Sustainable Water Resources in Urban Environments: Challenges and Opportunities

Kurt Schwabe, PhD

Adjunct Policy Fellow, Water Policy Center
Public Policy Institute of California

Professor of Environmental Economics and Policy
School of Public Policy
University of California Riverside

California's Water: Water for Cities

Ellen Hanak, Ken Baerenklau, Alvar Escriva-Bou, Jay Lund, Kurt Schwabe, Newsha Ajami, J. R. DeShazo, David Mitchell, Jean-Daniel Saphores, David Sedlak, and Casey Wichman
PPIC Water Policy Center
October 2016

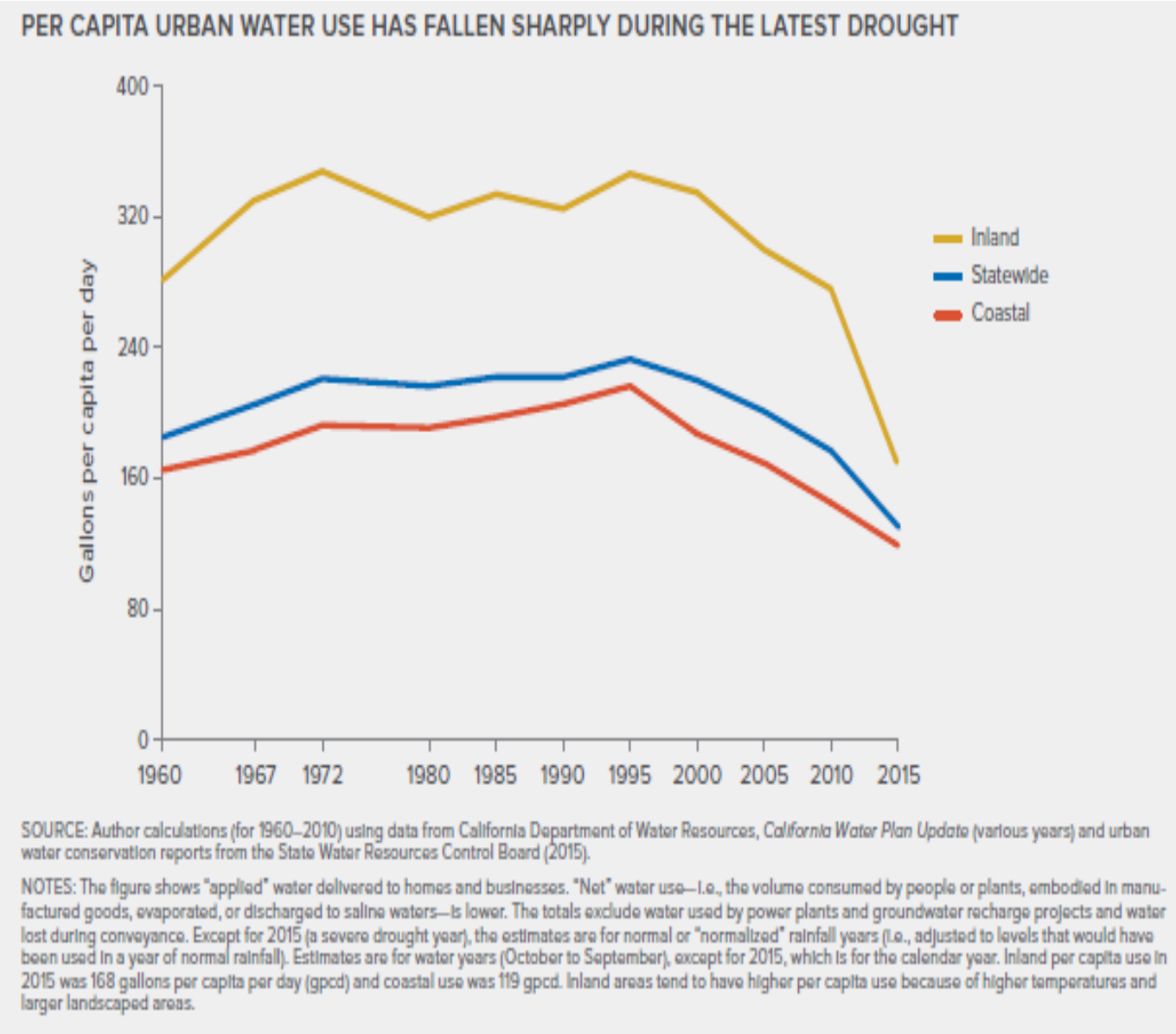
A. What happening with water use in cities?

