Sustainable Remediation Panel—What Will Affect the Remediation Industry Over the Next One to Two Years?

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Remediation recently developed a Sustainable Remediation Panel in which leaders in the field have volunteered to provide their opinions on difficult subjects related to the topic of how to integrate sustainability principles into the remediation practice. The panel's opinions are provided in a question-and-answer format, whereby selected experts provide an answer to a question. This issue's question is provided below, followed by opinions from four experts in the remediation field.

What are the primary anticipated developments or project opportunities in sustainable remediation over the next one to two years that will affect the remediation industry?

GRANT GECKELER

Both new and re-envisioned "sustainable" economic drivers will shape many project opportunities in the remediation industry over the next few years. From an economic standpoint, the industry's interest in sustainable solutions will reduce the barriers to first-time adoption of new technologies. Novel innovations and product offerings will continue to challenge traditional conceptions and economic frameworks of remediation and site cleanups. Of course, the risk of selecting a novel technology or method over a "tried-and-true" remedy is usually perceived as prohibitively high, unless quantifiable cost savings overcome such resistance points. In steps the momentum of sustainability. By revamping notions of negative environmental and economic externalities, sustainability factors essentially level the playing field and allow sustainable technologies to be viably considered despite these perceived switching costs. In essence, sustainability factors latently incentivize new, "greener" technologies when those options are available in price parity to traditional options.

New technologies that offer sustainability must be examined holistically in order to determine the full spectrum of economic savings. It is no surprise that sustainable technologies and methods will, by definition, achieve a baseline result through new and different processes. For instance, sustainable solutions may recover contaminants for recycling, utilize alternative power sources, reduce air emissions, and accrue carbon credits, or significantly decrease the project's overall carbon footprint. While each of these attributes has an obvious environmental benefit, more thought must be given to the cost savings associated with such benefits. Consultants and managers must continue to

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increasingly examine the total life cost of the project, incorporating the net economic value of such attributes provided through sustainable solutions. Through success and example, sustainable economic drivers will emerge as a tool to simultaneously reduce environmental externalities and shrink the overall cost of remediation.

TIMOTHY J. HAVRANEK

Over the next one to two years, the industry will see a number of standards and guidance documents produced by the U.S. Environmental Protection Agency, state regulatory agencies, and nongovernmental organizations (such as the Sustainable Remediation Forum and ASTM International) for clarifying the role of green remediation in remedy selection. In addition, a number of decision-making protocols and tools will be developed (or refined) by the US EPA, state agencies, the Department of Defense (DOD), and consulting firms for evaluating the sustainability of competing remedial strategies. The challenge will be to develop standards and tools that not only aid in identifying optimal green remediation strategies for a given site, but also help to achieve a consensus among the various site stakeholders (regulators, owners, and local community) so that such alternatives can actually be implemented.

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The real project opportunities lie in identifying strategies and evaluation methodologies that go beyond the minimization of "environmental footprints." The goal of a green remediation process should be the optimization of the net environmental, social, and economic benefits of the cleanup. Methods that evaluate overall benefits, account for stakeholder preferences, and help stakeholders converge toward beneficial site reuse will continue to be the most challenging and interesting components of the industry. However, as the industry continues to make advances in this area, we will see many more contaminated properties transformed from stranded or underutilized assets into operations such as alternative energy facilities, specialty manufacturing, or otherwise restored properties that provide benefits for the environment, the economy, and local communities.

RICHARD B. WICE

Sustainable remediation has been influenced by recent activity by the Department of Defense. The Air Force, Navy, and Army, through their engineering and environmental support centers like the U.S. Army Corps of Engineers, Air Force Center for Engineering and the Environment (AFCEE), and Naval Facilities Engineering Command (NAVFAC), are developing tools to identify and apply sustainable remediation practices to their respective programs. Several U.S. Environmental Protection Agency regions have developed green and sustainable practice guidelines. One example of this is US EPA Region II, where the use of biodiesel, clean diesel, alternative energy, and landfill gas as an energy source are being required at Superfund site projects in the region. In my own area of expertise, as an Air Force program contractor, we have seen requests for proposals specifically asking for the respondents to identify how they will apply sustainable remediation practices.

Contractual requirements for sustainable remediation are already here and might eventually expand to include the ways the contractor will measure and evaluate the performance of the sustainable remediation components in their projects. The concepts

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and ways to reduce energy, materials, greenhouse gas emissions, and the environmental footprint of remediation projects are easy to identify. The measurement and evaluation of these actions (are we gaining anything for the effort?) are not ready in an across-the-board fashion, so projects in various public and private sectors can be evaluated against an industry goal or standard. Along with the drivers to do sustainable remediation, stakeholders and groups like the Interstate Technology Regulatory Council's Green Remediation Team and the Sustainable Remediation Forum need to develop ways to measure and evaluate sustainable remediation. Once this is achieved and accepted by the remediation community (responsible parties, regulatory agencies, and contractors/consultants), we will probably see more acceptance of sustainable remediation and its formal incorporation as a standard way of doing business.

L. MAILE SMITH

Despite the obvious environmental and health benefits of cleaning up polluted sites, remediation often consumes large quantities of natural resources, raw materials, and energy. Implementation may even create pollution as it aims to clean it up. Sustainable remediation, however, maximizes the net environmental benefit of the cleanup, focusing on technologies and approaches that incorporate environmental, societal, and economic benefits over the life cycle of the project. As a concept, sustainable remediation has been around nearly as long as the remediation industry itself. However, it has really only been in the last five years that the topic has been discussed, examined, and promoted by a wide audience. Practitioners and advocates have spent that time defining the practice of sustainable remediation, raising awareness, and documenting their collective understanding and experiences.

While those efforts are ongoing, focus is shifting to defining the frameworks and policies under which sustainable remediation projects will be conducted. A large number of organizations have completed or are working on—and somewhat racing to publish—policy, guidance, standards, assessment methods, tools, and/or metrics, including the U.S. Environmental Protection Agency (six of the ten regions and headquarters at the time of this writing), at least a dozen individual states, the Association of State and Territorial Solid Waste Management Officials, the U.S. military (Army Corps of Engineers, Air Force, and Navy), Interstate Technology and Regulatory Council, ASTM International, the Sustainable Remediation Forum, the Sustainable Remediation Forum UK, and the Network for Industrially Contaminated Land in Europe. At present, there is no front-runner in the race. The objectives, mechanisms, and metrics that are common among these individual efforts will probably have the most influence on current and future remediation projects, as excessively specific objectives, infeasible mechanisms, and poorly defined and difficult-to-measure metrics are likely to fail to gain broad acceptance.

The search for cost savings (or even income generation) will lead to continued innovation and maturation of in situ treatment technologies, increased siting of renewable energy projects on land undergoing restoration, and government incentives to optimize active projects and reduce greenhouse gas emissions.

Economic factors will also drive innovation, greater consideration of formerly externalized costs (e.g., health costs of air pollution), and expedited cleanups to get under- or unused land back into service. The search for cost savings (or even income generation) will lead to continued innovation and maturation of *in situ* treatment technologies, increased siting of renewable energy projects on land undergoing restoration, and government incentives to optimize active projects and reduce greenhouse gas emissions. In fact, the policies of several US EPA regions state that they intend to

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measure cost differentials and associated environmental benefits of green and sustainable remediation practices, and that they now consider green and sustainable remediation practices *standard* unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach.

There will also be an ongoing conversation about the potential for "green washing," or misuse of the concept of sustainable remediation. Education and outreach efforts to recognize and support responsible applications of sustainable remediation, promote transparency, and gain trust with the regulatory and local communities will be an important and continuing focus.

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