

Project B1-2

Spatially- and temporally-informed life-cycle assessment of urban water systems

PROJECT OUTPUTS

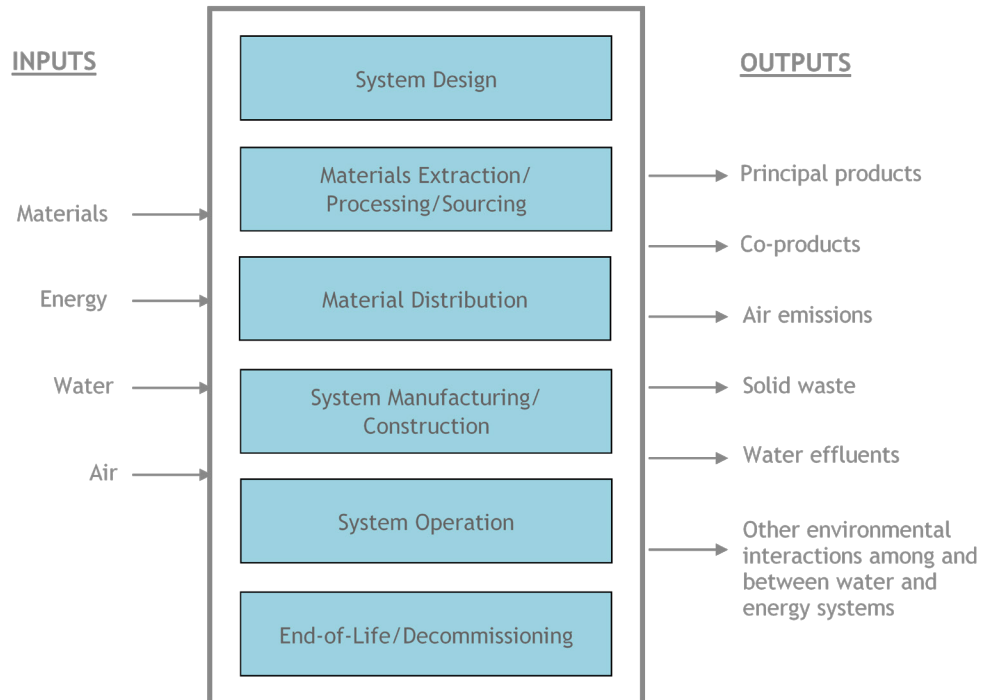
This project will estimate energy consumption, greenhouse gas emissions, and other air, water, land emissions for UWIN's case study cities using life-cycle assessment for current baseline operations and planned and potential future changes, including strategies identified in [Project B1-1](#).

The results can be compared to other systems' performance. We also may identify areas where efficiency, sustainability, and/or resiliency can be improved and identify tradeoffs between urban water system operations as well as opportunities for resource recovery.



It is critical to proactively and rigorously evaluate potential negative consequences as well as co-benefits associated with innovative water strategies before investments are made as they may affect society for years to come.

As water infrastructure in many cities nears the end of its decades-long useful lifespan, now is an ideal time for managers and planners to focus on their systems' resiliency, sustainability, and adaptability to long-term supply and demand changes that may result from climate change, population growth, urbanization, and other factors.



Source: Adapted from SETAC (1991)

This project will use life-cycle assessment (LCA; see above) to evaluate the energy and resource inputs and environmental outputs associated with urban water innovations to holistically analyze design decisions and characterize tradeoffs associated with technology selection, design life, scale, and connections between urban water networks (e.g., water supply, wastewater, and/or stormwater) as well as to energy systems.

LIFE-CYCLE ASSESSMENT

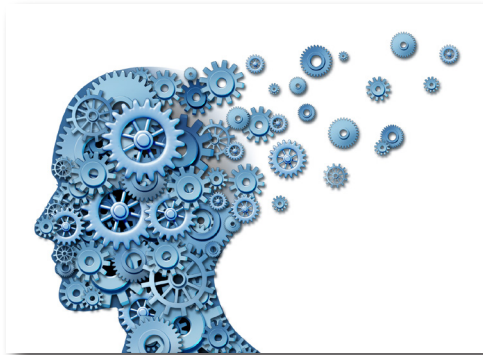
Life-cycle assessment (LCA) is a methodology developed to systematically quantify the material and energy inputs and outputs from a product, process, or system throughout all its stages of life. It uses a cradle-to-grave (or, in some cases, cradle-to-cradle) perspective, evaluating the design process, the entire supply chain associated with manufacturing, transportation, the use phase, and waste management.



LCA has been applied to urban water systems previously to:

- Identify major contributors to water systems' energy profile
- Compare of the effects of different treatment options
- Assess the impact of changing operational control parameters
- Evaluate of the effects of aging infrastructure

DECISION SUPPORT TOOLS



Decision-support tools developed by the project team, the Water-Energy Sustainability Tool (WEST) and the Wastewater-Energy Sustainability Tool (WWEST), will be used in the study.

WEST was developed to evaluate the life-cycle energy and environmental effects of potable and recycled water systems. It evaluates infrastructure and chemical

manufacturing as well as energy production. It also allows the user great flexibility when analyzing electricity and fuel production. WWEST is intended to quantify similar life-cycle effects of wastewater systems.

More information about LCA, the WEST and WWEST tools, and a description past work by Berkeley researchers on urban water system is summarized at <http://west.berkeley.edu>

DATA REQUESTS

A detailed list of specific data needs will be provided to case study utilities. General needs include:

- Overall system operations and interactions for urban water and energy systems
- Aggregated urban water infrastructure inventory (pipe, pumps, tanks, etc.)
- Operational materials inventory (chemicals, electricity, and fuels)

DATA USE

Data will be used as inputs to the WEST and WWEST decision-support tools to evaluate energy consumption, greenhouse gas emissions, and other environmental implications of urban water systems using life-cycle assessment.

PROJECT KEYWORDS

- Life-cycle Assessment
- Decision Support Tools
- Sustainability
- Urban Planning
- Green House Gas
- Climate Changed
- Embedded Energy and Carbon

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