A.1 Per capita water use has been falling since mid-1990s

- 1995: 232 gpcd
- 2010: 178 gpcd

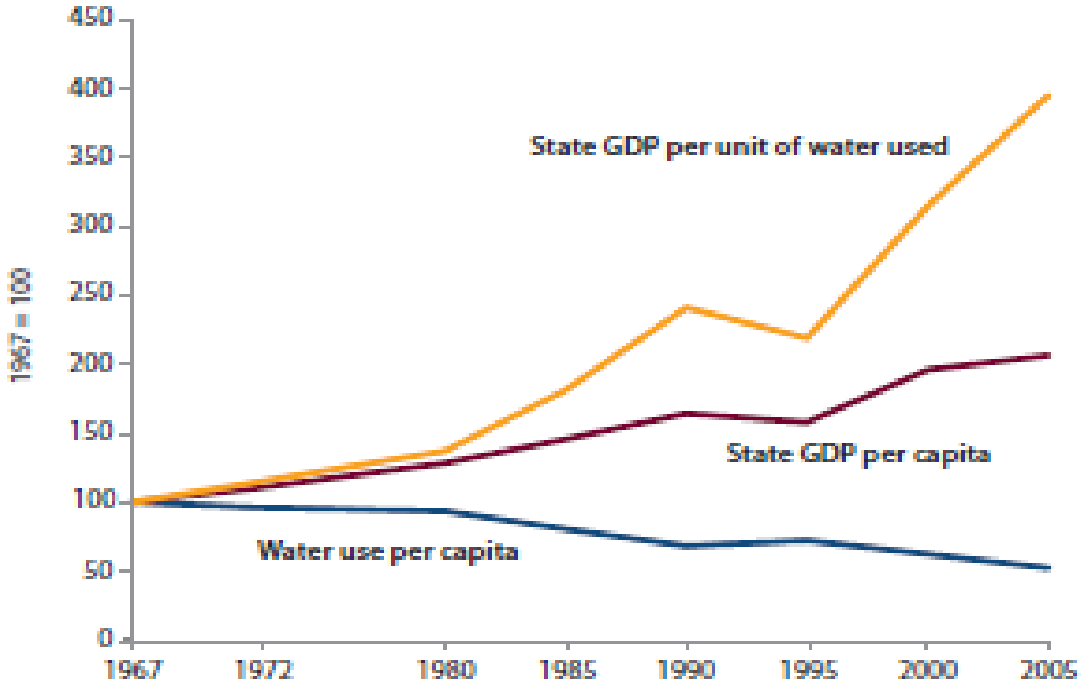
A.2 Communities significantly cut use during latest drought

- April, 2013 vs April 2015: 25% reduction (~130 gpcd)
- Since restrictions lifted…
  - August, 2015: 27.7% reduction
  - August, 2016: 17.7% reduction



A. What happening with water use in cities?

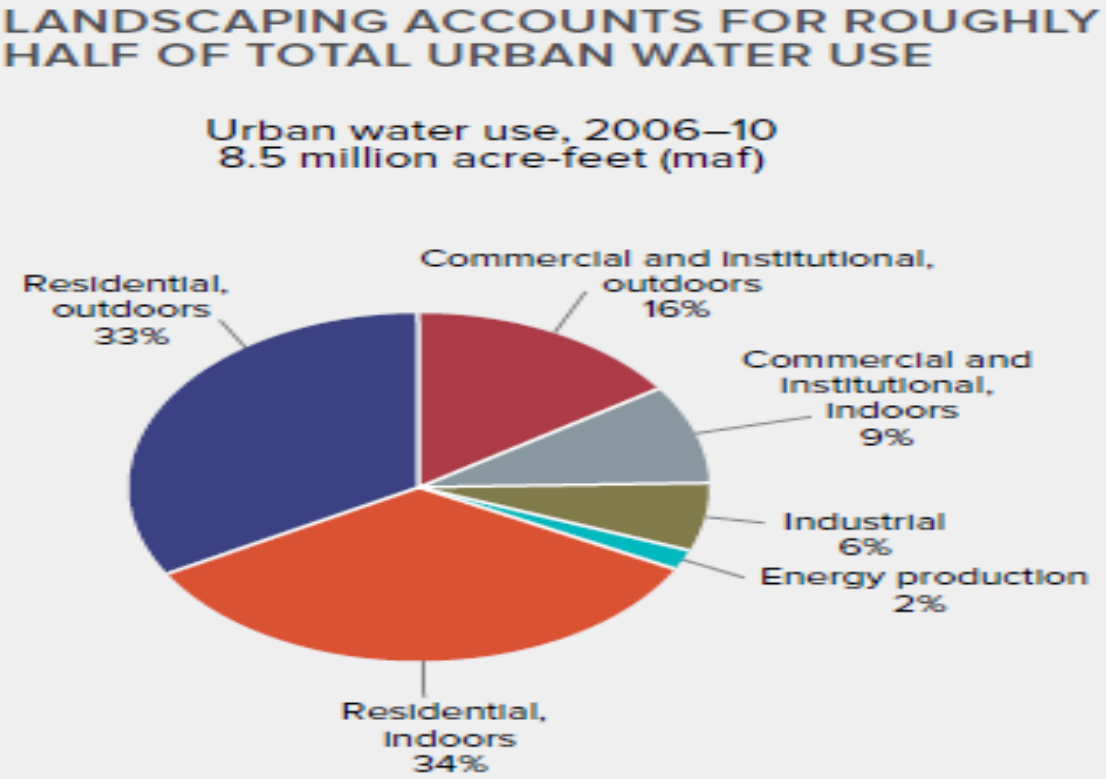
A.3 Urban economy less dependent on water intensive activities (Hanak et al. 2012)



SOURCE: Author calculations using California Department of Water Resources (water use), California Department of Finance (population), and U.S. Bureau of Economic Analysis (state GDP).

