; thus when these animals come in contact with even small amounts of it at the surface, they can suffer lethal and sub-lethal conditions, such as lung disease,\textsuperscript{20} skin lesions,\textsuperscript{21} and infertility.\textsuperscript{22} Oil also destroys the insulating ability of furry mammals like sea otters, and the water resistance of bird feathers, exposing these animals to the harsh elements of the marine environment.\textsuperscript{23} Oil exposure can also devastate fish populations by causing widespread heart defects,\textsuperscript{24} tissue damage,\textsuperscript{25} and decreased swimming ability.\textsuperscript{26} Plants and algae can’t photosynthesize in the presence of oil,\textsuperscript{27} which also means corals can’t survive either.\textsuperscript{28} Even a few molecules of oil can kill larvae of many species.\textsuperscript{29} Filter feeders such as clams and oysters pull toxins out of the water as they feed, and these substances can pass up the food web as they are eaten by other species, including humans.\textsuperscript{30}

Oil spills can be detrimental to human health. Many compounds in fossil fuels are neurotoxins and carcinogens. Oil spill cleanup workers, fishermen, and residents that become exposed to oil can suffer respiratory, neurological, hearing, and vision problems—and even death.\textsuperscript{31} The long-lasting impacts from oil spills can be extremely traumatizing, leading to chronic anxiety, depression, and PTSD.\textsuperscript{32}
LESSONS FROM THE GULF

The Gulf of Mexico’s history is wrought with horrifying examples of hurricanes damaging oil and gas infrastructure. Offshore rigs, wells, tankers, and subsea pipelines are continuously at the mercy of strong hurricane forces. Even more vulnerable to hurricane damage than offshore infrastructure is the onshore infrastructure associated with the transport and processing of oil and gas. Unlike hulking offshore rigs built to withstand natural wave energy and currents, coastal infrastructure in the Gulf of Mexico is weak and aging. As discussed previously, some pipelines date back to the 1940s and are abandoned, receiving minimal maintenance. Consequently, this leftover infrastructure is now corroding, leaking, and sitting right in the path of future hurricanes. Further, refineries aren’t flood-proof and are susceptible to extensive damage from storm surge, wind, and rain. This section outlines several examples of the consequences that often result when hurricanes and oil and gas infrastructure meet.
IVAN: CATEGORY 3 AT LANDFALL
ALABAMA, SEPTEMBER, 16, 2004

Hurricane Ivan made landfall near Gulf Shores, Alabama, on the morning of September 16, 2004, with maximum sustained winds of over 130 miles per hour. As it approached land, Ivan triggered a massive mudslide on the Gulf seafloor, which damaged a cluster of 25 oil wells, tangled a network of pipelines connected to the wells, and toppled an entire drilling platform in its wake. Some of this damage occurred near a wildlife refuge. Fifteen years later, the wreckage is still down there, leaking oil into the Gulf only ten miles off Louisiana’s coast. The company responsible for the damaged infrastructure, Taylor Energy, went bankrupt plugging nine of the wells, and is currently fighting a federal order to stop the leak. The company argues that the spill was an unprecedented “act of God,” and only a few gallons per day are being released from a small area. According to a recent federal study, however, the site has been leaking more than 4,500 gallons of oil per day into the ocean, resulting in a persistent oil slick that covers miles of ocean surface. In 2019, the U.S. Coast Guard took over the company’s efforts to plug the spill, by installing a containment device on the seafloor that has been catching 1,000 gallons of oil each day, but some oil continues to escape. In terms of volume over time, this is one of the most devastating oil spills to occur from a hurricane to date.

A sheen from the Taylor Energy oil spill seen from above. The spill, which began when Hurricane Ivan damaged a cluster of oil wells in the Gulf, is ongoing and leaks approximately 10,000-30,000 gallons of oil into the Gulf every day.
Hurricanes Katrina and Rita struck an area central to the oil and gas industry, back-to-back, in the span of less than one month. They inflicted $10 billion worth of damage to energy infrastructure alone. Together, they destroyed 115 oil platforms, damaged 558 pipelines, and spilled nearly 11 million gallons of crude oil into the Gulf. Before the Deepwater Horizon tragedy, it was considered the worst oil spill disaster since the 1989 Exxon Valdez oil spill in Alaska. The two largest spills resulting from the storms occurred within 10 miles of each other, in the coastal parish of Plaquemines along the Mississippi River. The first—at Bass Enterprise's storage site—dumped 3.78 million gallons of oil into the environment. The second—at Chevron's Empire storage terminal—spilled 1.4 million gallons. Another spill—the Murphy Oil Spill—was the largest release into a metropolitan area, with about a million gallons of oil spilling into the densely populated St. Bernard Parish, after Katrina's storm surge dislodged and lifted a storage tank holding petroleum products. The spill affected about 10,000 homes in surrounding neighborhoods.

