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Social, Environmental, and Economic Impact and Benefit Sustainability Analysis

Amanda D. McNally, PE | 04.18.2019



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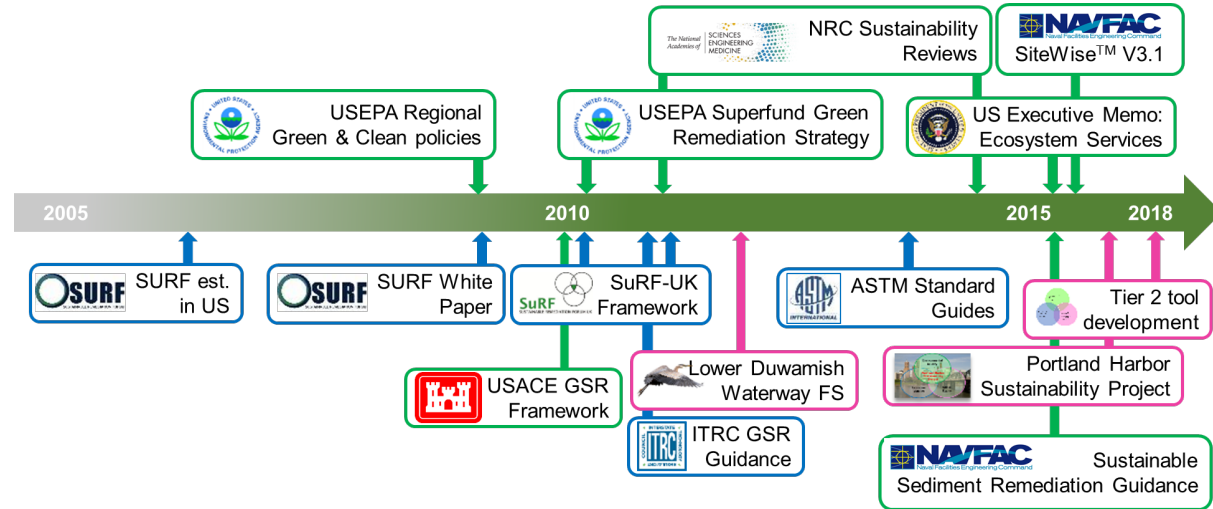
Sustainable remediation concepts have evolved



Sustainability: “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.” Executive Order No. 13514, 2009

Sustainable remediation:

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 (Sustainable Remediation Forum-United Kingdom)



Why is sustainability evaluation important?

Why now?

