

WATER DEMAND IN THE US: SOME MYTHS, REALITIES, AND PROPOSITIONS

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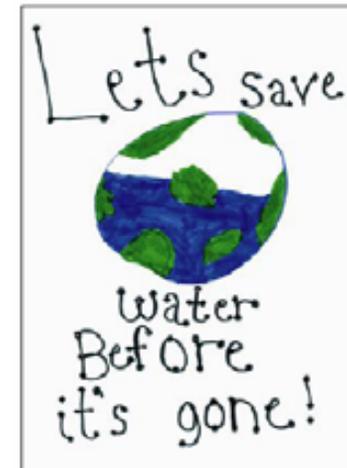
Revised 4/18/13



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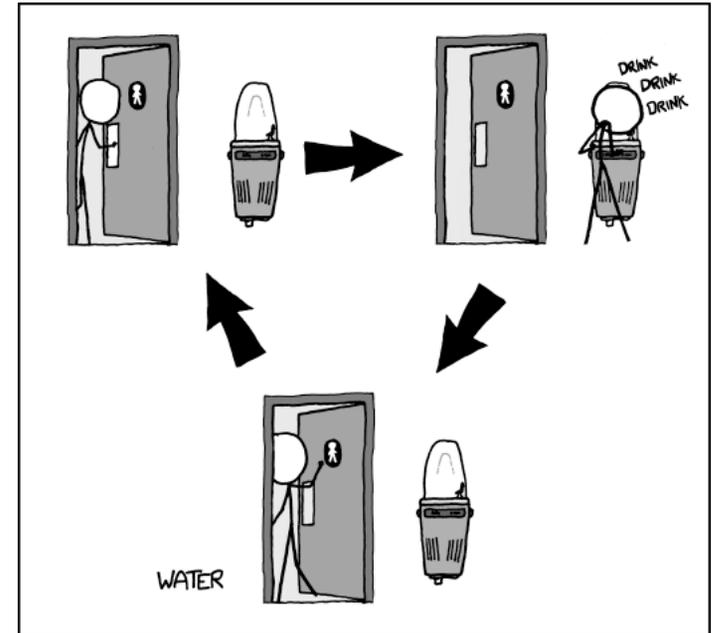
The scarcity myth

- “Water resources are becoming scarce”
- “World is running out of water, says U.N. adviser”
- “Water has joined the list of endangered species”
- “Action needed to avoid world water crisis, U.N. says”
- “Water crisis to be biggest world risk”
- “America's Dwindling Water Supply”
- “We have reached, or passed the point of peak water”
- “Growing water shortages predicted in many parts of U.S.”
- “The Ten Biggest American Cities That Are Running Out of Water”
- “Tapped Out? Water Shortages from Climate Change Threaten 14 States by 2050”
- “Global warming raises water shortage risks in one-third of U.S. counties”
- “Water wars between countries could be just around the corner”
- “Thirst” and “Running Dry” (movies)



The resource reality

- *All of the water ever on earth is still on earth*
 - ▶ Water is not oil, gas, coal, or electricity
 - ▶ Water is not consumed but *borrowed*
- Water is abundant and mostly renewable but
 - ▶ Finite in quantity
 - ▶ Transient in time in space (drought v. flood)
 - ▶ Variable in quality but filterable
 - ▶ Sometimes locally stressed or incapacitated
 - ▶ Costly to transport, with substantial environmental impact
 - ▶ Energy intensive – nonrenewable
 - ▶ Unevenly accessible globally (inequity)



I AVOID DRINKING FOUNTAINS OUTSIDE BATHROOMS
BECAUSE I'M AFRAID OF GETTING TRAPPED IN A LOOP.

The demand growth myth

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The New York Times
Wednesday, October 19, 2011

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Green
A Blog About Energy and the Environment

November 23, 2009, 11:40 AM

Report Warns of Rising Water Demand
By ROBERT P. VIALZER

A report on global water resources released Monday said that governments must address booming water demand or face grave human, environmental and economic consequences.

"Water needs to rise up the totem pole of political discourse," said Giulio Boccaletti of McKinsey, the consulting firm that wrote the report, during a press conference. "We need to stop flying blind in making decisions about water without a map on the table."

The report, *Charting Our Water Future*, says that in 20 years, water demand will be 40 percent higher than it is today, and more than 50 percent higher in the most rapidly



circle of blue
Reporting the Global Water Crisis

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Water Demand-Supply Gap Rising At Alarming Rate, Report Shows

WEDNESDAY, 02 DECEMBER 2009 01:16



By Andrea Hart
Circle of Blue

Global water demand will grow at an accelerated rate — from 4,500 billion meters cubed to 6 billion cubed — by 2030 increasing the water

