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Institutions, Incentives, and Water Efficiency: Effects of Utility Scale, Scope, Ownership, Oversight, and Rights

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Introduction

- Water systems in the U.S. vary substantially along a number of key structural dimensions that
 - ▶ Define the institutional character of the industry
 - ▶ Distinguish it from other utility industries (e.g., electricity, natural gas)
- Hypothesis
 - ▶ Structural characteristics matter to the adoption of efficiency and conservation practices by water systems
- Rationale
 - ▶ Structure affects water system resources, incentives, and mechanisms of accountability
- This paper provides a conceptual framework for thinking about the relevance of structural characteristics in order to improve design and implementation of water efficiency and conservation programs

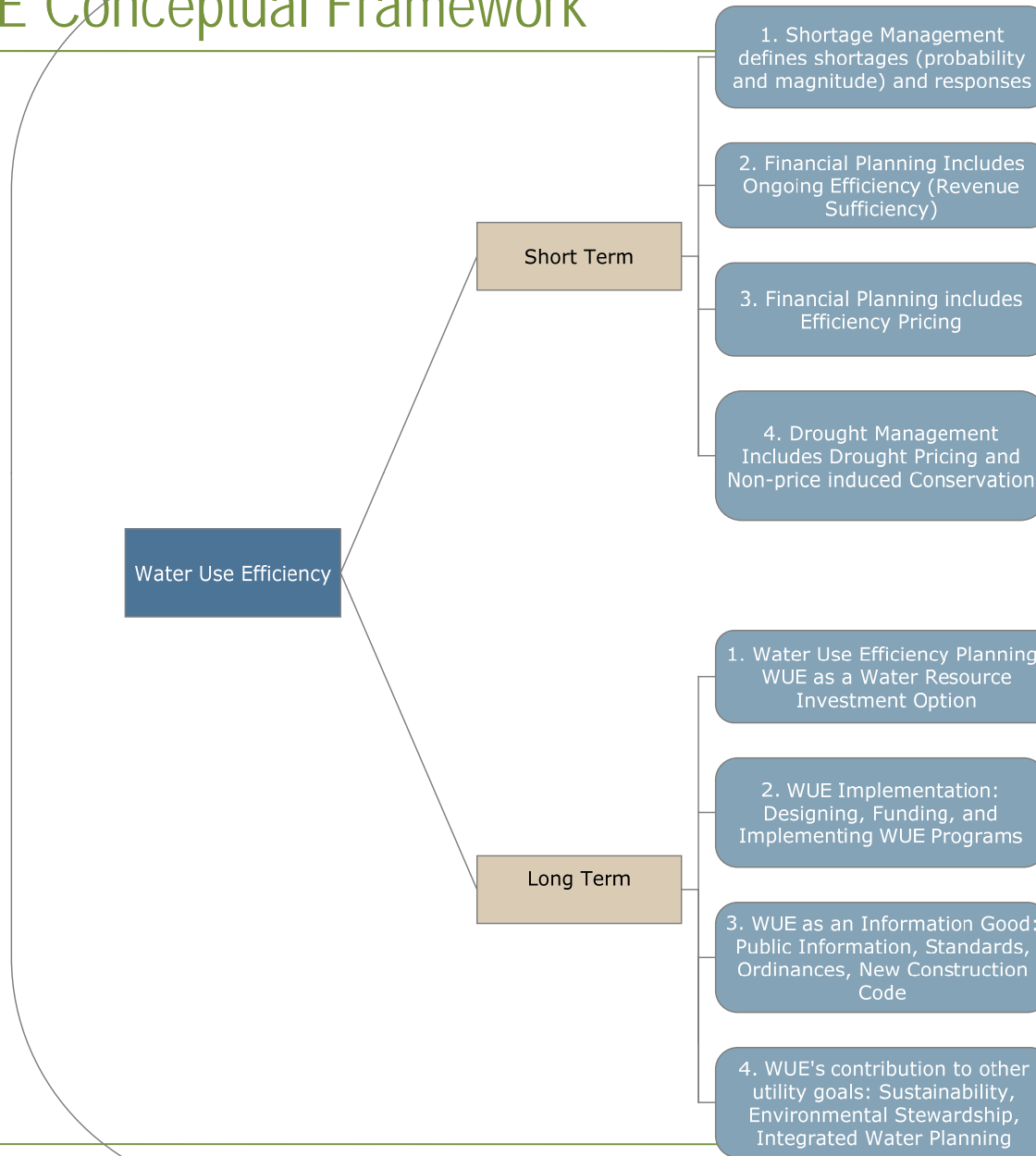
Confusion over Conservation

- “Conservation” can mean:
 - ▶ mandatory curtailment during water supply shortage,
 - ▶ any decrease in human water consumption, or
 - ▶ water that is stored for later consumption?
- “Conservation programs” can denote
 - ▶ a public relations campaign,
 - ▶ provision of efficient plumbing devices,
 - ▶ on-site water use surveys, or
 - ▶ retrofit on resale legislation or landscape ordinances?
- Conservation as Water Use Efficiency
 - ▶ Devices/practices whose benefits exceed costs

Role of Conservation

- Short Term Drought Response
 - In response to shortage, customers can reduce consumption (customer shortage cost is the avoided benefit of water use)
 - Utility drought management--information programs, restrictions, drought pricing—is a planning problem!
- Long Term WUE Investment
 - Benefit Cost Analysis--What is the potential for WUE investment?
 - Avoided Cost Analysis—What is the benefit of WUE?
 - Integrated Planning – What should the portfolio of water resources look like?

