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Evaluation of Customer Information and Data Processing Needs for Water Demand Planning and Management

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Presentation Overview

- Background on Water Research Foundation (WRF) Project 4527
  - Project Objectives
  - Research Approach
- Principal findings
- Common Opportunities/Barriers
- Recommendations

Project Background

WRF Project #4527

- Evaluation of Customer Information and Data Processing Needs
- Tailored Collaboration project
- Focus on “water demand-related” information

Primary driver for study

- Lack of consistent, standardized data to support planning and evaluation efforts

Water Utility Working Group

Tampa Bay Water

Southern Nevada Water Authority

San Diego County Water Authority

Regional Municipality of York

Canadian National Water Efficiency Network

Project Objectives

Define needs and establish priorities for improving the amount and quality of information used for water demand analysis

Identify interim “best practices” for moving toward standards

Project Approach

Study used surveys to gather input / perspectives

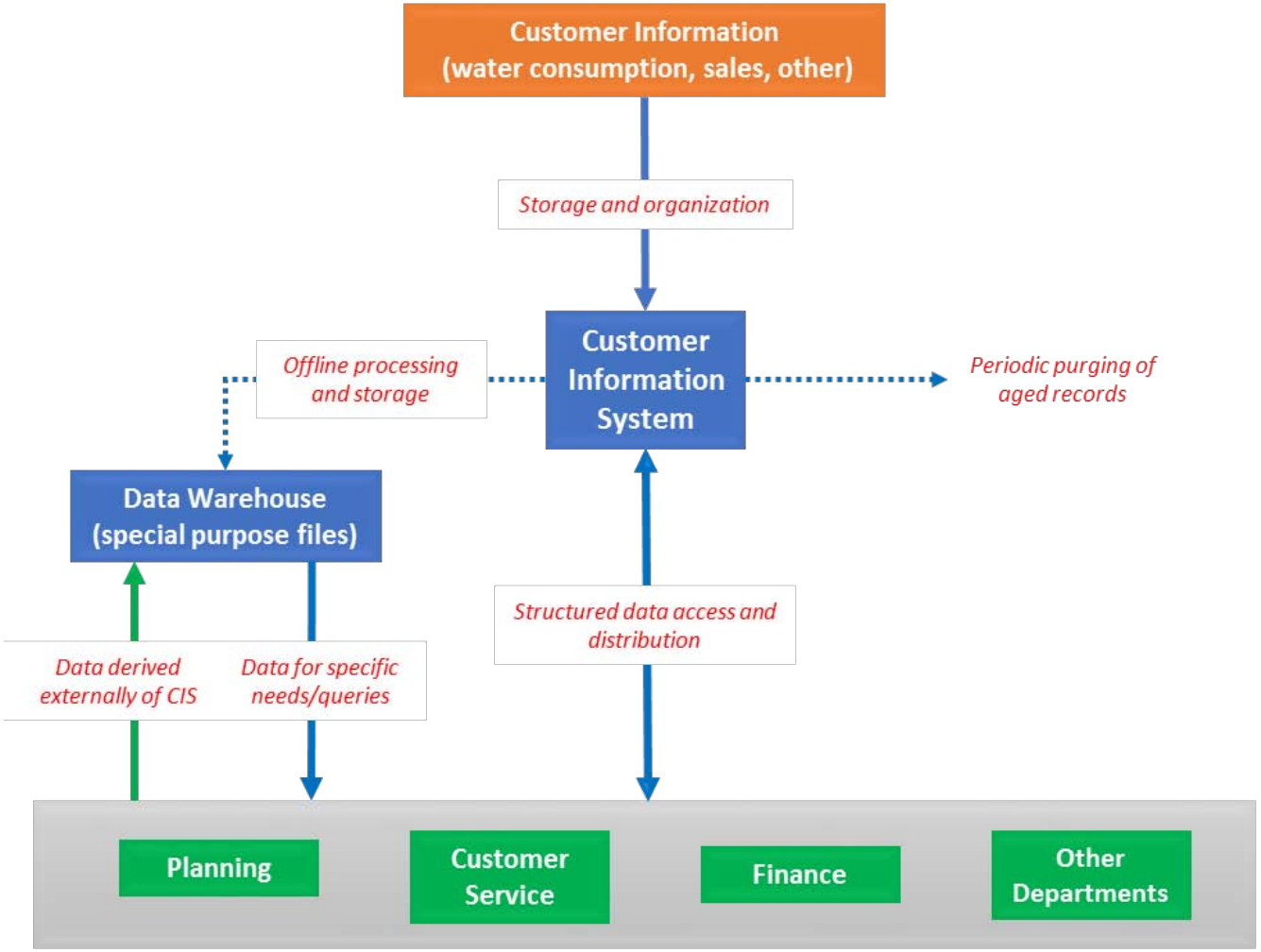
- ✓ Utilities – telephone interviews
  - ✓ 60 invites
  - ✓ 29 interviews completed (23 retail / 6 wholesale)
- ✓ Government agencies – written
  - ✓ 8 invites
  - ✓ 5 surveys completed
- ✓ Consulting firms – written
  - ✓ 7 invites
  - ✓ 5 surveys completed

