Canada Arizona Business Council

The Challenge of Sustainability

Graham Symmonds

Global Water

8 June 2012

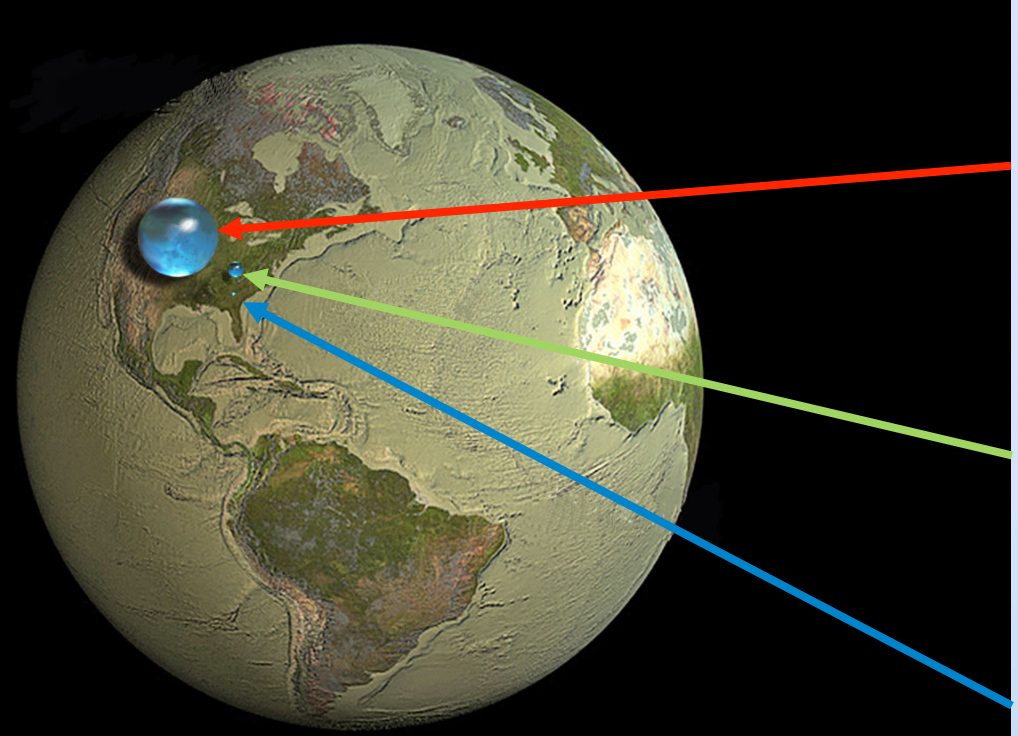
GLOBAL WATER FATHOM

About Global Water

14 Regulated Utilities

Utility Operating Systems

Where's the Water?



ALL OF EARTH'S WATER
Volume = 332,500,000 m3 (1,386,000,000 km3)
Diameter = 860 miles (1,400 km)

LIQUID FRESH WATER
Volume = 2,551,100 mi3 (10,633,450 km3) - 99 % is groundwater, Diameter = 169.5 miles (272.8 kilometers).

WATER IN LAKES AND RIVERS
Volume = 22,339 mi3 (93,113 km3).
Diameter = 34.9 miles (56.2 kilometers).

Credit: Howard Perlman, USGS; globe illustration by Jack Cook, Woods Hole Oceanographic Institution (©); http://ga.water.usgs.gov/edu/2010/gallery/global-water-volume.html

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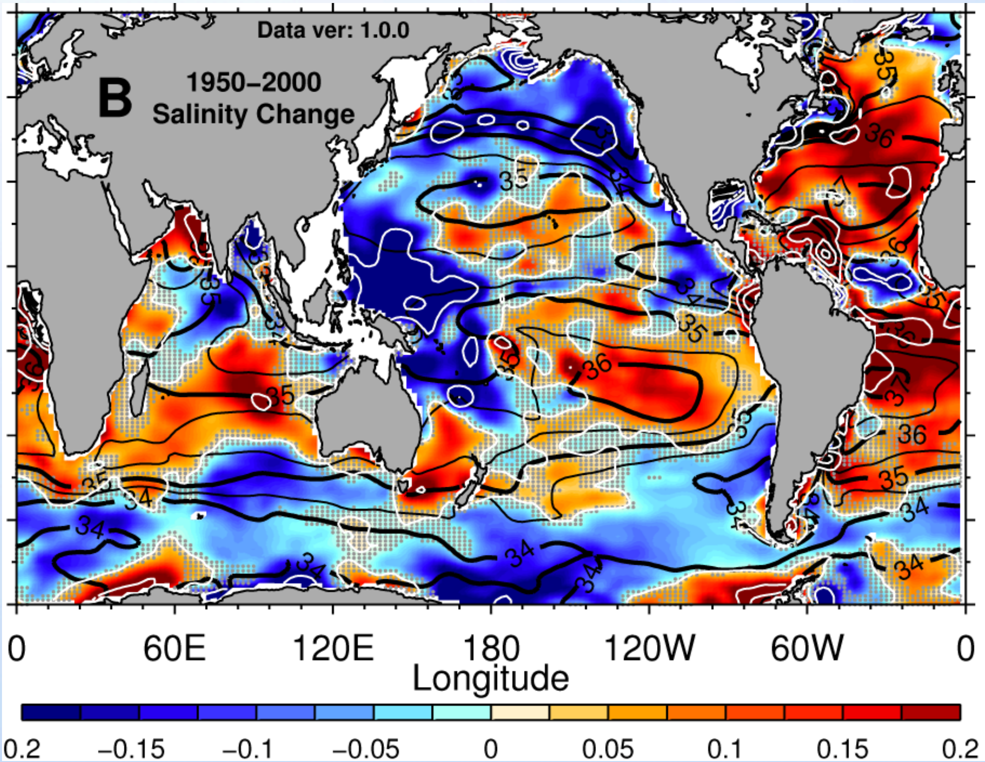
The Water Cycle is Speeding Up