WUE Conceptual Framework



Conservation and Institutional Structure

- How does institutional structure relate to water conservation planning and implementation?
- Who should do what?

Structural dimensions of water systems

Scale

Scope

Ownership

Oversight

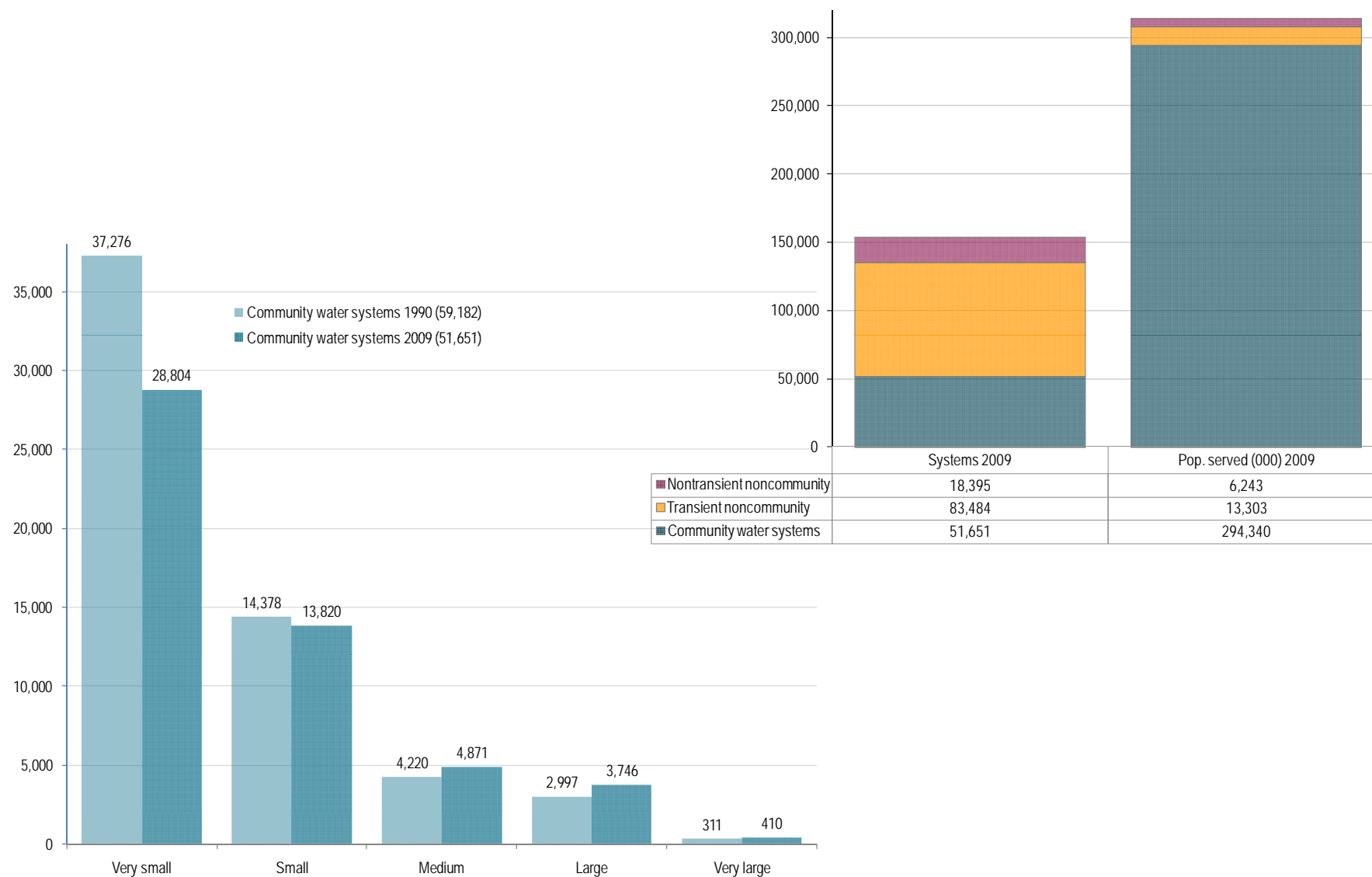
Water rights



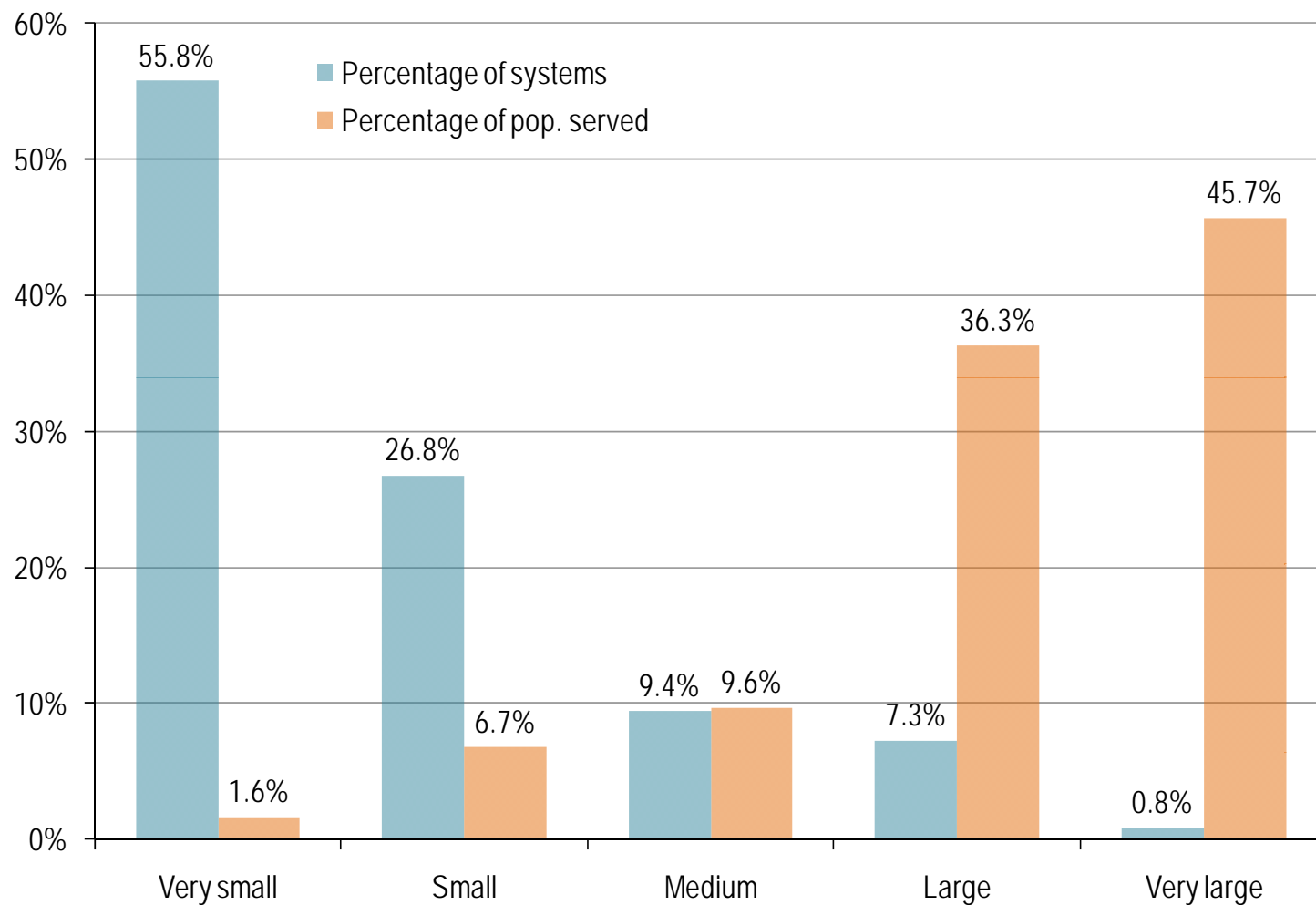
Water system scale

- Very small
- Small
- Medium
- Large
- Very large

Water systems in the U.S. (1990 and 2009)



Community systems by population served and ownership



USEPA Factoids 2009

Utility Scale – Fitting Utility Size to Conservation Guidelines

- Basic
 - ▶ Populations of 10,000 or fewer
- Intermediate
 - ▶ Populations between 10,000 and 100,000
- Advanced
 - ▶ Populations over 100,000
- Rational – Systems of different scale have differing resources and capabilities for planning and implementing long term Water Use Efficiency



Scale and conservation

- For small water systems, efficiency and conservation are very closely related to capacity development
- EPA guidelines suggest the following Level 1 measures
 - ▶ Universal metering
 - ▶ Water accounting and loss control
 - ▶ Costing and pricing
 - ▶ Information and education

Scale and conservation (continued)