Project Approach

Interview guides/questionnaires developed in collaboration w/WUWG and Project Advisory Committee

1. General use of water use, billing, and customer data
2. Accessibility and quality of data
3. Classification of customers
4. Use and linkage of external data sources
5. Challenges and opportunities for improvement

Generalized Model of Utility Information Management Processes



Source: Kiefer, J.C. and L.R. Krentz. 2016. *Evaluation of Customer Information and Data Processing Needs for Water Demand Analysis, Planning, and Management*. Denver: Water Research Foundation.

Customer Information Systems (CIS)

Primary Design Considerations

- Revenue collection is main driver
- Information to process and send water bills
  - Billed consumption
  - Rate classes and rate structure ($)
  - Billing address
- Planning and evaluation seldom mentioned as a factor for influencing CIS design

Utility Interviews

- “Demand data” supports array of planning and evaluation functions
- Utilities generally satisfied w/amount and quality of data
- Most interested in classifying beyond categories currently in CIS…but most do not.
- Linkage to external sources
  - Weather
  - Census/MPO
  - Majority indicated meters are geocoded either directly in CIS or in external GIS

- Long-term demand forecasting
- Short-term demand forecasting
- Master water planning
- Conservation planning
- Drought planning
- Capital improvement planning
- Financial planning

- Forecast monitoring
- Estimating non-revenue water
- Evaluating efficiency programs
- Water supply assessments
- Profiling water use
- Regulatory reporting/compliance

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Water Management Agencies

- Planning and regulatory functions
- Government agencies collect data through periodic collection/survey's
- Reliance on existing disaggregation/classification…lack of authority to require more
- Agencies generally expressed satisfaction with quality of data…meet current needs
    - Some issues w/consistency / uniformity and disaggregation by source / sector

- Regional/basin water supply studies
- Reservoir reallocation
- Water needs assessment
- Periodic withdrawal/water use surveys

- Metric development
- Permitting
- Policy development
- Repositories for public use

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Consultant Interviews

- Level of data disaggregation varies considerably
- Need for more refined, consistent customer classification (MF/NR)
- Linkage to external data not frequently made available by clients
- Geocoded data seldom made available…contrary to typical utility response
- Time collecting and processing data to support analysis:10-50%

- Water rate studies
- Water demand forecasting
- Water demand management plans
- Water supply studies and master plans
- Water shortage preparedness and planning

- Per capita use analysis
- Efficiency benchmarks
- Ranks and percentile analysis
- Water use profiling
- Efficiency program development/targeting
- Water audits
- Water loss auditing / non-revenue water analysis
- Distribution system hydraulic modeling

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Customer Classification

- Typical: Residential/Nonresidential
  - Multifamily (master-metered) grouped with commercial accounts
  - No differentiation among nonresidential customers
- 6 sample utilities w/MF classification
- 13 sample utilities w/NR designations beyond general/NR
- 10 retail utilities use external sources to further classify users

Linkage to External Data Sources

- External data available from a variety of sources
  - Tax Assessor / Census / Other
- Potential uses include:
  - Classifying customers
  - Developing water use metrics
  - Characterizing water use patterns over time/geographic areas
- Requires geocoding
  - Mapping address to the geographic coordinates of a parcel

Unique Water Using “Locations”

- 1 water use **location** associated with:
  - 1 business or function associated with:
    - 4 buildings
    - 2 tax parcels
    - 3 water meters

Associates metered water use records to the physical boundaries where water use occurs.