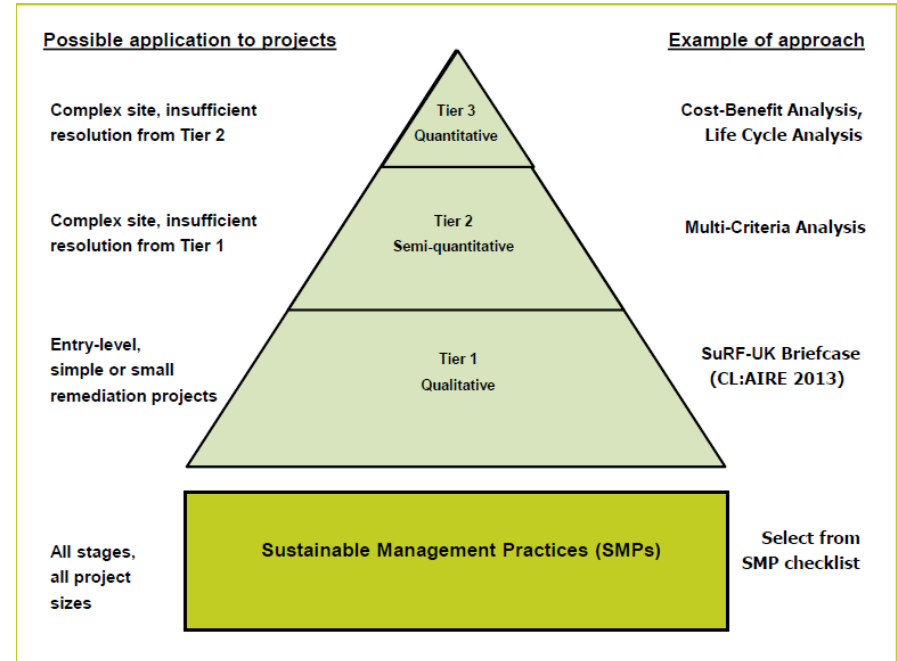


- National Research Council (NRC) has advised EPA to enhance role of stakeholder-focused sustainability in decision making (2014)
 - Consideration of impacts of remediation
 - Stakeholder communications
- Executive Orders (2003-15), Executive Memo on Ecosystem Services (2015) have provided basis to advance sustainability in the context of stakeholder impacts
- Superfund Task Force (2017) is focusing on redevelopment & community revitalization and engaging stakeholders
- Alternative land re-uses and remedial approaches will impact stakeholder groups differently
 - Sustainability assessment provides a framework for assessing, communicating and negotiating these trade-offs in a rigorous but accessible manner
 - Regulatory, environmental, economic and social tools assess alternative impacts from complimentary viewpoints

Assessment should only be as complex as needed



- Sustainable Remediation Forum (SURF) and others recommend a tiered approach
- Sustainable management practices (SMPs) should underlie all stages

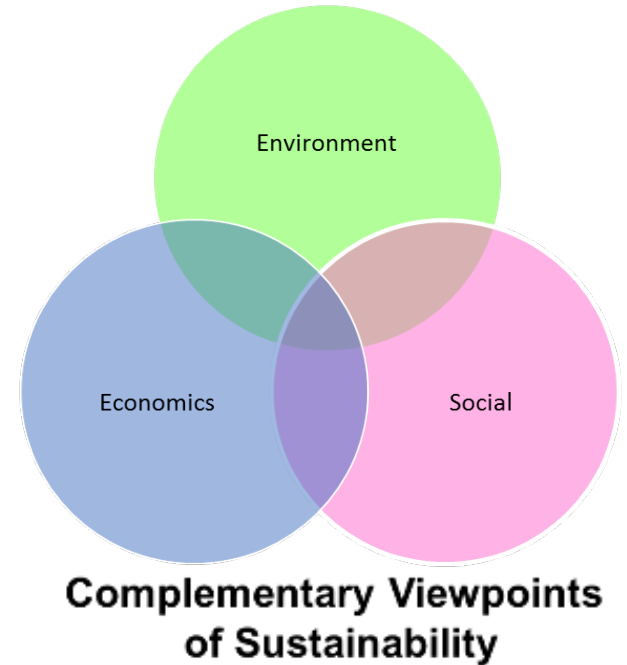


Source: SuRF-UK, S., 2014. Sustainable Management Practices for Management of Land Contamination; www.claire.co.uk/surfuk

Portland Harbor Sustainability Analysis was a detailed, Tier 3 Assessment at a complex site



- **Portland Harbor Sustainability Project**
 - Conducted sustainability analysis (environmental, economic and social) of EPA remedial options
 - Alternatives included dredging up to 9 million cubic yards of sediment, 17+ years of construction, and up to \$4 billion in costs
- **High-level, custom tool developed**
 - Methods in journal special series*
- **Not all sites are this large, data-rich or resourced**



