

Climate Change Adaptation: Resilience at Brownfields

Inventory

Existing Brownfield Sites

- Risks
 - Acute risk
 - Short term-risk
 - Long-term risk
- ...then drill down
 - Tanks
 - Equipment
 - Contents
 - Quality of Maintenance

Screening

Simple script to understand risks...

1. Active? People?
2. Activities occurring?
3. Maintenance Plan?
4. Proximity to Receptors?
5. Redevelopment Stage?
6. History during events?

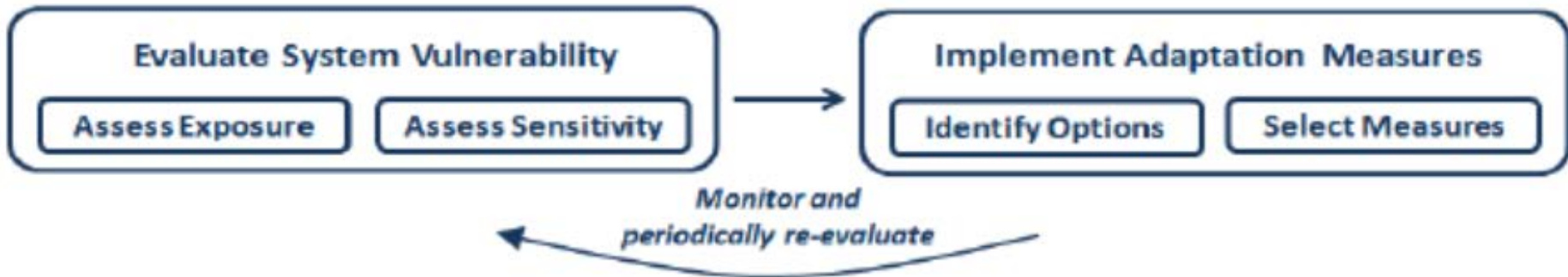
Prepare Now

Climate change vulnerability analyses and adaptation planning may be integrated throughout the project lifecycle, including:

- feasibility studies
- remedial designs
- OMM/reviews.

Climate Change Adaptation Management

Plan → Do → Check → Act



Evaluation of System Vulnerability

...to climate change may involve:

- **Identifying** climate change **hazards** of concern
- **Characterizing** the system's **exposure** to those hazards of concern
- **Characterizing** the system's **sensitivity** to the hazards of concern
- **Considering factors** that may exacerbate system exposure and sensitivity, such as a long operating period
 - VE may have a long operating period
 - *ex situ* containment systems

Climate Change Impacts

Temperature

- *Increased occurrence of extreme temperatures*
- *Sustained changes in average temperatures*
- *Decreased permafrost*

Precipitation

- *Increased heavy precipitation events*
- *Increased flood risk*
- *Decreased precipitation & increasing drought*
- *Increased landslides*

Wind

- *Increased intensity of hurricanes*
- *Increased intensity of tornados*
- *Increased storm surge intensity*

Wildfires

- *Increased frequency & intensity*

Sea level rise

Climate Change Exposure Assessment

...to climate change may involve:

...**identifies** climate change **hazards** of concern in light of potential climate/weather scenarios.

Dynamic information relevant to specific locations is readily available from several federal agencies to help screen potential hazards and identify those of concern

Characterizing the system's **exposure** to those hazards of concern

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 - GW P&T may have a long operating period
 - *ex situ* containment systems typically operate as long as the material remains hazardous, which in some cases may exceed 100 years

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Potential Points of System Vulnerability		Potential System Disruption				Adaptation Measures for High-Priority Vulnerabilities
		Power Interruption	Physical Damage	Water Damage	Reduced Access	
Soil Vapor Extraction System						
SVE System	Wells		Low		Low	
	Extraction pumps and aboveground controls	High	High	High	High	Power from off-grid sources; Well-head housing
	Vertical barriers		Low		Low	
	Pipe system		Low	Low	Low	
	Monitoring equipment	High	High	High	High	Power from off-grid sources; Remote access
Aboveground Components of the Treatment System	Electrical controls	High	High	High	High	Power from off-grid sources; Remote access
	Transfer pumps	Medium	Low	Medium		
	Pipe system		Medium			
	Electric equipment	High	Low	High		Power from off-grid sources
	Natural gas-driven equipment	Medium	Low	Medium		
	Ancillary equipment driven by fossil fuel	Medium	Low	Medium		
	Flow-through units	Medium	Low	Medium		
	Chemical storage containers		High	Medium		Relocation; Tie down systems
	Treatment residuals disposal system		Low	Medium		
Treated water discharge system	Medium	Low	Medium			
Site Operations and Infrastructure	Buildings, sheds, or housing	High	High	High	Low	Power from off-grid sources; Hurricane straps
	Electricity and natural gas lines	High	Medium	High	High	Relocation
	Liquid fuel storage and transfer	Medium	Medium	High	High	Concrete pad fortification; Tie down systems
	Water supplies	Medium	Medium	High	High	Coastal hardening
	Exposed machinery and vehicles		Medium	High	High	Relocation
	Surface water drainage systems		Medium	Medium	Medium	