"In a future GHG-forced 2° to 3°C warmer world, this implies a 16 to 24% amplification of the global water cycle will occur."

"The faster water cycles, the more abundant and more violent those storms might be. And wet places getting wetter can lead to more severe and more frequent flooding. Dry places getting drier would mean longer and more intense droughts."

Source: Durack & Wijffels, Journal of Climate, 2010 (CSIRO)
Paul J. Durack et al, Ocean Salinities Reveal Strong Global Water Cycle Intensification During 1950 to 2000 Science 336, 455 (2012)
R. Kerr, "The Greenhouse Is Making the Water-Poor Even Poorer", SCIENCE VOL 336 27 APRIL 2012

Water Scarcity

1999
2000

Water Sustainability

"The world today faces the enormous, dual challenges of renewing its decaying water infrastructure and building new water infrastructure. Now is an opportune moment to update the analytic strategies used for planning such grand investments under an uncertain and changing climate."

Source: Milly, et al, "Stationarity is Dead: Whither Water Management?", Science, 1 Feb 2008

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Supply-side vs Demand-side

<u>SUPPLY-SIDE</u>

- Cost: $$$$$$$
- Time: Long-term (years)
- Environmental Impact:
  Negative

<u>DEMAND-SIDE</u>

- Cost: $
- Time: Immediate/Short-term (months)
- Environmental Impact:
  Beneficial

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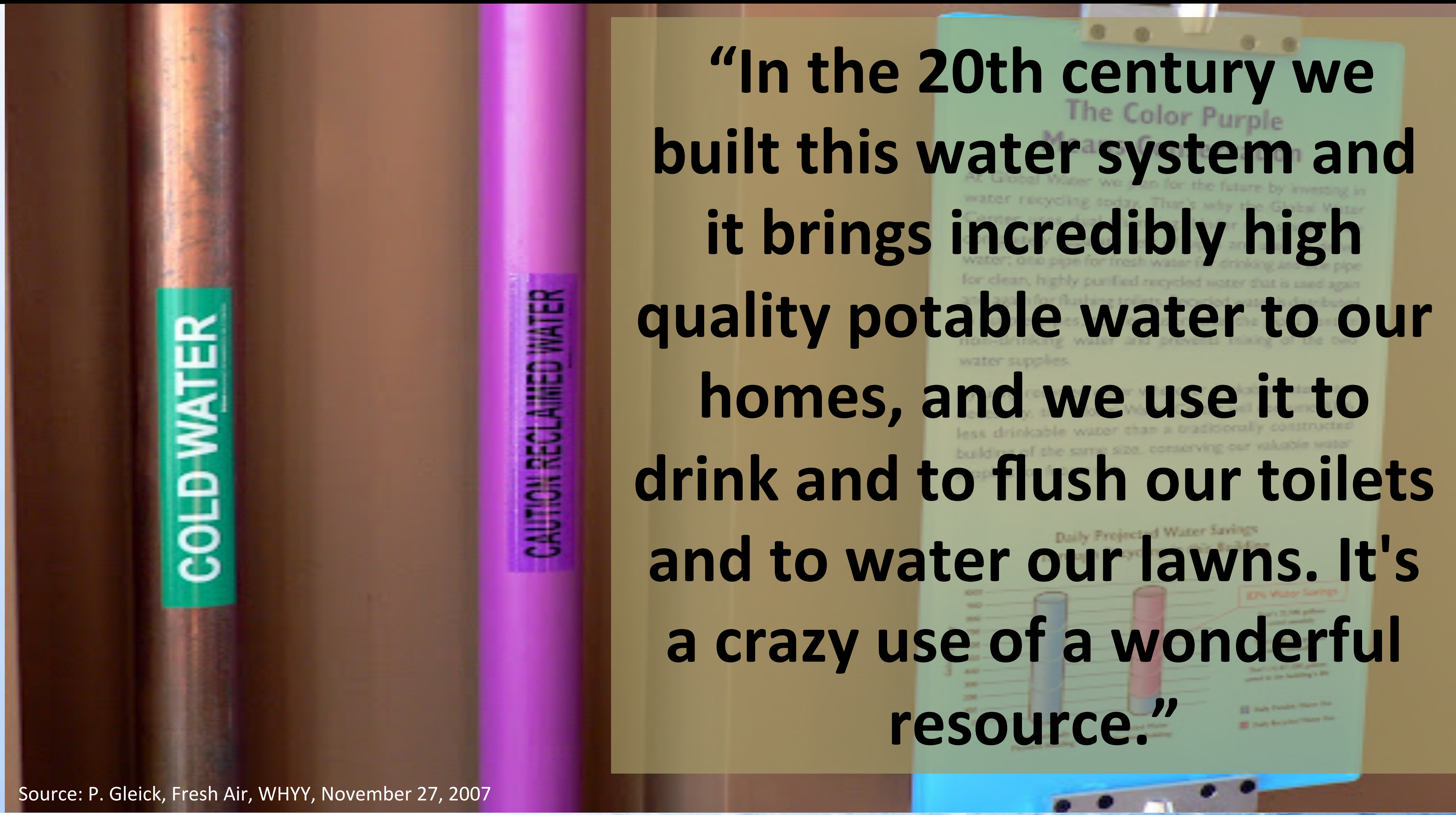
Off-Loading Demand



