



**Tuesday, April 26, 2016**

**2B - Stakeholder and/or Aboriginal Engagement**

**Location: Level 2, Salons 4&5**

**1:30 pm – 1:50 pm**

**Gathering and Analyzing Stakeholders' Opinion for Mine Remediation Using a Web-based Multi-Criteria Analysis Tool**

*David Sanscartier<sup>1</sup>, Susan MacWilliam<sup>1</sup>, Reanne Ridsdale<sup>2</sup>*

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*<sup>2</sup>University of Saskatchewan*

**The objective of the presentation is to discuss the multi-criteria analysis of a pilot project for the selection of remediation alternatives at a mine site based on stakeholders opinion. Stakeholders were consulted using the web-based tool Expert Choice®.**

### **Abstract**

Several sustainable remediation frameworks have been developed in recent years to guide the remediation of contaminated land. Pluralism (i.e., the consideration of views from different groups and individuals) is central to successful decision-making related to sustainability. As such, sustainability assessments should ensure stakeholders' participation in order to capture different views, values and beliefs. Gaining consensus during such process can be challenging given that "sustainable" is relative and depends on stakeholders' viewpoints, particularly in open and broad stakeholder engagement when views may conflict and diverge greatly.

Multiple criteria analysis (MCA) can be used to examine a variety of options against a range of environmental, social and economic criteria. It can help ensure sound decisions are made when multiple stakeholders with diverging and/or conflicting perspectives are involved. This pilot study used an MCA tool to gather stakeholders' opinion on a case study (the revegetation of an engineered cover over mine tailings at an abandoned uranium mine in Northern Saskatchewan).

Expert Choice®, a web-based software, was selected as an MCA tool. This tool uses pairwise comparisons to prioritize options with multiple criteria and get accurate results even when complex sustainability issues are under consideration. The software was used to both the design and the implementation of the survey.

Typically, survey participants would be selected from across a range of stakeholder groups affected by, and who could influence, a project. In this pilot study, the survey participants were five internal employees from different departments at the Saskatchewan Research Council (SRC). The selected employees acted as proxy stakeholders and reflected different perspectives of five commonly interested parties in such projects. The authors did not participate in the survey.

First, stakeholders were asked to compare nine sustainability criteria (community involvement, occupational risks, land condition, project cost, project risks, future economic opportunities, biodiversity, air quality, and greenhouse gases) one against the other. The criteria were then ranked and weighting factors were used for the determination of the preferred revegetation options. Then, stakeholders were asked to compare four organic soil amendment options for revegetation one against the other against all nine evaluation criteria. The survey tool automatically processed the survey data and generated results.

Based on the survey, greenhouse gases, project risks, and biodiversity were ranked the top three sustainability criteria. The locally-produced biochar was assessed as the most sustainable soil amendment option, with peat a close second.

The tool used for the survey design and data processing was suitable to collect diverging views from stakeholders and facilitate decision-making. The web-based tool simplified the survey process for both researchers and participants and alleviated some logistical issues around travel, financing and managing stakeholder consultation scattered over a large area. It is applicable for a wide range of projects type and scale.



2:00 pm – 2:20 pm

**Developing a Novel Sustainable Remediation Approach for Portland, Oregon Sediment Site**

*Deborah A. Edwards<sup>1</sup>, Amanda D. McNally<sup>2</sup>, Anne Fitzpatrick<sup>2</sup>, Sabine E. Apitz<sup>3</sup>*

<sup>1</sup>*ExxonMobil*

<sup>2</sup>*AECOM*

<sup>3</sup>*SEA Environmental Decisions Ltd.*

**The objective of the presentation is to present the sustainability framework developed for the Portland Harbor Superfund Site through an active stakeholder engagement process and quantification of key social, economic, and environmental metrics.**

**Abstract**

It is increasingly recognized that remediation and restoration approaches should be designed with final site uses in mind. The US EPA encourages the consideration of reasonably anticipated future land use when carrying out response actions; it has overseen response actions that protect human health and the environment and allow sites to be reused safely and productively. The bulk of such work has focused on land-based brownfield regeneration, but sediment remediation should follow a similar strategy. Sustainable remediation strategies should be informed not only by considerations of regulatory compliance but also by future river system visions based upon stakeholder goals, values and expectations. Establishing this vision requires input from multiple stakeholders and a transparent consideration of trade-offs not only of the values of a diverse community but also of the equitable distribution of risks and benefits of remedial actions and outcomes.

