

A holistic approach to water supply planning that incorporates social and environmental impacts

Comprehensive Analysis of Alternative Water Supply Projects Compared to Direct Potable Reuse (Reuse-14-03/4761)

The Central Issue

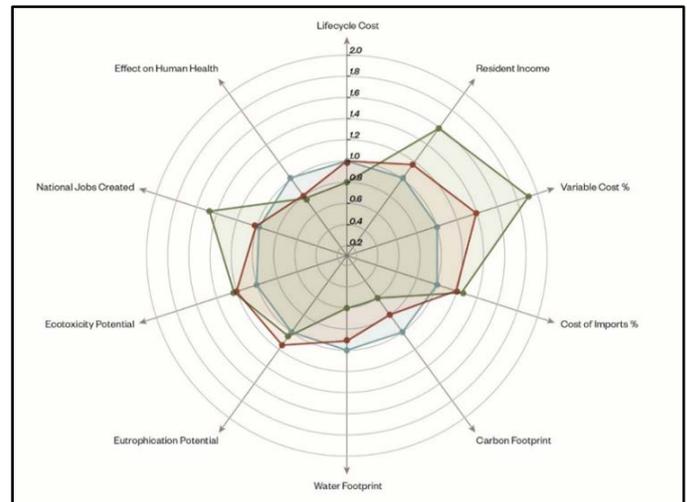
Population growth, urbanization, climate change, and the limited availability of water from traditional sources are creating water stress in many parts of the world, driving the need to consider alternative water supply options and overall diversification of the water supply portfolio. These water supply options must be compared in a transparent, publicly accessible manner to facilitate sound management-level decision making, public engagement, and education regarding the benefits and costs of each alternative water supply option.

Context and Background

The purpose of this project was to develop a quantitative framework with an accompanying tool that utilities can use to conduct a triple bottom line (TBL) comparison of the various water supply and treatment options, such as direct potable reuse projects, indirect potable reuse, groundwater or surface water development, desalination, and demand management. The resulting Water Supply Evaluation Tool (WaterSET) can convert user inputs related to treatment, transmission, and overall operations to impacts across multiple TBL criteria.

Findings and Conclusions

The TBL framework developed for this study provides a means for utilities to evaluate water supply options and treatment approaches for a single water supply or across a suite of supplies. A key feature of the approach used is that the multi-criteria decision analysis has been decoupled from the outputs of the TBL model, which allows users to view the quantitative impacts of water supply options with and without user-defined weightings of criteria prioritization. It also provides an opportunity for utilities to determine if, and by how much, different criteria weighting factors may impact the favorability of a specific water supply option or treatment approach. Both the multi-criteria decision analysis output and the TBL output have value in communicating risks and impacts with stakeholders, helping to guide the decision-making and planning process.



A radar chart used to visualize unweighted triple bottom line results for three water supply options.

The Water Supply Evaluation Tool (WaterSET) gives utilities the ability to more accurately characterize the full impact of various water supply options with a focus on direct potable reuse. This will allow for a more holistic approach to water supply planning beyond traditional financial metrics to incorporate additional social and environmental impacts. The WaterSET tool could also be further developed to include automated scenario modeling to implement a screening analysis of uncertainty. Screening analysis would identify which sources of uncertainty have the greatest impact on the outcomes of the analysis. Uncertainty analyses can also be incorporated into the multi-criteria decision analysis portion of the tool by presenting trade-offs among admissible choices. WaterSET can serve as a rigorous basis upon which to build further extensions to better inform decision makers who confront uncertainty.

Management and Policy Implications

This work enables utility managers to discuss the various economic, environmental, and social impacts associated with different water supply options and to demonstrate these impacts with case study results.



Related WRF Research

Project Title	Research Focus
An Economic Framework for Evaluating Costs and Benefits of Water reuse (Reuse-03-06)	Provides a foundational framework on determining the full costs and benefits of water reuse compared to other supply options.
Fit for Purpose Water: The Cost of Overtreating Reclaimed Water (Reuse-10-01)	Provides an analysis of treating water beyond the level that is needed for its intended purpose.
The Opportunities and Economics of Direct Potable Reuse (Reuse-14-08)	Provides an economic analysis of direct potable reuse and other water supply options with a focus on California

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Reuse-14-03/4761

July 2018

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