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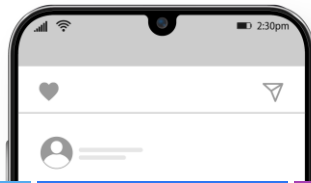


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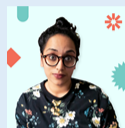
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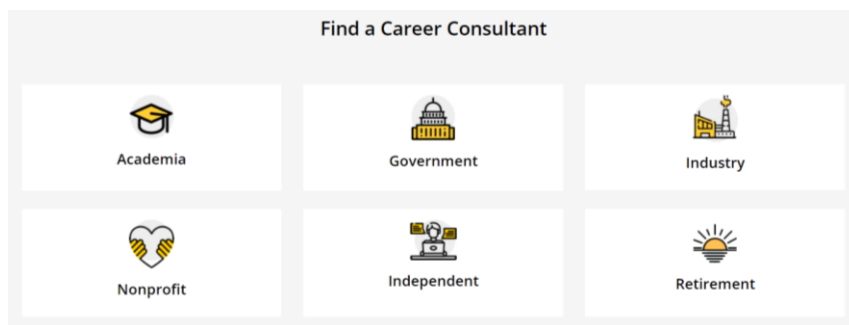
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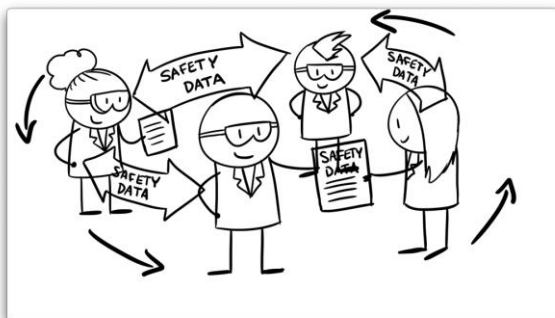
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**Are Hazardous Chemical Facilities Prepared for More Natural Disasters Due to Climate Change?**




**Krista Mantsch, MS MPA**  
Senior Analyst, Natural Resources and Environment Team, US Government Accountability Office



**Russ Phifer, PhD**  
Owner, WC Environmental, LLC

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18

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# CHEMICAL ACCIDENT PREVENTION: EPA Should Ensure Regulated Facilities Consider Risks from Climate Change

*Government Accountability Office (GAO)  
Report to Congressional Requesters, February  
2022*



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**GAO** United States Government Accountability Office  
Report to Congressional Committees

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June 2018

**CYBER INSURANCE**

Action Needed to Assess Potential Federal Response to Catastrophic Attacks

**GAO** United States Government Accountability Office  
Report to the Ranking Member, Committee on Environment and Public Works, U.S. Senate

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March 2019

**CHEMICAL ASSESSMENTS**

Status of EPA's Efforts to Produce Assessments and Implement the Toxic Substances Control Act

**GAO** United States Government Accountability Office  
Report to the Ranking Member, Subcommittee on Interior, Environment, and Related Agencies, Senate Committee on Appropriations

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June 2020

**CRITICAL MINERALS**

Building on Federal Efforts to Advance Recovery and Substitution Could Help Address Supply Risks

**GAO** United States Government Accountability Office  
Testimony Before the Subcommittee on Workforce Protection, Committee on Education and Labor, House of Representatives

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On Request of the Subcommittee on Workforce Protection, May 12, 2021

**WORKPLACE SAFETY AND HEALTH**

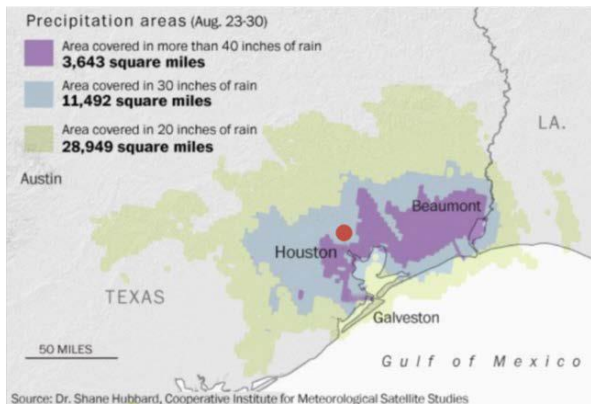
Data and Enforcement Challenges Limit OSHA's Ability to Protect Workers during a Crisis

Statement of Thomas M. Coak, Director, Education, Workforce, and Income Security



## Natural Hazards Pose Risks to Chemical Facilities

Images: Chemical Safety Board



21

21



## Natural Hazards Exacerbated by Climate Change

- High temperature extremes, heavy precipitation events, high-tide flooding events, and forest fires are all projected to **continue increasing**.
- **Socially vulnerable communities** are less able than others to adapt to or recover from natural disasters. They are also more likely to live in proximity to chemical facilities.



