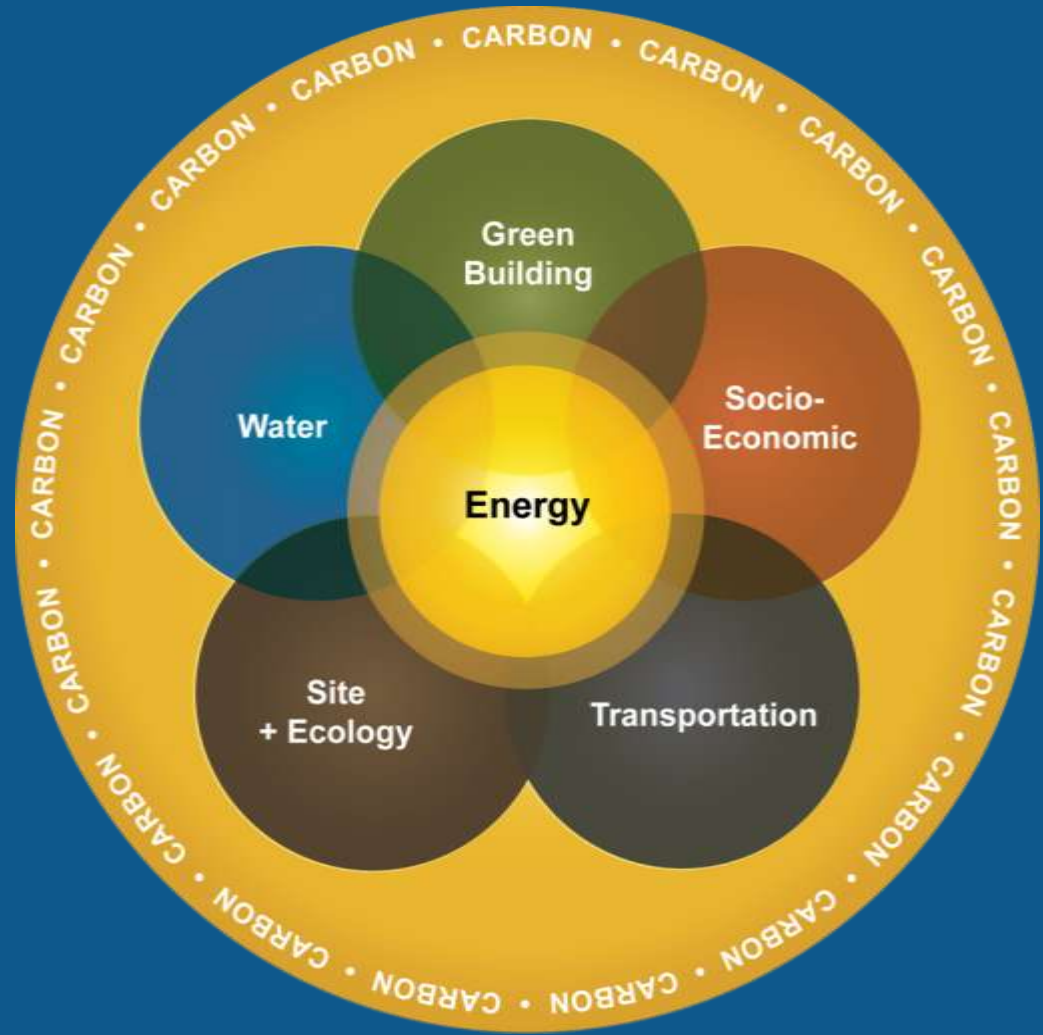


Evolution of the Brownfield Model : Integrating Sustainable Principles into Site Development and Cleanup

