Fairness in Sediment Remediation: Who bears the costs? Who reaps the benefits?

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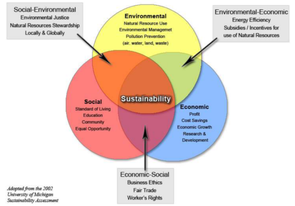
What is sustainability?

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)



Remediation is not a sustainable practice

- We remediate sediment, soil, groundwater to address past, unsustainable practices
- ***All*** active remediation results in (desirable and undesirable) **environmental**, **economic** & **social** impacts on the environment and community
- Given the uncertainty inherent in remedial activities, sometimes we are addressing how to balance ***certain harm*** against ***uncertain benefit***
- The challenge is optimization – how does one achieve the maximum environmental benefit with the minimum undesirable impact?

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

How we decide what is sustainable depends on the questions we ask, and the measures and scales we apply

To support sustainability in decision-making one must ask:*

- What attributes or conditions does the decision aim to sustain;
  - Objectives/criteria/indicators
- Who is affected by actions (risks and benefits);
  - Impacts/metrics
- For what period of time will actions convey benefits;
  - Scope/context
- At what cost?
  - Cost-benefit/cost-effectiveness
- Who answers the first four questions?
  - Stakeholders/decision makers

*Apitz (2018) Considering the Values Stakeholders Wish to Sustain in Decision Making. Integrated Environmental Assessment and Management. 14:670-671.

ASTM: Consensus-based Environmental Decision-making (CBED)

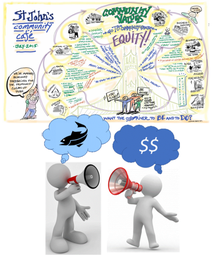
A stakeholder-focused process, to prioritize and select actions; optimizing environmental decisions that may affect a community or communities

1) Identification of Affected Stakeholders (stakeholder map)
   - Define clearly the criteria to be used
2) Information gathering
   - Stakeholder issues, perceptions, preferences and constraints
3) Option Generation and Forecasting
   - Predictive methods and models to describe ranges of possible outcomes
   - **Will likely need technical experts, but the Stakeholder Committee selects the experts and develops the scope of work**
4) Obtaining Informed Consent
   - **Decision assessment tools can be used to prioritize stakeholder decisions and analyze the trade-offs**
   - Agree on action or actions
5) Iterate as necessary

Engaging stakeholders to solve their shared problems

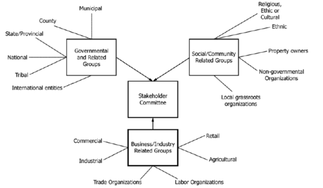
- It's all **social** - society (stakeholders) must decide on the values they wish to sustain
- Those who bear the costs and those who reap the benefits are not always the same
  - in space, time, or demographically
- Risks and benefits should be evaluated and communicated in terms of community values and priorities
  - To identify trade-offs and points of contention
- Data-driven decision making
  - To sustain societal values

Priorities of stakeholder groups differ



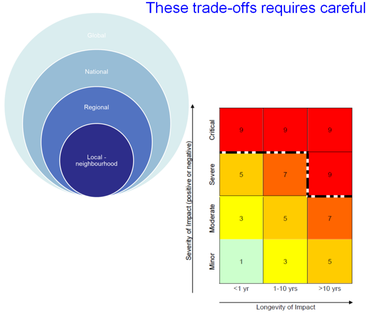
Approaches for determining stakeholder priorities

- Elicited approaches:
  - Surveys, questionnaires, interviews
    - In-person, mail, online…
  - Workshops
  - Facilitated outreach
  - Formal approaches (e.g., multi-criteria decision analysis, MCDA)
  - Can ask about values, specific issues, economic aspects (e.g., willingness to pay…)
- Inferred values based upon stakeholder value statements
- Bias can come from many sides – question design, selection (and self-selection), influence and strategic answers
- Tools to avoid bias:
  - Neutral parties, snowball sampling, iterations, comparisons over time or to other studies, transparency



Example of a Stakeholder Map Intended to Guide Identification and Notification of All Potential Participants in a CBED Process

Risks and benefits differ across space, time and demographics
These trade-offs requires careful consideration



- Jobs (lost and gained)
- Disturbance
- Ecosystem service loss and uplift
- Parks, green spaces
- Redevelopment, gentrification
- Vulnerability?
- Exposure?
- Access?
- Lifestyle?
- Education?
- Income?

SuRF category	Equity/EJ questions
Environment 1: Impacts on air	Distribution of emissions/transport impacts equitable? GHG offsets?
Environment 2: Impacts on sediment, soil, porewater and ground conditions	Impacts on long-term use options equitable? Effects on resilience?
Environment 3: Impacts on groundwater and surface waters	Impacts on long-term use options equitable?
Environment 4: Impacts on ecology	Disproportionate exposure to ecosystem impacts? Ecosystem service providing unit (SPUs) of community value protected? Remediation endpoints in line with restoration/enhancement goals?
Environment 5: Use of natural resources and generation of wastes	Equitable distribution of waste sites? Local access to resources impacted? Unintended consequences of alternative fuels (e.g., biofuels)
Environment 6: Intrusiveness	Consideration of vulnerable populations?
Economic 1: Direct economic costs and benefits	Who bears costs? Who reaps benefits? Balanced?
Economic 2: Indirect economic costs and benefits	Who bears costs? Who reaps benefits? Balanced?
Economic 3: Employment and employment capital	Jobs and education; buisiness opportunities equitably balanced?
Economic 4: Induced economic benefit	Who bears costs? Who reaps benefits? Balanced? Reflecting and considering community values? Gentrification risk?
Economic 5: Life span and project risks	Properly balanced against other concerns? All exposures considered (issues differ for sediments)
Econimic 6: Project flexibility	Effects/ communication with local community and vulnerable populations?
Social 1: Human health and safety	Classical EJ questions - how are risks balanced, in space, time and demographically?
Social 2: Ethical and equity considerations	Embraces all questions here
Social 3: Impacts on neighbourhoods or regions	Classical EJ questions - how are impacts balanced, in space, time and demographically?
Social 4: Community involvement and satisfaction	Are all stakeholders' needs considered? How are they balanced? Equitable distribution of benefits/ access?
Social 5: Compliance with policy objectives and strategies	How are regulatory and sustainability drivers balanced to meet stakeholder needs; ensure equity?
Social 6: Uncertainty and evidence	Are data and decisions transparent and accessible to all stakeholders?