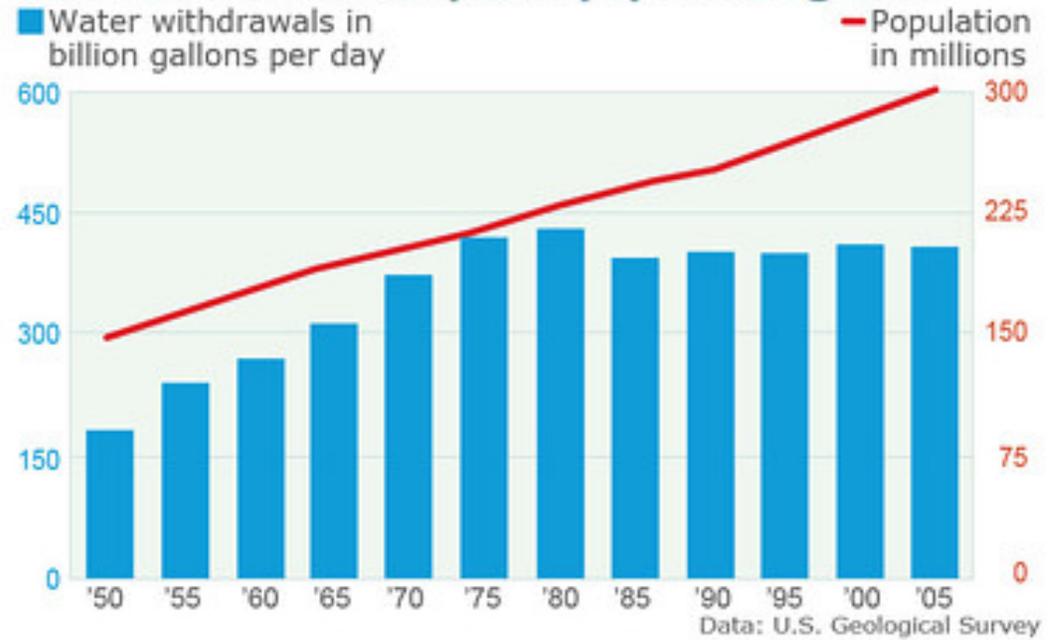
If water consumption continues without reform or regulation over the next 20 years, 40 percent of global demand will not be met, according to a McKinsey & Co. report released last week. More than one billion people already don't have access to clean water.

The report warns that governments must act now to avoid severe health and economic consequences.

"There is a looming water crisis where scarcity will increase — basically the demand is outstripping supply," said Lars Thunell, CEO of the International Finance Corporation, which, along with other organizations affiliated with the 2030 Water Resources Group, helped author the report.

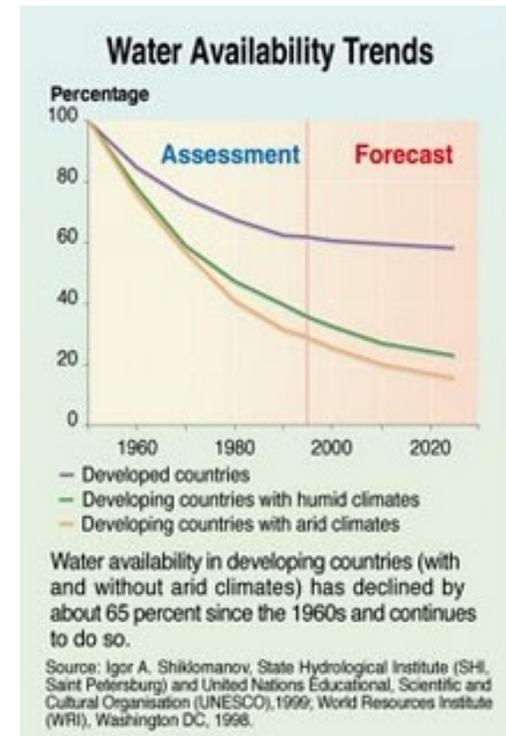
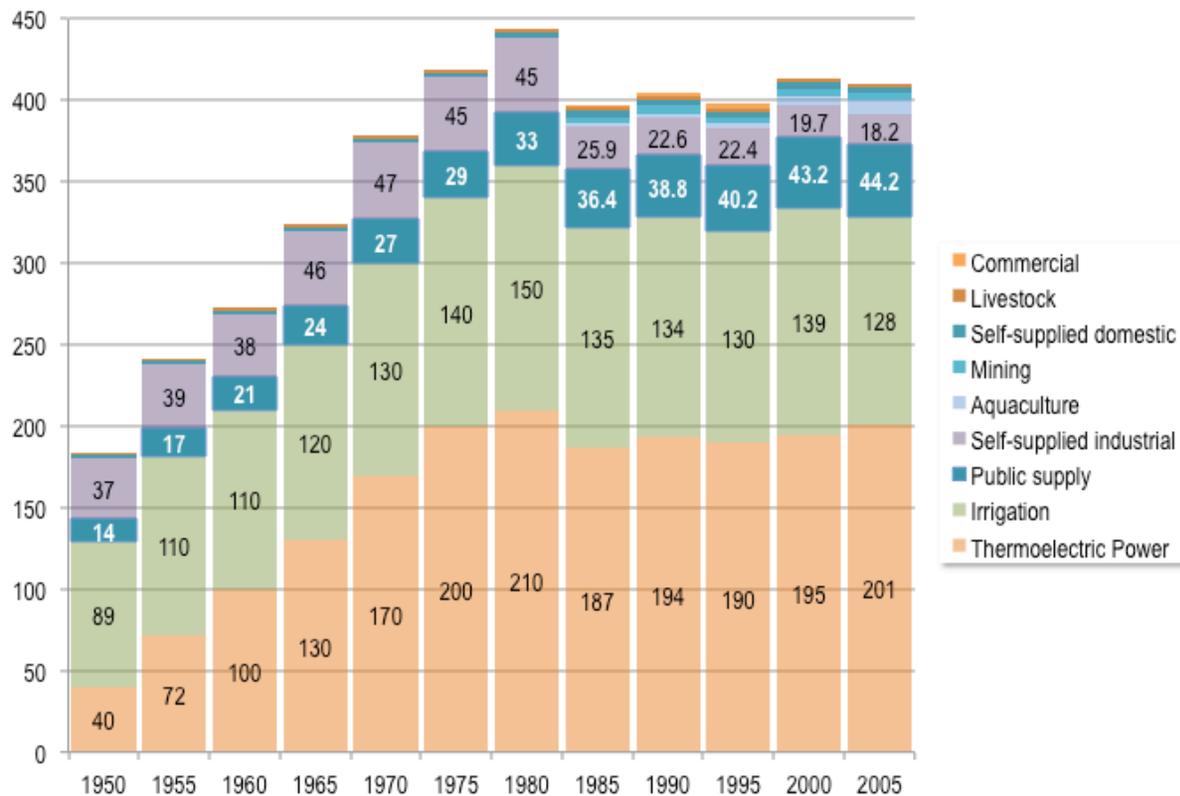
Formed in 2008, the 2030 Water Resources Group is comprised of the IFC and an extended business consortium, which includes Coca-Cola Co. and the Switzerland-based Nestle SA — all of which endorsed and signed the report. Representatives from the 2030 group held a conference last week announcing the report.