*<https://setac.onlinelibrary.wiley.com/toc/15513793/14/1>

Tools adapted for smaller, less data-rich sites



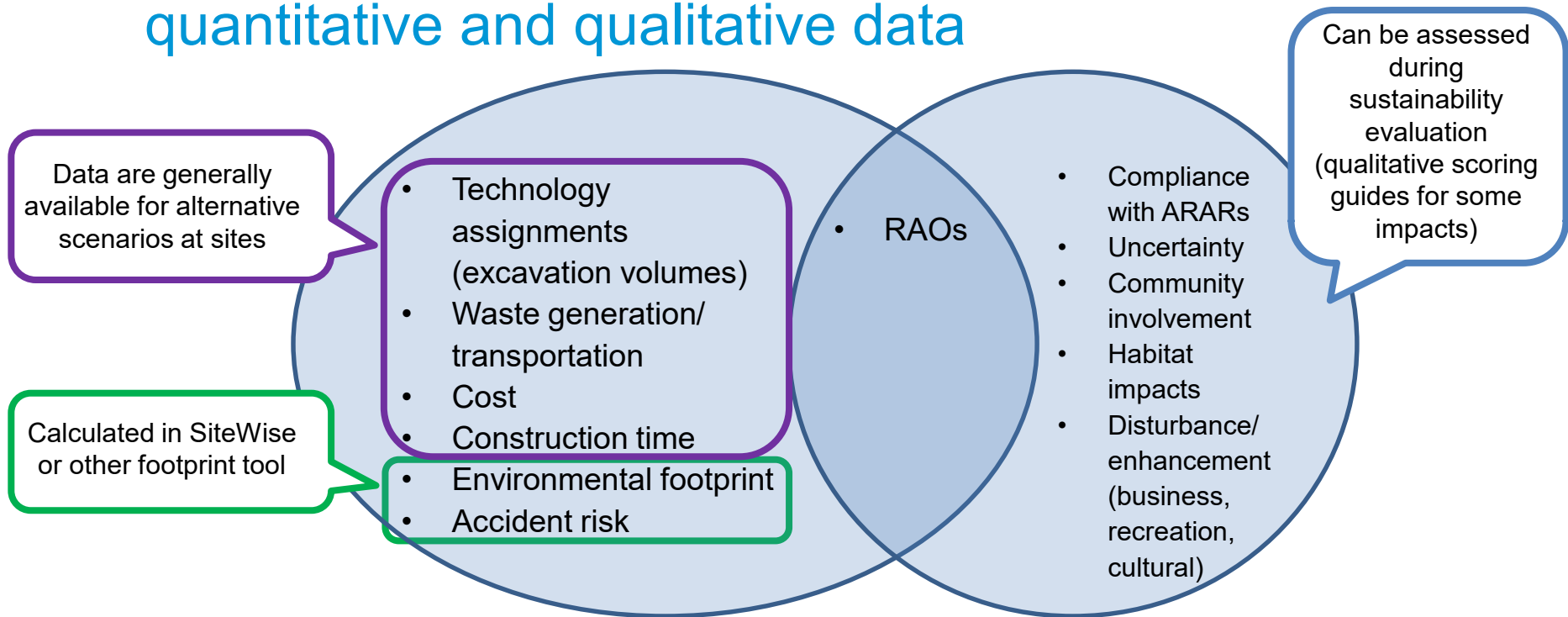
- Consolidated input sheet for quantitative and qualitative alternative characteristics
 - Standard alternative characteristics
- Automated regulatory and social calculations linked to input table
 - Transparent calculations and scoring
- Tool can be adapted for project-specific issues and run with inputs from site technical documents
- Living tool, can evolve with alternatives and data

