



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: OK4461

Title: Enhanced Life-Cycle Assessment (ELCA): Analysis to Guide Environmental Technology Implementation

Focus Categories: Law, Institutions, and Policy, None

Keywords: risk assessment, benefit cost analysis, life cycle assessment, stakeholder processes, integrated environmental decision-making

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Congressional Districts: Oklahoma 1st, 3rd, 4th

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Abstract

The proposed research will develop an Enhanced Life-Cycle Assessment (ELCA) framework for the integrated assessment of the implementation of environmental technologies. The framework will be demonstrated by assessing the life-cycle costs and benefits, risks, and stakeholder acceptability of treatment wetlands for cleanup and restoration at the Tar Creek Superfund site. The Tar Creek Superfund Site, located in Northern Ottawa County, Oklahoma, has been recognized as U.S. EPA's most difficult remediation challenge. Historic lead and zinc mining left approximately 1,000 hectares underlain by underground mines in northeastern Oklahoma. The underground voids contain 94 million cubic meters of contaminated waters. Since late 1979, acidic metal-rich waters have been discharging into Tar Creek from natural springs, boreholes and abandoned mine shafts. In 2000, Governor Keating's Task Force endorsed, in principle, the idea of treatment wetlands as a holistic, cost-effective solution for the environmental problems at the Tar Creek Site. As the idea of using treatment wetlands technology is reviewed with federal officials, the Oklahoma congressional delegation, and other interested parties, there will be a need for detailed technical and financial analyses that support the policy process. The Tar Creek Site has been controversial and any treatment recommendation will naturally raise concerns within public groups regarding factors such as safety, cost, and reliability. The proposed research will produce policy-relevant data regarding the use of treatment wetlands that will directly address stakeholder concerns. The proposed research will develop an ELCA methodology that facilitates comprehensive environmental decision-making by combining LCA inventory and impact analyses, risk assessment, and benefit-cost analysis within a stakeholder-based analytic-deliberative process. The proposed ELCA framework provides a systematic process for environmental technology assessment that accounts explicitly for the

interdependence among changes in releases of pollutants, human health risks, and economic impacts throughout the pollution control technology life cycle. The ELCA approach provides comprehensive analysis to inform the policy process, guided by stakeholder concerns and preferences regarding environmental management and pollution control.

Specific goals of the proposed research are:

- i) development of methods of assessing stakeholder concerns and preferences suitable for guiding policy-relevant analyses;
- ii) to integrate risk assessment and benefit-cost analysis methods with life-cycle assessment techniques;
- iii) to demonstrate the ELCA framework by producing policy-relevant data regarding the costs, benefits, risks, and stakeholder acceptability of using treatment wetlands at the Tar Creek Superfund site; and
- iv) to identify priority information needs of the decision-making process to help guide future scientific research.

In addition to developing a set of tools and a process for comprehensive evaluation of environmental technologies, this research will generate specific, policy-relevant data on the costs, benefits, risks, and stakeholder acceptability of using ecologically-engineered wetlands at the Tar Creek site. In addition, development and testing of the ELCA framework will create a statewide area of expertise in integrated environmental assessment that will be of value in improving environmental decision making in the State of Oklahoma. The proposed work will serve as the foundation for the establishment of an Oklahoma Center for Integrated Environmental Assessment and Decision-Making that will serve as a regional and national resource for environmental technology assessment. The principal investigators of the proposed research will serve as the core of this multi-disciplinary, multi-campus center.