Examples of Spatial, Temporal and Demographic Equity Issues and Strategies

Impact	Positive or negative impact?	Spatial equity considerations	Spatial equity strategies	Temporal equity considerations	Temporal equity strategies	Demographic equity considerations	Demographic equity strategies
Risk from con-taminant mobili-zation	-	Mobilized contamination impacts downstream sites (including the Colombia River)	Prevent offsite migration of contaminants using BMPs	Risks during (and some time after) construction		Increased contaminants in fish tissues can impact subsistence fishers, tribal members, Native Alaskan, tribal groups, the homeless and some immigrant communities	Education, communication, Institutional Controls
Impact on Shore-line habitat	-	Habitat impacts will be focused on remedial footprint	Minimize active footprint where possible; mitigate and restore	Some impacts will be short-term, some shore-line may recover	Use substrates to enhance recovery; mitigate and restore	Damaged habitat may impact cultural and recreational value, disproportionately impacting some communities	Mitigation, replacement and restoration. For improved habitat, access may increase equity of benefit, but different communities have different expectations of the river and shoreline
Real Estate-ality as removal	+	Stigma removal will be focused on areas on or adjacent to cleaned up sites	Larger remedies	Benefit will be realized after remedy; decades from now	Faster remedies	Stigma removal can also cause gentrification, a social impact that can negatively happen in revitalized areas	Planning and zoning can address some gentrification issues
Road traffic	-	Traffic impact will be focused on the sediment transloading, transport and disposal sites	Barging, trains, volume minimization	Traffic impacts will be for the life of the remedy, decades	Faster remedies	Traffic impacts will disproportionately impact those living, working and commuting along transport corridors	Sediment trans-loading and transport should be planned with community needs in mind
Impacts on recre-ation	-	Some recreation impacts will be focused on remedial footprint, others will be impacted by contaminant mobilization and thus affect all water users	Minimize active footprint where possible; mitigate and restore; minimize contaminant releases	Most impacts will be short-term; recreation will be available after management unless there is long-term access control; restoration may improve the recreational value of the river after remedy is complete	Shorter-term projects; early restoration; preservation of access routes	Damaged habitat may impact cultural and recreational value, disproportionately impacting some communities	Mitigation, replacement and restoration. For improved habitat, access may increase equity of benefit, but different communities have different expectations of the river and shoreline
Impacts on ac-cess to river	-	Access impacts will be focused on remedial footprint, others will be impacted by contaminant mobilization and thus affect all water users	Minimize active footprint where possible; mitigate and restore	Most impacts will be short-term; access may be available after management unless there is long-term access control; restoration may improve the access after remedy is complete; there are areas which may be restored to a temporarily distinct population, potentially decades away	Shorter-term projects; early restoration; preservation of access routes	Loss of access may impact cultural and recreational value, disproportionately impacting some communities; those living, working and commuting along transport corridors have the resources and time to get to the river; access is desirable to many in the houseless community	Mitigation, replacement and restoration. Improved access may increase equity of benefit, but different communities have different expectations of the river and shoreline, public transport, bike and walkingand access routes
Stakeholder in-volvement	+	Stakeholder involvement should be focused on affected parties, so should have a significant local component	Local outreach and accessible communication	Stakeholders who are affected (positively and negatively) span timescales and generations		Stakeholder participation often disproportionate to those who are most affected; those who live with the time and financial resources to take part	Involvement of broad-based community, ensuring that the affected become affecting, changing from subjects to key players; consultation with tribal members; open houses and meetings to reach diverse communities, multi-lingual outreach and communication, ensuring that those who are traditionally under-represented, balance decision-making
Amenability to re-use	+/-	The re-use impacts will be focused on remedial footprint, others will be impacted by contaminant mobilization and thus affect all water users. Re-use plans not part of remedy, but remedy should be designed to enable future and work near-shore more than those further away	Remediation, restoration and planning should be better linked; impacts on re-use should be considered	Re-use benefits are only realized after remediation complete, benefiting a temporally distinct population	Faster remediation, phased restoration and re-development, offset of pre-loss re-use, restoration and reuse-employment planning as part of decision-making	Different stakeholders have different expectations of the re-use of the river and its shoreline. Benefits primarily realized to those with transport and access	Balanced decision-making, multi-use planning, access and public transport

Remedial decision making is a "Wicked Problem"

- Difficult or impossible to solve
- No single **right** answer (but a number of **wrong** ones with lasting consequences)
- Need to include stakeholders to define problems and focus on desired solutions (scenario building)
- Requires iterative, adaptive and collaborative problem solving
- Equity considerations help optimize sustainability