Portland Harbor Superfund Site in Oregon is complex, with significant volumes of sediments above risk-based concentrations, water-dependent businesses requiring safe navigational access, tribal treaty rights, and substantial projected clean-up costs. The US EPA Region 10 Feasibility Study and Conceptual Plan for Portland Harbor, released in August and September 2015, respectively, are moving toward requirements that pose potentially tremendous technical challenges and years or decades to implement. ExxonMobil, as one of several sponsoring parties, has developed a sustainability framework to evaluate the proposed remedial alternatives and identify cost-effective, sustainable and equitable remedies for the site.

A sustainability assessment considers environmental, economic and social risks and benefits; social metrics are often less well-developed than are the others. To rectify this issue, the project team has developed a framework under which the social aspects of sustainability will drive how the other pillars are integrated and communicated. To achieve this, stakeholder values and priorities are elicited via reviews, surveys, discussions, interviews and meetings; these are “mapped” onto all sustainability metrics. In parallel, to address environmental justice, a social effect distribution assessment is carried out, evaluating who bears the costs, and who reaps the benefits of remedial options, in terms of demographics, space and time. Results of the sustainability assessment are communicated via a trade-off analysis, in which sustainability metrics are integrated in terms of stakeholder values, and scored both in terms of equity and stakeholder priorities. This approach goes well beyond the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) nine criteria for evaluating remedial options and allows for communication not only of traditional sustainability “scores” for remedial options, but also addresses how options might be ranked given the values and priorities, as well as exposure or access to various risks and benefits, of different stakeholder and demographic groups. This approach facilitates discussions of trade-offs and helps resolve points of contention.

This presentation will present the sustainability framework (currently in progress), highlighting the stakeholder engagement process, quantitative assessment of sustainability indicators and metrics, incorporation of probabilistic risk assessment, economic analysis, and recommendations for developing a sustainable remedial alternative for Portland Harbor.



2:30 pm – 2:50 pm

**Role of Risk Perception in Management and Stakeholder Engagement of Widespread Metals Source Pollution Clean-up**

*Melissa Harclerode<sup>1,2</sup>, Pankaj Lal<sup>2</sup>, Nareej Vedwan<sup>2</sup>*

<sup>1</sup>*CDM Smith*

<sup>2</sup>*Montclair State University*

**The objective of the presentation is to discuss the identification of factors influencing a community's risk perception to lead impacted soils and lead-based paint to modify public outreach efforts and incorporate heterogeneity of the community during engagement efforts.**

**Abstract**

Stakeholder engagement plays a prominent role in sustainable regeneration (i.e., remediation and redevelopment) of contaminated land. Engagement of stakeholders is performed for various reasons throughout the remediation project life cycle, included during remedy implementation, control, and monitoring. A common reason for engaging community representatives during this process is to educate the public on identifying and preventing exposure to contamination they can be in direct contact with. A majority of published case studies on this social aspect of remediation are sites impacted by non-point source pollution (e.g., nitrogen loads), recalcitrant contaminants (e.g., metals, radionuclides), and residential contaminant sources (e.g., impacted well water and construction materials). Eradicating multiple sources of recalcitrant, non-point source pollutants within a large-scale residential setting can be technically and financially infeasible, thus resulting in public outreach playing a dominant role in risk management. Risk perception of community stakeholders has a direct influence on the success rate of public outreach. An individual and community's perception to risk is directly influenced by site-specific physical, psychological, sociological, and demographical characteristics. Identification of these factors among the population can assist agencies implementing outreach activities to refine education material and modes of delivery to maximize benefits to the community and meet specific needs of the targeted public sector.