NOTES: Water use estimates are for applied use in the agricultural and urban sectors. Pre-2000 estimates are adjusted to levels that would have been used in a year of normal rainfall. Estimates for 2000 and 2005 are for actual use (both years had near-normal precipitation). Estimates omit conveyance losses (6–9% of the total). GDP was converted to real values using the GDP deflator for the nation as a whole.

A.4 Landscape irrigation largest urban water use

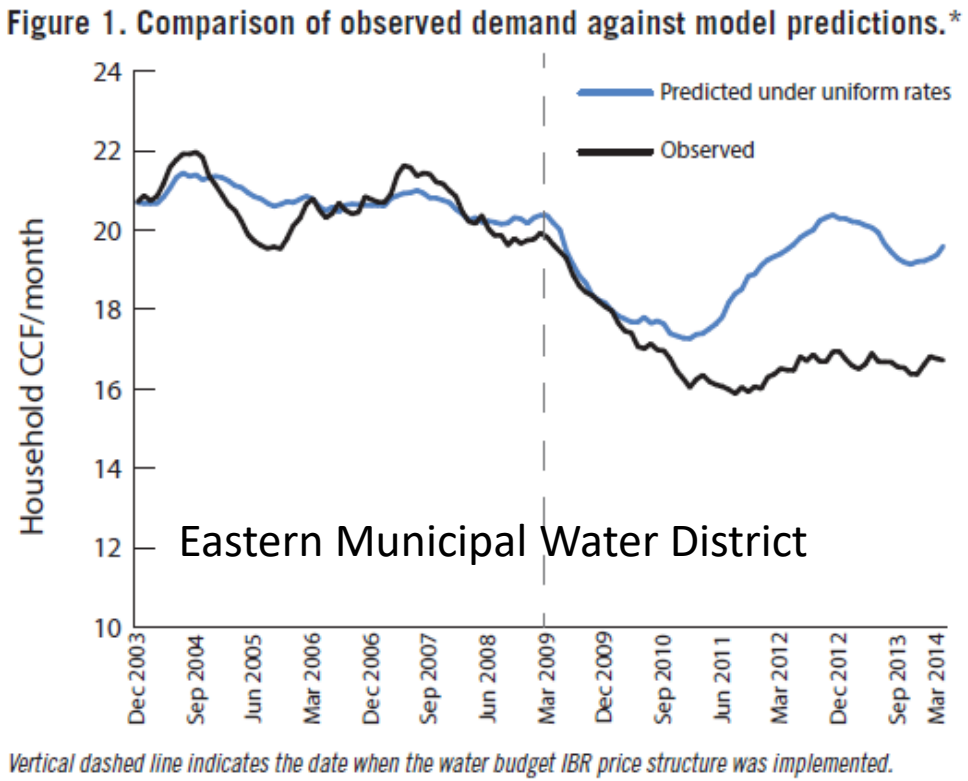


SOURCE: California Department of Water Resources.

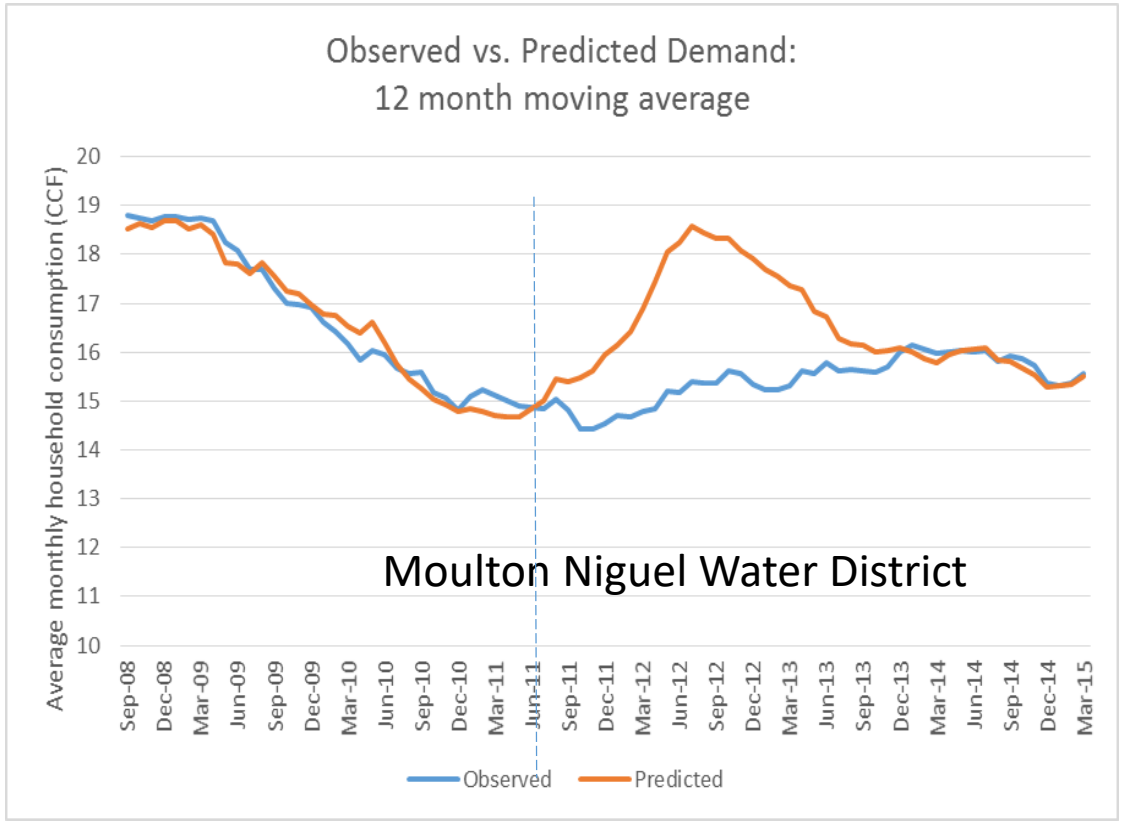
NOTES: The figure shows the average "applied" urban water use, as defined in the notes to the preceding figure. "Net" urban water use (also defined above) was lower (5.9 maf). Commercial and institutional outdoor use includes official estimates for "large landscapes" (parks, golf courses, cemeteries, etc.) and a third of the total estimate for commercial and institutional demand, which includes other outdoor water use.