- Larger systems can engage in additional activities
- Level 2 measures
 - ▶ Water-use audits
 - ▶ Retrofits
 - ▶ Pressure management
 - ▶ Landscape efficiency
- Level 3 Measures
 - ▶ Replacements and promotions
 - ▶ Reuse and recycling
 - ▶ Water-use regulation
 - ▶ Integrated resource management



Water system scope

- Retail utility
 - ▶ Purchased water distribution system
 - ▶ Water supply and distribution
 - ▶ Water and wastewater utility
- Wholesale utility

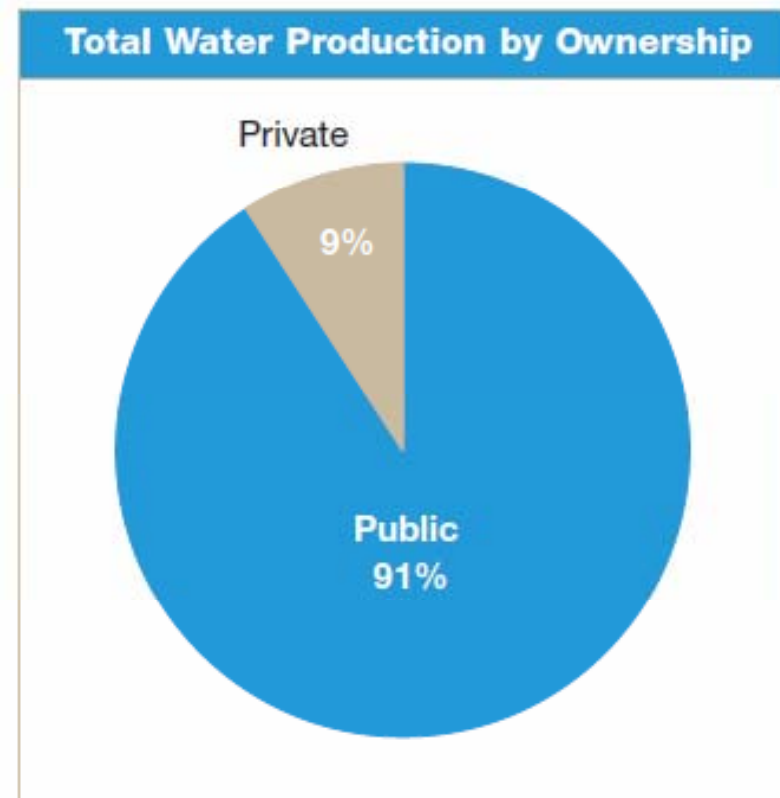
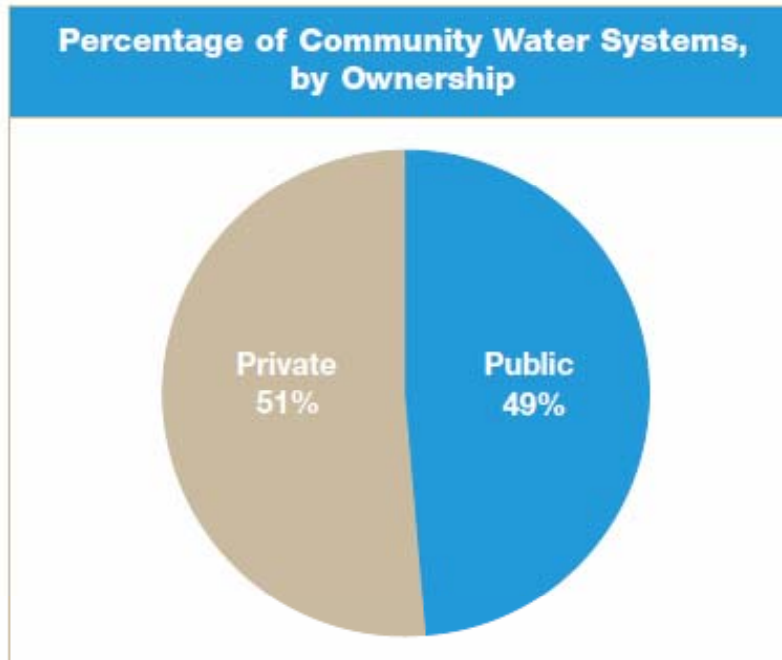
Scope and conservation

- Retail water utilities
 - ▶ Supply-side activities
 - ▶ Demand-side activities
 - ▶ Cost allocation and rate design
- Wholesale water utilities
 - ▶ Supply management (especially loss control)
 - ▶ Storage and load management
 - ▶ Rates and other incentives for retailers