"In the 20th century we built this water system and it brings incredibly high quality potable water to our homes, and we use it to drink and to flush our toilets and to water our lawns. It's a crazy use of a wonderful resource."

Source: P. Gleick, Fresh Air, WHYY, November 27, 2007

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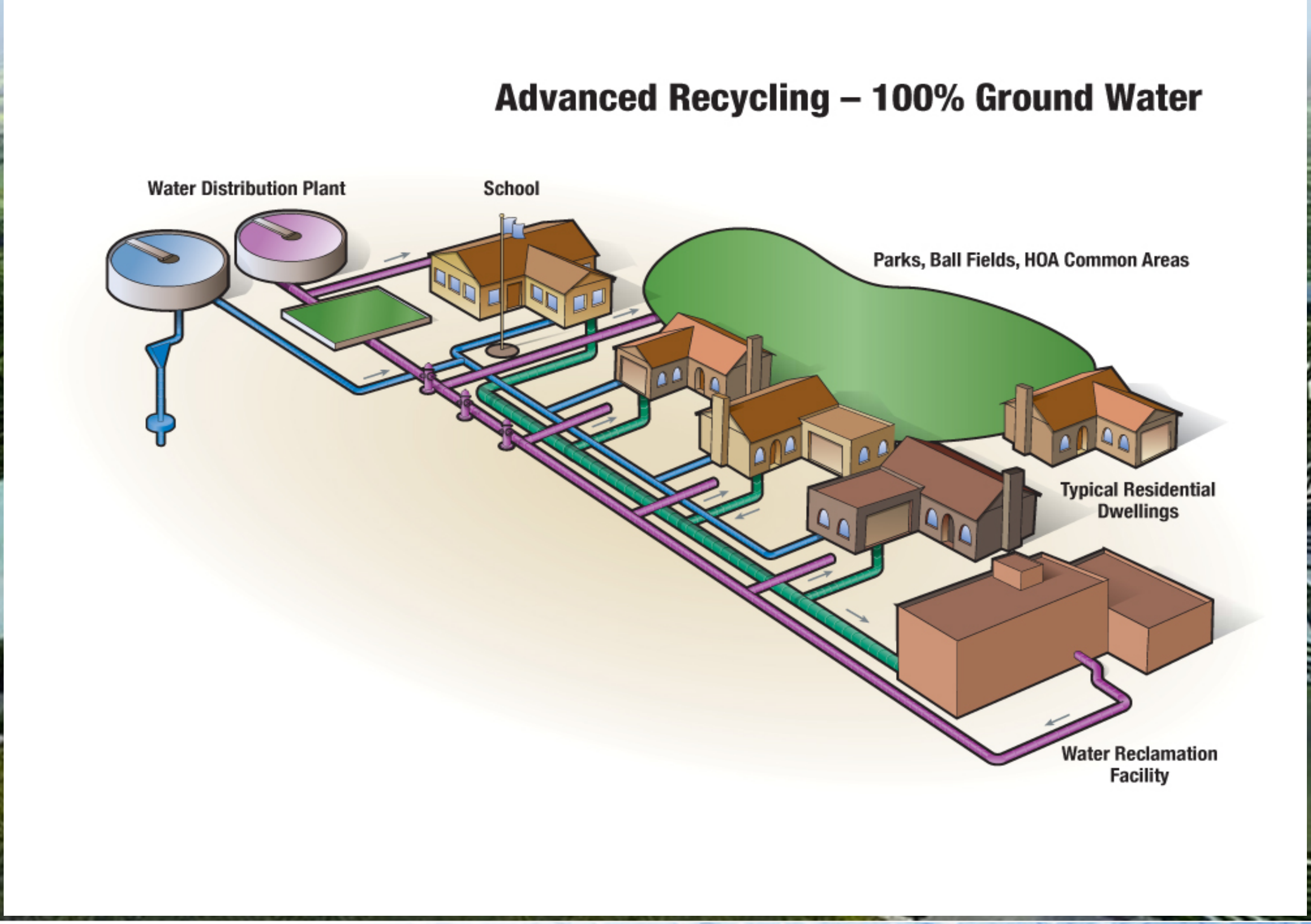
Infrastructure