B. Strategies to Address Reliability, Cost, and Financial Stability Issues

B.1 Pricing is important for managing demand…



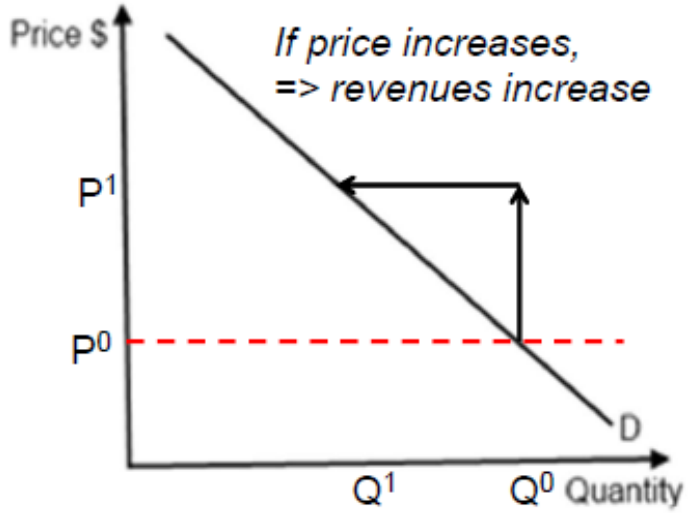
(Baerenklau, Schwabe, and Dinar 2015)

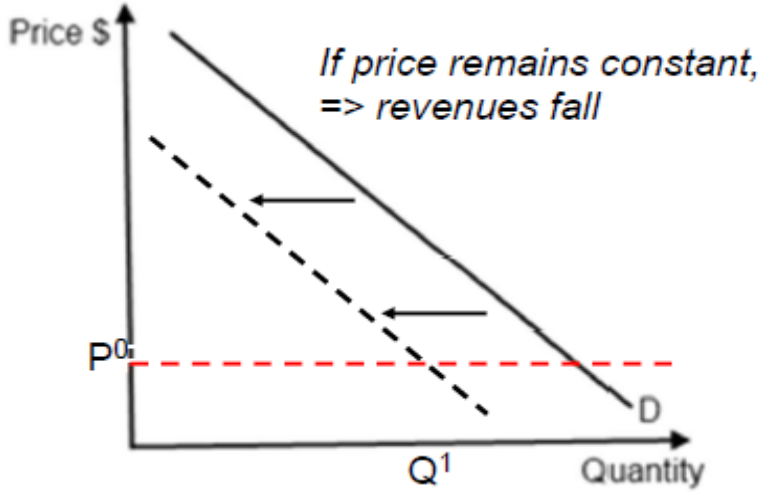


(Schwabe and Baerenklau 2016)

B. Strategies to Address Reliability, Cost, and Financial Stability Issues

B.2 …and proper pricing keeps utilities fiscally strong





- Mukherjee, Mika and Gold (2016) discuss IRWD, MWND, and LADWP rate structures as best practices and how to meet fiscal and conservation goals under Prop 218

B.3 Many utilities developing local supplies to increase resilience

- Recharging local groundwater (IPR via OCWD/OCSD GWRS)
- New surface storage facilities (e.g., Diamond Valley Lake)
- Desalination (Carlsbad Desalinization Plant)
- Stormwater capture

B. Strategies to Address Reliability, Cost, and Financial Stability Issues

B.4 Imported water supplies remain critical for many cities

- > 50% of water for cites in San Francisco Bay and Southern California come from other regions
- Imported water often less reliable and thus seek and invest in more reliable local solutions…