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Common Opportunities for Improvement

Areas for Improvement Identified by Predominantly Retail Utilities		
Theme	**Area for Improvement**	**# Retail Utilities Identifying Improvement (n=23)**
Measures of Occupancy or Scale	Occupancy at residential properties	7
	Number of units served at multifamily properties	7
	Measures of occupancy or scale for CII facilities (employment, rooms, beds, etc.)	5
	Area measures (e.g., irrigated acres, lot size, square footage of buildings)	5
Customer Classification	Development of multifamily class or sub-classes	3
	Development of CII classes and sub-classes	8
Other Classifiable	More frequent time measurement	4
	Socioeconomic and demographic information	4
	Information on large users/process use	2
	Geographic capabilities and matching	4
	Year of construction	2
	Better/additional contact information	2

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Common Challenges

Barriers for Making Identified Improvements

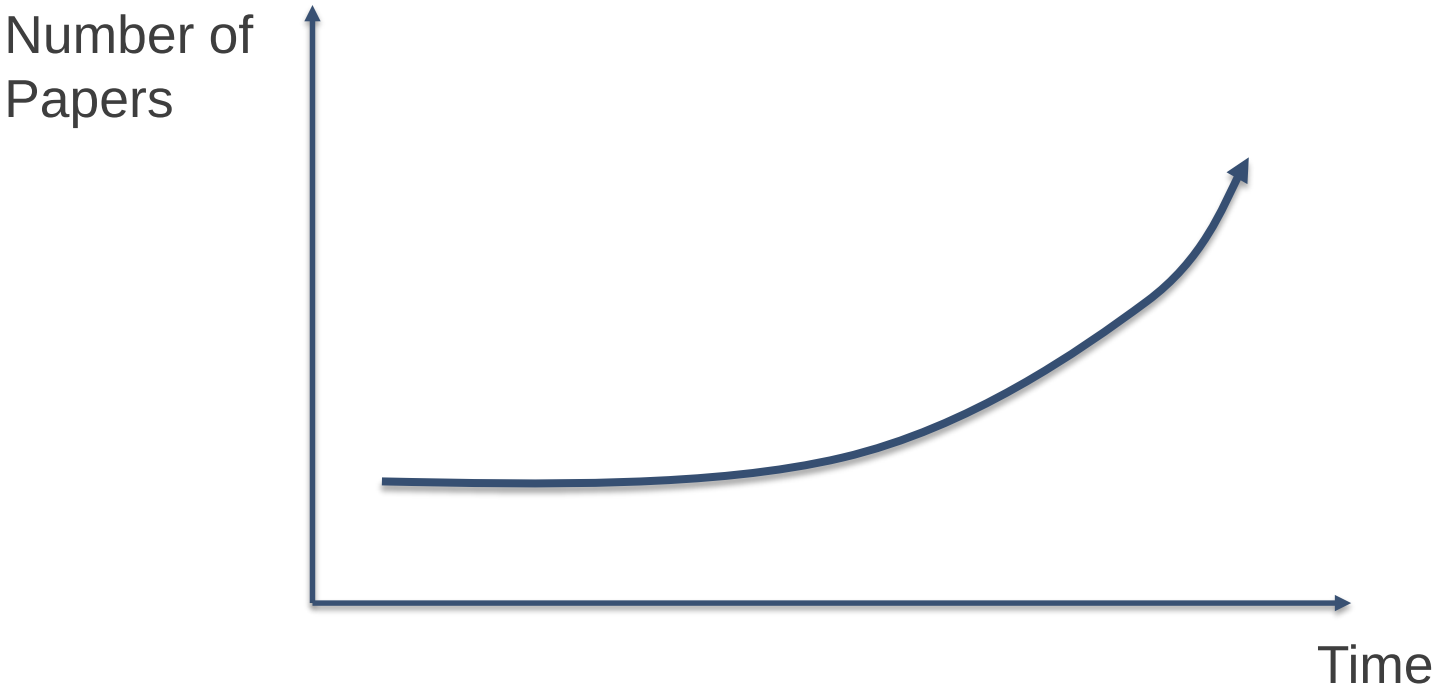
Agency or departmental priorities and incentives

Availability of resources and skills

Ability to quantify and demonstrate value

✓ Rates and revenue collection do not present a technical barrier but can be a practical barrier

Importance of Water Demand Research



House-Peters, L. A., and H. Chang (2011), Urban water demand modeling: Review of concepts, methods, and organizing principles, Water Resour. Res., 47, W05401, doi:10.1029/2010WR009624.

