Assessing Risk of Contaminant Migration on Environment and Coastal Communities Due to Hurricanes

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Introduction & Background

As global sea surface temperatures gradually increase, the intensity of hurricanes is predicted to increase as well. These natural disasters pose a potential risk of contamination exposure to communities from industrial and non-industrial facilities, and can adversely impact health conditions. Environmental impacts of natural disasters on communities are rarely studied due to the devastating nature of these events. Limited amount research covers a wide range of threats that the spectrum of natural disasters (earthquakes, wildfires, tsunamis, volcanic eruptions, etc.) pose on societal security. Studies specifically focusing on effects of contamination migration on environment and human health pertaining to hurricane activity are minimal, yet necessary to understand risk and mitigate future impacts of these devastating storms.

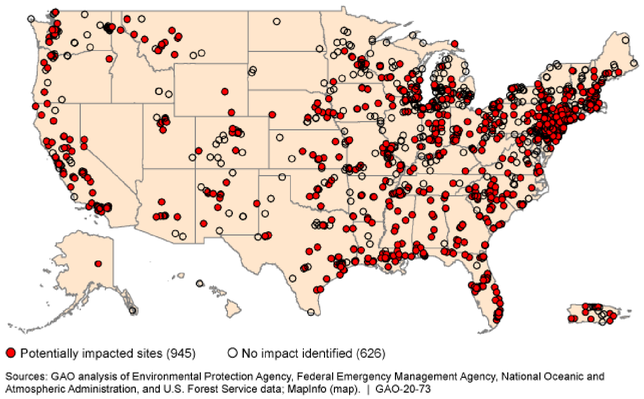
Method of Assessment

- Literature review of available historical events, local news reports, and government documents relating hurricanes and contamination
- Review of contaminant releases from industrial and non-industrial facilities, including Superfund sites (EPA recognized hazardous waste sites)
    - Industrial: petroleum & chemical plants
    - Non-industrial: waste lagoons & waste pits
- Contamination focus on heavy metals, PCBs, PAHs, pathogens, and organic compounds

Key Findings

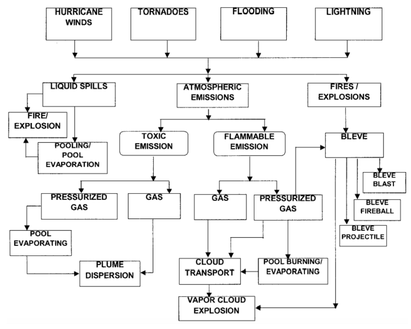
- Safety measures and controls currently in place at facilities containing contaminants do not protect from major storms
- Regulation and guidance documents are not updated to meet frequency and strength of current storm conditions
- Lack of long-term studies have inconclusive results
- Many locations have no baseline samples for post-storm comparison

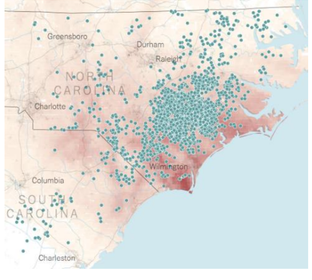
Case Studies



1. Analysis of Superfund sites found that 60% overseen by EPA are in areas that may be impacted by flooding, storm surge, and other elements of natural disasters (GAO, 2019).

2. Disaster modeling identified release mechanisms and secondary threats related to four main hurricane impacts at a petroleum refinery. Secondary disasters may be triggered, resulting in higher exposures (Cruz et al., 2003).





3. North Carolina communities located near hog farms had higher disease and mortality rates than people located away from hog farms. Hurricane flooding may mobilize the hog waste, increasing exposure to surrounding communities, as seen from Hurricane Florence (Kravchenko et al., 2018).

Conclusion

- Limited resources and incentive for responsible parties to suppress bad publicity contributes to underreporting and lack of documentation
    - Magnitude of risk to human health and environment may be underestimated
- Contaminant migration has not been at forefront of disaster response efforts
- Current information is unobtainable, incomplete, or inconclusive
- Understanding of hurricane risk, threats, exposures, and mitigation methods is limited

Recommendations

- Formation of a national program dedicated to collect water, air, soil, and population samples to act as a “baseline” for future sample comparison and funding for sample collection and lab analysis
- Collaboration across various disciplines, agencies, and geographical locations with an interdisciplinary focus is necessary to evaluate the problem and find solutions
- Vulnerability assessments, building codes, and zoning permits of facilities, as well as laws and regulations need to be up-to-date to reflect the current climate conditions
- Detailed plans of hurricane risk mitigation design and strategies at industrial and non-industrial facilities should be communicated to surrounding communities, and state & local agencies

References

- Ana Maria Cruz, Laura J. Steinberg and Ronaldo Luna, "Identifying Hurricane-Induced Hazardous Material Release Scenarios in a Petroleum Refinery," Natural Hazards Review 2, no. 4 (Nov, 2001), 203-210.
- Julia Kravchenko et al., "Mortality and Health Outcomes in North Carolina Communities Located in Close Proximity to Hog Concentrated Animal Feeding Operations," North Carolina Medical Journal 79, no. 5 (Sep, 2018), 278-288.
- Government Accountability Office, Superfund: EPA should Take Additional Actions to Manage Risks from Climate Change. Congressional Publications,[2019]).