

# Sustainable Remediation: Analysis of Current Frameworks



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## OUTLINE:

Section 1:  
Introduction

Section 2: Research  
Methods

Section 3: Results

Section 4: Discussion

Section 5:  
Conclusion



Oil Refinery Remediation, Long Island, NY

Source: <http://www.odormanagement.com/markets/remediation.php>

# Section One

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**INTRODUCTION**

# 1. Introduction

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- Remediation can play a key role for future development.
- Understanding the role of sustainability in remediation frameworks can contribute meaningfully to remediation industry

## Remediation Benefits:

- Remove contaminants
- Improve environmental health
- Improve safety for humans
- Land use planning
- Regional & Local Planning
- Urban Renewal

# Why is Sustainable Remediation Important?

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- Fewer Resources
- Less Energy
- Lower Negative Impacts
- Lower Costs
- Ethical
- Justice
- Maximize Land Use
- Redevelopment to Suitability Needs
- Fits Local & Regional Planning
- Enhance Corporate Image
- Economic Opportunity Spin offs

# What is the problem?

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Is it 'sustainable' name sake?

How is 'sustainability' operationalized in these frameworks.



High Line, New York  
<http://dornob.com/historic-preservation-urban-landscape-design/#axzz2ybNcAd3o>

# Research Purpose & Objectives

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To Critically Examine the Role ‘Sustainability’ and its Contributions in Sustainable Remediation (SR).

1. Examine how Sustainability is Integrated into SR Frameworks;
2. Examine how sustainability is operationalized in SR practice;
3. Recommendations for improved integration.

# Section Two

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**RESEARCH METHODS**

# Research Methods

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- Six remediation frameworks evaluated against seven criteria derived from sustainability assessment literature.
  - Major influences: Bond et al, 2013; Gibson, 2006a, 2006b.
- Criteria based on normative sustainability principles to assess the integration of sustainability.

# Normative Principles & Sustainability Criteria

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<b>CRITERIA:</b>	<b>SOURCES:</b>
[1] How is sustainability integrated?	Bond et al, 2013; Gibson, 2006a; Hacking & Guthrie, 2008; Pope et al, 2004
[2] Are there tools specifically allocated for sustainability appraisal?	Gibson, 2006a
[3] Are LCA principles or tools encourage in the remedy selection or future land use selection?	Niederl-Schmidinger & Narodoslowsky, 2008; Manuilov et al. 2009; Jeswani et al. 2010;
[4] Is future land use and design part of the remedy alternative selection process?	Fourtuna et al, 2012; NEPA, 2008
[5] Does the framework encourage intragenerational land use and design?	Gibson, 2006a; Gibson, 2006b
[6] Does the framework encourage intergenerational land use and design?	Gibson, 2006a; Gibson, 2006b
[7] How is public engagement integrated in the framework?	Bond et al. 2013; Gibson, 2006a; Gibson, 2006b

# Six Remediation Frameworks

- ASTM International (2013). *Standard Guide for Integrating Sustainable Objectives into Cleanup*. Designation E2876- 13
- Government of Canada (2013). *Federal Contaminated Sites Action Plan (FCSAP): Decision-Making Framework*. ISBN 978-1-100-22157-1
- United Kingdom Sustainable Remediation Forum (Bardos et al.) (2011). *Applying Sustainable Development Principles to Contaminated Land Management Using the SuRF-UK Framework*. DOI: 10.1002/rem.20283
- United States National Environmental Protection Agency (2008). *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites*. EPA 542-R-08-002
- United States Sustainable Remediation Forum (Holland et al) (2011). *Framework for Integrating Sustainability into Remediation Projects*. DOI: 10.1002/rem.20288
- Wisconsin Initiative for Sustainable Remediation and Redevelopment (2012). *Green & Sustainable Remediation Manual: A Practical Guide to Green and Sustainable Remediation in the State of Wisconsin*. Pub-RR-911