Importance of Water Demand Research

Residential End Uses Study Update (4309)

Methodology for Evaluating Water Use in CII Sectors (4375)

Water Use in the Multifamily Housing Sector (4554)

Changes in Water Use under Climate Change Scenarios (4263)

Water Demand Forecasting in Uncertain Times: Isolating the Effects of the Great Recession (4458)

Common Obstacles

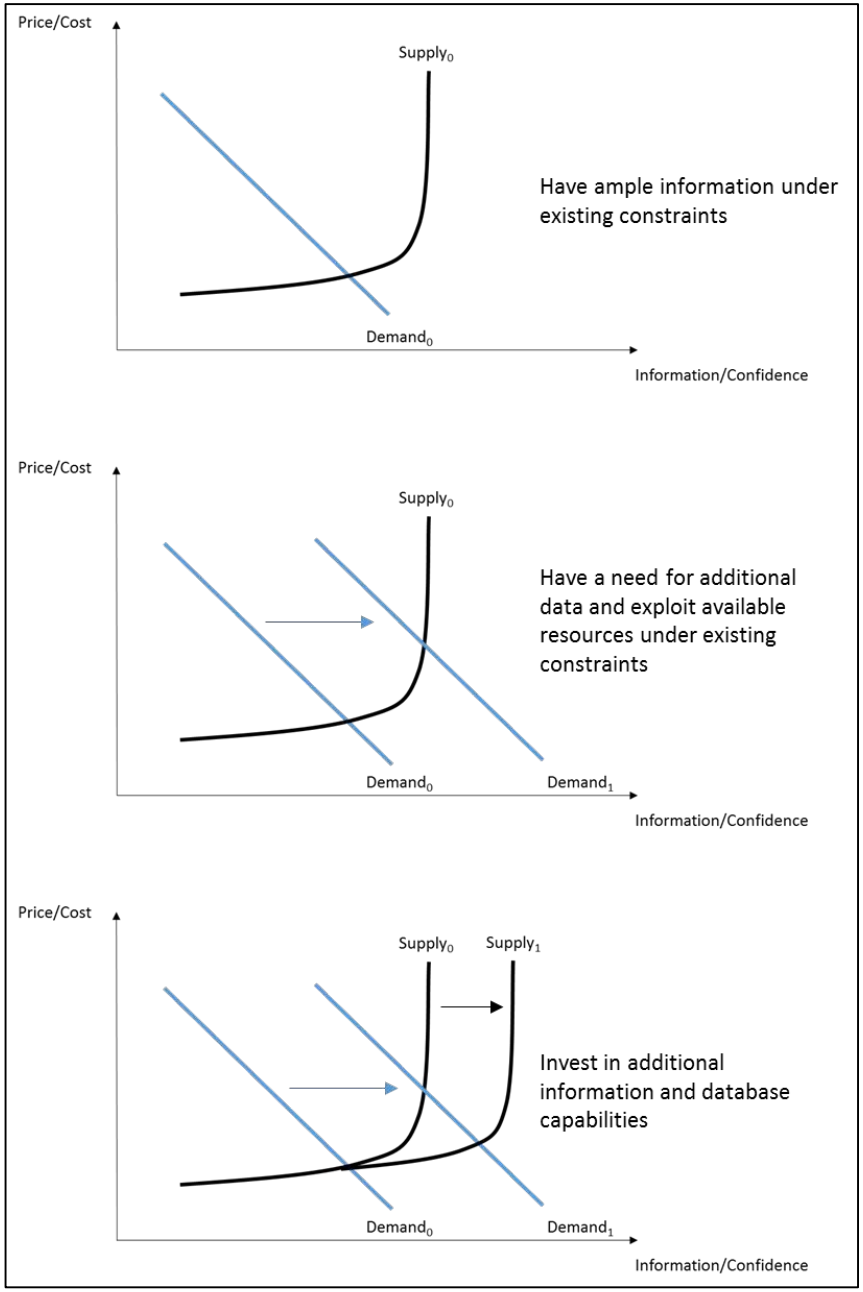
- ✓ Classification
- ✓ Linkage to explanatory data
- ✓ Amount of historical data available
- ✓ Consistency across places