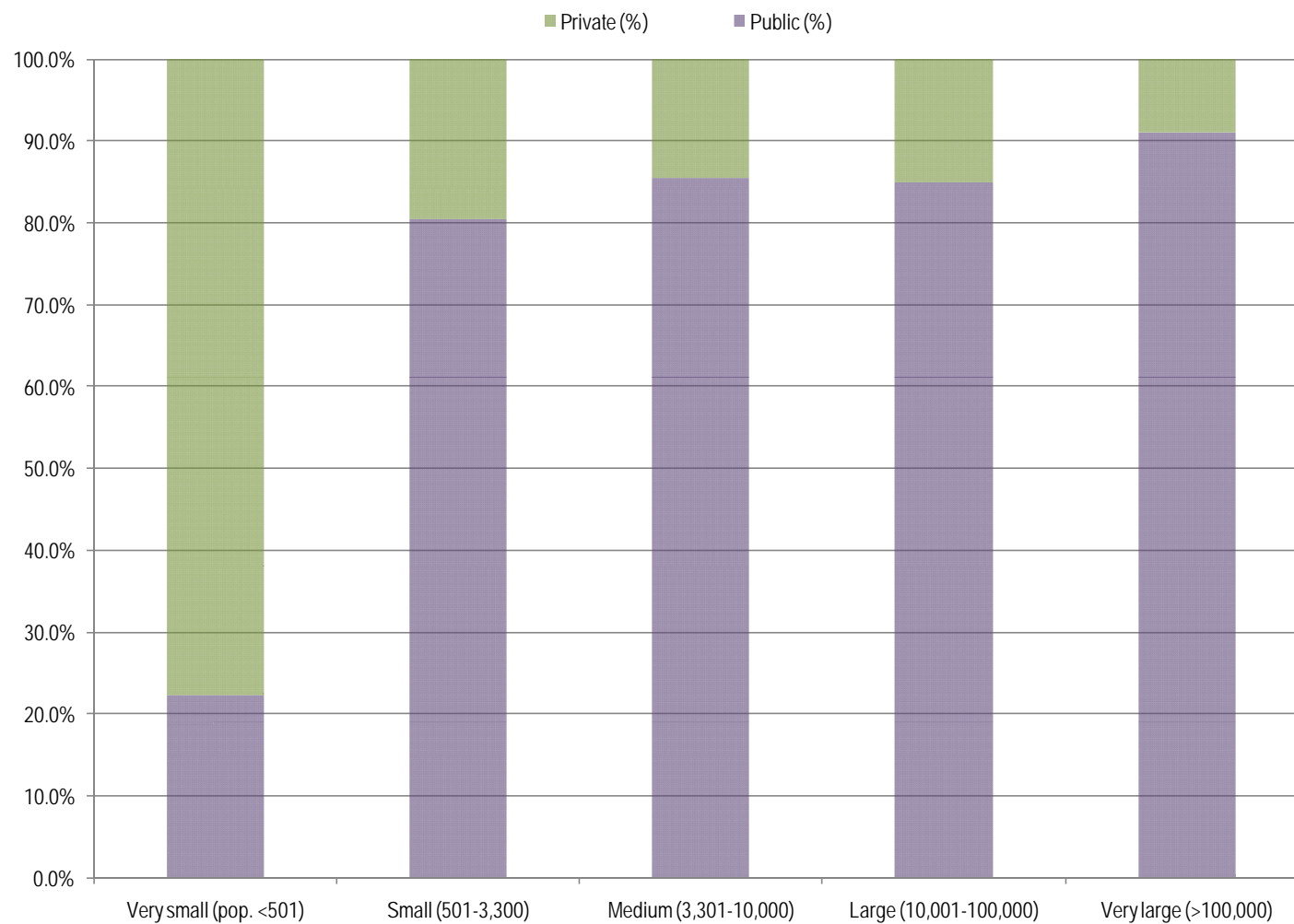
Water system ownership

- Privately owned utility
 - ▶ Single owner company
 - ▶ Multi-system utility
 - ▶ Multi-utility holding company
- Nonprofit utility
 - ▶ Nonprofit corporation
 - ▶ Homeowners association
 - ▶ Cooperative
- Publicly owned utility
 - ▶ Public authorities and districts
 - ▶ State and county systems
 - ▶ Municipal and other governmental systems
- Publicly owned and privately managed (contract operations)
-

Role of the private sector (USEPA, CWSS 2000)