A risk perception survey was conducted of 244 community members in an urban setting in northern New Jersey, USA. The case study area was chosen due to the presence of wide-spread sources of lead-based paint in residential dwellings and lead-impacted surface soil due to historic fill material. Survey questions were developed to identify the following: (1) determine if residents are aware of lead contamination in soil and paint that may be present at their homes; (2) identify actions being taken by residents to address contamination issues; and, (3) evaluate residents' perception of risk to lead contamination compared to other hazards, such as crime and flooding.

Preliminary survey results suggest that the majority of the respondents are knowledgeable about lead-based paint and has taken some measures to prevent exposure. However, the community is relatively unaware of the presence of lead in surface soils and has not taken measures to mitigate risk. Survey results also suggest that other hazards residents may encounter within their community (e.g., burglary, traffic accident) are perceived as higher risks than being exposed to pollution. However, respondents agree that it is the individual's responsibility to be aware of environmental risks and to address them. A correlation analysis was conducted to identify features related to the community's risk perception of lead pollution to assist with modifying outreach efforts. Factors evaluated included ability to control risk, perceived severity, knowledge base and awareness, existing exposure scenarios, environmental stewardship, and demographics. In conclusion, education and outreach for remediation projects should be re-evaluated to address heterogeneity of risk perception within the community and promote empowerment of residents to control risk.

3:30 pm – 3:50 pm

**Integrating the Social Element in Remedial Decision-Making: State of the Practice and Way Forward (A SuRF Initiative)**

*D. Reanne Ridsdale<sup>1</sup> and Melissa Harclerode<sup>2</sup>*

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**The objective of the presentation is to discuss the identification of factors influencing a community's risk perception to lead impacted soils and lead-based paint to modify public outreach efforts and incorporate heterogeneity of the community during engagement efforts.**

**Abstract**

Sustainability evaluations support and improve the remedial decision-making process by considering the broader context of the beneficial and detrimental impacts of remediation. Guidance, frameworks and case studies have been published at an international level illustrating established sustainability assessment methodologies and successful implementation within the remediation industry.



Though the terminology adopted, indicators evaluated and metrics used may differ, one common theme among international organizations and regulatory bodies is more comprehensive and transparent methods are needed to evaluate the social dimension of sustainable remediation appraisal. Current practice in sustainable remediation appraisal can be improved to better integrate the social dimension. The presenters are collaborators and representatives of international Sustainable Remediation Forum (SuRF) organizations, policy-makers networks, academia and standardization committees.

Based on a literature review and stakeholder input, this presentation focused on three main areas: (1) status quo of how the social element of sustainable remediation is assessed among various countries and organizations; (2) methodologies to quantitatively and qualitatively evaluate societal impacts; and, (3) findings from this research, including challenges, obstacles, and a path forward. Case studies illustrating the successful use of methodologies focused on the social element were compiled.

Several existing social impact assessment techniques are readily available for use by the remediation community, including rating and scoring system evaluations, enhanced cost benefit analysis, surveys/interviews, social network analysis and multi-criteria decision analysis. In addition, a list of ten main social indicator categories were developed: health and safety; economic vitality; stakeholder collaboration; benefits community at large; alleviate undesirable community impacts; social justice; value of ecosystem services and natural resources; risk-based land management and remedial solutions; regional and global societal impacts; and, contributions to local and regional sustainability policies and initiatives.

Evaluation of the social element of remedial activities is not without challenges and knowledge gaps. Identification of obstacles and gaps during the project planning process is essential to defining sustainability objectives and choosing the appropriate tool and methodology to conduct an assessment. Challenges identified include meaningful stakeholder engagement, risk perception of stakeholders, and trade-offs among the triple bottom line. In addition, continued discussion of these factors promotes innovation and development. The following areas were identified as research opportunities in the social aspect of remediation: value of environmental metrics; risk perception of re-use; integrated and objective-led assessment approach; and, life cycle assessment.