Research generates knowledge, but research requires information

Segments of the Water Utility Community

With respect to information needs for planning:

1. Those without pressing needs for additional information
2. Those that work within constraints of data available within their organization and data management systems
3. Those who have already invested in or are actively seeking additional data and processing capabilities



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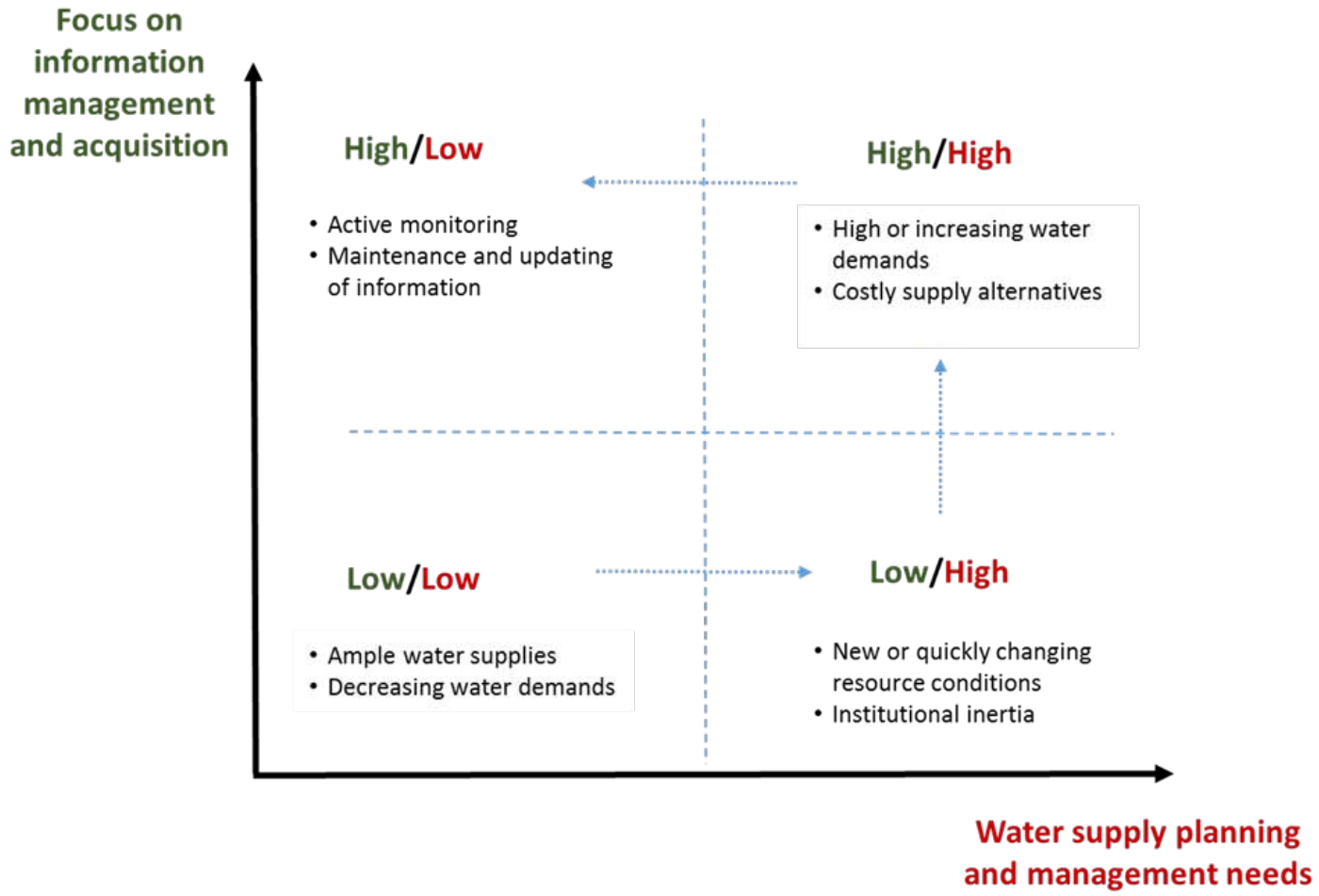
Evolution of Planning Needs and Information Management



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Recommendation #1

Standardization of water customer classes and adoption of uniform class definitions.