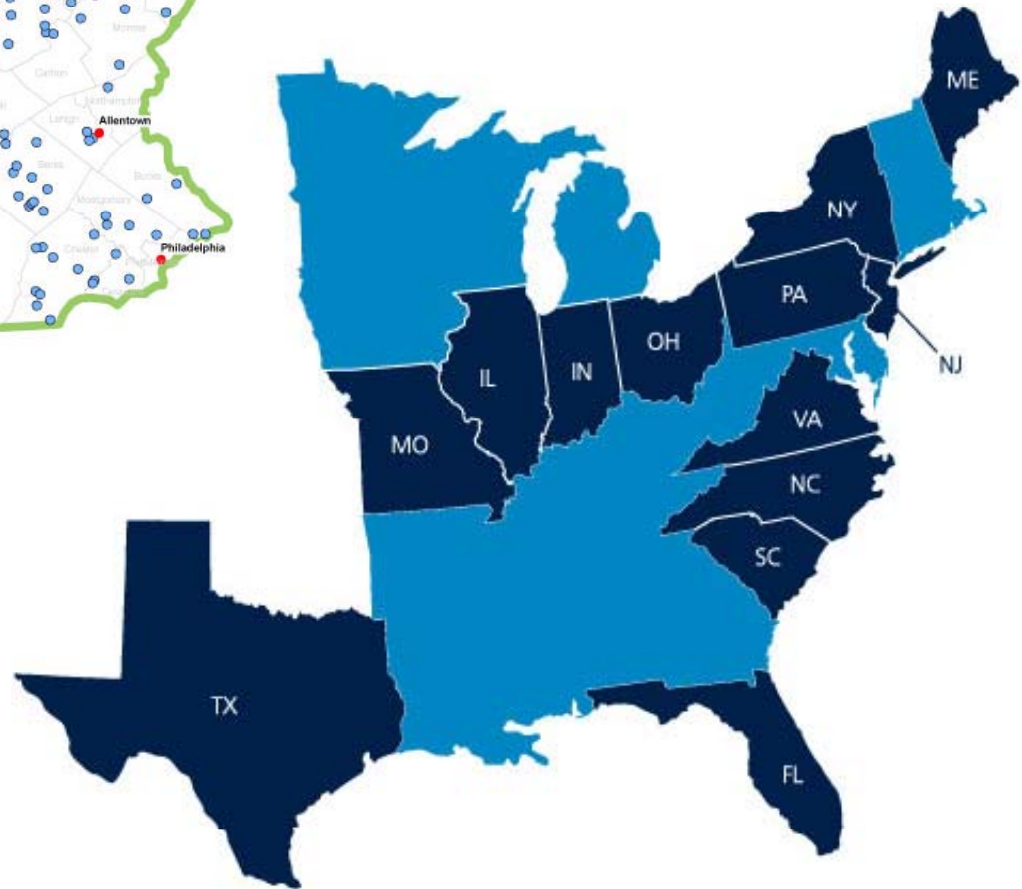


Community systems by population served and ownership



USEPA CWSS 2000

Multi-state, multi-system regional holding company (Aqua)



Ownership and conservation

- Both publicly and privately owned systems are affected by
 - ▶ Rising costs (infrastructure, supply costs)
 - ▶ Falling demand (conservation and recessionary effects)
 - ▶ Declining revenues
- Need for
 - ▶ Better forecasting
 - ▶ More frequent rate adjustments
- Some municipal systems are experiencing “excess capacity” and conservation will seem at cross purposes
- Privately owned utilities must be sustainable and will be concerned about
 - ▶ Loss of revenues in the short run
 - ▶ Loss of investment opportunity over the long run
- Methods like “decoupling” may be less controversial for publicly owned systems (where excess earnings are not a concern)

