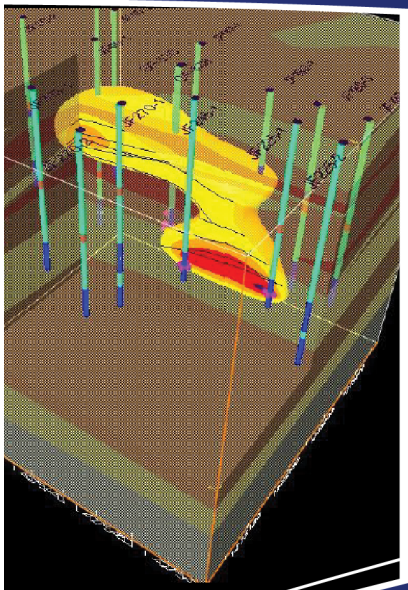


Integrating Climate Change Adaptation into the Superfund Program

Anne Dailey
Superfund Program, EPA HQ

Topics

- EPA-wide Priority
- Potential Issues
- Project Manager's Role
- Integration throughout the Superfund Process
- Key Points

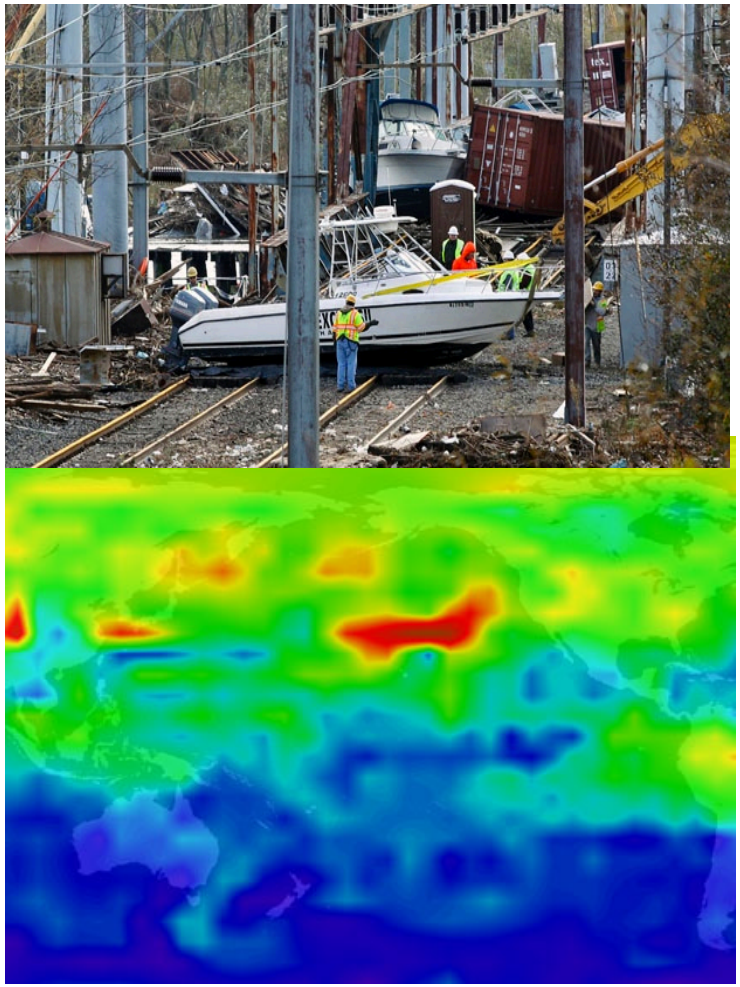


Image credit: U.S. Global Change Research Program (www.globalchange.gov).