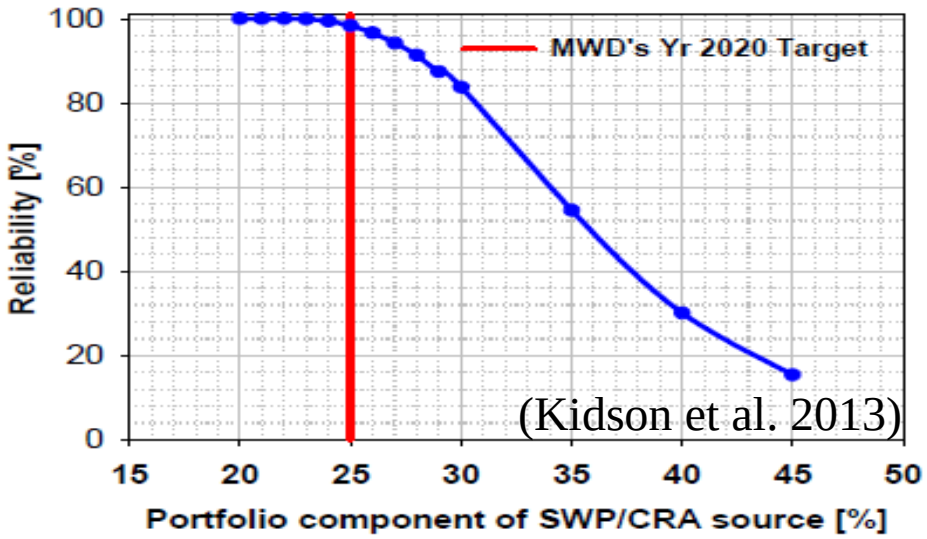


Fig. 1: Reliability of MWD's Yr 2020 supply with increasing portfolio exposure to SWP/CRA surface water sources.

B.5 Water trading is a growing supply source

- Long-term water lease agreements with farmers comprise 10% of SoCal urban supplies
- Storage in rural groundwater basins on the rise

B. Strategies to Address Reliability, Cost, and Financial Stability Issues

B.6 Proposition 218 poses challenges for water management

- Specifies that certain rates and fees cannot exceed cost of service
- Narrow court interpretations question feasibility of tiered water rates
- Restricts use of pricing structures to fund lifeline programs
- Limits ability of larger communities to share the cost of annexing smaller systems—a means to ensure safe drinking water in some rural communities
- ***Salt*** (2015) and ***Mukherjee et al.*** (2016) provide examples for moving forward under Prop 218

C. Urban Water Management: Looking Ahead

C.1 Establish state drought policies that incentivize local action

Issue: One-size fits all top-down approaches likely expedient, but not efficient

- provides disincentive for investments in locally designed, cost-effective approaches

Solution: Develop predictable policy that incentivizes both conservation and continued local investment in diversified supplies

C.2 Guide the courts on water management priorities

- Develop legislation to guide courts in interpreting Prop 218's cost recovery requirements
- Emphasize importance of supply diversification and conservation as strategies to combat growing water scarcity

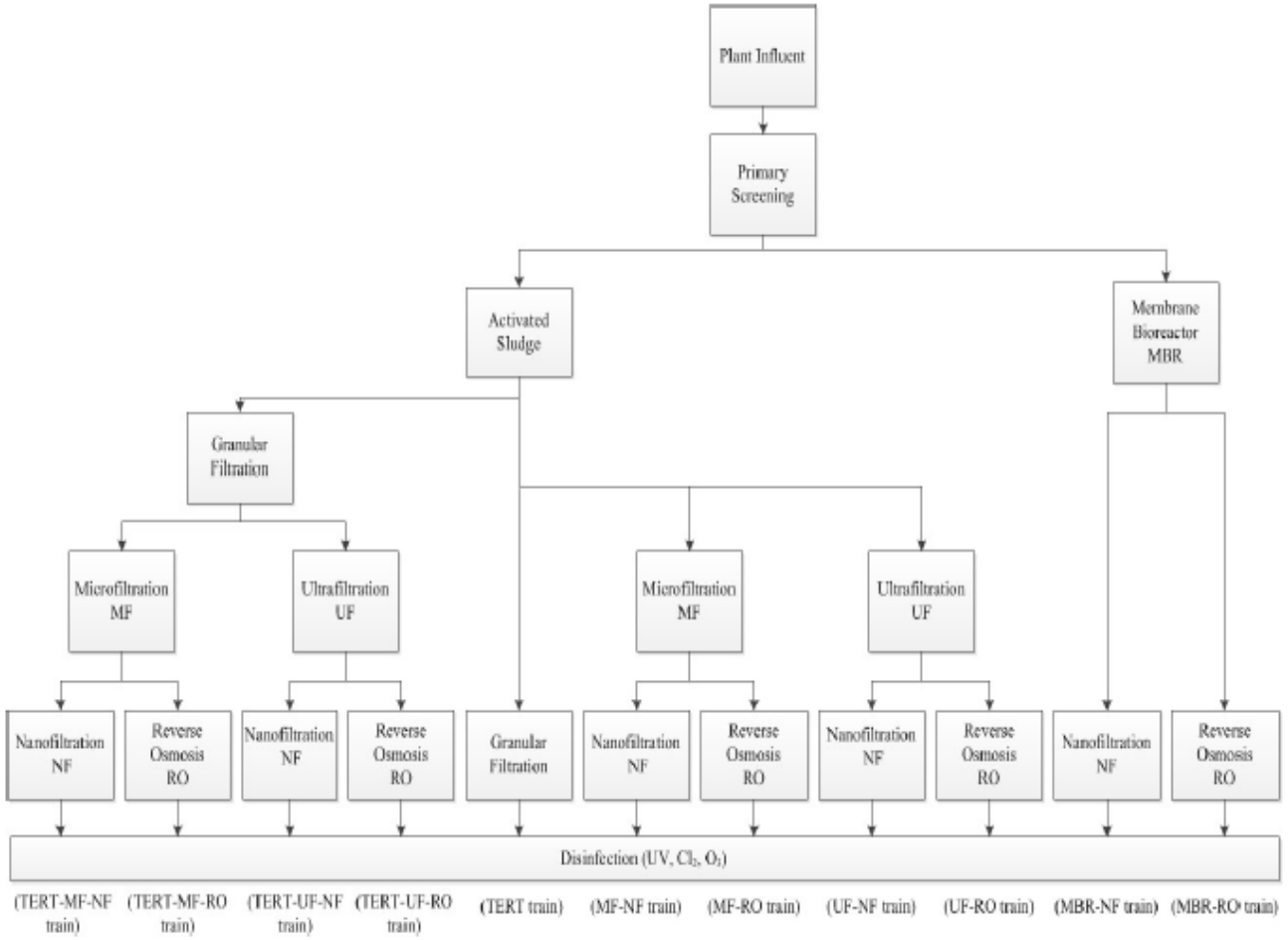
C.3 Use new bond funds for cutting-edge actions