SEEI+BeST		
Social, Environmental, & Economic Impact + Benefit Sustainability Tool		
A quantitative tool to evaluate the sustainability of remedial alternatives at Tier 2 contaminated sediment sites		
User Entered Data	1. Site Info	Enter general site information that provides context for the evaluation of remedial alternatives
	2. Inputs	Enter data for each remedial alternative from cost estimates, feasibility study, footprint analysis, or other data sources
Regulatory Criteria (RegCrit)	3. RegCrit - Criteria	Identify regulatory cleanup criteria (if different from CERCLA) and assign a weight to each criterion
	4. RegCrit - Calculations	Metrics mapped to regulatory criteria are calculated and scored. <i>No data entry on this tab.</i>
	5. RegCrit - Summary	Numerical summary of regulatory criteria results
	6. RegCrit - Graphics	Graphical summary of regulatory criteria results (weighted benefit, cost-benefit, cost-effectiveness)
Value Criteria (ValCrit)	7. ValCrit - Weights	Assign weights to each value and metric
	8. ValCrit - Calculations	Metrics mapped to value criteria are calculated and scored. <i>No data entry on this tab.</i>
	9. ValCrit - Summary	Numerical summary of value criteria results
	10. ValCrit - Summary Graphics	Graphical summary of regulatory criteria results (weighted benefit - stacked bar and radar)
	11. ValCrit - Value Graphs	Graphical results for each value (by metric)
	12. ValCrit - Value Graphs Stacked	Graphical results for each value (by alternative)

Available Inputs for Tier 2 Analysis



- Tier 2 tools intended for sites with a combination of quantitative and qualitative data

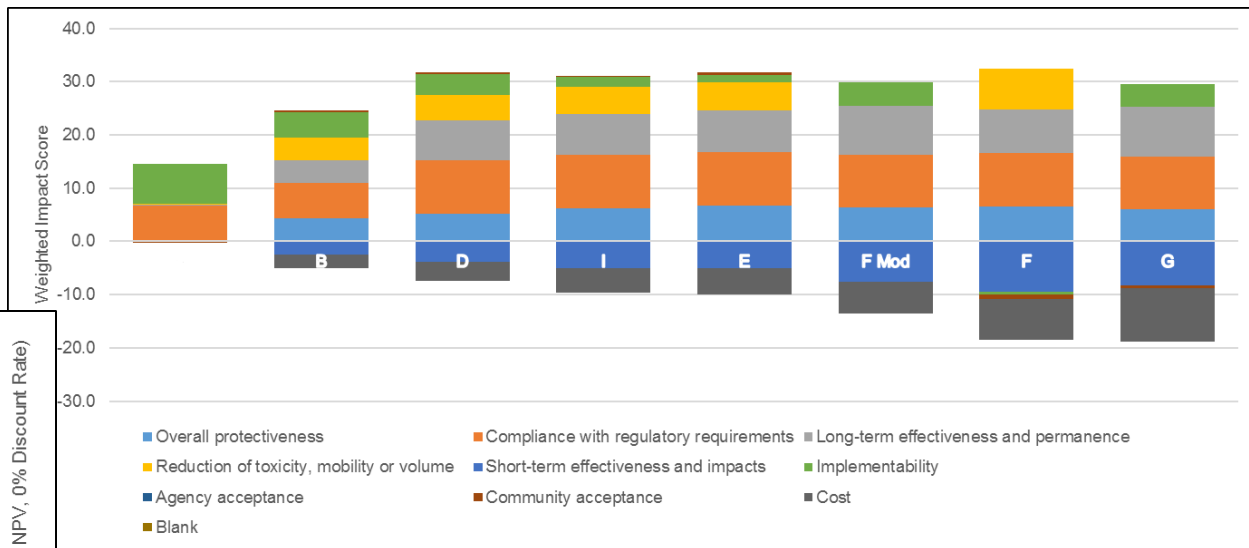
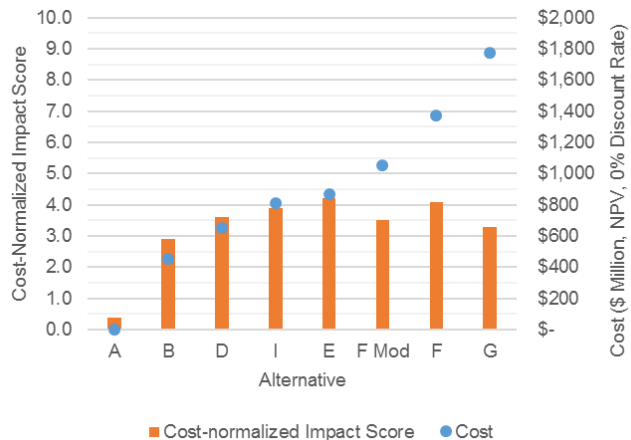