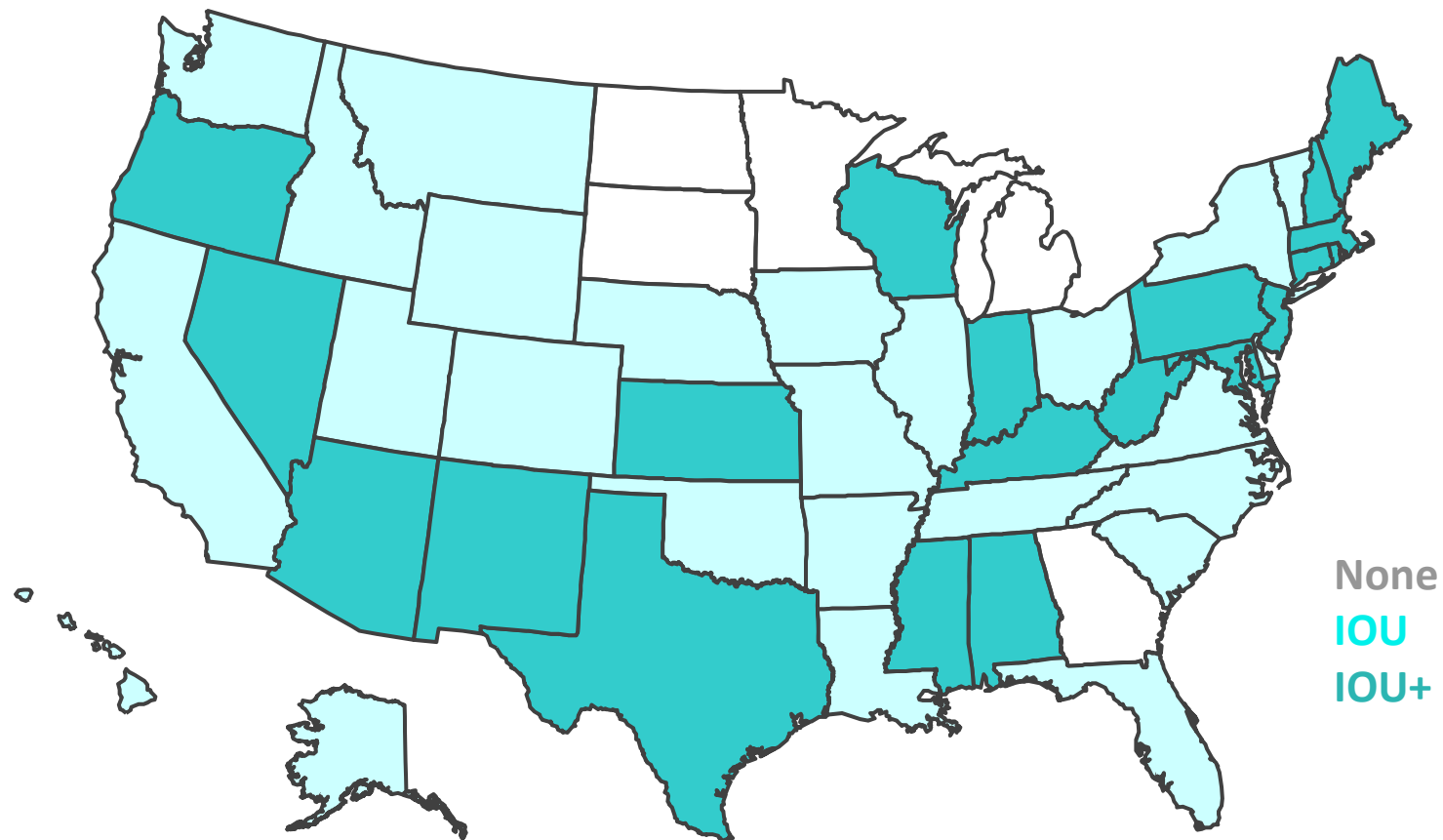
Water system oversight

- Local economic regulation
 - ▶ Nonprofit boards
 - ▶ Municipal department
 - ▶ Independent local governing board
- State economic regulation
 - ▶ Regulated privately system
 - ▶ Regulated nonprofit system
 - ▶ Regulated privately owned system

Regulation of water systems in the U.S.

	Federal	Interstate	States (primacy)	Sub-state	Local
Water quantity		River basin commissions (varies)	Resource Agencies	Water management districts (varies)	
Water quality	Congress, EPA		SDWA and CWA primacy agencies		Health departments
Water funding			State revolving fund agencies		
Water prices			PUCs (mostly private systems)		Public ownership, other local controls

State PUC jurisdiction



Oversight and conservation

- Interest and commitment of oversight boards will influence conservation
- Government owned utilities may have competing interests (e.g., growth and growth management)
- Government systems must comply with GASB rules for asset management; some are also regulated by the state PUCs
- PUC regulated systems are highly accountable but constrained
 - ▶ Accounting systems
 - ▶ Cost-based ratemaking
 - ▶ Standards of review
 - ▶ Recovery of expenditures on programs
 - ▶ Prudence reviews
- Economic regulators may become more aware of potential impact of water conservation on energy consumption (and vice versa), which may affect policies and associated incentives

Water system rights

- Riparian (Western states)
- Prior allocation (Western states)
- Hybrid states: California, Kansas, Nebraska, North and South Dakota, Oklahoma, Oregon, Texas, and Washington
- Evolving systems for monitoring and permitting withdrawals
 - ▶ Great Lakes Compact

Regional water law



Figure 2-3. Mississippi River Basin

Rights and conservation

- Water law may influence access to water for development purposes
- Prior appropriation constrains access but facilitates exchange
- Riparian rights may lead to stress and conflict
- New regulatory mechanisms may affect options for water systems, including pricing policies (Great Lakes Compact)