Priority to Address Climate Change

- President's recent call to action on climate change
- Addressing climate change is one of EPA's top priorities
- EPA's mission is to protect human health and the environment
- Extensive investments in Superfund remedies
- Increase remedy resilience
- Luck favors the prepared

Climate Change Impacts

Key potential climate change impacts agreed upon by climate experts and included in EPA's Climate Change Adaptation Plan are:

Increased extreme temperatures	Sustained changes in average temperature	Sea level rise
Decreased permafrost in Arctic regions	Decreased precipitation days, increasing drought intensity	Increased heavy precipitation events
Increased flood risk	Increased frequency and intensity of wildfires	Increased intensity of hurricanes

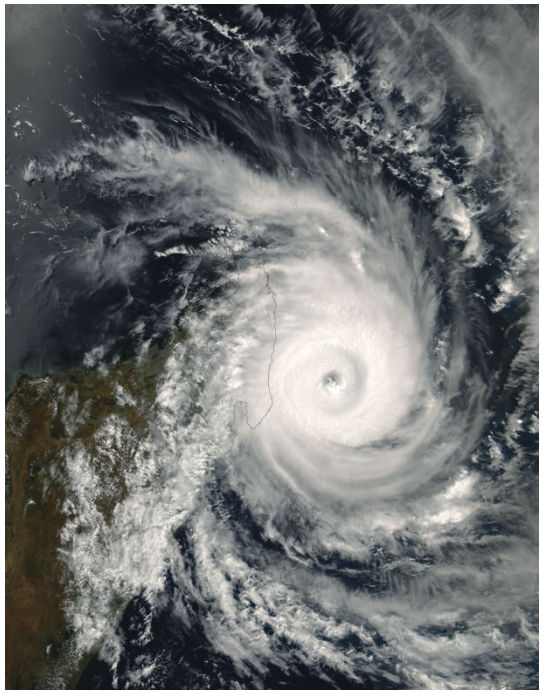


Image credit: U.S. Global Change Research Program (www.globalchange.gov)

Potential Issues at Superfund Sites

- Past may not predict the future
- Some older remedies may not fully consider climate change
- Some cleanups may need strengthening
- Many remedies in place for a long time
- Standard practices may no longer be effective
- Processes and protocols may need adjustment

The Good News!

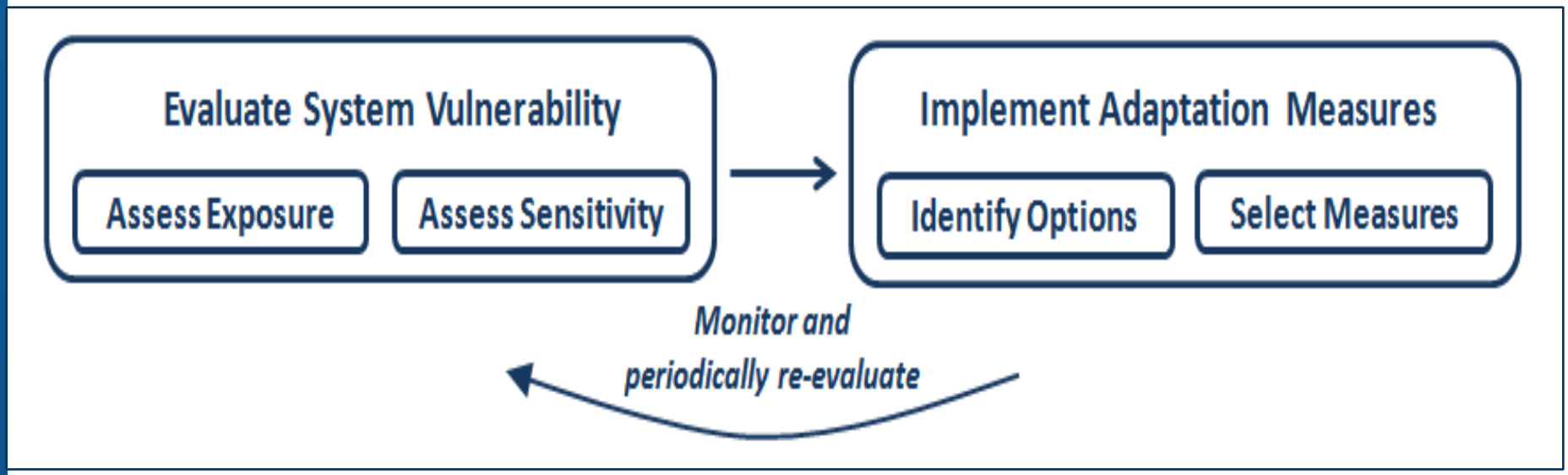
The existing Superfund process for planning and implementing contaminated site cleanups provides a robust structure to:

- Evaluate vulnerability,
- Consider potential climate change impacts and
- Implement adaptation measures.

