Benefits from Remediation, Restoration, and Revitalization

SHC 9.3
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Contribution of Site Remediation and Restoration to Revitalizing Communities and Improving Well-being (Report)

**Partner Needs**

- Evidence linking environmental condition of restored sites to human health and well-being
- Metrics and methods to demonstrate linkages between remediation or restoration and redevelopment
- Integrating community priorities, redevelopment goals, and human health and well-being impacts into remediation and restoration decisions
Contribution of Site Remediation and Restoration to Revitalizing Communities and Improving Well-being

Scientific Challenge

• Implementing interdisciplinary and translational social-ecological systems research at remediation and restoration sites
• Leveraging an improved understanding of human communities to improve remediation and restoration outcomes
### Output Structure

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<td><em>Innovative metrics</em></td>
<td><em>Ecosystem-health relationships</em></td>
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<td>Natural hazards <em>risks and resilience</em></td>
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Assessing Ecosystem Services and Human Well-being Indicators (SHC 9.3.1)

Partner Challenge
• Links between the 3 Rs poorly documented with limited data
• Partners lack practical indicators

Addressing the Challenge
• Research will validate indicators of human well-being
• Collaborative, retrospective analysis of completed projects

Short-term Goals
• Reports and briefing documents on validated indicators
• Estimate the economic value of cleanup at contaminated sites.

Long-term Goal
• Provide a science-based approach to assess revitalization outcomes in the AOC context
Validation of Waterfront Revitalization Indicators at Community Scale

**Waterfront attribute indicators**

- Ecosystem services
- Brownfields
- Recreational amenities
- Shoreline type

**Human well-being indicators**

- Demographics
- Public health
- Community resilience
- Life expectancy
- Economic opportunity

Replicate census tracts

Economic Benefits of AOC and Superfund Cleanup

Conceptual Model for Quantifying Revitalization

Remediation
- Dredging
- Construction of aquatic habitats

Use values
- Recreational fishing
- Non-use values
- Existence values

Revitalization

Number of fish caught by anglers

Economic Valuation

• Recreation demand model
• Stated preference
• Benefit transfer

Removed Beneficial Use Impairments

Degraded Fish and Wildlife Populations

Linking the Environment and Human Benefit

Product 1
Support for RAP Research

- EPA Great Lakes National Program Office
- States

“The importance of research demonstrating how community investment in revitalization is linked to the on-going environmental clean-up efforts can’t be overstated. Indicators [developed by EPA] of waterfront revitalization will help document a comprehensive view of an estuary in recovery. Having access to EPA scientific expertise and their technical briefings on revitalization indicators will fulfill MPCA’s data-driven mission of informing decisions and help delist the St. Louis River AOC. Our progress and overall success is directly enhanced by their participation and expertise.”

Doug Wetzstein, Acting Director of Industrial / Remediation Divisions, Minnesota Pollution Control Agency (excerpt from letter to Michael Slimak and Andrew Geller)
Partner Challenge

- “Superfund does not only seek to clean up sites—we want to see sites back in productive use serving their local community.” (Larry Zaragoza, OLEM/Superfund February, 2020; Resilience Workshop)
- Sustainable, resilient projects
- Contaminated sites plan in the context of potential exposure to natural hazards
- Partners: Office of Land and Emergency Management (OLEM), Regions, communities

Image credit: The Bay City Times
Addressing the Challenge

• The Cumulative Resilience Screening Index (CRSI) provides natural hazard exposure information:
  – Hurricanes        - Drought          - Inland Flooding
  – Tornadoes         - High Winds       - Hail
  – Coastal Flooding  - Landslides       - Earthquakes
  – High Temperatures - Low Temperatures - Wildfires

• Information at the county level and in some cases by latitude-longitude
Research Activities – 2020-2022

SuperCRSI (Fig.1) → Exposure Histories → CRSI Verification

Overlay of Exposure and Contaminated Sites Data → Exposure Histories Updated for CRSI Risk Domain → Use Hurricane, Tornado and Wildfire Data from 2016-2019

**Long-term Goal:** EPA Office of Land and Emergency Management and Regions will use in developing restoration or revitalization plans
Figure 1. Map of co-occurrence of magnitude of natural hazard exposures and Superfund sites
Assessing How Human Health and Well-being is Affected by Site Remediation and Restoration (SHC 9.3.3)

Partner Challenges

1. Identify changes in community and individual health related to ecosystem goods and services (EGS) and contaminated site revitalization
   - EPA Partners: Region 3, Region 4, Office of Environmental Justice, Brownfields Program, and Office of Land and Emergency Management
   - Deliverables: Reports, webinars, peer-reviewed publications, and databases of health effects

2. Quantify the health benefits of R2R2R
   - EPA Partners: Region 2, Region 4, Office of Environmental Justice, Great Lakes National Program Office, and Office of Land and Emergency Management
   - Deliverables: Reports, peer-reviewed publications
Three projects

1. Impact of EGS and Brownfields on Vulnerable Populations
2. Public Health Benefits of Revitalizing Brownfields
3. Health Benefits of Greenspace Access for Patients with Diabetes
Impact of EGS and Brownfields on Vulnerable Populations

Addressing the Challenge
• Associate adverse health effects of brownfields and health benefits of EGS in vulnerable, patient populations

Short-term Goals
• Classify current brownfield status
• Create integrated database of brownfields, EGS, and health records

