# Benefits of Remediation, Restoration, and Revitalization (R2R2R)

## SHC Research Area 9

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# Disclaimer

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# Research Area 9 Introduction

- The research in Topic 3 (RA9-11) will:
  - identify interrelationships among EPA's work in remediation, restoration, and revitalization (R2R2R)
  - explore factors affecting:
    - those activities such as chronic and acute environmental stressors, (e.g., "nuisance" flooding, hurricanes)
    - the realization of benefits to health and well-being, resilience, and economic vitality.

# BOSC 2019 Recommendations

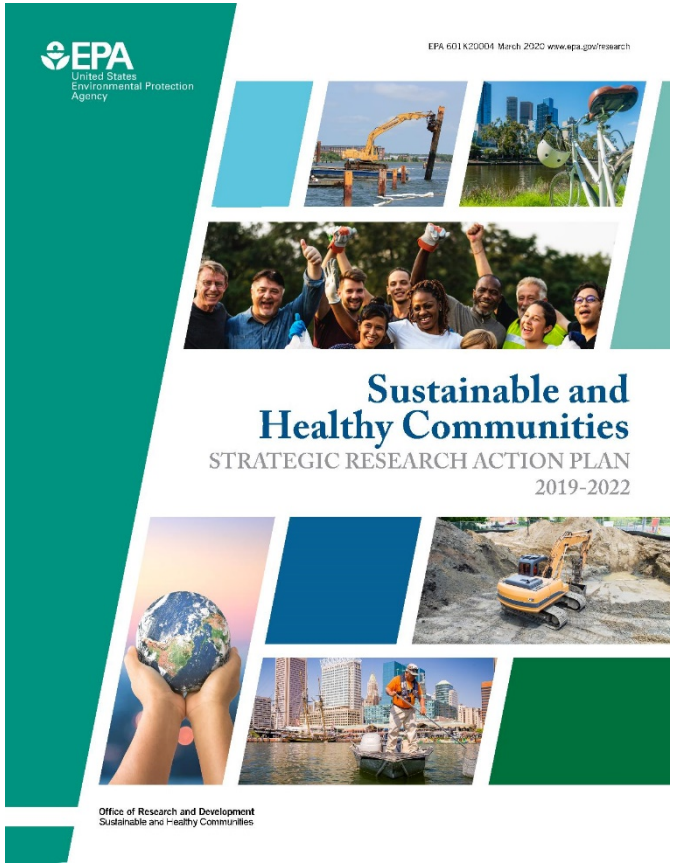
- **Ecosystem Services and Community Wellbeing**: Recognize that benefits and values emerge from a cascading process, which is mitigated at each step by social and cultural factors resulting in inequitable access to ecosystem service benefits within communities. We look forward to seeing metrics on the flow and value (or lack thereof) of ecosystem services for specific groups or communities along these lines in the forthcoming implementation plan.
- **Comparative Community Experiences with Contamination and R2R2R**: SHC is uniquely positioned to go back to communities who have been through the process of R2R2R - or are further along the process - to identify what stakeholders wish they would have known or done along the way.
- **Cultural Resilience**: Research suggests that cultural differences can influence disaster response and recovery. By incorporating research attention on cultural resilience, place attachment, and intergenerational transfer of knowledge within communities, SHC may gain critical insights into factors enabling or constraining success along the community R2R2R pathway.

# RA9 Research Focal Points

- Research is focused on:
  - links between ecosystem goods and services and human health and well-being;
  - evaluating environmental restoration and ecosystem services contribution to community health and revitalization;
  - risks and impacts to vulnerable life stages and communities;
  - providing EPA, states, and communities with metrics to evaluate environmental conditions and public health and well-being.

# Remediation to Restoration to Revitalization

- Research area 9 completes the connections from site-specific remediation and restoration efforts to the surrounding and nearby communities impacted by contamination or other disasters that render areas unusable.
- It builds on the experiences and identified needs from collaborative work with OLEM's Superfund and Brownfields programs, Great Lakes National Program Office (GLNPO), EPA regions and states.



