Actionable Science for Communities

Updated Lifecycle Inventory Data for Spreadsheets for Environmental Footprint Analysis (SEFA) Tool – SHC 3.63.1

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Purpose/Utility of Research

The SEFA tool is designed to estimate the environmental footprint of environmental remediation sites. The SEFA tool includes cradle-to-gate life cycle inventories of chemicals and materials used at environmental remediation sites. The inventory analysis involved sorting and aggregation of relevant elementary flows into the environmental footprint categories included in the SEFA tool. The developed material emission factors are intended for implementation in SEFA workbooks. The SEFA tool will be revised to incorporate water use and updated emission factors in order to more accurately estimate the environmental footprint of a cleanup.

Highlights

- Developed life cycle inventory datasets to be incorporated in the SEFA tool in order to improve environmental footprint estimates for remediation activities
- SEFA tool associates user-described activities with pre-calculated emission factors
- SEFA tool allows for user-entered data regarding site remediation activities that estimate life cycle energy usage, greenhouse gas emissions, criteria air pollutants, hazardous air pollutants (HAPs) and water usage
- SEFA tool identifies opportunities for environmental footprint reduction at contaminated site cleanups
- SEFA documents footprint reductions achieved at sites

Lessons Learned

- As with any model of the real world, there is a level of uncertainty in the calculated emission factors developed for the SEFA tool
- Data quality is affected by dependence on data from different countries, different unit operations, and different sources
- Environmental footprinting science is moving forward by incorporating water usage and refining other emission factors

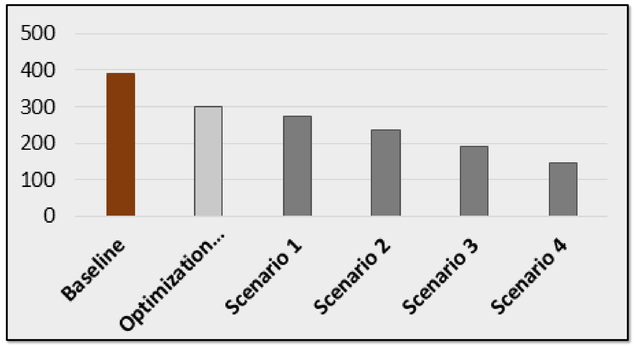
Estimated Air Emissions at the Whitney Young Branch Library Cleanup Site

Criteria	Units	Conventional Strategy (estimated total)	Greener Cleanup Strategy (actual total)	Environmental Footprint Reduction (% of conventional practice)
Energy	Million Btu's (British thermal units)	9,072	3,968	56%
Hazardous pollutants	Pounds	28	11	61%
Particulate matter	Pounds	6,769	2,734	60%
Nitrogen oxides	Pounds	9,002	3,657	59%
GHGs	Tons (carbon dioxide equivalents)	706	319	55%
Sulfur oxides	Pounds	2,321	1,104	52%

Use of a greener cleanup strategy resulted in significant reductions to the project's air emission-related footprint, when compared to a conventional cleanup strategy, as estimated using SEFA.

More information about this site can be found at clu-in.org/greenremediation/profiles/whitneyyoung.

Estimated Greenhouse Gas Reductions (tons CO_2 per year)



Footprint analysis can be used to test greenhouse gas reductions for multiple scenarios at a cleanup site, as shown in this hypothetical example

Many cleanup sites use heavy equipment, as shown here at Barksdale Air Force Base in Bossier City, LA, and can benefit from footprint analyses to identify opportunities for footprint reduction

More information about this site can be found at clu-in.org/greenremediation/profiles/barksdaleafb

Materials such as sugar beet lime may be used as soil amendments at cleanups sites, as shown here at the California Gulch Superfund Site in Leadville, CO

More information about this site can be found at clu-in.org/greenremediation/profiles/californiagulch

Application & Translation

The EPA has implemented several case studies which highlight the net environmental gains as well as the science challenges to minimize environmental footprints in remedial cleanup actions. Other federal and state cleanup programs have also begun to consider how remedial actions could reduce their environmental footprints. One of the research challenges is to gather cradle-to-gate data for assessing industrial systems and/or activities. This database is the life cycle inventory which quantifies all energy and raw material requirements, atmospheric emissions, water emissions, and other releases resulting from products and processes used at environmental remediation sites. "The SEFA tool will use life cycle inventory data to generate the following metrics: NOX (kg NOX), SOX (kg SOX), Global Warming: GWP100 (Global Warming Potential) (kg CO2 eq), Water Use (m3 H2O), PM10 (kg PM), HAPs (kg HAPs), Energy Demand: CED (Cumulative Energy Demand) (MJ), and possibly Fossil Depletion: FDP (Fossil Depletion Potential) (kg oil eq)."

Intended End Users

EPA Region 9 RCRA staff requested the updated life cycle inventory data on behalf of EPA HQ through EPA's Engineering Technical Support Center. The inventory data will be incorporated in the SEFA tool by EPA HQ. The updated SEFA tool will assist federal, state, industry, EPA site contractors, and NGOs who are responsible for cleanup sites in a variety of cleanup programs such as Superfund, RCRA, Brownfields, Leaking Underground Storage Tanks and PCBs. The underlying life cycle inventory models will be useful to site remediation managers, LCA practitioners, and those working in the area of chemical and material sustainability.