- List of 17 primary categories as an initial basis for future refinements
- Supports more refined evaluation of trends and water use modeling
- Provides better level of detail for deriving water use metrics
- Permit more meaningful comparisons across utilities

Initial Recommended Customer Classification Scheme

No.	Principal Category	Example Potential Subcategories
1	Single-family Residential	Single-family homes
2	Multifamily Residential	Duplex
		Triplex
		Apartments buildings
		Mobile home parks
3	Dominant End Use	Commercial/industrial laundries
		Laundromats
		Car washes
		City parks and recreation areas
		Public pools and water parks
		Golf courses
		Landscape irrigation—only
4	Lodging	Hotels and motels without irrigation & cooling
		Hotels and motels with irrigation & cooling
		Resort/large convention hotels
5	Office Buildings	Large office with cooling towers
		Office complexes with irrigation
		Small office without cooling towers and irrigation
6	Schools	Pre-schools and daycare
		Primary and secondary schools
		Universities/college campuses
7	Health Care	Hospitals and sanitariums
		Medical centers, doctor offices, and labs
8	Eating Places	Full service restaurants
		Fast food outlets
		Bakeries & cafeterias
9	Retail Stores	Shopping centers and malls
		Grocery stores and supermarkets
		Convenience stores
10	Warehouses	Warehousing cold storage
		Other warehouses
11	Auto Service	Auto service
12	Religious Buildings	Religious buildings
13	Retirement Homes	Long-term nursing homes
		Retirement homes
14	Manufacturing	Heavy industry plants
		Light industry plants
		Food and beverage processing plants
		Other manufacturing establishments
15	Largest CII Customers	Top quantity customers
16	Other Commercial	Personal services (beauty shops, health spas, fitness)
		Miscellaneous commercial
17	Other Institutional	Correctional facilities
		Group live-in shelters
		Miscellaneous institutional

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Benefits of Sub-classification

Sub-classification permits establishment of more homogeneous groups for analysis/metric development

- Multifamily, vary in similarity w/single-family customers

  Multiple dwelling units, master-metering, unique water end uses, common property

- Nonresidential, variety of business or facility functions

  Sub-classification can improve ability to evaluate water use patterns

Differentiating MF customers helps refine estimates of water use for all other sectors

Recommendation #2

Geographical referencing of water customers and unique locations.

- Creates bridge between water use and property ownership or management data
- Associates metered water use records to the physical boundaries where water use occurs
- Permits aggregation to various geographic levels, where supplemental data may exist

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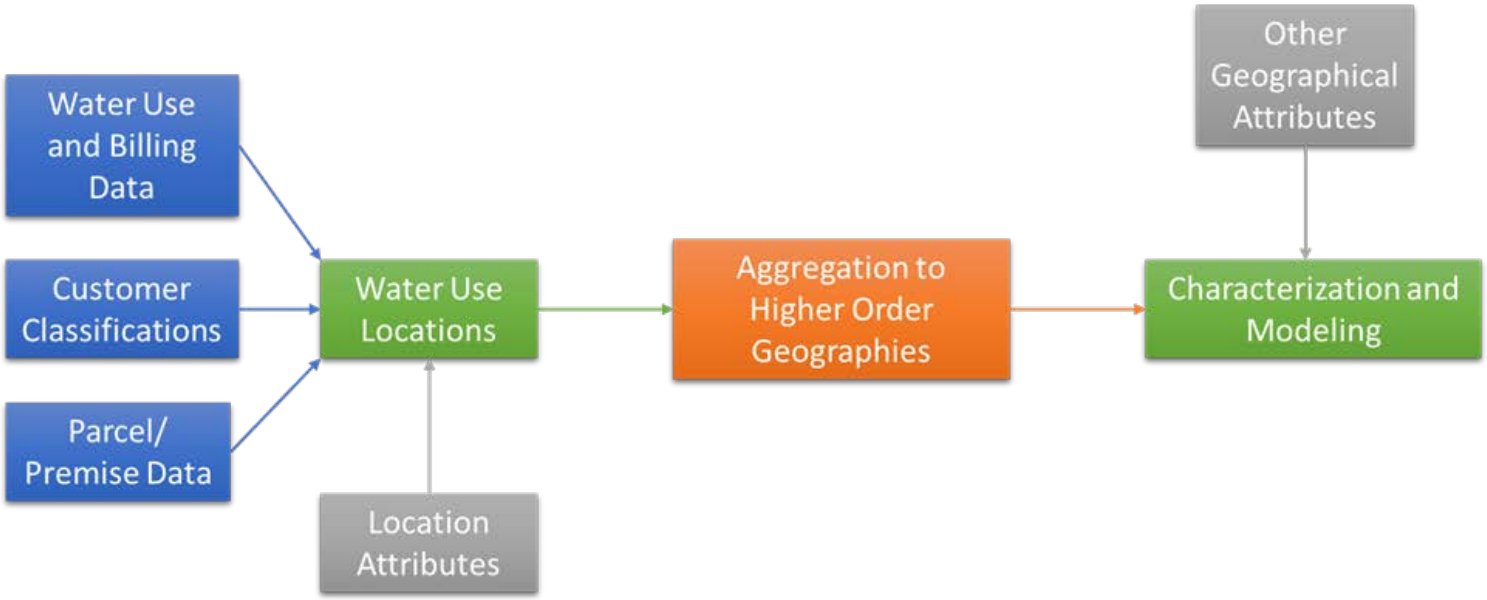
Benefits of Geographical Referencing