# Complementary Research Areas

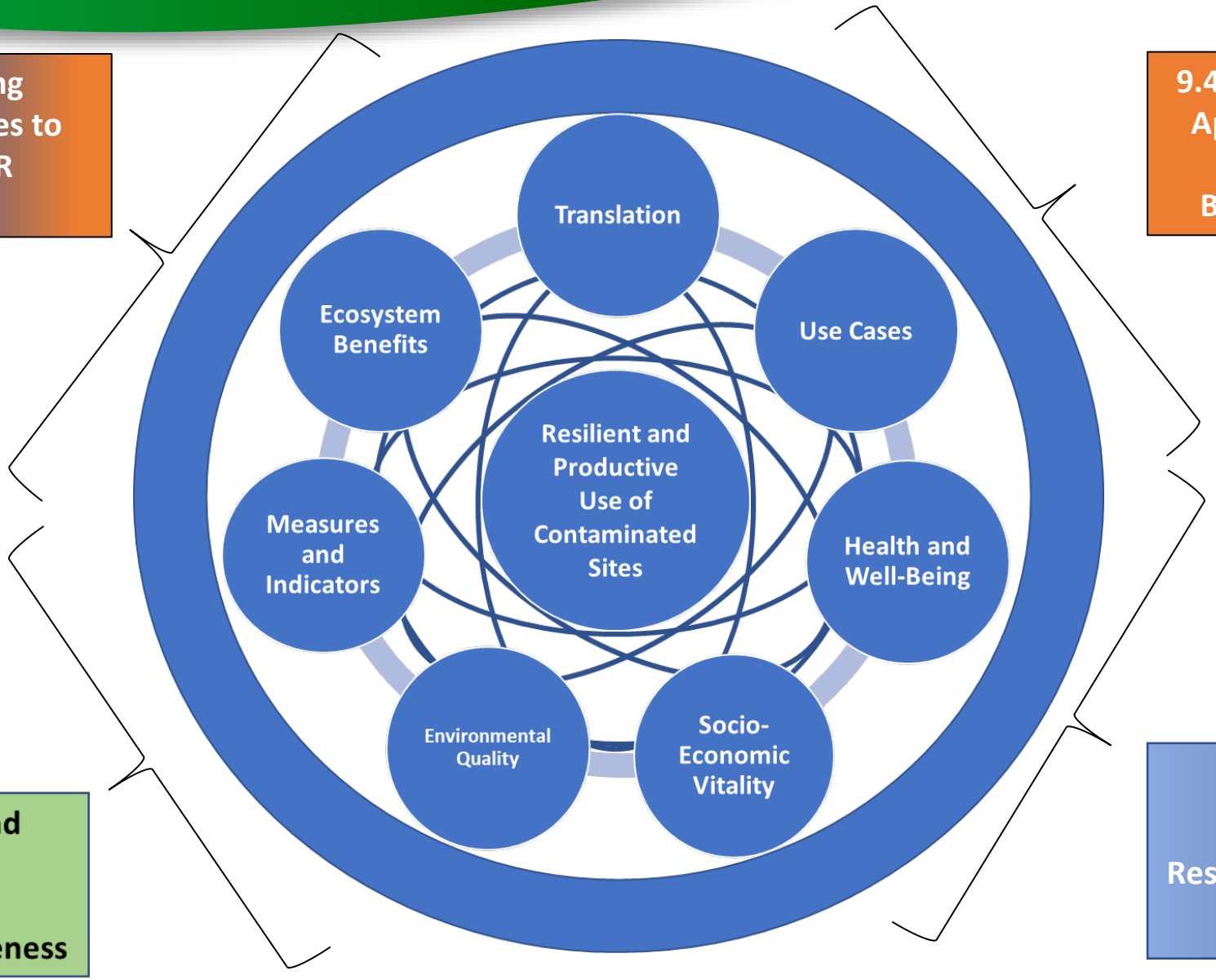
## Resilient Community-Driven Solutions

| | Characterizing Community Resilience and Restoration Effectiveness | What are the Risks and Benefits to Community-based Health & Well-being? | What are the Solutions for Communities to Ongoing Environmental Challenges? | How do we Effectively Support Decision Making ? |
|---|---|---|---|---|
| RA9 Benefits of Remediation, Restoration and Revitalization | 9.1 – Methods and Measures for Characterizing Restoration Effectiveness | 9.2 – Translating Ecosystem Services to Support R2R2R<br>9.3 – Impacts of Site Remediation and Restoration on Community Revitalization | | 9.4 – Case Studies to Apply and Analyze Use of Tools at Brownfields Sites |
| RA10 Resilient Communities | 10.1 – Assets and Vulnerabilities | 10.2 – Vulnerable Populations and Cumulative Impacts<br>10.4 – Impacts from Environmental and Natural Disasters | 10.5 – Actions for Resilient Communities | 10.3 – Translating Science into Decision Making |

# Complementary Outputs

**9.2 – Translating Ecosystem Services to Support R2R2R**

**9.4 – Case Studies to Apply and Analyze Use of Tools at Brownfields Sites**




**9.1 – Methods and Measures for Characterizing Restoration Effectiveness**

**9.3 – Impacts of Site Remediation and Restoration on Community Revitalization**

# Evaluation of Restoration Effectiveness

- EPA, states, and the private sector invest heavily in restoration activities relevant to contaminated sites.
- Approaches for assessing restoration effectiveness are relatively new.
- Temporal and spatial variability in existing restoration success metrics are poorly characterized and difficult to implement.
- The resilience of the socio-ecological systems to environmental changes, such as extreme weather events, is also poorly characterized.
- Managers lack data and methods to project future restoration effectiveness or assess the effectiveness of previous restoration actions.

# Methods and Measures for Evaluating Restoration Effectiveness.

- Use physical, chemical, genomic, biological, ecological, health promotion, and/or socio-economic lines of evidence to:
  - Evaluate spatial and temporal scales for methods and metrics that meet partners' needs.
  - Evaluate effectiveness of linked remediation and ecological restoration actions, including potential threats from extreme weather events.
  - Refine or develop approaches to assess restoration effectiveness.
  - Measure change in ecological condition and associated beneficial uses.