U.S. water use far outpaces population growth



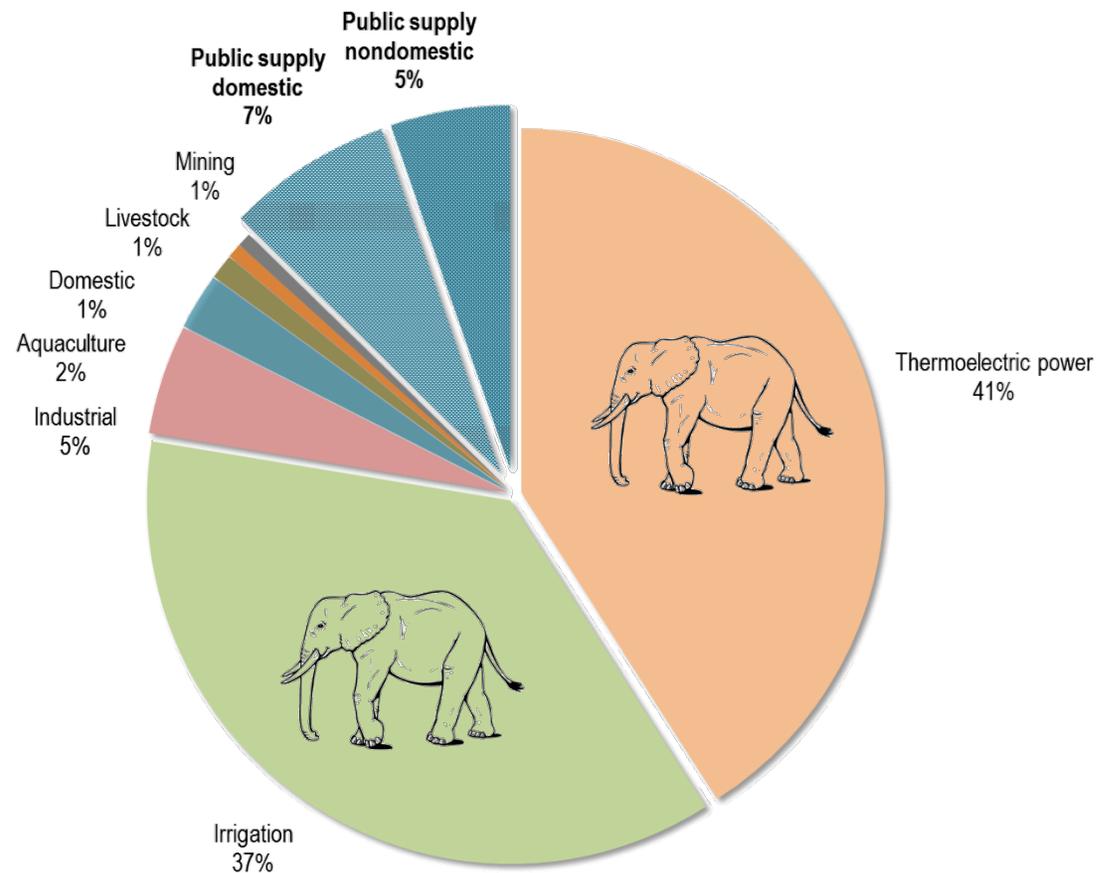
The water withdrawal reality

- All water uses are becoming more efficient
 - ▶ Relative to population and output
 - ▶ Demand stabilizes with development

