Assessing the Sociotechnical of Remediation through Humanitarian Engineering and SustainAlytics Framework

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Background/Objectives. Over the past 20 years, engineering pedagogy has grown to give more consideration to human aspects. Humanitarian engineering related majors, minors, and Masters programs have become available at colleges including University of Texas at Austin, Colorado School of Mines, The Ohio State University, Oregon State University, University of California at Berkley, and Worcester Polytechnic Institute. Outside of academia, organizations like Engineers Without Borders and Pure Earth have engaged engineers in development work and humanitarian aid. However, industry has largely hesitated to incorporate sociotechnical considerations, with an even smaller representation of humanitarian engineering metrics in existing remediation sustainable assessment tools. In an effort to address this workflow process and data gap, the SustainAlytics Framework (SAF) was developed to inform identification of criteria and tools to more holistically assess engineering project sustainability through economic, environmental, and social modules.

Approach/Activities. The Social Module of the SAF describes potential ways in which a project could impact environmental justice and quality of life in the affected community. Social metrics were devised through review of environmental justice literature and current events, and in consultation with diversity, equity and inclusion subject matter experts in a variety of engineering service groups (such as transportation and FEMA response). Each social metric describes a specific social justice consideration, for example, the level of community engagement and feedback throughout the project timeline, or the disruption of culturally significant community sites. Other metrics are aimed at measuring niche impacts, such as net change in tree canopy before and after project implementation. Tree canopy affects community health and quality of life by lowering urban heat and providing shade and beautification, and the SAF seeks to capture these potential EJ impacts. Metric data types vary; some can be described only qualitatively to preserve the integrity and nuance of unique community situations. Others can be quantified or monetized (for instance, the dollar amount of community economic growth after a project is implemented).

Results/Lessons Learned. The SAF can assess the sustainability of all types of engineering projects, and it has preliminarily been used to assess remediation projects such as brownfield redevelopment, permeable reactive barrier installations, and contaminated groundwater. Overall, traditional sustainability metrics such as energy reduction and resource reuse are done well, but a major area for improvement is the consideration of the community throughout the project lifecycle. Understanding community desires, valuing local knowledge, seeking feedback, and prioritizing community autonomy can all increase project sustainability. To achieve these goals, engineers and planners must take time to identify, understand, and build rapport with the community prior to project definition or implementation.