Regulatory Impacts: Metrics generate cost and benefit information on alternatives based on regulatory criteria



Criteria can be aggregated for an overall score

Example results shown for a Tier 2 adapted Portland Harbor dataset

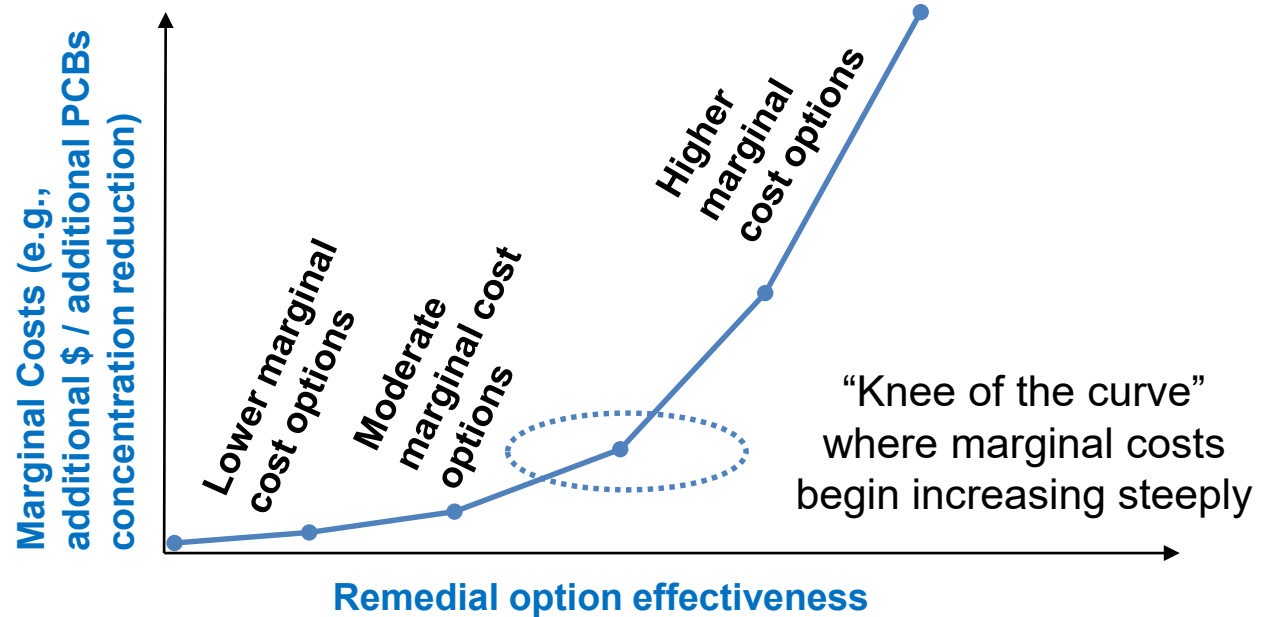


Remedial alternatives are scored in terms of impacts on regulatory criteria

Economic impacts: Incremental Cost-Effectiveness Analysis



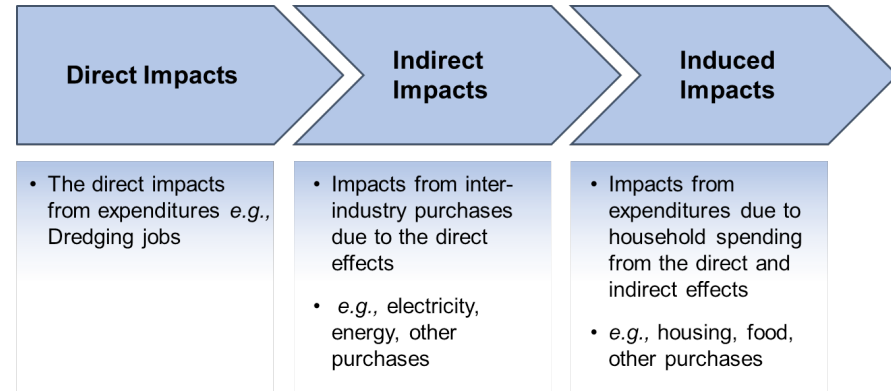
- Cost-effectiveness analysis uses costs and non-monetary benefits
- Uses incremental cost-effectiveness to evaluate the “knee of the curve” (“additional bang for additional bucks”) for clean up activities



Economic Impact Analysis



- Evaluates impacts of alternatives on the site and surrounding economy
- Input-output model evaluates “Full” Economic Impacts