# Section Three

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**RESULTS**

# Overview of Frameworks

	ASTM	FSCAP	NEPA	SuRF-UK	SuRF-US	Wisconsin
Strengths	<p>Clear defined goals and definitions with sustainable management, BMP, and sustainable development.</p> <p>Straightforward and detailed objectives.</p>	<p>Simple 10 step process and references to other governmental organizations.</p>	<p>Step-Process incorporating BMPs with the Core Elements. Supports alternative energy throughout framework.</p>	<p>Separates Sustainability assessment from management. However, uses both to build a theoretical base for the framework.</p>	<p>Uses a tiered approach that incorporates layers of data to support project decision-making.</p>	<p>Clear step-wise processes, and uses technical tools and calculations for decision making.</p>
Weakness	<p>Structure of the framework is difficult to follow, not a fluid stepwise process.</p>	<p>No consideration of sustainable or green remediation. Limited management processes.</p> <p>Sustainability is only present as an objective.</p>	<p>No conceptual introduction into sustainability.</p>	<p>Presents different steps in different sections. This separates what should be fluid process.</p>	<p>Lack of social and economic aspects. As well as clear defined stepwise process.</p>	<p>Addresses economic and social issues very briefly and does not incorporate them in detailed metrics.</p> <p>Misses “stewardship” as a core element, which diminishes sustainability.</p>

# C1: How is Sustainable Remediation Defined?

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- Wisconsin, 2012: Sustainable remediation **encompasses green remediation and includes detailed analyses** associated with remedies as part of the design and analysis of various alternatives, and may include the evaluation of economic and societal costs and benefits, along with traditional environmental considerations
- SuRF US 2011: Sustainable remediation reflects a more **holistic approach aimed at balancing the impacts and influences of the triple bottom line** of sustainability (environment, social, & economics) while protecting human health and the environment.
- SuRF UK, 2011: The practice of demonstrating, in terms of environmental, economic and social indicators, that the **benefit of undertaking remediation is greater than its impact**, and that the optimum remediation solution is selected through the use of a balanced decision-making process.
- NEPA, 2008: No definition of sustainable remediation, yet within the **document outlines six core principles. The core principle ‘Stewardship’ include social and economic elements.** Additionally, NEPA lists ‘increasing sustainability of site clean ups’ under the “Green Remediation Objectives”.
- FCSAP, 2013: **No definition of sustainable remediation or sustainability** presented in the document, however in Appendix A, table 2 lists category/evaluation matrix which include sustainable development, socio-economic impacts, land use, amongst other sustainable aspects.
- ASTM, 2013: No definition of sustainable remediation. However, defines sustainability as “to create and maintain **conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations**” (p.4).

# C2: Tools for Sustainability?

ASTM	FCSAP	NEPA	SuRF-UK	SuRF-USA	Wisconsin
<p>Qualitative and Quantitative tools are used to support BMPs, data collection and analysis.</p>	<p>Risk assessments are encouraged. A rating scheme of objectives are suggested.</p>	<p>Conceptual Site Models, BMPs on six core elements. Focus on “whole site” planning.</p>	<p>Sustainability Assessment and Sustainability Management are the key aspects to their framework, and to sustainable remediation.</p>	<p>Emphasis on layering of data (three-tiered approach) and sustainable conceptual site model.</p>	<p>Variety of calculations and metrics to assist in sustainability (reduction of resources).</p>

# C3: Life Cycle Assessment (Tool or Concept?)

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## Tool

- Wisconsin says to have calculations to show the best option for reducing resource use.
- NEPA encourages life cycle perspective to evaluate chemical, biological, and economic interactions.

## Concept

- Time Horizons of each BMPs and criteria (ASTM).
- Post-design phase and remedy balance in full scope (SuRF-USA).
- Fundamental boundary conditions in assessment (system and life-cycle boundary) (SuRF-UK).

To maximize sustainability, land reuse should be considered as early as possible (NEPA).

Risk-based criteria linked with end-use can be used to define acceptable limits (SuRF-UK).

End use should be updated to reduce unnecessary steps (SuRF-USA).

Redevelopment of lands can help community revitalization and conservation of Green space (Wisconsin)



## C4: Future Land Use & Design

Flowing Gardens, China.

Source: <http://archpaper.com/news/articles.asp?id=5250>

ASTM encourages proponents to use local facilities, local labour and to train residents to increase availability for jobs.

NEPA emphasizes that alternative energy can be routed to the community for subsidized cost, employment opportunities and community longevity.

Wisconsin notes that conservation of greenspace brownfield revitalization.



## C5: Intragenerational Equity

Tianducheng development, China. Source: <http://www.dailymail.co.uk/news/article-2384036/Inside-Chinas-mini-Paris-Town-built-look-just-like-French-capital-complete-Eiffel-Tower-Champs-Elys-es.html>

# C6: Intergenerational Equity

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Implicit in the basic principle of remediation. However, some frameworks quite explicit about certain aspects.