While some of the toppled offshore oil platforms were recovered, others disappeared in the wake of the two storms. Several months later, a storage tanker traveling from Houston to Tampa struck one of the sunken and displaced platforms hiding below the ocean surface, spilling nearly 2 million gallons of oil slurry into the Gulf.

The two hurricanes also triggered an unprecedented amount of hazardous-material releases from processing and storage facilities onshore. More than 200 onshore releases of hazardous chemicals, petroleum, or natural gas were reported. Storm surge was responsible for the majority of petroleum releases and failure of storage tanks was the most common mechanism of release. According to one report, many air pollutants were released during emergency shut downs in preparation for the hurricanes, and start-up procedures after the hurricanes, a common practice seen during emergency planning.
IKE: CATEGORY 2 AT LANDFALL
TEXAS, SEPTEMBER 13, 2008

Hurricane Ike made landfall in Texas as the largest Atlantic hurricane on record in size. It destroyed dozens of offshore oil platforms, spilling more than half a million gallons of crude oil into the Gulf of Mexico—enough to fill an Olympic-sized swimming pool. The storm’s strong winds and considerable surge pushed these pollutants onshore, contaminating residences along the coast. Aerial photos show extensive oil slicks on floodwaters near Galveston, Texas, and across Southern Louisiana. As the storm approached, nearby refineries and petrochemical plants burned off hundreds of pounds of toxic substances as part of emergency protocol. Then-Governor of Texas Rick Perry temporarily suspended all environmental rules that would prohibit such releases, and in other cases, power failures sent even more chemicals straight into the atmosphere.

ISAAC: CATEGORY 1 AT LANDFALL
LOUISIANA, AUGUST 28, 2012

Hurricane Isaac made landfall in Louisiana twice, striking Plaquemines Parish on August 28, 2012, and then Port Fourchon the following day. Substantial amounts of pollution were released into the environment as a result of the hurricane, including 340,000 gallons of oil and related chemicals and 192 tons of toxic gases from various energy production facilities. Many of these chemicals were recognized neurotoxins and known carcinogens. One refinery owned by Marathon Corporation dumped 12.6 million gallons of untreated stormwater runoff into Lake Maurepas.

Although Hurricane Isaac was among the weakest hurricanes on record to hit Louisiana, and its rainfall and storm surge were by no means unprecedented, more than 100 pollution incidents from energy infrastructure were reported to the Coast Guard. This highlighted the staggering lack of preparedness by oil and gas companies in the face of natural disaster potential. Levees built to contain contaminated water failed, allowing dangerous chemicals to enter surrounding wetlands and waterways, storm and wastewater storage capacity was insufficient, and irresponsibly placed tanker cars shifted during flooding. Hurricane Isaac made it clear that oil and gas companies did not take the proper precautions necessary to safeguard their facilities.
HARVEY: CATEGORY 4 AT LANDFALL
TEXAS, AUGUST 25, 2017

Few can forget the overwhelming storm surge and biblical deluge Hurricane Harvey brought to Houston and the Gulf Coast of Texas. Houston is at the center of the nation’s oil and gas industry and contains abundant oil and gas infrastructure. Production facilities, which are located adjacent to many socially vulnerable communities, were a large source of storm-induced pollution. The storm damaged 22 percent of all oil refineries in the area, leaking more than 2 million pounds of dangerous air pollutants into the communities and natural environment around Texas.62,63 Photos from the scene revealed large, jet-black plumes emitting from oil and gas waste disposal facilities.64 Separately, dozens of facilities burned off excess natural gas products that had nowhere to go, because production downstream had stalled, emitting dangerous levels of nitrous oxides into the atmosphere.65 Health problems associated with the pollution are still ongoing, and may persist for years to come.66

Floodwaters rise at the Marathon oil refinery in Texas City, TX during Hurricane Harvey.
HURRICANE PATTERNS IN THE ATLANTIC

While hurricane season officially takes place from June 1 through November 30 each year, peak season in the Atlantic basin typically occurs from mid-August to mid-October. The average season produces twelve named storms, of which six become hurricanes, and three become major hurricanes (Category 3 or higher). North Carolina, South Carolina, and Georgia are among the five southeastern states historically hardest hit by storms in the nation. Some cities are more vulnerable to storm strikes than others, due to their placement along the coast and regional currents. Eastern North Carolina, for example, is more exposed to hurricane strikes than other areas in the region. The Outer Banks observes an average return period of seven years.

Ten of the Atlantic’s top 50 cities hit most frequently by tropical storms are located in the Southeast. Certain seasons are also more active than others, due to a range of environmental factors such as El Niño. Of course, even during less active seasons, it only takes one bad storm to inflict significant damage to a coastline.

