

Multi-Metric Sustainability Analysis

Collaborators: National Renewable Energy Laboratory (PI-Shannon Cowlin, Margaret Mann, Jaquelin Cochran)
Colorado School of Mines (PI-David Muñoz and Vincent Whisker)

Project Description

This project will establish a multi-metric sustainability analysis (MMSA) framework for evaluating conventional and renewable electricity-producing energy technologies. The framework will include metrics from social, economic and environmental categories to facilitate comparisons among technologies, in different locations, and for different end goals. This study aims to facilitate understanding of impacts and decision-making based on current knowledge of the relationships between energy system choices and sustainability impacts rather than to monitor system sustainability over time.

Accomplishments and Current Status

The research team has focused on evaluating existing research and approaches to MMSA and on developing a visual communication tool to frame the approach to evaluating inputs. Figure 1 shows a conceptual diagram of the visual tool planned for use in presenting results along with the initial 6 indicators selected for evaluation. The overall approach in this multi-metric evaluation is defined by:

- Use of **disaggregated** indicators rather than trying to derive one value combining multiple metrics
- Selection of indicators that can be evaluated in **quantitative** terms rather than relying on qualitative estimates of impact
- Reporting impacts as **absolute** values rather than relative to a baseline

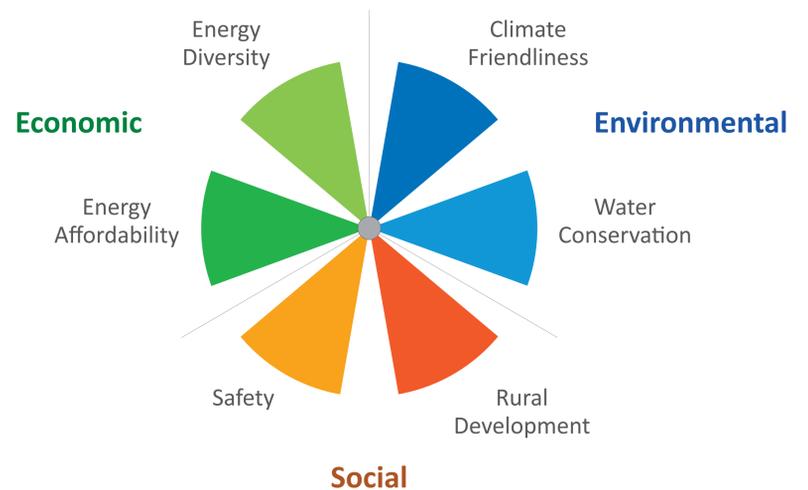


Figure 1: Conceptual diagram of visual tool for multi-metric sustainability analysis

Next Steps

The visual tool will facilitate easy comparisons among technology/site combinations, as shown in Figure 2. To allow for intuitive comparisons, the larger pie slices all need to represent more desirable outcomes, and next steps include identifying appropriate units and scales for these pie pieces based on current research approaches and values relevant for the range of technologies to be evaluated. Existing knowledge will then be used to apply this approach to evaluating two technology options at one location to highlight strengths and opportunities to improve this approach further.

	Technology A	Technology B	Technology C
Location 1			
Location 2			

Figure 2: The visual tool facilitates comparisons among technology/site combinations

Expected Outcomes and Applications

This research will yield a proposed new approach for evaluating and communicating anticipated outcomes from possible electricity-generating options. Foundational research on current approaches to the initially-selected indicators will help guide application of this approach, and the new visual tool can be used to allow quick, initial comparisons that are supplemented with the more detailed analysis. At its core, this project aims to produce a decision support approach and visual tool that can enable technologists to identify potential weaknesses, planners to evaluate options based on localized concerns, and policy makers to assess the relationship between economic, environmental and social priorities and technology impacts.