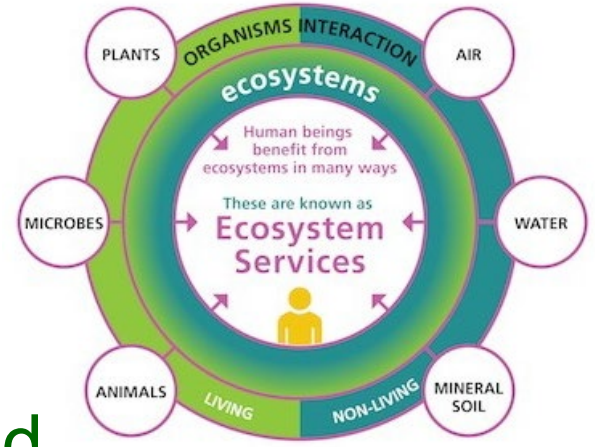


# Linking Remediation and Restoration to Revitalization

- GLNPO and OLEM's Brownfields program want to know how site remediation and restoration contributes to community health and revitalization.
- Local, state and federal programs need evidence to communicate links between restored site environmental condition and human health and well-being.
- Approaches are needed to integrate community priorities, redevelopment goals, and human health and well-being impacts into remediation and restoration decisions, such that outcomes are more beneficial for community revitalization efforts.
- Decision makers also need metrics and methods to demonstrate linkages between relatively smaller scale and shorter term remediation/restoration actions and larger, longer term redevelopment/revitalization efforts.

# Output 9.2






## Ecosystem Services Tools and Approaches to Support Remediation to Restoration to Revitalization.

- Report on applications of ecosystem services tools and approaches in support of R2R2R decision making including:
  - Assessments of methods for quantifying and mapping ecosystem services in different decision contexts;
  - Evaluation of potential application of methods to support decision making in remediation, restoration, or revitalization contexts;
  - Translation or development of methods, knowledge, data sets and tools to facilitate application of ecosystem services and their benefits as decision support in remediation, restoration, or revitalization contexts.

# Output 9.3

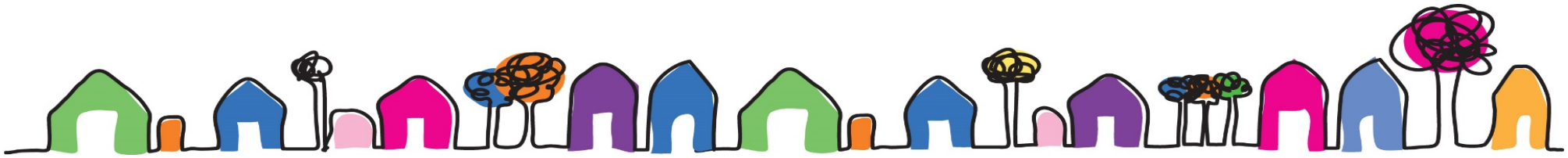
## Contribution of Site Remediation and Restoration to Revitalizing Communities and Improving Well-being.

- Develop, validate, and demonstrate innovative metrics to assess longer-term social and economic benefits (i.e. revitalization).
- Synthesize metrics and methods for linking remediation and restoration to revitalization and evaluate risks and resilience of contaminated sites from natural hazards.
- Evaluate causal connections between ecosystem condition and human health and well-being.
- Evaluate market and non-market economic valuation for communities measuring impact of remediation, restoration, and revitalization efforts.
- Assess the impact of sociocultural and biophysical factors that may modify ecosystem-health relationships.



# Translating ORD Tools for Brownfield Communities

- Brownfield grantees developing area-wide plans and other actions designed to revitalize properties and communities seek to maximize the public benefits from site cleanup, redevelopment, and revitalization efforts.
- SHC's science-based tools can potentially support improved redevelopment decisions, but need to be more widely available and tested in real-world situations to ensure usability.



# Case Studies to Apply and Analyze Use of Tools at Brownfield Sites.

- Select relevant tools and assess their applicability across different project types, timeframes, and community scales.
- Evaluate and improve the applicability and usability of these tools, and identify refinements needed to support their wider use.
- Develop products that describe the tool functions, experience level needed, data and system requirements, and criteria for tool selection in the context of Brownfield-related activities.
- Pilot testing and outreach to users to increase awareness of existing tools.

# Outputs and Partners

- Output 9.1:
  - OLEM, GLNPO, EPA regions and NEPs
- Output 9.2 and 9.3:
  - EPA Regional Superfund and RCRA Corrective Action Programs;
  - GLNPO and OW;
  - OLEM/OSRTI and OBLR;
  - Federal and State Agencies
  - OP/OCR and their regional coordinators;
  - U.S. Army Corps of Engineers (USACE),
  - ASTHO, APHA, and CDC.
- Output 9.4:
  - OLEM/OBLR and ECOS