- Agencies eligible for $2.3 billion in state bond funds for region water supply and quality projects under Prop 1
- Invest in innovative projects – e.g., new types of collaborations

C. Urban Water Management: Looking Ahead

C.4 Many utilities developing local supplies to increase resilience

Example: Wastewater Reuse for Agriculture: Development of a Regional Water Reuse Decision-Support Model (RWRM) for Cost-Effective Irrigation Sources (Tran, Jassby, and Schwabe 2016)



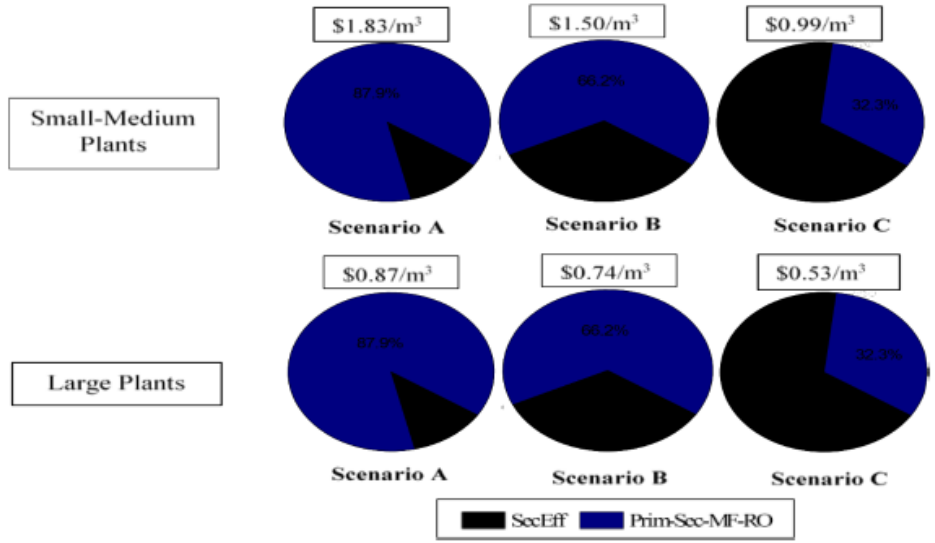
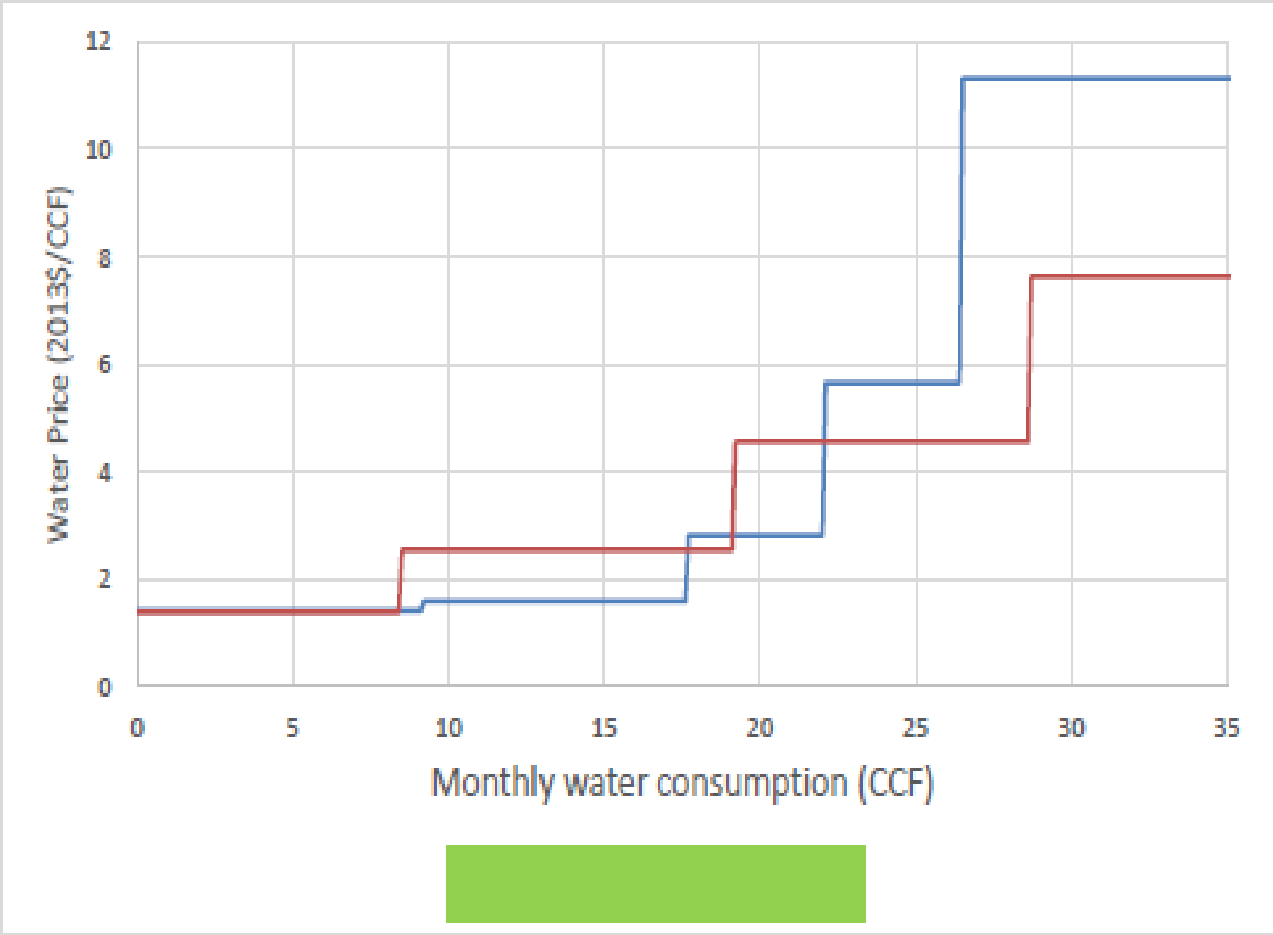