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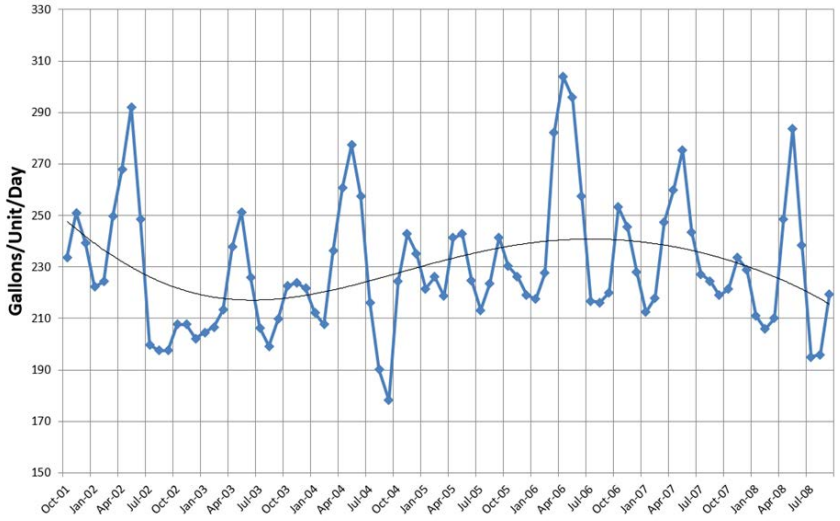
Recommendation #3

Preservation of historical water use and billing information

- Preserve minimum of 10 years metered water consumption history
- At any given time, the last decade of water usage trends can be examined
- Basis for examining past trends, developing alternative water use metrics and benchmarks, and modeling consumer behavior



Benefits of Standardized Data

Utility Benefits

Improved, more robust knowledge base and metrics influencing

- Water demand forecasts
- Efficiency program development
- Rate structures and pricing
- Benchmarking

Water utilities on the “front line” of this effort

External benefits may exceed internal benefits

Benefits of Standardized Data

“External” Benefits

Enhance quality of national, basin, regional assessments

- Identifying and evaluating trends in important sectors
- Estimating climate change impacts
- Estimating economic impacts
- Estimating trends in efficiency

More refined Public and Domestic water withdrawal estimates for USGS surveys

Basis for disaggregation for EPA’s Portfolio Manager

Alternative metrics for Planning and Regulatory agencies

Concluding Remarks

Establish a “Water Demand Data Committee” to encourage standardization efforts

1. Ensure information benefits are adequately captured across perspectives
    - Federal, state, regional water management agencies
    - Water utilities
    - Researchers
    - Consultants

Water Demand Data Committee

2. Finalize the minimum requirements of a standardized water customer classification scheme **and** the processes necessary to ensure uniformity in class definitions

3. Establish a desirable set of water use metrics and the information needed to calculate them

Water Demand Data Committee

4. Propose, design, and conduct additional research to elaborate on and develop solutions for common challenges

5. Serve as proponent for:
   - Articulating the benefits of water use data standardization
   - Establishing a common vernacular on the topics of customer classification, water use metrics, and water data management

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