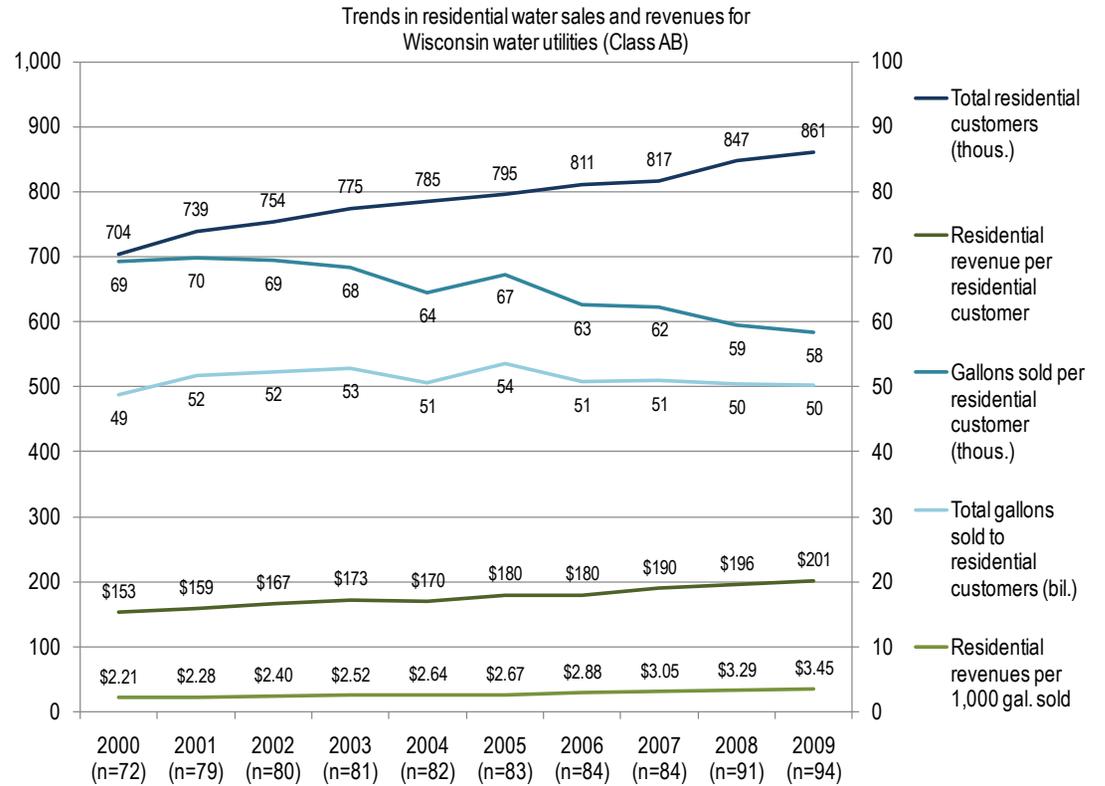
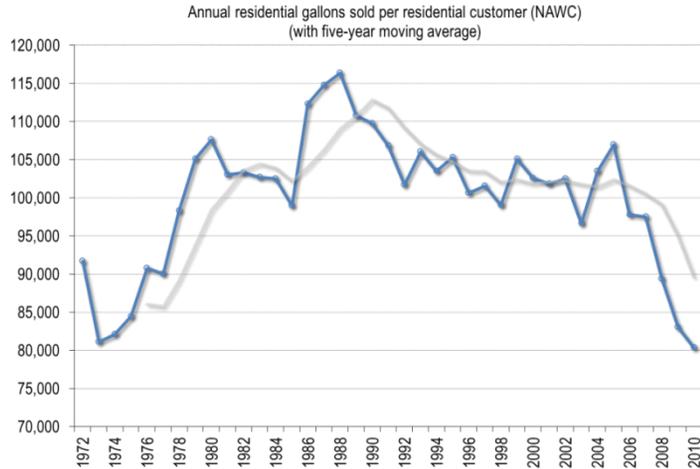


The public-supply myth

- The public-supply sector could bear a disproportionate burden for water pricing and efficiency



The water-sales reality



The cost-avoidance myth

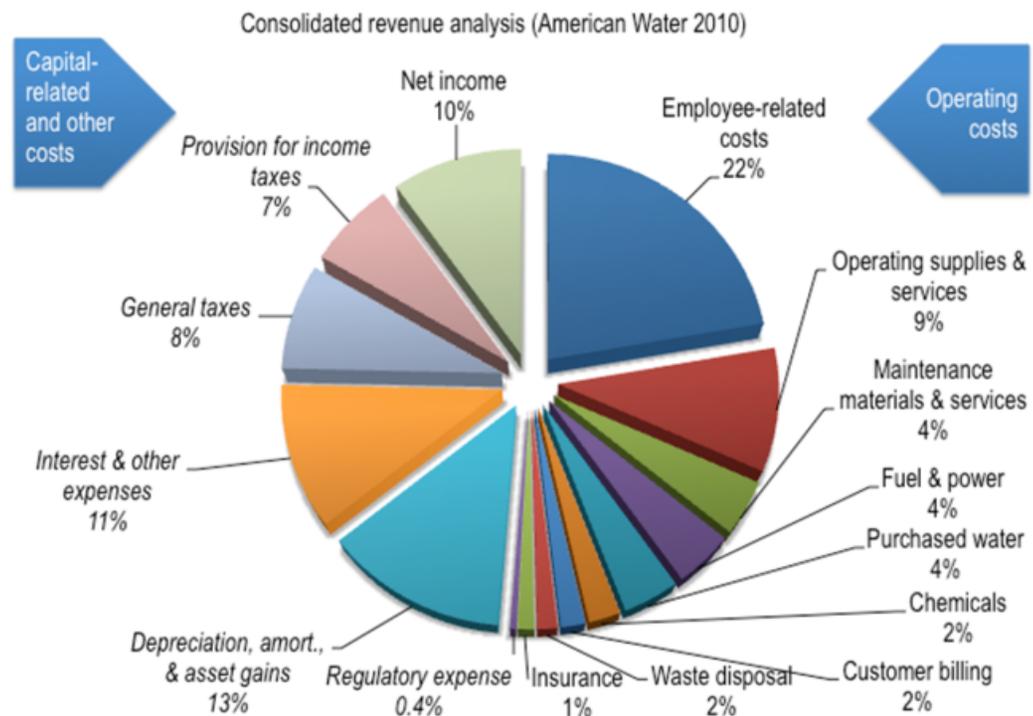
Table 5: Estimated Annual Cost Savings from Reduced Potable Water Use Based on Mid-Level Scenario Assuming One-Inch Rainfall Capture Capacity and Limitations on Rate at Which Captured Water is Used