Partner Impact
• Evidence of health effects of active brownfields and of local EGS
Public Health Benefits of Revitalizing Brownfields

Addressing the Challenge
• Associate health biomarkers to community changes
• Relate well-being indicators to environmental improvements in R2R2R framework

Short-term Goal
• Collect, scale, and utilize health and well-being indicators at local and national levels

Partner Impact
• Improved communication on health benefits of brownfields revitalization
Health Benefits of Greenspace Access for Patients with Diabetes

Addressing the Challenge
• Model health benefits of local greenspace for pre-diabetic and diabetic individuals

Short-term Goal
• Merge greenspace access data with health records of diabetes patients

Partner Impact
• Support of health impact assessments for health-oriented urban policy interventions
Three projects

1. Benefits of removing impairments at remediation sites
2. Benefits of environmental rejuvenation on vulnerable populations
3. R2R2R as a natural experiment for human health and well-being
Benefits of Restoring Ecological Impairments at Remediation Sites

Addressing the Challenge
• Systematic review of BUI (e.g., aesthetic degradation) and human health linkages

Short-term Goal
• Develop communication tools on impact of removing beneficial use impairments (BUI) for Great Lakes coastal communities

Partner Impact
• Support of health impact assessments for health-oriented urban policy interventions
Benefits of Environmental Rejuvenation on Vulnerable Populations

Addressing the Challenge
• Assess impact of environmental rejuvenation on physiological and behavioral endpoints

Short-term Goal
• Evaluate cardiometabolic benefits of environmental rejuvenation

Partner Impact
• Provides key information on the benefits of environmental rejuvenation

Environmental/housing enrichment improves cardiovascular function and response to exercise

- Depleted housing conditions
  - Restricted space
  - No psychosocial enrichment
  - Seclusion
- Enriched housing conditions
  - Open space
  - Psychosocial enrichment
  - Socialized housing

10% ↓ in resting/exercise heart rate
R2R2R as a Natural Experiment for Human Health and Well-being

Addressing the Challenge
• Natural experiments using completed site rejuvenation

Short-term Goal
• Select initial study areas and analytic methods

Partner Impact
• Improved data on benefits and impacts of clean-up processes
Economic Evaluation of Contaminated Site and Brownfields Remediation (SHC 9.3.4)

**Partner Challenge:** Estimate the economic impacts of remediation and restoration of brownfields and contaminated sites

- **Brownfields:** Remediate, Redevelop
- **Contaminated Sites:** Cleanup, Restore

Data Sources: American Community Survey, Zillow, EJScreen Tool, EnviroAtlas
Region 4: Interested in demonstrating the economic impacts of land cleanup

Addressing the Challenge

• Quantitatively evaluate the economic impacts of brownfield and/or superfund cleanup and restoration (market and non-market valuation)
• Region 4 potential study sites: Atlanta, GA; Orlando, FL; Tampa, FL; Gainesville, FL
• Output: Presentations, data, models, peer-reviewed publications, report

Short-term Goal

• Identify case study site

Gainesville, FL Depot Park brownfield project
GLNPO: Interested in the economic impact of remediation and restoration of Great Lakes Areas of Concern (AOCs)

**Addressing the Challenge**

- Quantify the economic benefits of remediation and restoration (removal of Beneficial Use Impairments)
- Spatial and panel data will be collected at active clean-ups and de-listed AOCs
- Research Output: Data, maps, report, and peer-reviewed publications

**Short-term Goal**

- Identify prospective and retrospective study sites
Where to work? Development of Remediation and Restoration Strategies (SHC 9.3.5)

Goal: Demonstrate watershed-scale strategies for determining where and how to implement contaminated site remediation and restoration practices

- Great Lakes communities
- Puget Sound communities
- San Juan Bay, Puerto Rico

Work with long-standing partners (federal, state, tribal, community)
Great Lakes Demonstration Site

Great Lakes Communities

Contaminated Sites
- Brownfields
- Superfund
- Stormwater runoff

Revitalized communities
- Improved ecosystem services
- Improved human health

Partner Challenge
- Spatial distribution of contaminant-related risks
- Watershed strategies to protect remediation, restoration progress

Addressing the Challenge
- Implement hydro-biogeochemical models of contaminant fate, transport, and bioaccumulation
- Identify land-use strategies for reducing contaminant impacts

Short-term Goal
- Test strategy for bioaccumulation-related risk (based on a recently completed model)

Product 5
Partner Challenge
- Reducing contaminant loads in urban stormwater
- Quantify link between condition (toxics in fish) and human health

Addressing the Challenge
- Identify green and gray infrastructure best practices (VELMA, Aquatox)
- Provide partners science-based strategies to mitigate stormwater

Short-term Goals
- Green infrastructure modeling demos for Seattle area communities
- Begin partner and community outreach workshops (DASEES)

Product 5
San Juan Bay, Puerto Rico

Partner Challenge
- identify areas most vulnerable to flooding with contaminated water
- Spatial patterns of emerging contaminants and ecological impairment

Addressing the Challenge
- Database: frequency, duration, and extent of neighborhood flooding
- Identify hot-spots

Short-term Goals
- Develop community flood maps
- Identify emerging contaminants of greatest concern

Contaminated Sites
- Brownfields
- Superfund
- Stormwater runoff

Revitalized communities
- Improved ecosystem services
- Improved human health

Communication and education

Product 5
Thank you

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