Great Lakes Compact



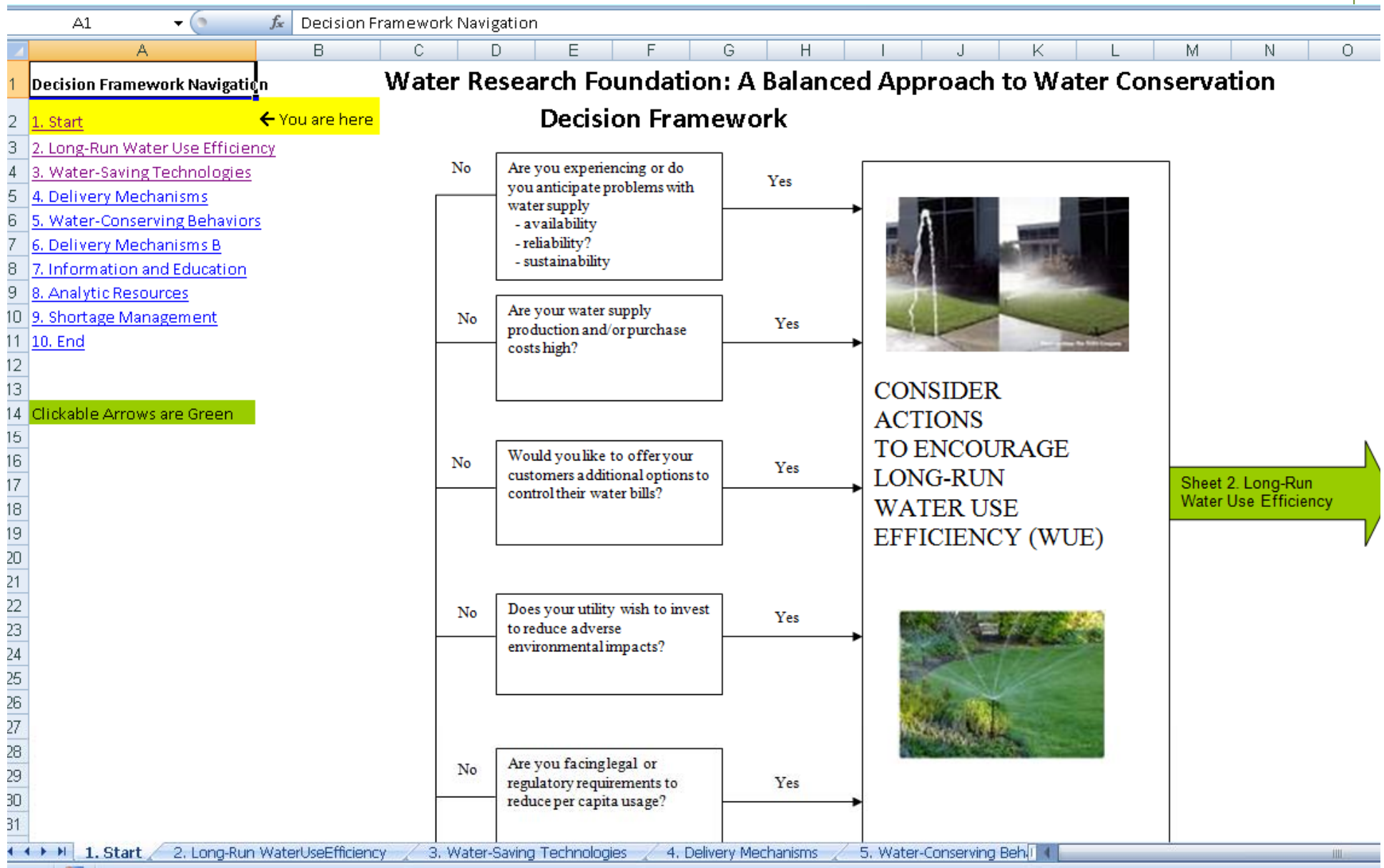
Other institutional influences

- Federal and state drinking water and wastewater regulations
- Federal funding programs (state revolving loan funds)
- Interstate and intrastate basin regulations
- Intergovernmental subsidies and transfers
- Fiscal and tax policies; grant and loan requirements
- Procurement and personnel guidelines
- Accounting and corporate governance rules
- Game changers for the water industry and conservation
 - ▶ Reuse
 - ▶ Desalination
 - ▶ Energy-water nexus

How Institutional Structure Affects the Conservation Challenges and Opportunities

	Challenges	Opportunities
Size	Small systems and industry fragmentation	Linking conservation to capacity development
Scope	Wholesale and retail water system operations	Aligning incentives and strategies to optimize solutions
Ownership	Differing incentives of public and private systems	Cost avoidance and methods for addressing cost recovery
Oversight	Uneven role of oversight bodies in encouraging conservation	Increased uniformity of oversight expectations and enforcement
Rights	Variations in water law and water availability	Refinement of governance of withdrawal and use

Decision Framework of A Balanced Approach to Water Conservation



WaterRF 4175—A Balanced Approach to Water Conservation: Removing Barriers and Maximizing Benefits

Water Research Foundation Report available in early 2011...

- Conceptual Framework for Water Use Efficiency
- Institutions and Efficiency
- Planning Models and Methods
 - ▶ Short Term Financial Models
 - Adapting the Traditional Utility Finance Model to Include Conservation Pricing and WUE Programs
 - ▶ Long Term Resource Planning
 - Benefit-Cost Models – Program Planning and Tracking
 - Avoided Cost Models – Conservation Program Benefits
 - Integrated Planning Models – Risk, Uncertainty, and Planning Portfolios
- Case Studies of Utility Conservation Implementation
- Decision Framework and Best Implementation Practices

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