Project Manager's Role

- Ask questions and use common sense
- Understand climate change issues near the Superfund site
- Understand potential vulnerabilities
  - Existing or planned remediation systems
- Implement adaptation/mitigation measures
  - More options during earlier stages of cleanup
- Monitor and update as needed

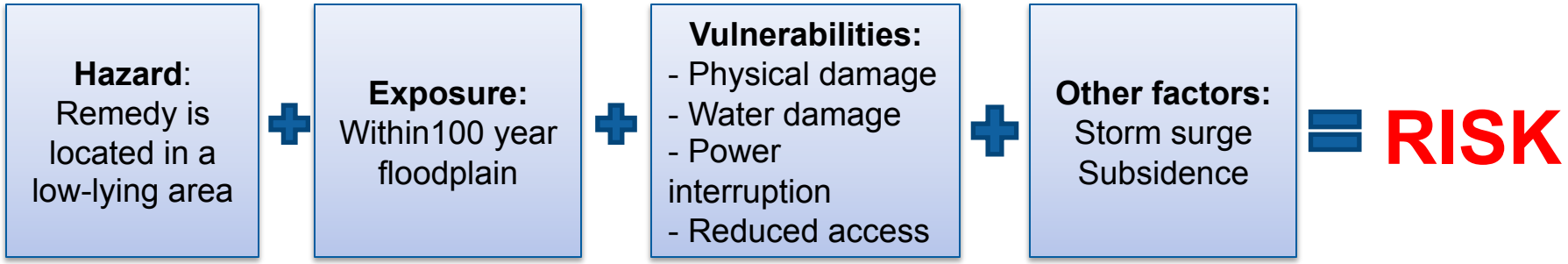
Climate Change Adaptation Management



From EPA, 2014. Climate Change Adaptation Technical Fact Sheet.

Evaluate System Vulnerabilities

- Identify climate change hazards of concern
- Characterize the remedy's exposure
- Characterize the remedy's sensitivity
- Consider factors that may exacerbate exposure and sensitivity of remedy