 - *Positive* impacts of expenditures
 - *Negative* impacts of locals paying for some expenditures (and thus foregoing other spending)
- **Metrics for economic impacts**
 - Employment (Jobs)
 - Gross regional product (GRP)



Separate analysis, but feeds into Tier 2 sustainability tool

Engage stakeholders to solve shared problems



- It's all **social** - stakeholders must decide on the values they wish to sustain
- Social sustainability tool bridges indicators of impact to community values and priorities
- Data-driven decision making
 - To identify trade-offs and points of contention
 - To **sustain** societal values
- Provides systematic, transparent community engagement

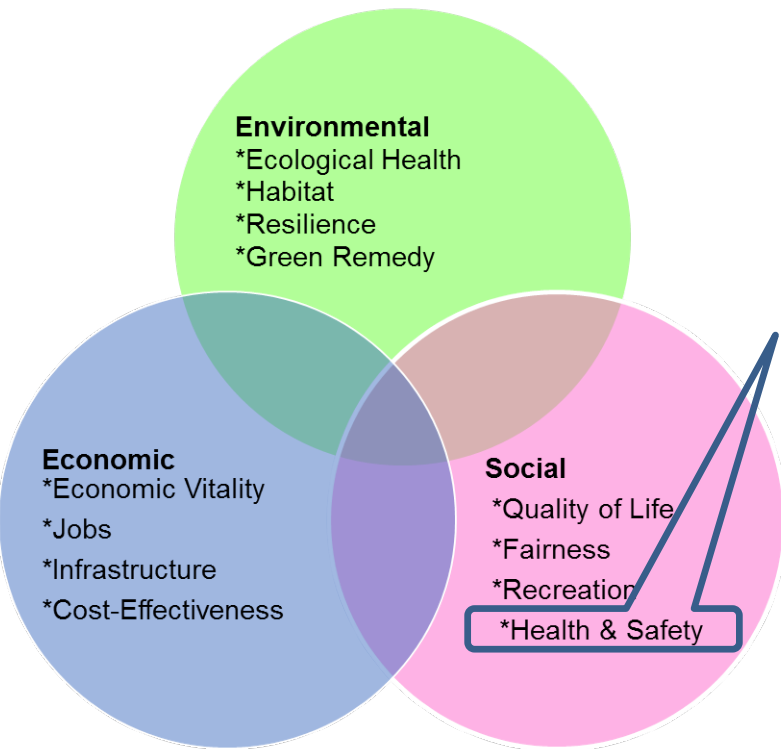
Quantifying Issues with Sustainability Metrics