City	Rainwater Captured and Used (MG/yr)	Water Rate (\$/1,000 gal)	Wastewater Rate (\$/1,000 gal)	Combined Rate (\$/1,000 gal)	Potential Cost Savings (\$)
Atlanta, GA ¹	1,982	\$2.73	\$10.33	\$13.06	\$25,885,000
Austin, TX ²	2,155	\$1.00	\$3.43	\$4.43	\$9,545,000
Chicago, IL ³	5,416	\$2.01	\$1.73	\$3.74	\$20,255,000
Denver, CO ^{4b}	1,140	\$1.91	\$1.95	\$3.86	\$4,400,000
Fort Myers, FL ⁵	330	\$3.93	\$9.58	\$13.51	\$4,460,000
Kansas City, MO ⁷	1,090	\$3.19	\$3.05	\$6.24	\$6,800,000
Madison, WI ⁸	483	\$1.88	\$1.78	\$3.66	\$1,770,000
Washington, DC ⁹	1,751	\$3.36	\$4.83	\$8.18	\$14,325,000

Source: NRDC <http://www.nrdc.org/water/rooftoprainwatercapture.asp>

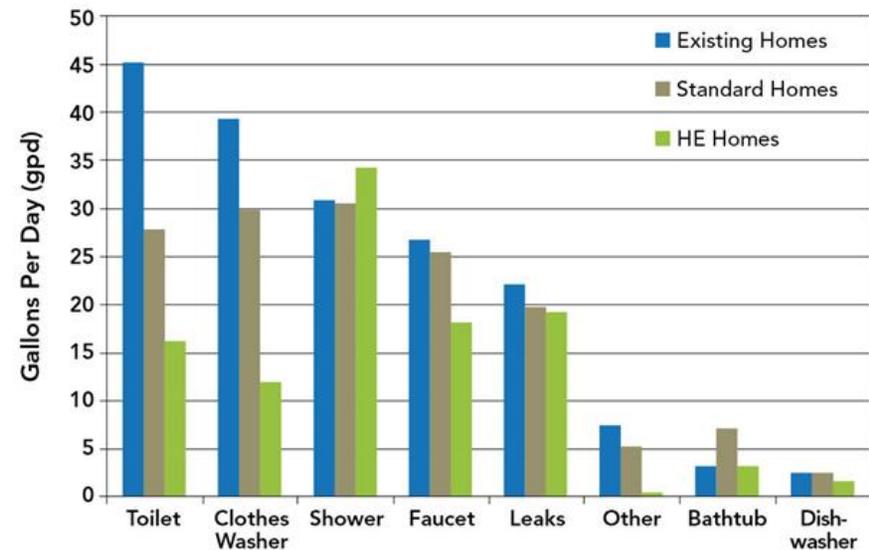
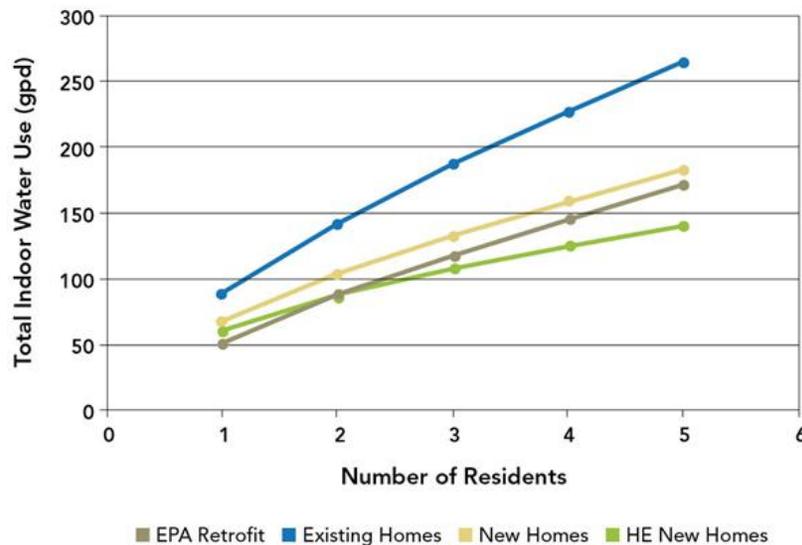
The fixed-cost reality

- Water efficiency avoids operating costs (including energy related costs) in the short run and capital costs in the long run, but it does not avoid all costs
- In the short run, most costs are fixed; in the long run, most are variable
- Fire protection is a constraint