Figure 2. Optimized blending ratios for citrus irrigation from the MF-RO treatment train for small-medium and large treatment facilities; due to TDS restrictions, all model solutions require some degree of desalination (RO). Three scenarios were investigated: (A) with crop nutrient and bicarbonate constraints (baseline); (B) without crop nutrient constraints; and (C) without crop nutrient and bicarbonate constraints.

C. Urban Water Management: Looking Ahead

C.5 Develop flexible and resilient water pricing



Schwabe and Baerenklau 2016)

WMWD Water Budget Rate Structure
(Barr and Ash 2015)

Water Budget$_i$ = (# Residents)*(60 gcpd)*(days) + (ET)*(irrigated area)*(0.8)*CF*DF*(days)

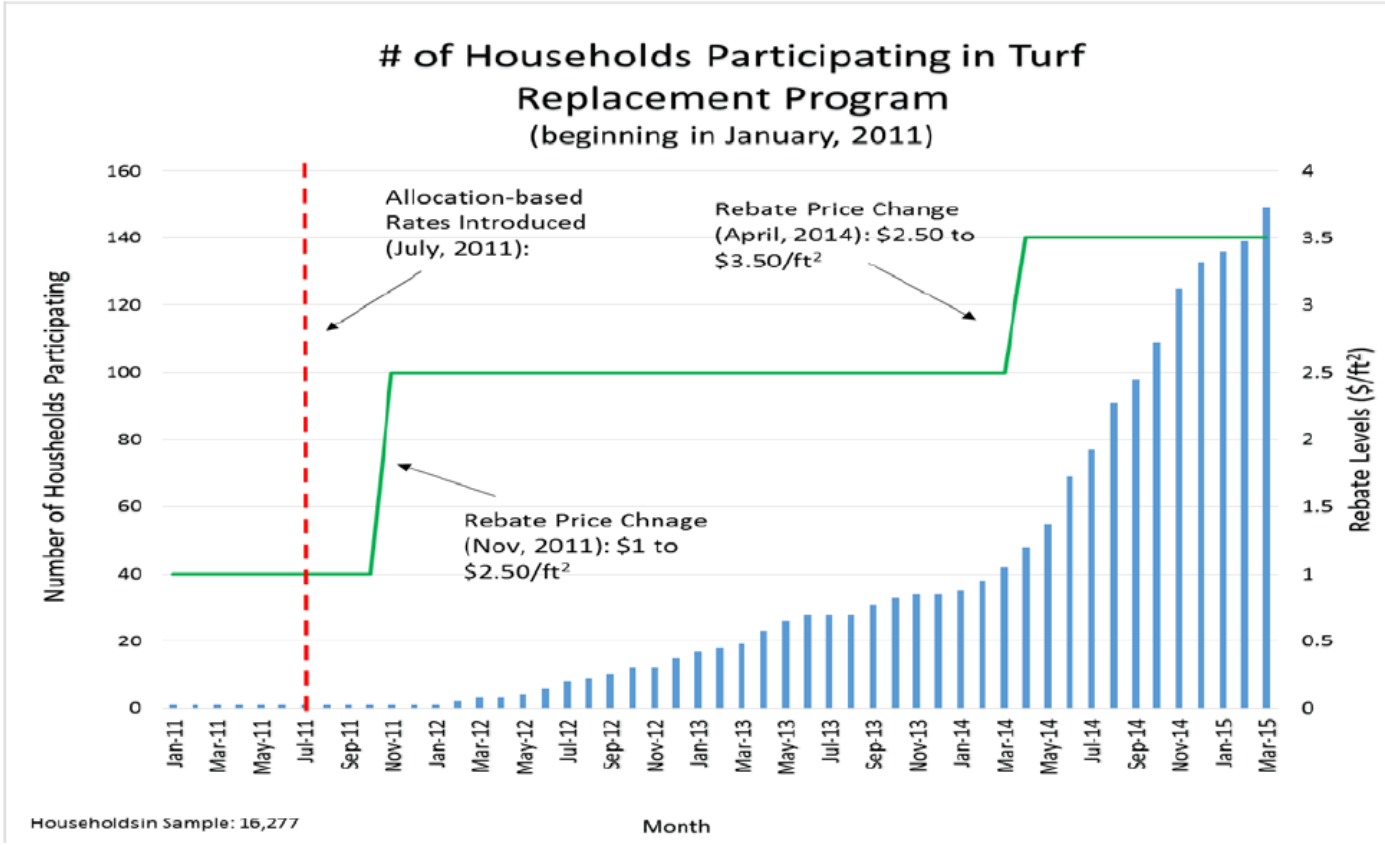
