Integrating Climate Change Adaptation into the Superfund Program

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Topics

◆ Background
◆ Project Manager’s Role
◆ Integration throughout the Superfund Process
◆ Site Example
◆ Key Points / Discussion

EPA 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
Background

◆ The *USEPA Policy Statement on Climate-Change Adaptation* (2011) directed each national program office and region to develop a climate change adaptation implementation plan by June 2013.

◆ Executive Order (EO) 13653 (2013) directed each federal agency to evaluate climate change risks and vulnerabilities to manage the effects of climate change on the agency's mission and operations in both the short and long-term.

◆ In June 2014 EPA released the final EPA Climate Adaptation Report.

Basic Question for the Agency

“How is climate change likely to affect the ability of your office to achieve its mission and strategic goals?”

Basic Question for the Superfund Project Manager

“How is climate change likely to affect the protectiveness of my site remedy, and what should I do about it?”
OSWER, Climate Change and Tribes

OSWER Climate Change Adaptation Implementation Plan

- EPA engaged tribes through a formal consultation process in the development of the agency’s Climate Adaptation Plan.

- Tribes identified erosion, temperature change, drought, and various changes in access to and quality of water as some of the most pressing issues.

- Supporting the development of adaptive capacity among tribes is a priority for the EPA.

Specific Actions Identified:

- Work with the agency’s climate change workgroup and EPA’s Office of Research and Development to share mapping data and protocols with its partners, including tribes to help inform their adaptation activities.

- Assist the Institute for Environmental Tribal Professionals (ITEP) in developing adaptation into their normal climate change training.

(OSWER = Office of Solid Waste and Emergency Response)
OSWER, Climate Change and Tribes

National Tribal Caucus, Environmental Protection for Indian Country, Budget Request and Priorities, FY 2017

◆ Expand the Work of EPA Office of Solid Waste and Emergency Response on Climate Change:

“The National Tribal Caucus appreciates the efforts of EPA Office of Solid Waste and Emergency Response (OSWER) in developing a climate change adaptation plan, and asks OSWER to expand its work on climate change to include the unique issues facing tribes.”
Key Definitions*

◆ **Climate Change**
Any significant change in climate measures lasting for an extended period of time… includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

◆ **Vulnerability**
The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes…function of the character, magnitude, and rate of variation; its sensitivity; and its adaptive capacity.

◆ **Climate Change Adaptation**
Adjusting to a changing climate to minimize negative effects and take advantage of new opportunities.

◆ **Resilience**
A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.

*http://www.epa.gov/climatechange/glossary.html*
Climate Change: Adaptation vs Mitigation

◆ While we continue to pursue reductions in GHG emissions (mitigation), we must prepare to handle impacts from climate change that is already happening (adaptation)

◆ In Superfund, through green remediation practices, we seek to reduce GHG emissions to mitigate climate change (among other goals)

◆ Through adaptation, we seek to ensure remedy resilience in the face of climate change impacts
Potential Climate Change Impacts

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

<table>
<thead>
<tr>
<th>Increased extreme temperatures</th>
<th>Sustained changes in average temperature</th>
<th>Sea level rise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased permafrost in Arctic regions</td>
<td>Decreased precipitation days, increasing drought intensity</td>
<td>Increased heavy precipitation events</td>
</tr>
<tr>
<td>Increased flood risk</td>
<td>Increased frequency and intensity of wildfires</td>
<td>Increased intensity of hurricanes</td>
</tr>
</tbody>
</table>

Image credit: U.S. Global Change Research Program (www.globalchange.gov)
Potential Issues at Superfund Sites

- Past may not predict the future
- Climate change impacts may compromise some remedies
- Some remedies in place for a long time
- Need to maintain protection of human health and environment

Some sites within 100 yr and 500 yr floodplain (based on CERCLIS ID location)
USEPA Superfund prioritization of adaptation measures reflects:

- The Agency’s mission to protect human health and the environment
- Climate change adaptation within the Agency and broader federal government
- Superfund law, regulations, policy and guidance
- Best available science
- Agency and program budget constraints
The Good News!

The existing Superfund process for planning and implementing contaminated site cleanups provides a 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

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

Hazard: Remedy is located in a low-lying area

Exposure: Within 100 year floodplain

Vulnerabilities:
- Physical damage
- Water damage
- Power interruption
- Reduced access

Other factors: Storm surge Subsidence

=RISK
Implement Prioritized Adaptation Measures

◆ Identify current and projected potential impacts
◆ Assess risks
◆ Identify and prioritize potential adaptation/mitigation measures
◆ Identify feasible first steps
◆ Build team, leadership, partner and community support
◆ Implement prioritized 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
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?
  ▪ If issues, may need updated O&M Plan or remedy decision
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 impairment 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

Region 2 approach for considering climate change impacts in Five Year Reviews

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 performance 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 performance 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).
Climate Change Adaptation

Background Information

EPA’s first policy statement (PDF) on climate change adaptation, which was issued in June 2011, recognized that climate change can pose significant challenges to the Agency’s ability to fulfill its mission of protecting human health and the environment. It called for the Agency to develop a plan for addressing future climate changes and to incorporate climate change considerations into EPA’s activities. The policy also required every national–program and regional office to develop an implementation plan providing details on how it will carry out the work outlined in an Agency–wide plan.

In February 2013, EPA released its Agency–wide draft Climate Change Adaptation Plan (PDF) for public comment. EPA’s Superfund Climate Change Adaptation Action Plan is integrated in the June 2013 draft Office of Solid Waste Emergency Response Climate Change Adaptation Implementation Plan (PDF).

The Agency’s focus on climate adaptation is part of the larger federal effort to increase the nation's adaptive capacity and prepare a healthy and prosperous nation that is resilient to a changing climate. In June 2013, the President announced his plan (PDF) to cut carbon pollution and prepare the United States for the impacts of climate change. Broader federal action to enhance climate preparedness and resilience in the United States are outlined in the November 2013, Executive Order 136 Preparing the United States for the Impacts of Climate Change.
In February 2013, the U.S. Environmental Protection Agency (EPA) released the draft *U.S. Environmental Protection Agency Climate Change Adaptation Plan*. 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.

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.

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* processes are generally more advantageous for treating low-volume groundwater releases, especially near receptors.
American Cyanamid Superfund Site
Bridgewater, New Jersey

**Primary Hazard:** Floods

**Rationale:** This 435-acre site located along the Raritan River experienced significant flooding in 2011 due to Hurricane Irene.

**Adaptation Measures:**

- Elevated critical electrical instrumentation 5 feet higher than Hurricane Irene flood waters
- Installed submersible pumps in bedrock wells to maintain hydraulic control during future floods
- Reinforced earthen berms surrounding two highly contaminated waste impoundments
- Requiring future capping systems to be designed to withstand a 500-year flood event

Source: Joseph Battipaglia, U.S. EPA Region 2
Key Points

- USEPA priority to address climate change
- Existing Superfund process provides structure to consider climate change vulnerability / adaptation
- Ask questions and use common sense
- Earlier the better
- Luck favors the prepared
For more information

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◆ http://www.epa.gov/superfund/climatechange/
Discussion/Questions?