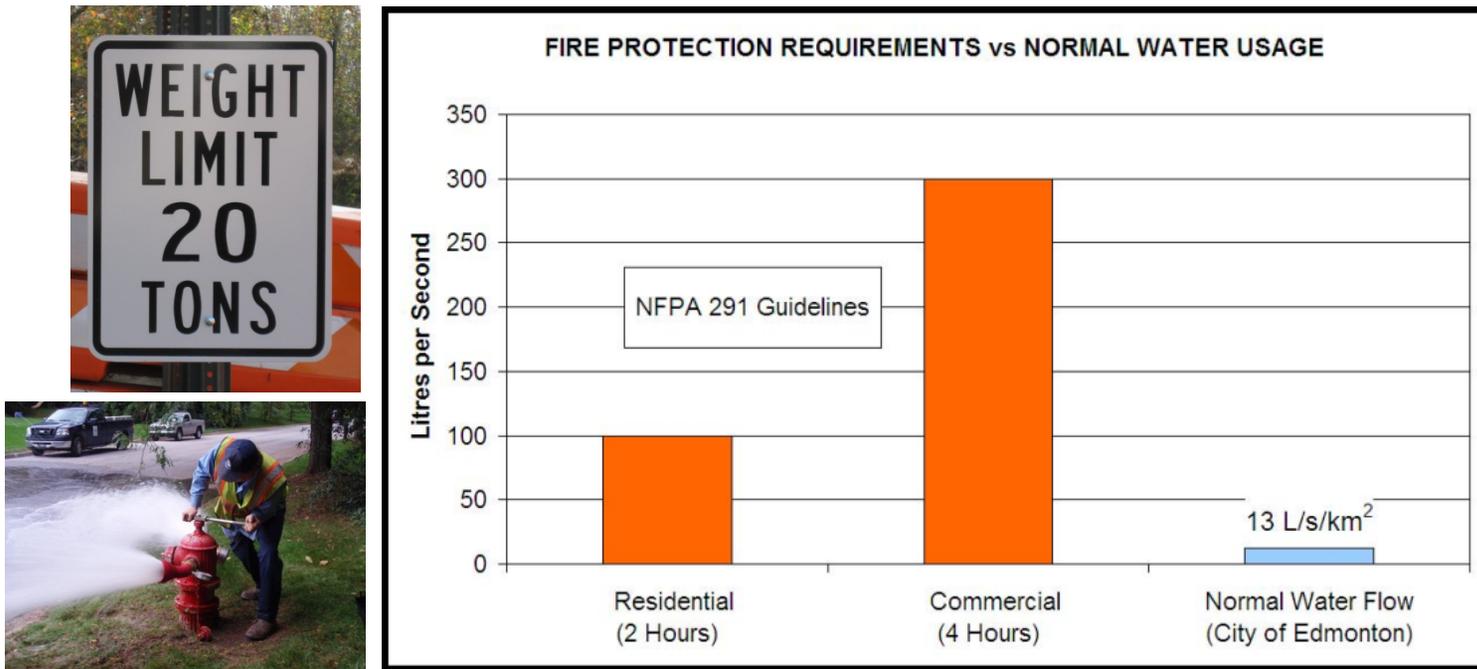
The hyper-efficiency myth

- Hyper-efficiency (<25 gpcd) may be deleterious to water system operations and human health – and thus actually be costly and inefficient
- Households are becoming much more efficient (<40 gpcd for indoor use)
- The marginal value of conservation diminishes due to current system requirements
- Conservation locally may have limited global impact and more for energy than water

