STATE WATER RESOURCES CONTROL BOARD
Recycled Water Research Needs Workshop
October 29, 2014

Thematic Topic #4: Financial, Environmental, and Social Factors of Water Reuse

---

Definition of the Topic:

Water reuse provides a reliable, climate-independent local source of supply. While scientific and technological advances can address public health and water quality concerns regarding the implementation of water reuse projects, secondary issues must be acknowledged and addressed when considering the viability and acceptance of specific activities. A "triple bottom line" (TBL) approach should be taken to evaluate the financial, environmental, and social factors of various water supply options being considered. This holistic analysis factors in the sustainability influences (which may be positive or negative) that water reuse poses versus traditional water sources. Equally (if not more important), a public outreach and engagement campaign is key to community acceptance of a reuse project.

Important factors considered under a TBL approach should include:

- Cost of treatment between potable water and reuse water.
- Energy requirements.
- Associated greenhouse gas (GHG) emissions.
- Environmental benefits/impacts from reduced wastewater discharge due to water reuse activities.
- Various social benefits (including supply reliability, enhanced green space, and sustainable design).

These costs and benefits will be evaluated individually for affordability, compatibility, and other criteria, but they should also be considered in a cumulative nature to determine how each variable will affect the regional water resources equation. Another social aspect that is worthy of significant attention is public acceptance, which is critical to launching and maintaining water reuse projects. While the quality of reuse water is safe and fit for its intended use, the public can have trouble overcoming apprehension over the source of this supply. Outreach and engagement are key components of the success of water reuse projects.

State of the Knowledge:

Evaluating the true cost of a specific water supply necessitates using a TBL perspective by taking the full financial, environmental, and social factors into consideration. By using a TBL framework, decision makers can help ensure that the end-use need for water quality corresponds to the proper level of treatment without expending unnecessary funds, energy, and GHG emissions or generating other social costs (WRRF-10-01). For end-users that do not require

potable water (e.g. irrigation, some industrial uses), costs and resources can be conserved through appropriate planning and management of the water supply.

A major driver for the cost of water is energy consumption, both in treatment and conveyance from the water source to end user. Different sources of water have different energy requirements. For instance, imported water requires considerable energy to move it in sufficient quantity from its source to where it is needed. Desalination, on the other hand, may be used locally, but requires large amounts of energy to separate salt from water. Along with the financial cost of energy consumption, the associated GHG emissions result is a significant environmental cost. Tools exist (e.g., Water-Energy Simulator WRRF-08-16) that allow users to evaluate the energy and GHG implications of population growth, impact of climate change, development of alternative water and energy sources, and water treatment improvements resulting from stricter water-quality guidelines and emerging contaminants.

Environmental impacts can also significantly influence how decision makers evaluate different water treatment and supply options. Because reclaimed water is locally sourced for local use, it reduces the need for water transfers from one region to another. For example, if reuse is further expanded in California, it has the potential to reduce the need for imported water from the San Joaquin Delta in the north, thereby supporting the natural flow of water in the delta. This would allow for greater protection of endangered species (like the delta smelt), potential restoration of native salmon populations, and decreased tension between agricultural interests in the Central Valley and environmental groups. In addition, indirect potable reuse (IPR) applications can protect and enhance existing reservoirs and aquifers against depletion. An IPR project, the Groundwater Replenishment System in Orange County pumps half its produced water into injection wells to prevent seawater intrusion from contaminating the groundwater basin. In this case and others, recycled water improves the quality of its receiving water; however, impacts from reduced flows must be considered.

In general, barring any unforeseen regulatory changes, the cost of treating wastewater and drinking water can be expected to follow historical trends. In terms of water reuse, this predictability-of-cost is especially valuable because it can allow a utility to accurately predict the cost of maintaining a reliable stream of water that can be used for a variety of purposes. Drought and the uncertainty surrounding the future availability of water gives additional economic value to the inherent reliability of water reuse by allowing industry and other users to be able to better project future costs. There is also an associated social value with avoiding future water restrictions and having the assurance of a stable source of water in the future.

In terms of public perception and acceptance of reuse, local, state, and national campaigns have been successful through engagement on the water cycle and importance of quality (rather than the source). Utilities (particularly in California) have learned that proactive, robust outreach with simple messages and broad reach are worthwhile. Willingness to accept wastewater as an adequate source often varies on the environmental buffer and final end use. There is a statewide movement in California for direct potable reuse (DPR); through effective messaging, DPR can become an accepted source of potable water in the future (WRRF-13-02).

A summary of the TBL is provided in Table 1.

Table 1: Triple Bottom Line Summary

	Factors	Impacts
Financial	• Capital Construction Costs • Operations and Maintenance • Energy Usage	Costs for reuse are highly site-specific in how they can compare to other supply options. Options like desalination and importing water have very high energy requirements and costs. The cost of water reuse varies depending on the location, but is often competitive (if not most economical).
Environmental	• Wastewater Discharges • Brine Disposal • GHG Emissions • Water Diversions • Climate Change Resiliency	Water reuse has the potential to greatly reduce or eliminate wastewater discharges. For RO applications, there can be issues in brine disposal. Reuse has the potential to reduce water diversions from one ecosystem to help preserve local environments.
Social	• Local Economic Impact • Supply Reliability • Aesthetics • Quality of Life	Reuse creates a local supply of water to be used for a variety of purposes to bolster the local economy while reducing dependence on other sources, like imported water. Reuse can help support irrigation for parks and other recreational activities to improve the local quality of life.

Research and Program Needs:

- Full evaluation to quantify (place a dollar value on) the non-monetary environmental and social impacts of water reuse compared to traditional sources of water.
- Full accounting of energy use and GHG emissions associated with water reuse, along with traditional water sources.
- Low-energy treatment options to decrease the cost and carbon footprint of water reuse.
- Integrating the need for climate change adaptation into a water reuse strategy.
- Public campaign on the value of water and viable options for a resilient water supply.
- Communication strategies to better engage stakeholders and the public on the benefits of water reuse, including DPR.