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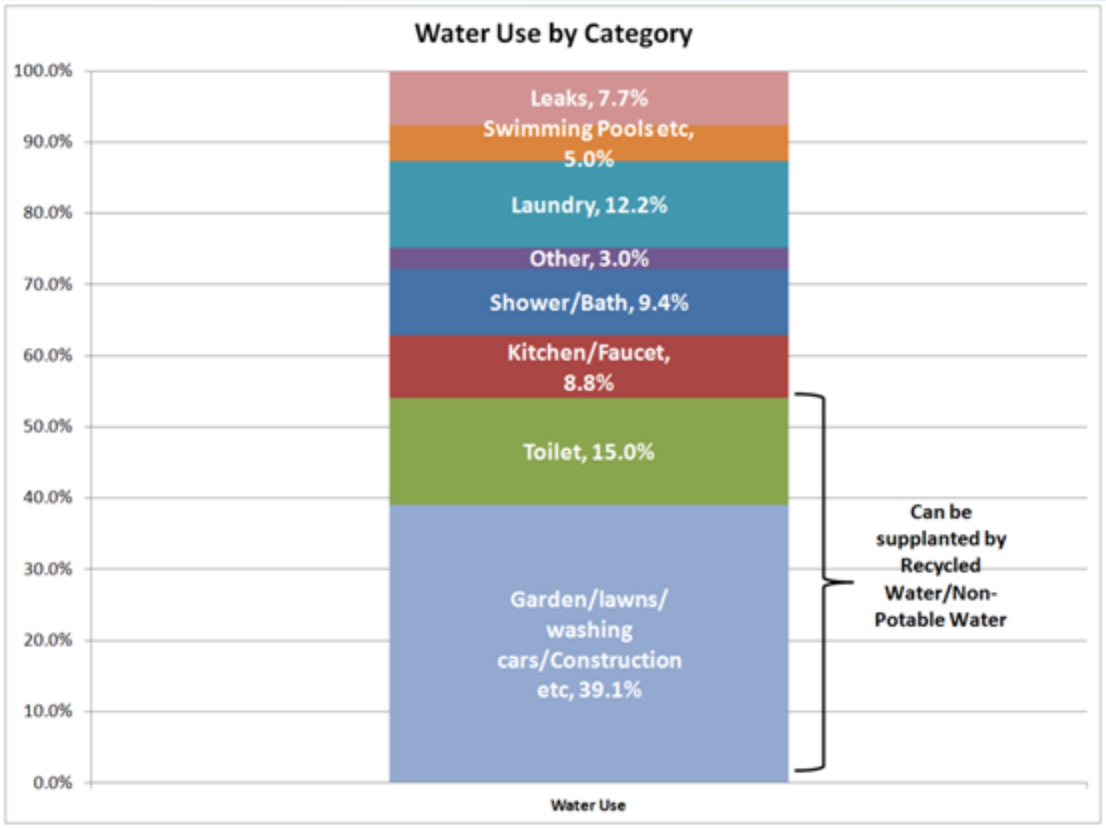
Off-Loading Demand



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Demand-side

"A key to improving efficiency is understanding where, when, and why we use water."

Source: Gleick, P., "Roadmap for sustainable water resources in southwestern North America," PNAS, 14 Dec 2010

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Changing Behavior

[…]interventions that combine appeals, information, financial incentives, informal social influences, and efforts to reduce the transaction costs of taking the desired actions have demonstrated synergistic effects beyond the additive effects of single policy tools.

RATES + INCENTIVES + DATA

Source: Dietz, T., Gardner, G., Gilligan, J., Stern, P.C., Vandenbergh, M.P., Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. Proceedings of the National Academy of Sciences, 106(44), pp. 18452-18456, 2009