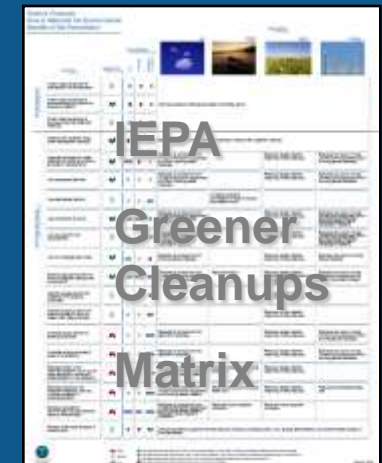
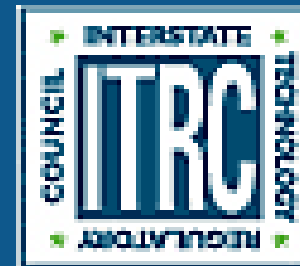
- / Ecological Resources
- / Site Cleanup
- / Energy
- / Transportation
- / Green Building
- / Water
- / Socio /Cultural
- / Economic



Sustainable System Integrated Model (SSIM)
quantifies cost versus results for sustainability metrics.

Green and Sustainable Remediation (GSR) – A New Paradigm?

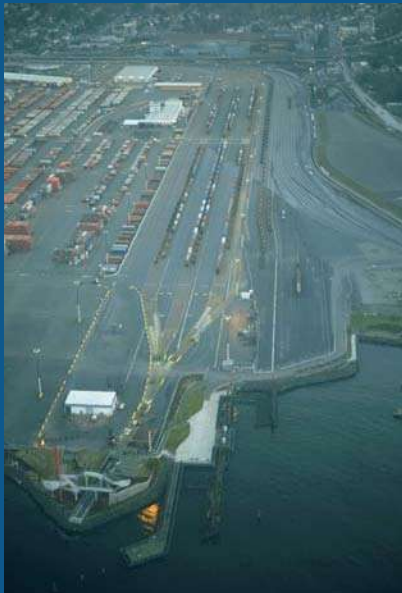
- Emerging area with significant regulatory & industry involvement.
- The focus is on reducing the “footprint” of remedial actions in terms of energy use, GHG emissions, water & raw materials consumption as well as assisting in beneficial uses of the property
- Considerable debate on how to integrate sustainable considerations into the regulatory process
- There are many opportunities to conduct remediation in a greener way
- Low or alternative energy solutions and in situ remedies should generally be more sustainable



Example: Evaluate, Quantify & Rank Adaptive Reuse Options for Negative & Positive Impacts

Core Element	Evaluate Negatives	Evaluate Positives
1. Energy	Total energy use: natural gas (BTU), electricity (kWh), fuel (gallons)	Renewable energy applied (KWh saved by solar, wind, geothermal, biomass energy)
2. Air	Total air pollutants, GHG emissions (CO ₂ e), dust	GHG emission reductions (CH ₄ to CO ₂)
3. Water	Total water use (gallons or liters)	Water recovery (gallons or liters)
4. Land	Total land disturbed (acres); noise and lighting disturbances	Land reuse (acres); ecosystems enhanced
5. Materials & Waste	Waste generated (tons)	Materials reused (tons)

Evolution of the Brownfield Model – Site Reuse as catalyst for cleanup



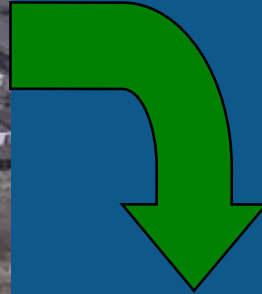
Benefits

1. Cleanup integrated into site infrastructure reducing total project costs
2. Created 1000 new family wage jobs
3. < 3 years from RI to cleanup
4. More efficient transportation infrastructure reduced regional GHG

Evolution of the Brownfield Model – Green Buildings



Former Manufactured Gas Plant



High Tech Research Center

Evolution of the Brownfield model: Green Technologies for site cleanup



- In situ technologies less resource intensive
- Storm water management integrated into site development
- Wetlands mitigation and shoreline enhancements create fish friendly habitat



- *Former MGP closed in place*
- *1,395 solar modules*
 - *Largest solar array in New England*
 - *450 kw of electricity*
 - *Results in annual reduction of 589,570 lbs of CO₂*
 - *Environmental, Aesthetic, Educational, Economic Benefits*



Evolution of the Brownfield model: Sustainability indicators considered in cleanup and site development