22

22



## EPA's Risk Management Plan (RMP) Rule

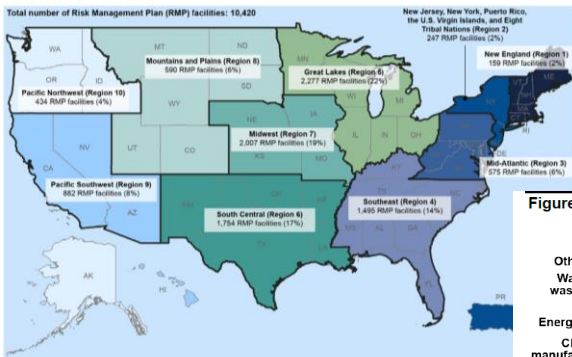
- Applies to stationary sources (facilities) where certain hazardous chemicals above a threshold quantity are present in a process.
- Facilities must develop and implement a risk management program that includes, among other things, a prevention program and an emergency response program.
- Builds upon existing industry codes and standards.
- Facilities must submit a Risk Management Plan describing their Risk Management Program to EPA every five years.

23



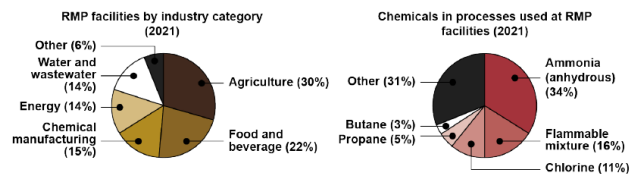
## Risk Management Plan (RMP) Rule Facilitates

Figure 1: Number and Percent of RMP Facilities with at least one Program 2 and 3 Process per Environmental Protection Agency Region (December 2020)



Source: GAO analysis of Environmental Protection Agency (EPA) data and Map Resources | GAO-21-104494

Figure 2: Characteristics of Risk Management Plan (RMP) Facilities

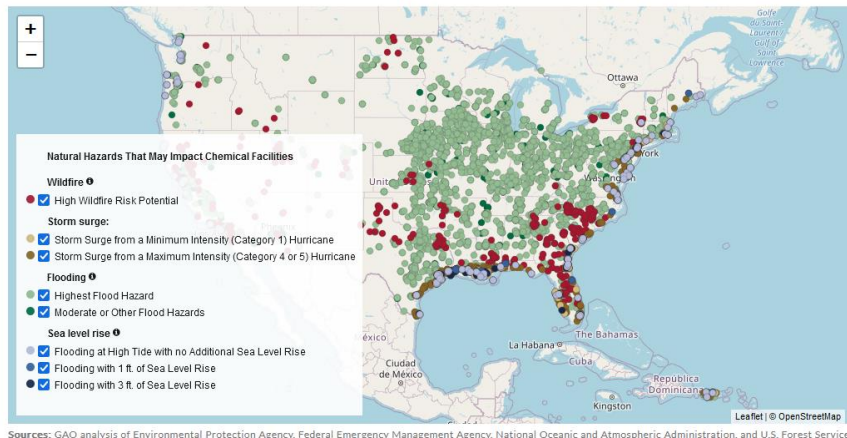


Source: GAO analysis of Environmental Protection Agency data. | GAO-22-104494

24



## RMP Facilities Located in Areas That May Be Impacted by Wildfires, Storm Surge, Flooding, Sea Level Rise



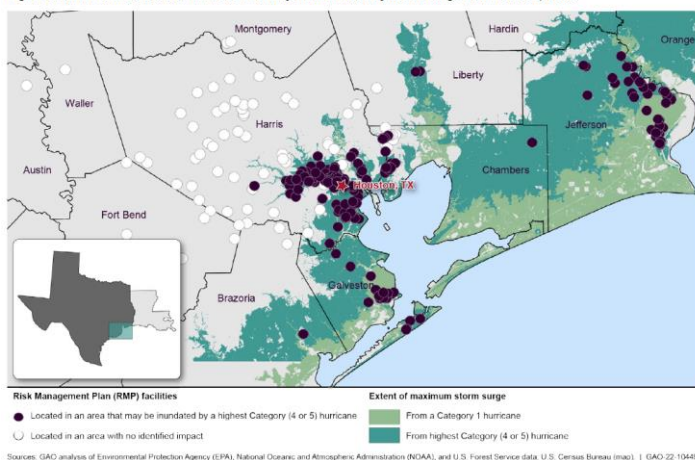
Sources: GAO analysis of Environmental Protection Agency, Federal Emergency Management Agency, National Oceanic and Atmospheric Administration, and U.S. Forest Service