The 2018 and 2019 Atlantic hurricane seasons were especially intense. In both years, tropical storms formed before the hurricane season officially began on June 1, a pattern which has now continued for a record-breaking six years in a row with the May 17, 2020, formation of Tropical Storm Arthur. In 2018, both of the major hurricanes—Florence and Michael—caused a combined $49 billion in damages and contributed to one of the costliest years in terms of weather and climate disasters for the nation. Hurricane Florence dealt the Carolina coastal plain the second so-called 1,000-year storm in only two years, following Hurricane Matthew in 2016. Although Florence weakened significantly before making landfall, it brought unprecedented amounts of rainfall and flooding to parts of North and South Carolina. Florence was the wettest...
hurricane on record in this region, dumping about 8 trillion gallons of rain on North Carolina, according to National Weather Service radar estimates.\textsuperscript{76}

The 2019 season shattered even more records. The year tied with 1969 as the fourth most active season on record. At one point, six named storms were active at once in the Atlantic and Pacific, forecasters reported, hitting a record first set in 1992.\textsuperscript{77} The season produced a Category 5 hurricane for a record-breaking fourth year in a row.\textsuperscript{78} Hurricane Lorenzo was the farthest east we’ve ever seen a category five hurricane in the Atlantic Ocean.\textsuperscript{79} This was unusual for hurricanes in the Atlantic, which usually gain power further west. Hurricane Dorian broke a record for the strongest recorded storm to ever strike the Bahamas and tied for the strongest hurricane ever observed in the open Atlantic.\textsuperscript{80} The storm caused extensive damage to primary and secondary roads across eastern North Carolina, and its 7-foot storm surge trapped residents in remote areas for weeks.\textsuperscript{81} Now, as the 2020 season is just beginning, experts are already predicting another above-average season, with an estimated 19 named storms forming in the Atlantic.\textsuperscript{82}

When examining present-day observations, however, it is important to look beyond just the statistics of one particularly active season. Compared to historic trends, present day hurricane patterns are just as staggering. The Atlantic basin is seeing more major hurricanes (Category 3 or higher) today than it did before the 1980s.\textsuperscript{83} Additionally, scientists have noticed that the zone in which hurricanes can survive and sustain maximum intensity is expanding poleward, and hurricane season itself has also become longer.\textsuperscript{84}
CONCLUSION

Evidence from the Gulf of Mexico demonstrates that hurricanes and oil and gas activities are not compatible. For decades, hurricanes have caused numerous oil spills and hazardous material releases when encountering oil and gas infrastructure, both onshore and offshore. The stories described in this report offer important lessons for the East Coast—another hurricane-vulnerable region that may soon be opened to offshore drilling. The Trump Administration should listen to Southeast communities who’ve said “not off our coast.” The Atlantic coast already faces a perilous future from hurricanes that are becoming more intense with climate change. Adding oil and gas development to the mix further threatens our region’s valuable natural resources.

Atlantic Ocean fishing is a multi-billion dollar industry.
END NOTES

1 For the purposes of this report, the Southeast is defined as Virginia, North Carolina, South Carolina, and Georgia.
10 Id.
11 Id.
12 Id.
13 Id.
17 GAO, supra note 2.
27 Lane, A., and Peter Lynton Harrison. “Effects of oil contaminants on survivorship of larvae of the scleractinian reef corals Acropora tenuis, Goniatrea aspera and Platysgyra...


34. Ellis, supra note 9.


39. Stein, supra note 5.

40. Renaud & Miller, supra note 37

41. Stein, supra note 5.


43. About 100 of these pipelines were major structures with diameters of 10 inches or more. GAO, supra note 2.

44. Sarthou, supra note 41.


51. Id.


55. Associated Press, supra note 52.

56. GAO, supra note 55.

57. Id.

58. GMC, supra note 55.

59. Id.

60. Id.

61. Id.

62. Stein, supra note 5.


64. Eustis & Hoke, supra note 33.


67. Hurricane season is the period each year when hurricanes typically form in the Atlantic Ocean.

68. A named storm produces winds of 39 mph or higher, while a hurricane produces winds of 74 mph or higher and a major hurricane produces winds of 111 mph or higher.

69. Chen, Xing, Mukesh Kumar, and Brian L. McGlynn. “Variations in streamflow response to large hurricane-season storms in a southeastern US watershed.” Journal of Hydro-


Those in the top 10 include: 1st: Cape Hatteras, NC (every 1.33 years); 2nd: Morehead City, NC (every 1.51 years); 4th: Wilmington, NC (every 1.68 years); 9th: Savannah, GA (every 1.90 years); and Myrtle Beach, SC (every 1.95 years). Williams, Jim. “Ranking of cities and islands affected most by tropical storms and hurricanes.” Hurricane City (2019). Found at: http://www.hurricanecity.com/rank.htm.


