

# Transformative Approaches and Technologies for Water Systems

## Problem Summary and Decision Context

**Problem:** Increasing stresses on water resources will impact water supply and demand. Stressors include population growth and density, climate variability, energy consumption, contaminants, and deteriorating infrastructure.

The American Society of Civil Engineers predicts a funding gap of 84 billion dollars for water and wastewater infrastructure needs by the year 2020 with an increase in the funding gap to 144 billion dollars by 2040 (ASCE, 2011). Transformative, sustainable approaches to water systems will be necessary in order to meet future demands.

**Objective:** Advance the transformation of water systems towards a more sustainable future.

## Utility to Agency

**This project will provide EPA with the following:**

- A sustainability assessment framework integrating drinking water, wastewater, and water reuse/resource recovery components.
- Advances in real-time monitoring.
- Evaluations of alternative systems, including economic development potential.
- New approaches to waterborne human health risk measurements.

## Tasks and Projected Deliverables

**Task 6.03A:** *Systems approaches for assessment of water reuse*

**Task 6.03B:** *Novel detection tools for systems applications*

**Task 6.03C:** *Transformative approaches for water systems and water reuse*

**Task 6.03D:** *Water Technology Innovation Cluster*

**Task 6.03E:** *Approaches to assess the overall health of a community*

**Task 6.03F:** *Human and ecological health impacts associated with water reuse and conservation practices (STAR Grant)*

### Examples of expected deliverables:

- Suite of integrated system-based tools, including life cycle assessments, life cycle costs, advanced water footprinting approaches, energy analyses, and resiliency assessments.
- Development of a biologically-based effects monitor that senses and responds to chemical exposures that could have adverse health effects.
- Case studies and demonstrations of transformative technologies, with an emphasis on mapping pathways to successful mainstreaming of niche technologies and the potential for system optimization through redefining wastewater treatment as a resource recovery process.
- Evaluation of the potential role of waterborne pathogens as triggers for novel health outcomes, such as diabetes and other autoimmune disorders.



## Future Directions

- Advance the development of a comprehensive, systems-based life cycle assessment framework for future sustainable water management planning in communities.
- Improve the adoption of new technologies and systems for water treatment through the NetZero and Water Technology Innovation Cluster programs.

## Partner Engagement Opportunities

**Partners and potential collaborators:**

- EPA Program Offices and Regions
- Department of Defense
- Private sector and trade organizations
- Centers for Disease Control and Prevention
- Utilities, state, and local communities