Implement Adaptation Measures

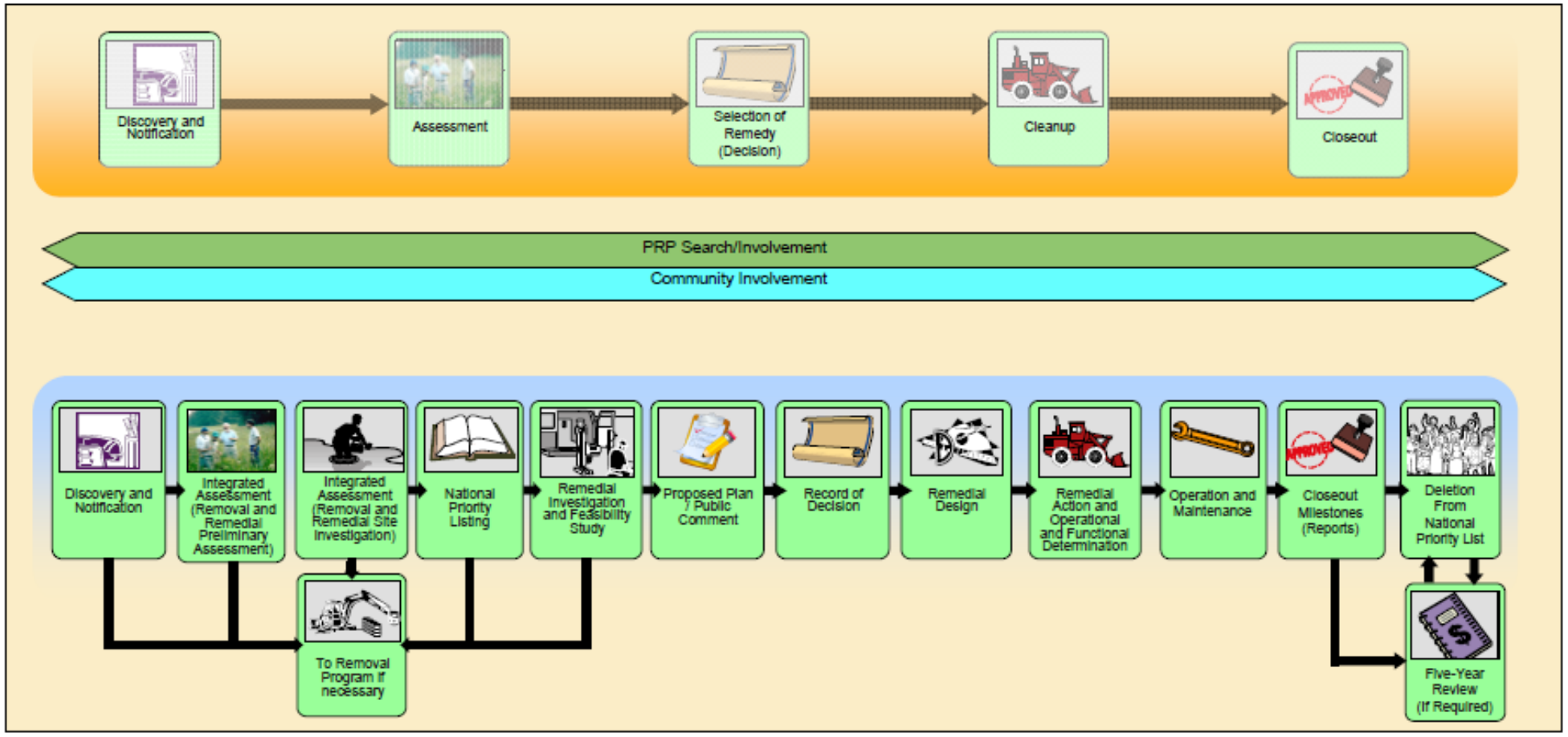
- Identify current and projected potential impacts
- Assess risks
- Identify potential adaptation and mitigation measures that may apply to site scenarios
- Identify feasible first steps
- Build team, leadership, partner and community support
- **Implement priority adaptation/mitigation measures**

Monitor and Periodically Re-evaluate

- Track progress and status of response actions
- Continue monitoring changes in climate and impacts
- Review assumptions and new information
- Update and revise as needed

Integrate Consideration of Climate Change in the Existing Superfund Process

Remedial Process



Major Phases in Remedial Process

- Remedial Investigation/Feasibility Study
  - Nature and extent of contamination
  - Human and ecological risks
  - Develop and screen remedial alternatives
- Remedy selection
- Remedy design
- Remedial action
- Post Construction

Remedial Investigation/Feasibility Study

- Consider climate change when:
  - Assessing the nature and extent of the contamination and associated risk
  - Developing conceptual site model
  - Evaluating remedial alternatives, developing remedial design and considering long-term stewardship
- Use best available data and models
- Confer with local/regional experts
  - For example, nearby port authority

Analysis of Remedial Alternatives: Nine Remedy Evaluation Criteria

- Threshold Criteria:
  - Overall protection of human health and the environment
  - Compliance with applicable and relevant and appropriate requirements
- Balancing Criteria:
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility or volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost
- Modifying Criteria:
  - State acceptance
  - Community acceptance

Remedy Selection

- Use best available guidance, data and other resources
- Consider climate change impacts as part of remedy alternative evaluation and selection
- Incorporate consideration of:
  - Exposure to potential climate change impacts
  - Remedy vulnerabilities
  - Adaptation and mitigation measures

Remedial Design/Remedial Action

- Consider site vulnerabilities and adaptation measures
- Consider:
  - Below ground components
  - At and above ground components
  - Site operations and infrastructure
- Incorporate in design and implementation
  - For example, elevate electrical panels, armor containment, etc.
- Consider long-term stewardship

Post Construction Completion

- Operation and maintenance (may be oversight role)
  - Monitor remedy for climate change related vulnerabilities
  - Emergency operations and response plans
  - Record management
- Five-Year Reviews
  - Evaluate remedy implementation and performance to determine if protective
    - Is the remedy functioning as intended?
    - Are the assumptions, data and cleanup levels still valid?
    - Is there new information that could call into question protectiveness of the remedy?
  - If issues, may need updated O&M Plan or remedy decision

Region 2 approach for considering climate change impacts in FYRs

Have you seen evidence of any of the following situations at your site?

