This presentation premiered at WaterSmart Innovations

watersmartinnovations.com
Quantifying Water Conservation Potential in Phoenix, AZ

Industrial, Commercial, and Institutional (ICI) Sectors
Presentation Outline

- Observations and Research Goals
- Supply and Demand Context
- Areas of Focus (Sectors)
- Research Challenges
- Solutions
- What We Learned
- Recap and Conclusions
Observations

- Steady decline on a per capita basis for both Residential and Non-residential accounts
- More efficient plumbing fixtures/devices
- Transition to less water-intensive landscapes
- Changes in business practices and technologies
Establish baseline demand for ICI sectors
Identify major trends affecting water demand
Identify key decision making processes
Forecast future demand and wastewater generation
Estimate future water demand reductions if efficiencies are accelerated WSD
Groundwater (2%)

Salt/Verde Rivers (49%)

Colorado River (43%)

Reclaimed Wastewater (6%)
Water Consumption by Sector FY 12/13

- Multifamily: 15%
- Single Family: 51%
- ICI: 23%
- Landscape: 11%
Non-residential Water Demand

![Graph showing Non-residential Demand (AF) and Population over time.](image)
Focus Areas

- Office, Retail, and Warehouse
- Hotels, Motels, and Resorts
- Schools
  - Elementary, Middle, High Schools
- Hospitals
ICI Research Challenges

ICI is complex: many sectors and sub-sectors with different end uses for water

Many tools and data sources
- Meter Data, Assessment Records, Audits, Interviews

Meter to Property relationships:
- One to One, One to Many, Many to Many
ICI Research Challenges
ICI Research Challenges
ICI Research Challenges (Office, Retail, Warehouse)

- Joining data from different sources is messy
ICI Research Challenges

- Significant changes in:
  - Office, Warehouse, Retail Occupancy Rates (2000 – 2014)
  - Employment Rates (still not at 2007 levels)
  - Hotel Vacancy Rates

- Top down analytics are complicated by volatile economy and vacancy rates

- What did we do?
Decisions to upgrade are made at different levels

Commercial fixtures are very gradually replaced once installed; about 1/3 still have 3.5 (+) gpf toilets

Replacement rates <3% per year

Property managers: irrigation efficiency is very low priority

Lack of separate landscape meters

Cooling towers are an obstacle
What We Learned
(Office, Retail, Warehouse)

Vacancy Rates by Class 1999-2013

Source: CoStar Property®
What We Learned (Hotels, Motel, Resorts)

Key decision makers vary by property

The ownership and management structures are very complex

50% built < 1994 ⇒ old plumbing fixtures
  ◦ 3.5(+) gpf toilets still in use

Some reductions in laundry (towels, linens) with re-use programs
What We Learned (Schools)

- Decisions for infrastructure changes are made by district; concentrated decision making
- District Facility and Construction Managers are best point of contact
- Key person can provide overview of water use profile for district
- Schools more progressive than expected
What We Learned (Schools)

- Schools built ≥1994 have newer fixtures
- Some schools built <1994 have upgraded
- Irrigation Efficiencies
  - Artificial turf on sports fields; upfront cost a barrier (~$800K)
  - Irrigation technologies are in place in many properties
Estimating Potential Reductions (Example: High School)

- High school: 2,600 students and 130 staff
- 3.5 gpf toilets and 1.5 gpf urinals
- 50/50 male: female
- Installing 1.28/0.125 gpf toilets/urinals saves ~ 10 AF/year
- Replacement is occurring without incentives
Breakdown sectors into building blocks
- End Uses (Devices, services, etc.)

Find which blocks are likely to change
- This is likely in schools with plumbing fixtures
- Demand from cooling towers unlikely to change

Future demands can be forecasted by aggregating these estimates by sector

Need to understand replacement/adoption rates vary by sector
NON-RESIDENTIAL DEMAND BY SECTOR

- LARGE COMMERCIAL: 21%
- HEAVY INDUSTRY: 8%
- GOVERNMENT AND INSTITUTIONS: 9%
- OFFICE AND MEDICAL BUILDINGS: 5%
- RESTAURANTS AND BAKERIES: 5%
- HOTELS AND MOTELS: 5%
- SCHOOLS: 4%
- FIRE HYDRANT METER: 3%
- COMMERCIAL - MISC: 5%
- IRRIGATION ONLY ACCOUNTS: 35%
Conclusions

- Finding the key person/level of organization that makes decisions is crucial.
- Top down analysis inadequate to accurately define demand profiles; can be used to create samples for investigation and support conclusions by sector.
- Future demand depends highly on adoption rates for technology, which vary by sector.
- Baseline demands are influenced by year of construction, current vacancy rates.
Conclusions

- Reductions are quantifiable
- Transitions are occurring without rebates or incentives in many sectors
- Although demands are falling more than 1%/year, there are still opportunities for efficiency gains
- Conservation measures can be directed toward sectors with the largest potential
- Changes can be accelerated
- Information critical if shortages occur and demand curtailment is desired
Questions

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