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**4:00 pm – 4:20 pm**

**Surf Italy: Stakeholder Engagement as a Key Element for Sustainable Principles Implementation in Contaminated Site Management**

*Claudio Albano<sup>1</sup>, Alessandro Nardella<sup>2</sup>, Paola di Toppa<sup>3</sup>, Silvia Anna Frisario<sup>1</sup>, Lisa Pizzol<sup>4</sup>*

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**The objective of the presentation is to showcase SuRF Italy's focus to engage stakeholders in the development of practical tools to support the implementation of sustainable remediation practices for management of contaminated sites.**

**Abstract**

In line with international guidance and tendencies on sustainable remediation, SuRF (Sustainable Remediation Forum) Italy was created in 2012 as part of RECONnet, the Italian network on the management of contaminated sites, to promote sustainable remediation (SR) practices.

The mission of SuRF Italy is to represent a permanent forum for discussion, at the national level, between the main stakeholders involved in the management of contaminated sites, and to define and promote application of shared sustainable procedures on the full life-cycle of all phases of remedial activities. The working group includes representatives of industry, consultants, academia, as well as national and local authorities.

In September 2014, SuRF Italy published its first white paper on sustainable remediation (Sostenibilità nelle bonifiche). The goal of the document is to present the state of the art of SR at the international level, and identify the challenges and opportunities for its implementation in Italy. Particular emphasis was placed on importance of stakeholder involvement and providing recommendations for their engagement within the decision-making process for a remediation project. The identification of steps where technical choices can be shared and agreed upon will contribute to speeding up the remediation proceedings, especially for complex sites.

Based upon what was presented in the white paper, SuRF Italy is developing an operating manual for sustainable remediation aimed at providing practical guidelines and best practices to easily integrate the sustainability principles into the lifecycle management of



contaminated sites. Guidance of how to engage, inform and communicate with the stakeholders will also be a key section of the manual. Sharing information and stakeholder engagement in the decision making process represents crucial factors for integrating sustainability into the management of contaminated sites; from planning to clean up to final redevelopment.

A key element for the success and wide endorsement of the manual as a relevant tool to support SR in Italy, will be represented by the contribution and shared authorship by site-owners, consultants, academia and regulators, allowing for a plurality of perspectives and holistic approach.

This presentation will summarize the outcomes of activities developed by SuRF Italy, with a specific focus on stakeholder engagement and expected benefits deriving from its application.

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4:30 pm – 4:50 pm

### What is Efficient Remediation and How Can it be Measured?

Robert Anderson<sup>1</sup>, Jenny Norrman<sup>1</sup>, Lars Rosén<sup>1</sup>, Tore Söderqvist<sup>2</sup>, Frida Franzén<sup>2</sup>

<sup>1</sup>Chalmers University of Technology

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**The objective of the presentation is to present conclusions of a literature review on efficiency in remediation, investigated stakeholder views, and proposed remediation efficiency indicators.**

#### Abstract

The main objective of the SAFIRE (Sustainability Assessment For Improved Remediation Efficiency) research project is to evaluate whether sustainability assessments can improve the efficiency of site remediation, and, if so, in what ways. The project stems from the Swedish EPA's concern over the slow progress, low-level of innovation and high costs of state funded remediation projects.

The first phase of the project includes the mapping of stakeholder views with regard to remediation efficiency and identification of possible efficiency indicators. To accomplish this, a review of how efficiency and effectiveness are currently considered in soil remediation was performed. It has been conceptualized that efficiency and effectiveness are thought of on three different levels in literature: the technical level, where remediation technology efficiencies are measured; the project level, where efficiency indicators are typically used with respect to time and cost; and, the national level, where efficiency is considered with reference to the progress of national remediation programs.

As a complement to the literature review, stakeholder interviews, questionnaires, and/or focus groups will be conducted on four case study projects around Sweden where the Sustainable Choice Of REmediation (SCORE) sustainability assessment method is being applied. Three of the sites are state funded remediation projects and one is a private exploitation site. The selected projects will allow for consultation with individuals with different backgrounds and opinions on efficiency in site remediation. SCORE, developed at Chalmers University of Technology, is a multi-criteria decision analysis tool for assessing economic, environmental and social sustainability of remediation alternatives, both qualitatively and quantitatively (cost-benefit analysis) and including uncertainty analysis. The presentation gives: (1) a summary and conclusions of the literature review performed on efficiency in remediation; (2) results of the mapping of stakeholder views; and, (3) the resulting proposed efficiency indicators to be used in later stages of SAFIRE.