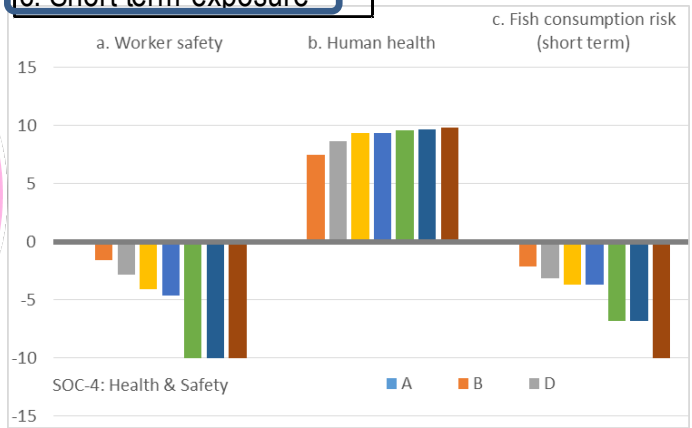
What stakeholder issues are affected by remediation?

How are they affected (indicators)?

How is this quantified (metrics)?

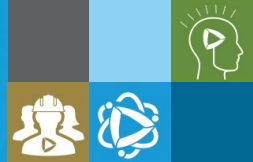


- Human health & Safety**
- a. Worker safety
 - b. Long-term risk reduction
 - c. Short-term exposure



- ❖ SiteWise or similar
- ❖ Risk calculations in FS
- ❖ FS, years of construction, number of pathways in conceptual models (data dependent)

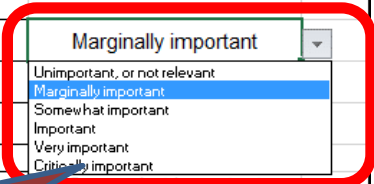
Scores are weighted by stakeholder priorities



Value (names link to calculation sheet)	Metric (names link to calculation sheet)	Value weighting (links to calculation sheet)	When considering impacts of remediation, how important is this value to you?	Metric weighting (links to calculation sheet)	When considering impacts of remediation, how important is this aspect of the value to you?
Ecological Health		5.00	Critically important		
ENV-1a	a. Residual risk, T=0			1.00	Marginally important
ENV-1b	b. Downstream risk			2.00	Unimportant, or not relevant
ENV-1e	c. Residual Risk, long term			4.00	Marginally important
Habitat			Very important		Somewhat important
ENV-2a	a. Residual risk, T=0			1.00	Critically important
ENV-2b	b. Downstream risk				Critically important
Resilience					
ENV-3a	a. Residual risk, T=0			4.00	Very important
ENV-3b	b. Downstream risk			5.00	Critically important
Green Remedy					
ENV-4a	a. Residual risk, T=0			3.00	Important
ENV-4b	b. Downstream risk			3.00	Important
ENV-4c	c. Residual Risk, long term			2.00	Somewhat important
ENV-4d	d. Residual risk, T=0			2.00	Somewhat important
ENV-4e	e. Residual risk, T=0			2.00	Somewhat important
ENV-4f	f. Residual risk, T=0			2.00	Somewhat important
Economic Vitality			Very important		
ECON-1a	a. Residual risk, T=0			5.00	Critically important
ECON-1b	b. Downstream risk			1.00	Marginally important
ECON-1c	c. Residual Risk, long term			1.00	Marginally important
ECON-1d	d. Residual risk, T=0			1.00	Marginally important
Jobs		1.00	Marginally important		
ECON-2a	a. Employment (local)			3.00	Important
ECON-2b	b. Local training and			4.00	Very important

User can select 1 of 6 qualitative ranks for inferred or measured values:

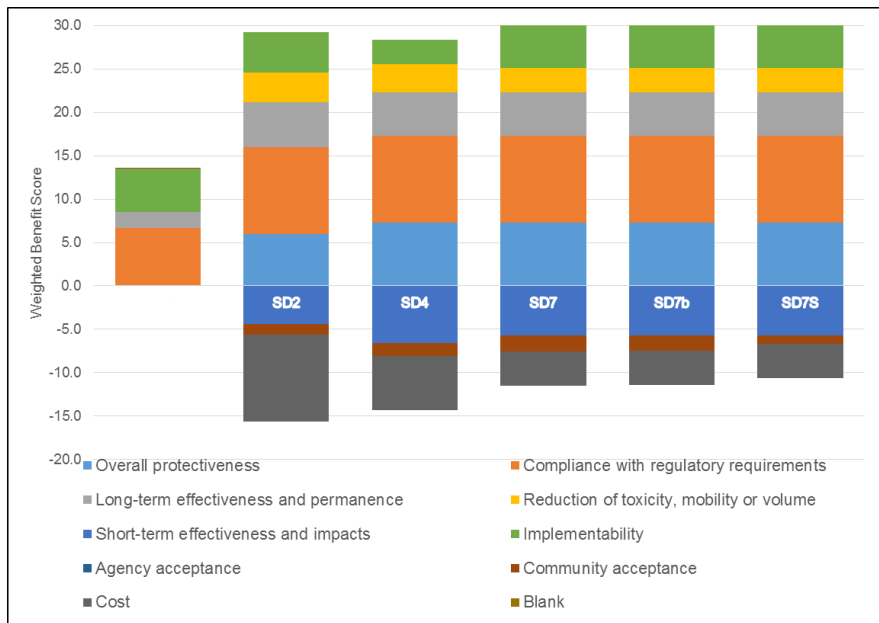
- Not relevant
- Marginally important
- Somewhat important
- Important
- Very important
- Critically important



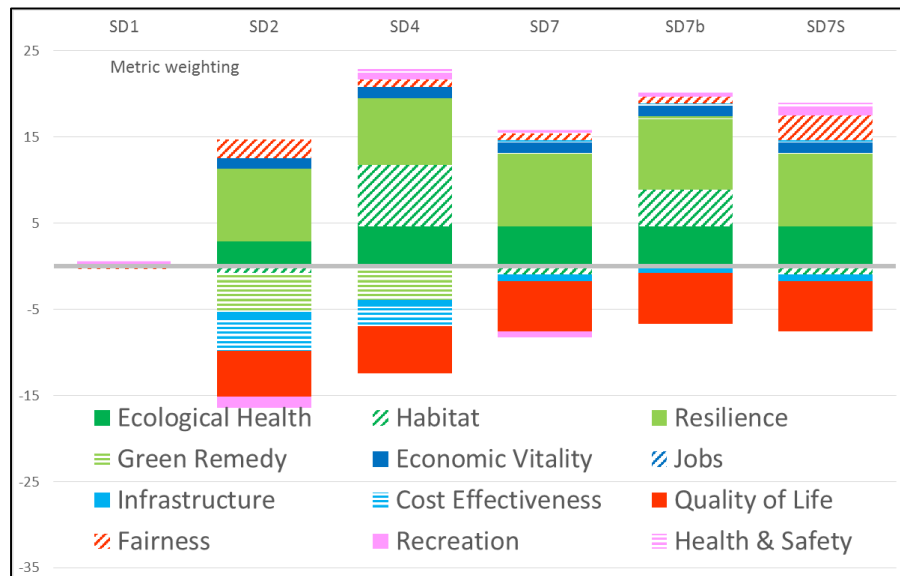
Same Alternatives, Different Viewpoints



Scored in terms of regulatory criteria



Scored in terms of community impact



Summary



- Site-specific information can be used to evaluate sustainability
 - Environmental/regulatory, economic and social impacts
 - Informed by stakeholder (including regulator) values
 - Consistent with emerging policy and guidance
- Sustainability tool supports users in community-linked remedial decision making
 - Scores indicators of impact based on alternative characteristics
 - Narrative scoring tables for less quantitative indicators (fairness, uncertainty, infrastructure...)
 - Guides weighting of regulatory and social indicators based on priorities
 - Clarifies “what is at stake”, including important trade-offs from a range of perspectives
- Relatively cost-effective and efficient way of advancing a sustainability analysis into the stakeholder realm, using much of the same data

Contributors



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