Flexibility: customers may adjust allocations as their circumstances change

- Increase/decrease w/ weather, landscape, # of household residents, etc.
- If state guidelines differ, easily adjusted
  - No need to change overall rate structure)

C. Urban Water Management: Looking Ahead

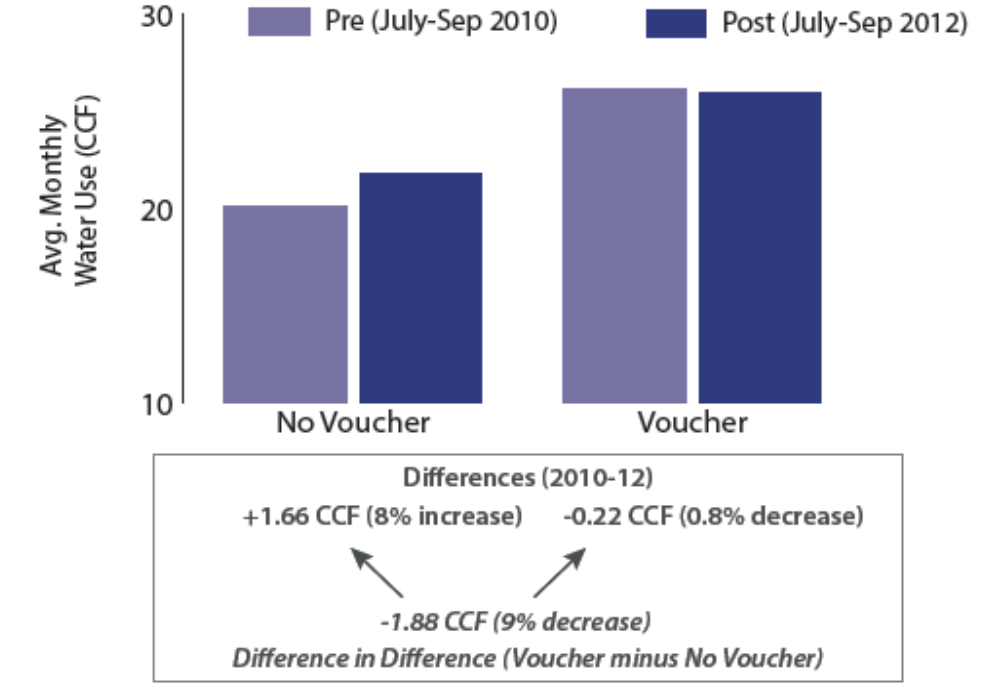
C.6 Encourage more outdoor conservation

Figure 2. Turf Replacement Program (Turf)



(Schwabe and Baerenklau 2016)

Figure 2. Water Use Pre- and Post-Phase II Program Period*



** EMWD's Phase II Program—offering vouchers for high efficiency sprinkler nozzles ran from 10/2011 to 6/2012. Total accounts ~91,151; Accounts redeeming vouchers ~1,211.*

(Schwabe, Baerenklau, and Dinar 2016)