25



## RMP Facilities and Storm Surge

Figure 8: RMP Facilities Located in Areas That May Be Inundated by Storm Surge near Houston, Texas



Sources: GAO analysis of Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), and U.S. Forest Service data. U.S. Census Bureau data. | GAO-22-10484

26



## Risk Management Programs and Natural Hazards

- Identification of **natural hazards**
- Identification of **actions to safeguard against risks** from hazards
- **Emergency response planning** informed by identified hazards.
- Facilities face a unique challenge in managing risks of an accidental release caused by a natural hazard because such a **release may occur simultaneously with the damage and disruption caused by a natural disaster.**



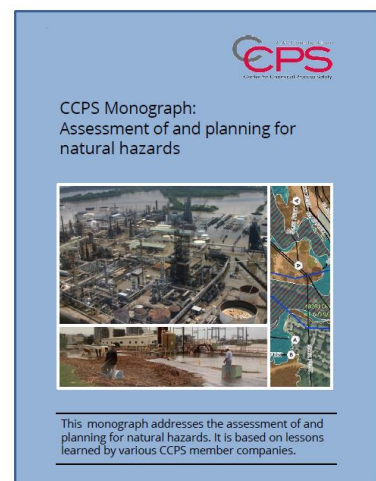
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27



## Challenges Facing RMP Facilities

- Insufficient information about risks from natural hazards and climate change these risks.
- Insufficient direction on how to incorporate risks from natural hazards and climate change into risk management programs
- Costs of managing these risks.
- Small facilities face greater challenges.



28


28



## Challenges Facing EPA

- EPA does not consistently assess how facilities are managing risks from natural hazards and climate change.
- RMP inspectors have insufficient guidance and training.
- EPA does not consider natural hazards or climate change, or the relative social vulnerability of surrounding communities, when selecting facilities for inspection

Facility/Process: \_\_\_\_\_

 <p><b>U.S. ENVIRONMENTAL PROTECTION AGENCY CHECKLIST FOR RISK MANAGEMENT PROGRAM INSPECTIONS OR AUDITS*</b></p> <p><b><u>At Program 3 Stationary Sources</u></b></p> <p><b>Under Title 40 C.F.R. Part 68 - Chemical Accident Prevention Provisions</b></p> <p><small>*The purpose of the reviews are different, but the information needs are similar.</small></p> <p><small><i>Instructions. For each question answer by checking Yes (Y), No (N), or Not Applicable (NA). Each question is paraphrased from the regulation and the cite given. For every point of clarification or incident of violation list the evidence supporting it in the comment field. (For example, employee interview and name). This document is divided into the Subparts and sections of the regulation -40 CFR Part 68. If a section does not apply to the subject source, indicate so and proceed to the next section.</i></small></p>
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29

29



## Recommendations to EPA

**GAO made six recommendations, including that EPA:**

- issue regulations, guidance, or both to clarify requirements and provide direction to facilities on incorporating natural hazards and climate change into risk management programs
- provide additional compliance assistance to RMP facilities related to risks from natural hazards and climate change.
- develop a method for inspectors to assess the sufficiency of RMP facilities' incorporation of risks from natural hazards and climate change into risk management programs and provide related guidance and training to inspectors.

30

30



## Revisions to the RMP Rule?

- EPA agreed with our recommendations
- EPA plans to issue a draft revised RMP rule by September of this year, followed by a final rule in August 2023.
- EPA plans to issue additional compliance assistance for facilities and instruction for inspectors.



Source: Pinellas County Government. | GAO-22-104494

31

31



## Report and Interactive Map Link

Chemical Accident Prevention: EPA Should Ensure Regulated Facilities Consider Risks from Climate Change | U.S. GAO

<https://www.gao.gov/products/gao-22-104494>

### Other relevant work:

- *FEMA Flood Maps: Better Planning and Analysis Needed to Address Current and Future Flood Hazards.* GAO-22-104079. (Washington, D.C.: Oct. 25, 2021).
- *Climate Resilience: Options to Enhance the Resilience of Federally Funded Roads and Reduce Fiscal Exposure.* GAO-21-436. (Washington, D.C.: Sept. 22, 2021).
- *Electricity Grid Resilience: Climate Change Is Expected to Have Farreaching Effects and DOE and FERC Should Take Actions.* GAO-21-346. (Washington, D.C.: Mar. 5, 2021).
- *Water Infrastructure: Technical Assistance and Climate Resilience Planning Could Help Utilities Prepare for Potential Climate Change Impacts.* GAO-20-24. (Washington, D.C.: Jan. 16, 2020).