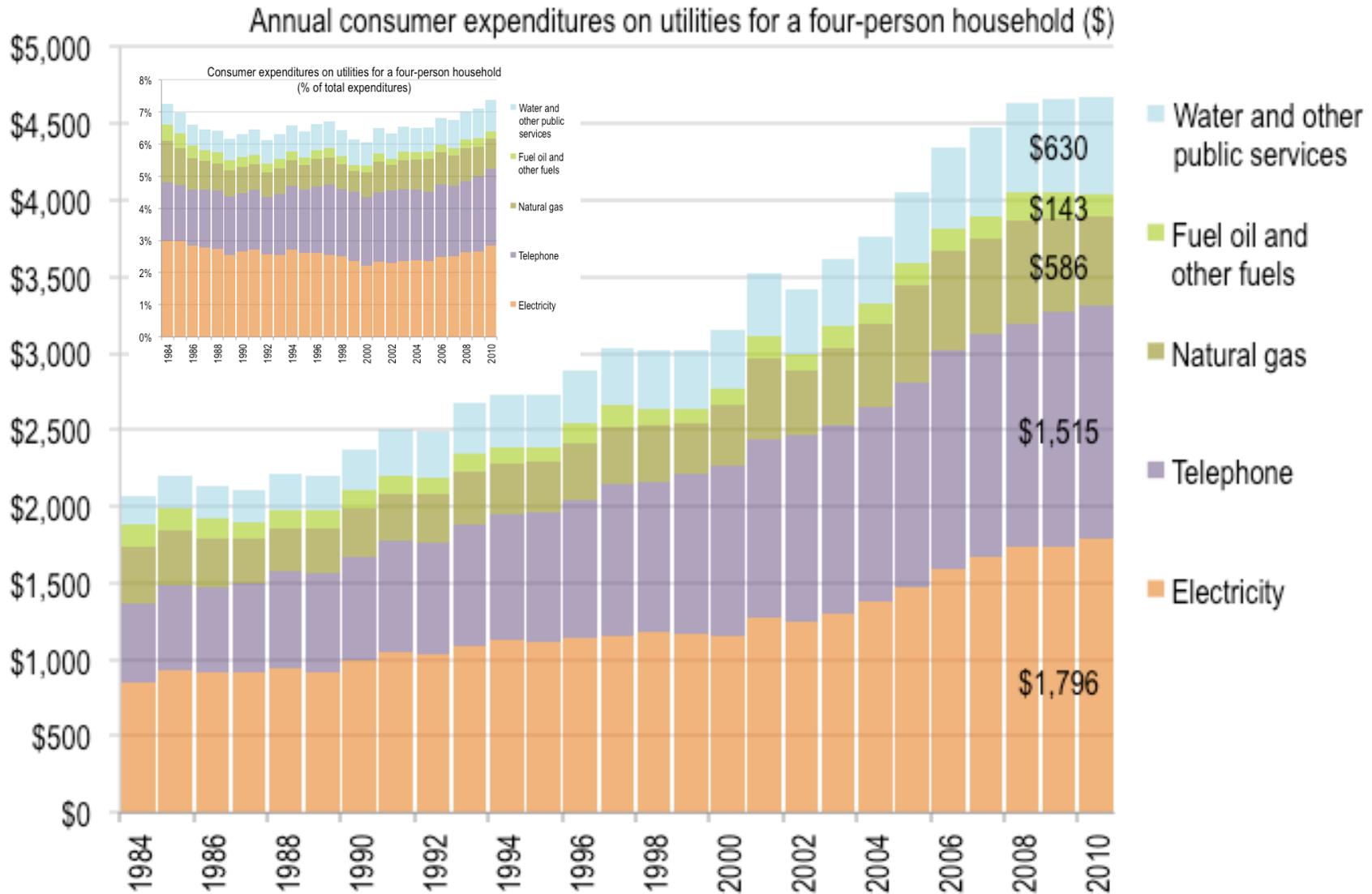


The infrastructure reality

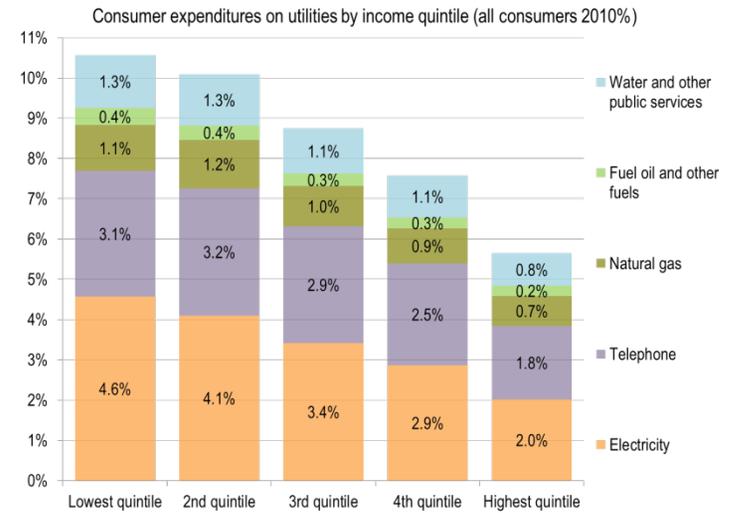
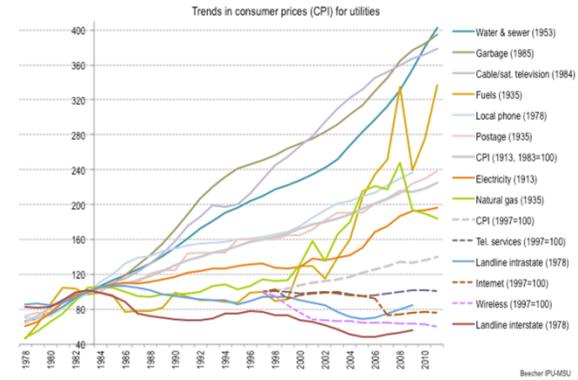
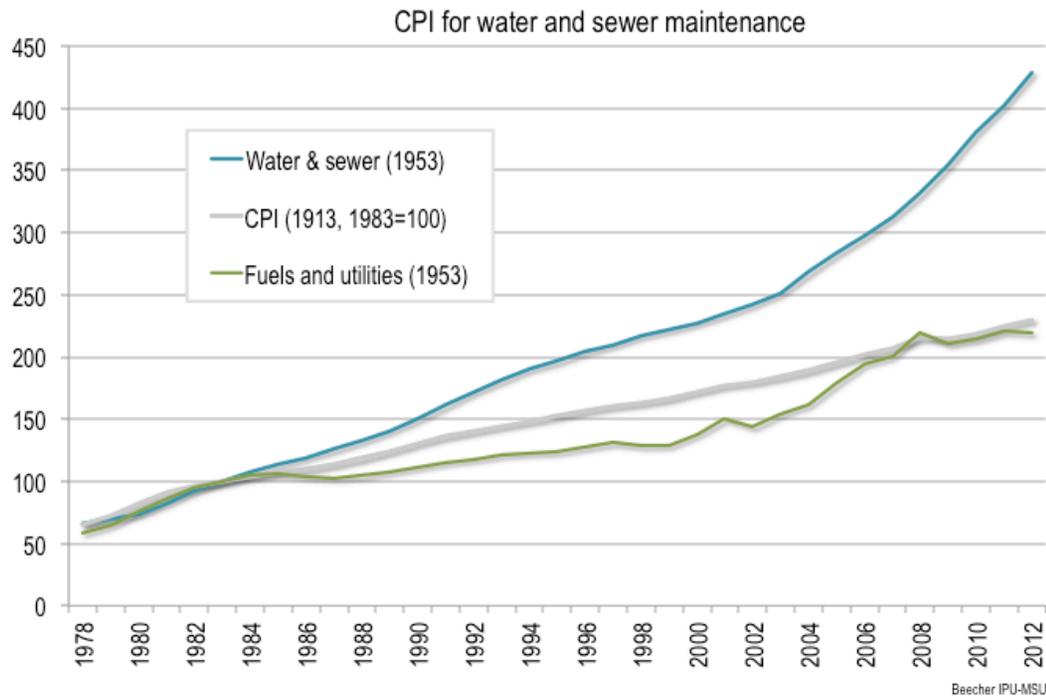
- Water systems deliver multiple products through one set of pipes
 - ▶ About 20 tons of product monthly to *efficient* homes (5,000 gallons)
- Water systems are designed for fire protection
 - ▶ With hyper-efficiency, could move from a marginal to a primary cost driver



