

Project Information Summary



Unlocking the Nationwide Potential of Water Reuse: Task D (5197D)

Principal Investigator: Sherri Cook, PhD, University of Colorado-Boulder

Project Team: University of Colorado-Boulder

Research Program Manager: Miriam Hacker

Year Funded: 2022

Project Duration: 44 months

Total Project Value: \$5,356,929

Goal and Objectives

Task D aims to identify strategies and pathways to support the successful adoption of sustainable water reuse through three main objectives:

1. Identify drivers and pathways to water reuse success using qualitative comparative analysis on cases of attempted or implemented projects
2. Identify the landscape of water reuse opportunities by using quantitative sustainable design to evaluate planned and potential projects
3. Identify strategies for tailoring water reuse capacity building efforts that are sensitive to contextual differences.

Background and Motivation

This task focuses on determining pathways, or combinations of contexts and strategies, that enable the implementation of water reuse projects. These pathways enable the identification of tailored strategies for different contextual differences in US communities, including those that are underserved. Targeted strategies can be the difference between a failed or successful project and can include treatment technology selection/operation, stakeholder engagement/communication approaches, and planning/implementation timelines based on context to minimize water reuse barriers. To generate the data and understanding needed to tailor strategies, extensive data is needed on various case studies.

Existing implementation guidance is primarily based on limited data, usually from small numbers of cases. This task focuses on developing evidence-driven guidance by systematically collecting data on factors that have contributed to or hindered success through a rigorous, cross-case analysis of attempted and implemented water reuse projects. To this end, fuzzy-set qualitative comparative analysis (fsQCA) will be used to synthesize and interpret how factors combine—in different contexts across the nation—to lead to water reuse adoption. To further improve understanding of future water reuse planning decisions in different contexts (especially in locations where water reuse potential is high but has yet to be considered) quantitative sustainable design (QSD) will be used. QSD is a design and modeling approach that uses rigorous methodologies, such as life cycle assessment and costing, to evaluate the environmental, economic, and social implications associated with building and operating a water reuse facility. By using this approach, the research team will be able to evaluate more water reuse scenarios and contexts to more fully characterize the landscape of water reuse opportunities in the United States.



Research Approach

Task D1 – Identify Drivers and Pathways to Water Reuse Success Using Qualitative Comparative Analysis on Cases of Attempted or Implemented Projects.

1. Collate, code, and calibrate factors (drivers and barriers) from existing literature, including different organizational processes, technologies, social factors, contextual factors, end use, and water sources.
2. Collaboratively work with Expert Panel #1 to view, discuss, and rate the importance of the drivers (and barriers) discovered and to synthesize and prioritize factors to study in the case studies.
3. Conduct multiple case studies of water reuse projects to investigate the extent to which those drivers, barriers, and outcomes are present in each case.
4. Conduct a cross-case analysis using qualitative comparative analysis (QCA) to analyze and determine pathways, or combinations of factors, that lead to an outcome of interest (i.e., water reuse adoption).

Task D2 – Identify the Landscape of Water Reuse Opportunities by Using Quantitative Sustainable Design to Evaluate Planned and Potential Projects.

1. Characterize case studies of planned and potential water reuse projects to increase the national representation of barriers and drivers with input from Expert Panel #2.
2. Develop a sustainability assessment framework that can comprehensively evaluate a project's economic, environmental, and social considerations using QSD.
3. Apply the framework to evaluate case studies of existing, planned, and potential water reuse projects to identify characteristics that support sustainable water reuse implementation in different contexts.

Task D3 – Identify Strategies for Tailoring Water Reuse Capacity Building Efforts that are Sensitive to Contextual Differences.

1. Convene experts to evaluate regional differences and barriers and help to define, understand, and inform the research regarding drivers shaping future water planning decisions. There will be three expert panels throughout the project.

Deliverables

- Report detailing a systematic literature review on the factors that influence water reuse adoption
- Framework to evaluate the social, economic, and environmental sustainability of water reuse projects
- Report describing strategies to build water reuse capacity in different contexts that includes pathways of factors that enable water reuse adoption and characteristics that support sustainable water reuse implementation

For more information, contact:

Lyndsey Bloxom,
lbloxom@waterrf.org

The Water Research Foundation

1199 N. Fairfax St., Ste 900 | 6666 W. Quincy Ave.
Alexandria, VA 22314-1445 | Denver, CO 80235-3098

www.waterrf.org

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