- Alternative energy may allow for multi-generational benefits. However, the focus on reducing footprint, cleaning-up and redeveloping land will ultimately benefit future generations (NEPA).
- Think beyond the current generation and maintain focus on long-term human and environmental health (SuRF-UK & SuRF-USA).
- ASTM notes “future site use and BMPs should consider intergeneration impacts and outcomes for surrounding areas (p.4).

# C7: Level of Public Engagement?

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- Stakeholder groups should be consulted because they may have a unique understanding to the redevelopment area (SuRF-UK & SuRF-USA).
- Ensuring positive collaboration for views and input of stakeholders are incorporated into the final design, and should be consulted on BMPs (ASTM).
- Stakeholders can provide key information about site history, end-use and safe exposure limits (FCSAP).
- Transparency and community involvement is extremely valuable to a successful project (Wisconsin).

# Section Four

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## **DISCUSSION:**

- 1) THE DEFINITION OF SUSTAINABILITY SETS CONTEXT IN WHICH SUSTAINABILITY IS OPERATIONALIZED IN THE FRAMEWORK**
- 2) CONFUSION AROUND SOCIAL ASPECT IN SUSTAINABILITY**
- 3) PUBLIC COLLABORATION OR PUBLIC BUY-IN**

# 1. The Context of “Sustainability”

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The SuRFs and ASTM both use sustainable development principles or aspects in their definition.

- Holistic; triple-bottom line; not compromising future

NEPA “recognizes that incorporation of sustainability principles can help increase the environmental, economic and social benefits of cleanup” (p. 1).

Wisconsin definition includes “SR analysis are performed during the remedy selection process, and are applied through” (p.2-1)

SuRF-UK adopts a ‘high level’ approach.

SuRF-US adopts a ‘high level’ approach, but also supporting tools

ASTM uses management, core elements, sustainability BMPs

NEPA shows a management approach of only core elements. Stewardship is key, but it focuses on energy, largely bio-physical.

Wisconsin has a tool based approach, with various tools and overlapping methods.

# Example: Integration of Sustainability

- Wisconsin (2012) presents sustainability not as a rigid definition, but a series of tools. These tools are scattered across the framework. While the encouragement of incorporating sustainability is to reduce the environmental impact of remediation projects, it does not include the fundamental view of 'big picture' of sustainability or as a guiding principle (refer to Bond et al, 2013 and Gibson, 2006.)
- SuRF UK (2011) presents a highly theoretical view of sustainability and sustainability management. It's presented as an underlying principle to be included in decision making processes and steps of the framework.

## 2. Confusion on Social Aspects of Sustainability

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Social dimension of sustainability not consistently defined or integrated.

- No definition given of social aspects.
- Some approaches view the ‘social’ aspect of sustainability as mere public communication.
- Often mentioned in definition of sustainability, but then missing from the SR framework.
- Limited guidance on how to incorporate social aspects of sustainability into the framework.

Examples:

Wisconsin describes social & community metrics as safety, traffic, dust, land re-use, community assets.

NEPA uses “social” in page one & page 43, with no direction or tools. Indirectly speak of benefits through energy independence.

ASTM discusses the relationship between sustainability and local community vitality, enhancement of individual human environments (p. 6).

# 3. Public Consultation or Public Buy-in

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What is the purpose of consultation?

- Regulatory requirement?
- License to operate?
- Is engagement part of the due diligence process?
- Is engagement for enhancing project design from incorporating unique elements that communities want.
- SuRF-UK defines a sustainable assessment as a “consultative process that seeks to find a consensus” (p. 88).
- ASTM considers collaborative participation is a key objective to the guide (p.8).
- NEPA instructs “solicit community involvement to increase public acceptance” (p.7) and to fulfill regulatory requirement (p.8).

# Conclusion

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# Successful integration of sustainability in SR Frameworks

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- Frameworks must encourage public collaboration for key information about the site and early in the design phase.
- Framework should be simple to follow, complete with theoretical background and with linear milestones and goals
- Framework must include clear process and steps to include parameters, tools and have outcome oriented goals.
- Clear definition of sustainability.
- Operationalize the definition.
- Use a consistent definition of sustainability and understood between all project stakeholders.
- Stakeholders should have information disseminated in appropriate language

# Sustainability Concepts: Beyond the Venn

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- Outcome Orientated
- Long Term Focused
- Project Alternatives
- Minimize Trade-offs
- Maximize Benefits
- Minimize Impacts
- Intergenerational/  
Intragenerational  
considerations
- Transition from  
consultation to  
engagement



# Thank You for Your time!

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Source: Squamish Ocean Front Development Lands

Please contact me with any questions:

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# Sources:

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