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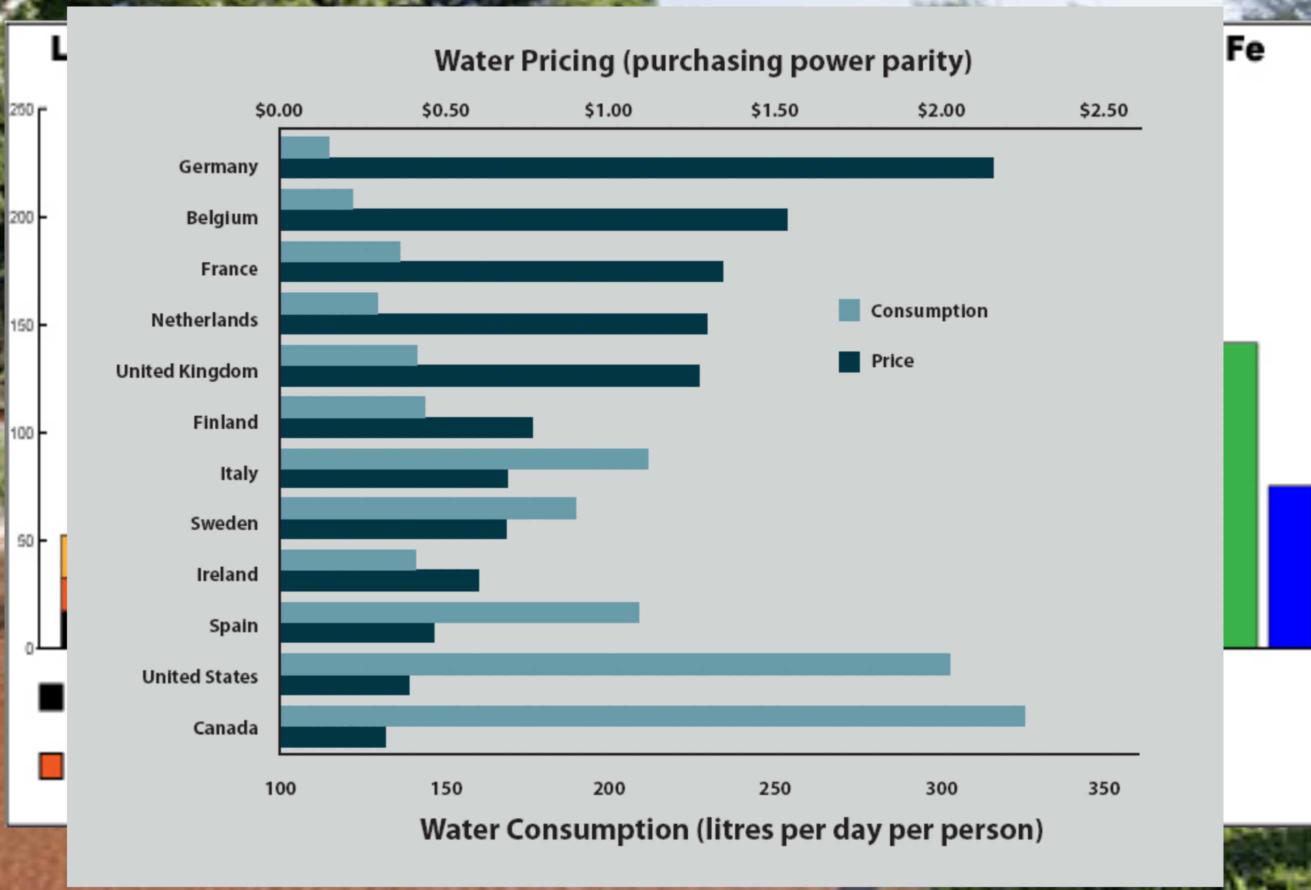
Why Rates are Important



Source: Brett Walton "The Price of Water: A Comparison of Water Rates, Usage in 30 U.S. Cities", April 26, 2010, Circle of Blue

Source: Oliver M Brandes et al, "Worth Every Penny: A Primer on Conservation-Oriented Water Pricing", POLIS Water Sustainability Project, May 2010

The Effect of Rates

On average, a 10% increase in the marginal cost of water can be expected to reduce residential demand by 3-4% in the short run. In the long term, such an increase could be expected to yield a 6% decrease in demand.

Source: Sheila M. Olmstead and Robert N. Stavins, "Comparing price and nonprice approaches to urban water conservation", 25 April 2009, WATER RESOURCES RESEARCH, VOL. 45, W04301, doi:10.1029/2008WR007227, 2009 p. 4