The underpricing myth



The pricing reality



Apparent causes for falling water sales

- Economic and recessionary influences
- Demographic shifts (e.g., pop., household size, growth policies)
- Commercial and industrial process efficiencies and technologies
- Standards and codes for efficient fixtures, appliances, and landscaping
- Water and energy utility conservation programs
- Aging water meters that under-register usage
- Incentives that accelerate deployment (programs, rebates)
- Changing culture and environmental ethic (reduced urban irrigation)
- Price (cost) effects on discretionary use (elasticity) – avg., marginal, “total bill”

Socioeconomic drivers (economic activity, recession)

Per-household or connection drivers (family size)

Per-capita drivers (standards)

Why water prices may matter more today

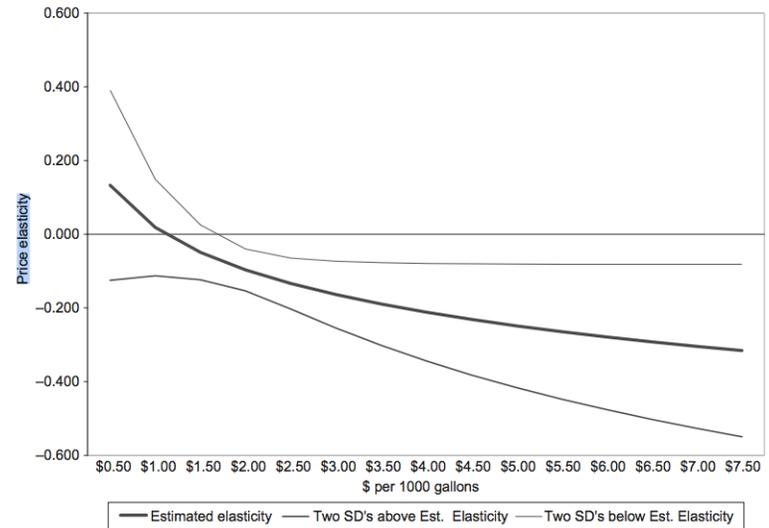
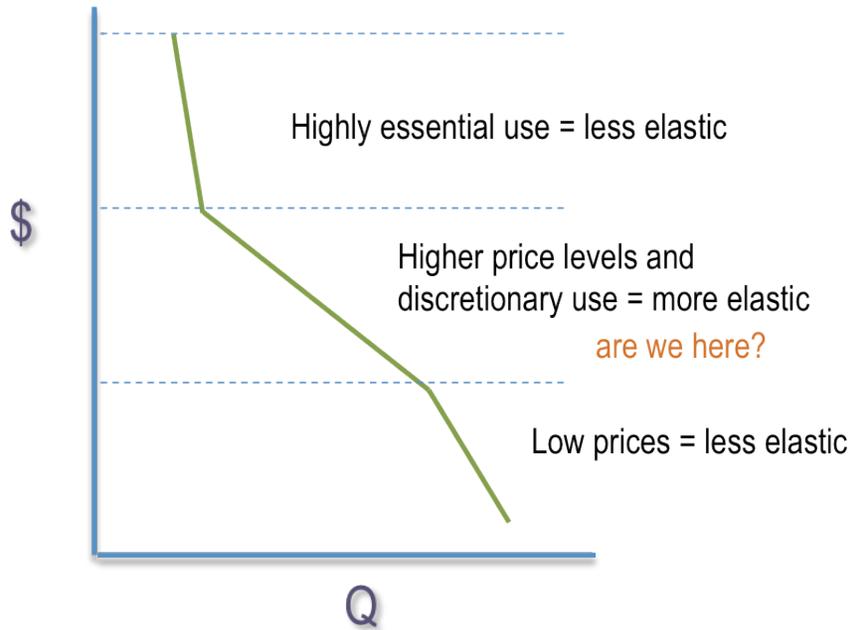


Fig. 1. Estimated price elasticities and ranges at different marginal prices

Revenue shortfalls: key culprits

Lack of timely rate adjustments (including rate politics)

Inadequate cost and demand forecasting (for test year)

Rate design (blocks and reliance on variable charges)

Concurrent loss of other revenue sources (subsidies, fees)

Some propositions

- Water efficiency provides socialized benefits with individualized costs
 - ▶ Water utilities need to own the problem of falling sales
 - ▶ Conservation raises rates (revenue neutrality); costs raise bills
 - ▶ Engagement and messaging matter (not lower bills but “lower highs”)
- Demand for public supply will stabilize and find new equilibriums
 - ▶ Demand and revenues will become more predictable “organically”
 - ▶ Capacity utilization will improve (peak to average sales)
 - ▶ Water defies Jevons Paradox – no offsetting uses of water
 - ▶ Easier to model water than energy
- Rate design is part of the answer but not *the* answer
 - ▶ Be cautious re exotic rates and high fixed charges
 - ▶ Be cautious about revenue stability and assurance mechanisms
 - ▶ Well designed variable rates can provide revenue stability
 - ▶ Forecasting probably matters more than rate design
 - ▶ Ratemaking should rest on established principles

Some propositions

- Utilities need to move from a growth to a sustainability paradigm
 - ▶ Some systems have excess capacity
 - ▶ Communities cannot grow their way out
 - ▶ Aging water infrastructure must be re-optimized
 - ▶ *Don't build tomorrow's infrastructure to yesterday's demand*
- Water does not have to be a “wicked problem”
 - ▶ Technologies and economics are straightforward (though we are still learning about *behavior*)
 - ▶ *Governance* remains the core challenge
 - ▶ But the problem cannot be solved by the public supply sector or water ratepayers alone