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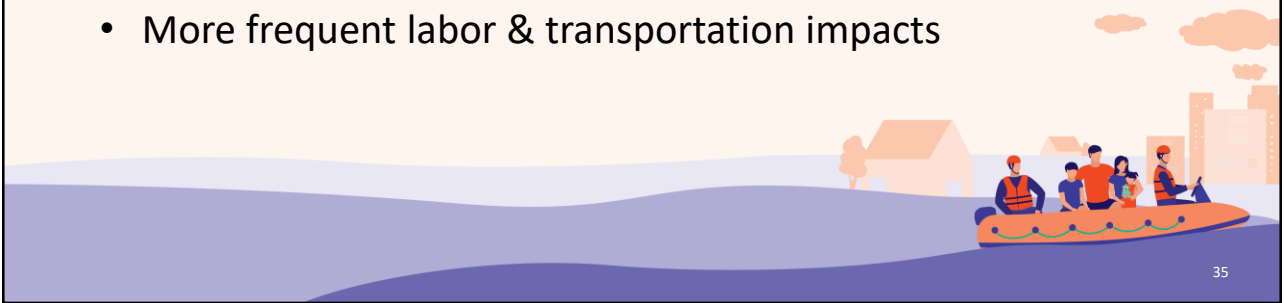
# Hazardous Chemical Facilities Preparedness for Natural Disasters Due to Climate Change

Russ Phifer, WC Environmental, LLC



## Results of Climate Change

- Greater frequency of extreme weather events
- Sea rise & increased flooding in coastal areas
  - Higher average temperatures
  - Disruption from the “norm”
- More frequent labor & transportation impacts



35

35

## Example – Petrochemical Industry

- Raw materials include crude oil from Texas, Louisiana, Oklahoma
- **Transportation network – ready access to ports**
- Need to secure facilities from hurricanes and flooding



36

36

## Options for the Petrochemical Industry to Secure Facilities

- **Option 1: Move away**
  - Compromises access to shipping
  - Alternatives include pipelines & trucking at added costs
  - Possible loss of labor force
- **Option 2: Secure Existing Sites**
  - Berming, diking, canals – flood infrastructure



37

37

## Is the chemical industry (as a whole) prepared?

- **Not everyone, no.**
  - Recent incidents following extreme weather events are a demonstration
- **Can regulators enforce change?**
  - Yes...but there are political challenges
- **Bright side:** Many facilities are well prepared and are proactive in addressing climate change



Arkema Chemical Plant Fire in Crosby, TX  
After Hurricane Harvey

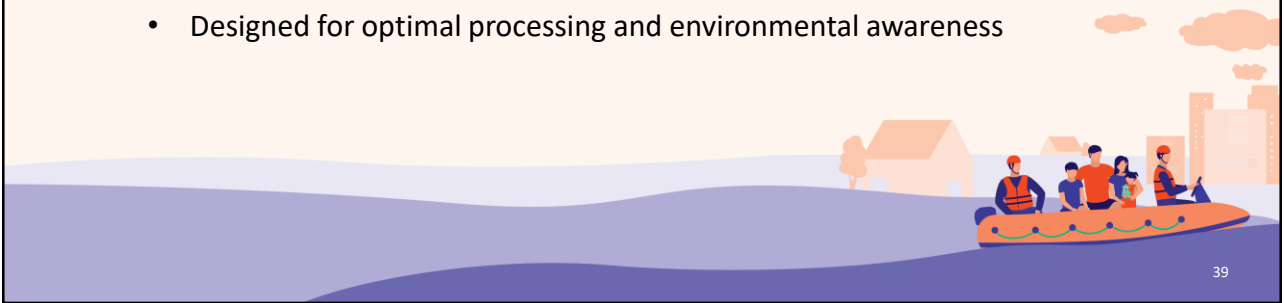


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## What can the chemical industry do to better prepare for climate change?

- **Become greener**
  - More environmentally friendly production (ethylene)
  - Manufacture and utilize biofuels
- **Utilize algorithm from Texas A&M for the petrochemical industry**
  - Designed for optimal processing and environmental awareness



39

39

## What else?

- **Prepare and implement procedures to protect facilities through risk assessment planning**
  - Include alternative plans for transportation, labor, & product storage
- **Regularly perform security vulnerability analysis to seek improvement**



40

40

## References

- [Integrated Approach of Safety, Sustainability, Reliability, and Resilience Analysis via a Return on Investment Metric](#)
  - ACS Sustainable Chem. Eng. 2019, 7, 24, 19522–19536 | October 28, 2019
- [A Greener Route to Ethylene](#)
  - Alex Tullo, C&EN, 2021, 99 (39), p 20 | October 25, 2021
- [Almost 600 Louisiana sites with toxic chemicals lie in Hurricane Ida's path](#)
  - Tristan Baurick and Jeff Adelson, nola.com | August 28, 2021

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