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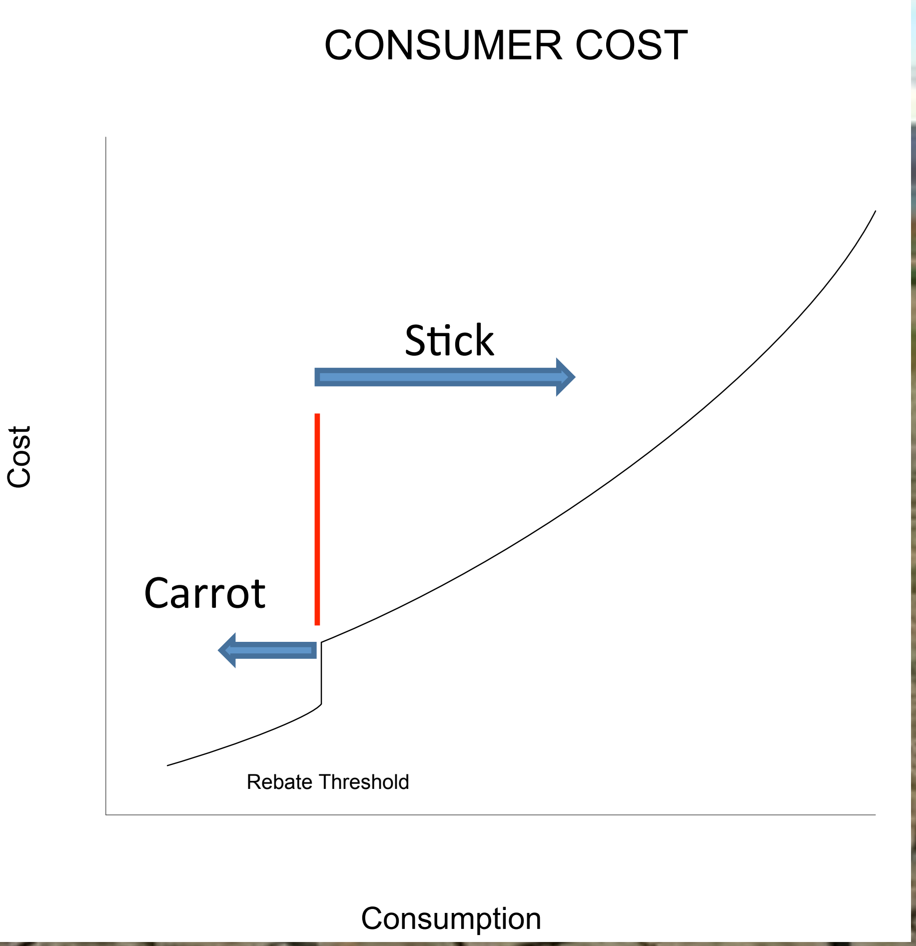
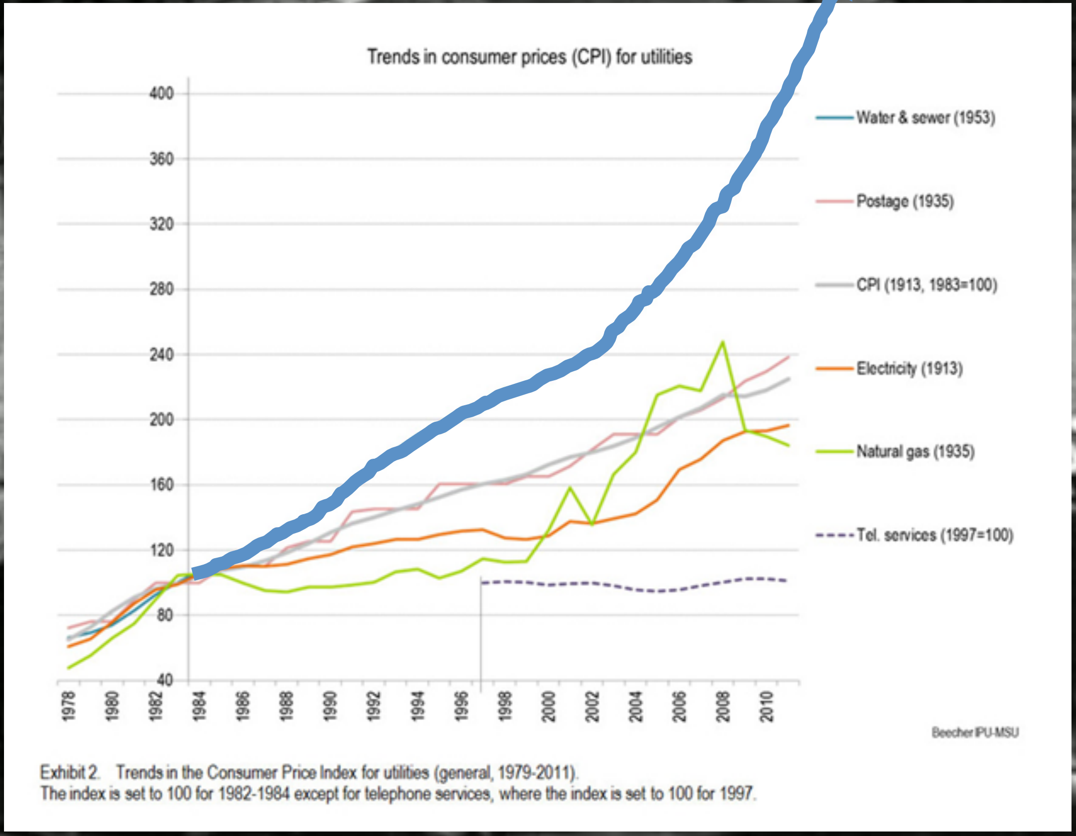
Altering Behavior - Incentives



As Rates Increase…

People will demand information



Source: Brett Walton, Circle of Blue, "The Price of Water 2012: 18 Percent Rise Since 2010, 7 Percent Over Last Year in 30 Major U.S. Cities", 10 May 2012