-Contaminant release or migration from remedies due to water level rise or flooding.

-Remedy impairement due to water level rise, flooding, storms and/or winds.

-Other site changes that may be related to any of the following climate change impacts:

Sea level rise

Increasing frequency of heavy precipitation events

Increasing intensity of storms (winds/precipitation/storm surge)

Increasing risk of floods

Changes in temperature

YES

Does the O&M Plan have provisions for responding to these changes?

YES

Include this template language in the O&M section of the FYR: *Potential site impacts from climate change have been assessed, and the perfomance of the remedy may be impacted by the following climate change effects in the region and near the site (list potential effects from above). However, the O&M Plan addresses these impacts by... (describe relevant mitigation or adaptation measures from the O&M Plan).*

NO

Include this template language in the O&M section of the FYR: *Potential site impacts from climate change have been assessed, and the perfomance of the remedy may be impacted by the following expected effects of climate change in the region and near the site: (list potential effects from above). Consider updating the O&M Plan to include the following measures...(describe relevant mitigation or adaptation measures).*

NO

Include this template language in the O&M section of the FYR: *Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.*

http://www.epa.gov/superfund/climatechange/

Climate Change Adaptation Technical Fact Sheet: Groundwater Remediation Systems

United States Environmental Protection Agency

Office of Superfund Remediation and Technology Innovation

EPA 542-F-13-004
December 2013

In February 2013, the U.S. Environmental Protection Agency (EPA) released the draft *U.S. Environmental Protection Agency Climate Change Adaptation Plan.*[1] The plan examines how EPA programs may be vulnerable to a changing climate and how the Agency can accordingly adapt in order to continue meeting its mission of protecting human health and the environment. To answer a related question, "*How is climate change likely to affect the ability of the Superfund Program to achieve its mission and strategic goals?*" EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) conducted a screening analysis to identify climate change impacts most likely to affect remedies that are commonly used for contaminated groundwater, soil, or sediment; evaluate associated vulnerabilities of the remedies; and establish climate change adaptation strategies for new and existing remediation systems. Based on the findings, OSRTI developed a preliminary Superfund climate change adaptation action plan that is integral to a broader plan proposed in 2013 by EPA's Office of Solid Waste and Emergency Response.[2]

Existing processes for Superfund cleanup planning and implementation provide a robust structure that allows consideration of climate change impacts. Due to wide variation in the location and geophysical characteristics of contaminated sites, the nature of remedial actions at those sites, and local or regional climate and weather regimes, the process of considering climate change impacts and potential adaptation measures is most effective through use of a place-based strategy. Climate change vulnerability analyses and adaptation planning can be integrated throughout the Superfund process, including feasibility studies, remedial designs and remedy performance reviews.

A key component of the preliminary Superfund climate change adaptation action plan involves developing tools that can help project managers and other cleanup stakeholders to identify, prioritize and implement site-specific measures for increasing remedy resilience to climate change impacts.

As the first in a series, this fact sheet

Groundwater remediation systems are a common element of contaminated site cleanup projects and may function *ex situ* and/or *in situ. Ex situ* processes often involve extracting contaminated groundwater from an aquifer and transferring it to an aboveground system where the water is treated; this approach is commonly known as "pump and treat" (P&T). In contrast, *in situ* processes typically involve injecting reagents directly into the subsurface to promote desired biological or chemical reactions in contaminated groundwater. *In situ* methods also may require construction and use of a well network and

Key Points

- Agency priority to address climate change
- Existing Superfund process provides a robust structure to consider climate change vulnerability and adaptation
- Ask questions and use common sense
- Earlier the better
- Luck favors the prepared
- More info: http://www.epa.gov/superfund/climatechange/