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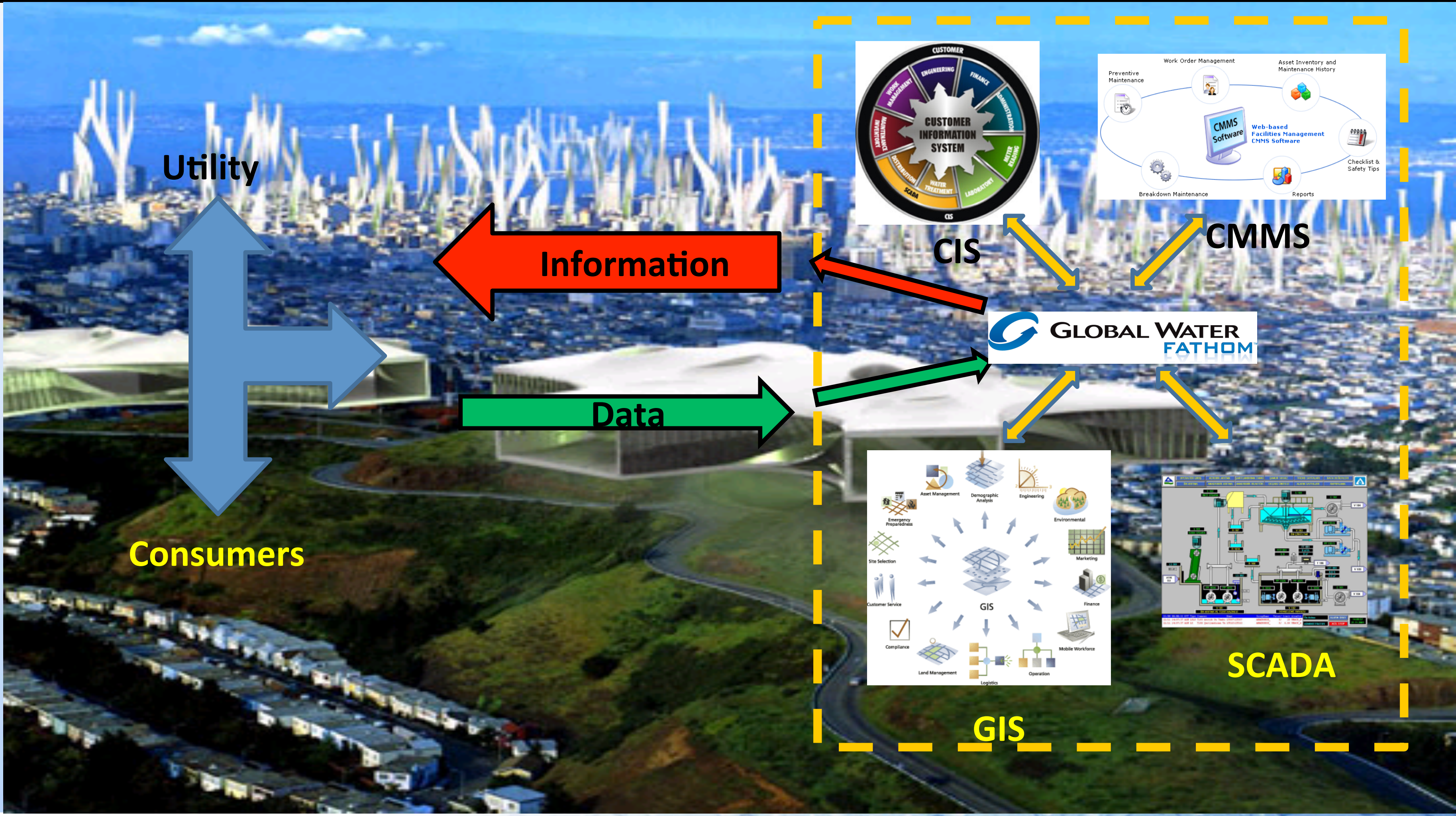
Smart Grid for Water



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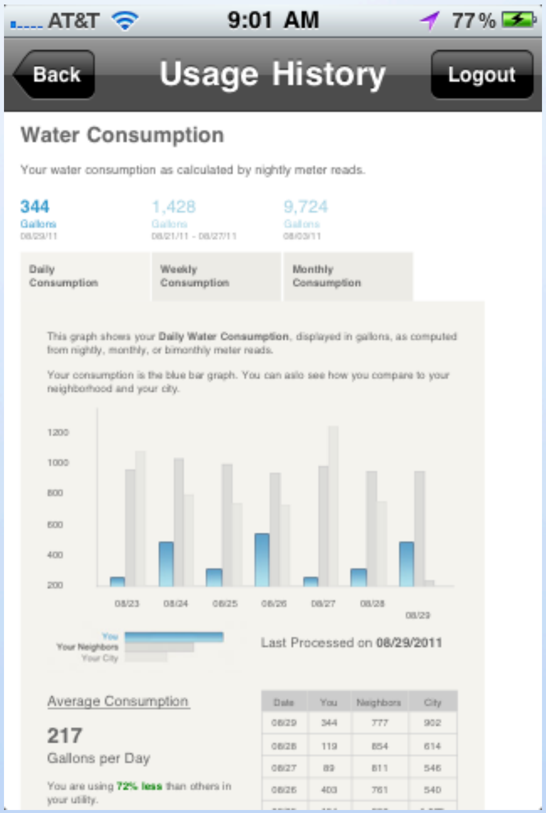
The Importance of Data



"People don't recognize how powerful the pull of the crowd is on them…We can move people to environmentally friendly behavior by simply telling them what those around them are doing."

Source: Simon, S. "The Secret to Turning Consumers Green", Wall Street Journal, 18 October 2010

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Personalized Data

How much water do I use?

How do I fare compared to my street, my neighborhood, my city?

How much water should I use?

Based on weather data and evapotranspiration calculations – how much should I have used outside?

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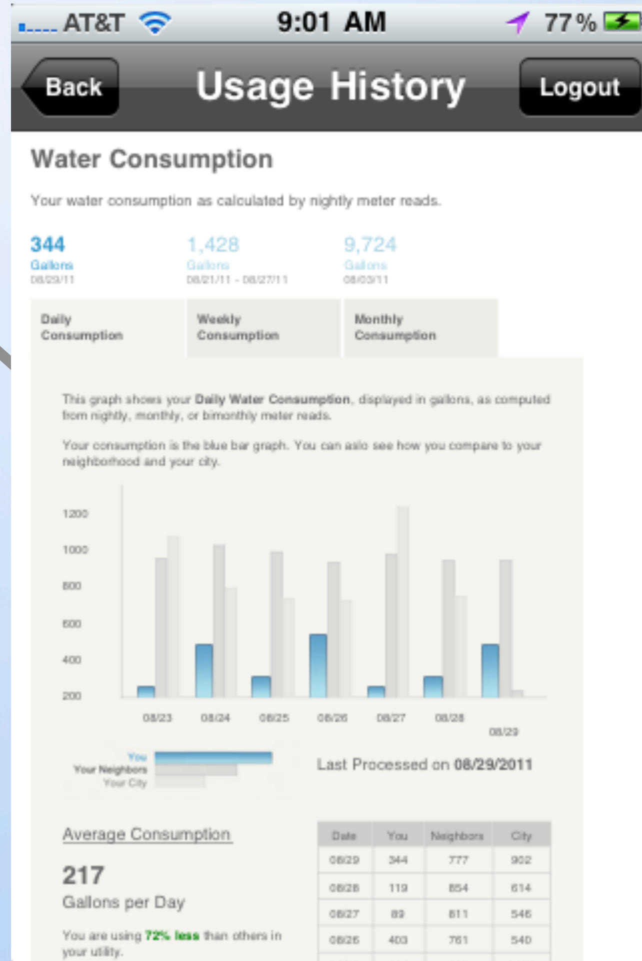
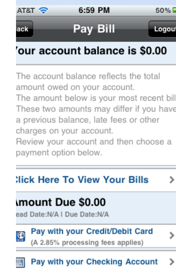
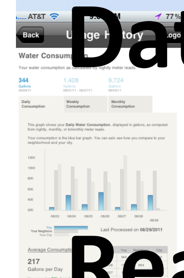
Access to Data = Conservation



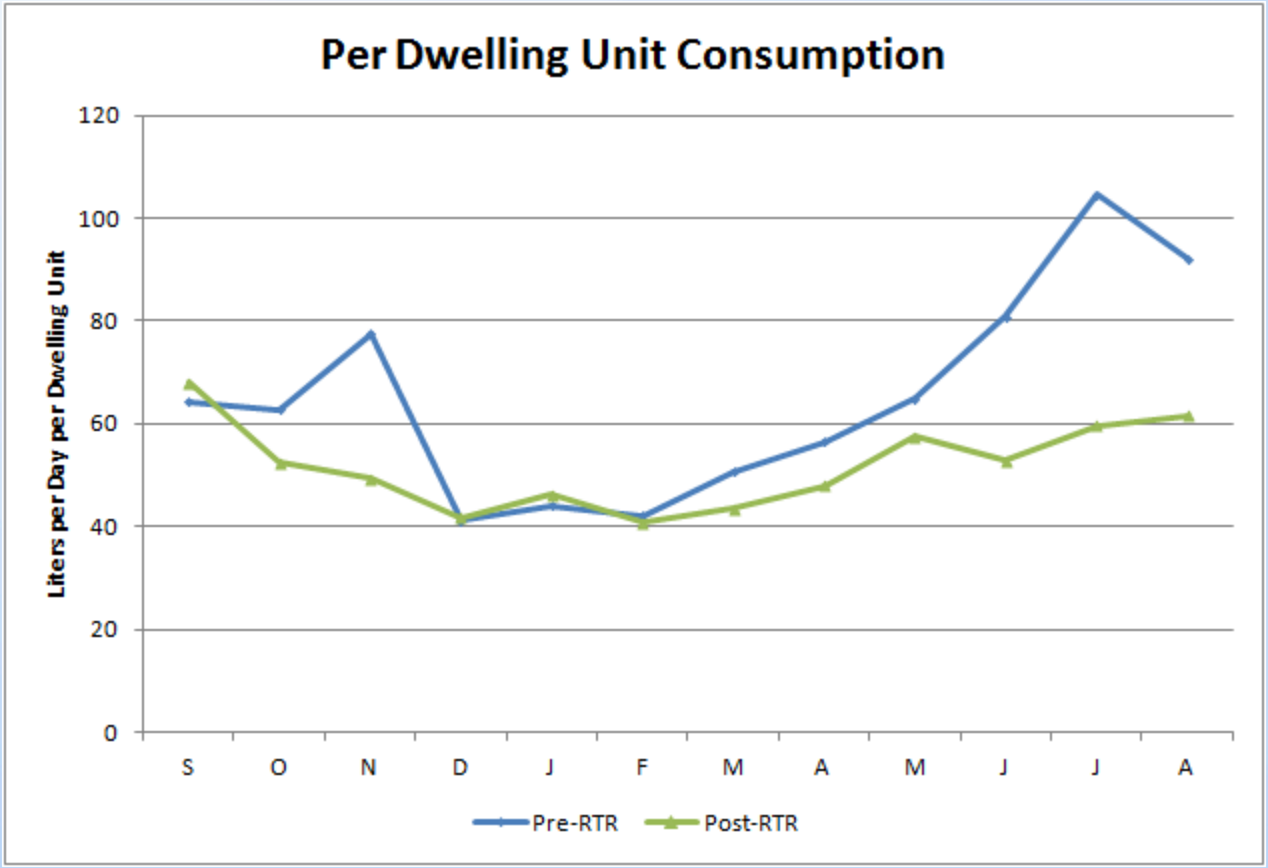




Real-time Data

Real-time Conservation

Incentives and Information



Changing Behavior

"Truly sustainable water management and use requires efficiency, smart economics, advanced technology and better governance and water management."

Source: Dr. Peter Gleick, "The Real Cost of Water We Use", presented at the Stanford Graduate School of Business, 9 Feb 2010