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FOOD & RESOURCE

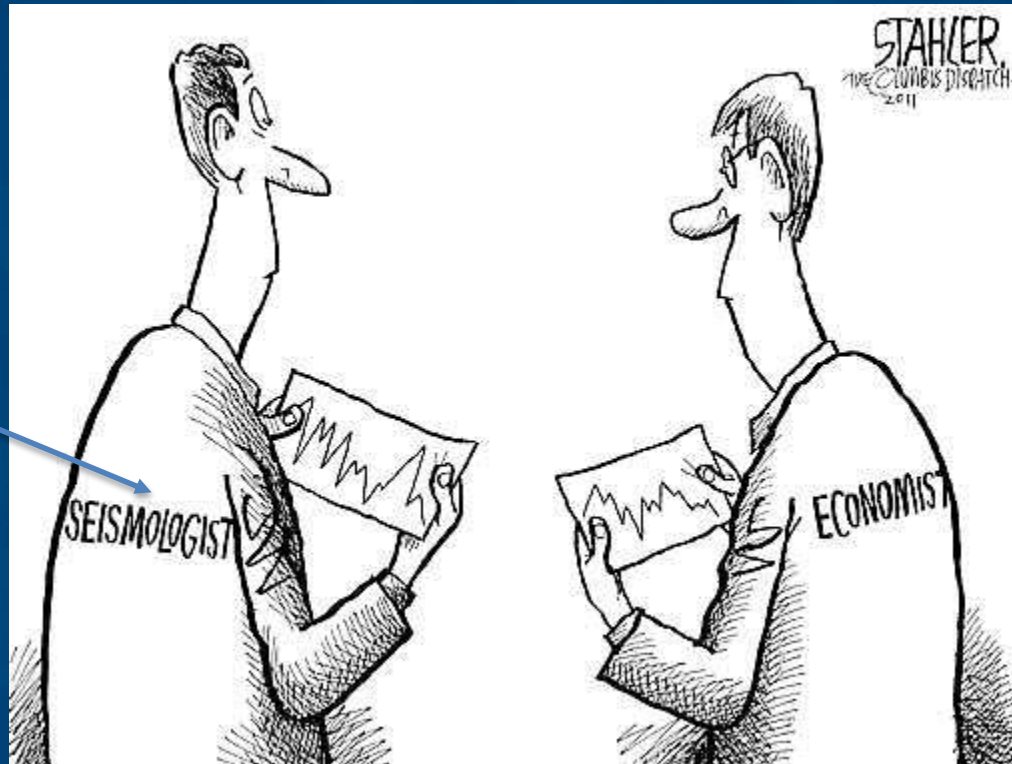
ECONOMICS

DEPARTMENT

Thresholds of the Florida Urban Water  
System in a Future World:  
*Economics Research Component*


Tatiana Borisova  
Associate Professor  
Water Economics

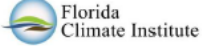
Climatologist



# 2010 Workshop: What we “NEED” to help Water Utilities plan for water supply in the face of climate impact uncertainties and risk

- Projections of demand based on demographics, socioeconomics temperature, rainfall projections
- Policies/regulations that are suited & unique to each region

 **UF** Water Institute  
UNIVERSITY of FLORIDA

 Florida  
Climate Institute

“Public Water Supply Utilities Climate Impacts  
Working Group”

**WORKSHOP REPORT**

**WORKSHOP ONE**

Wednesday, September 22, 2010  
9:30 – 4pm

Hosted by  
Orlando Utilities Commission in Orlando, Florida

## FUTURE world: Changes in

- i. Sea level rise rates,
- ii. Wet season length decrease  
Temperature mean / variances
- iii. Extreme Events
- iv. Aquifer level reductions

### Natural System (Surface and ground water hydrology)

- i) Aquifer levels / stream flows
- ii) Water quality
- iii) Seasonality
- iv) Variance of weather and climate (droughts, flooding, etc.)
- v) Sea level rise

### Human System (Water supply and demand system)

- i) Landuse Changes (Coastal/Inland)
- ii) Water demand
- iii) Policies: water withdrawal and allocation
- iv) Water suppliers: cost-recovery, conservation, and investments

Water quality / runoff  
Water withdrawal rates  
Meteorology



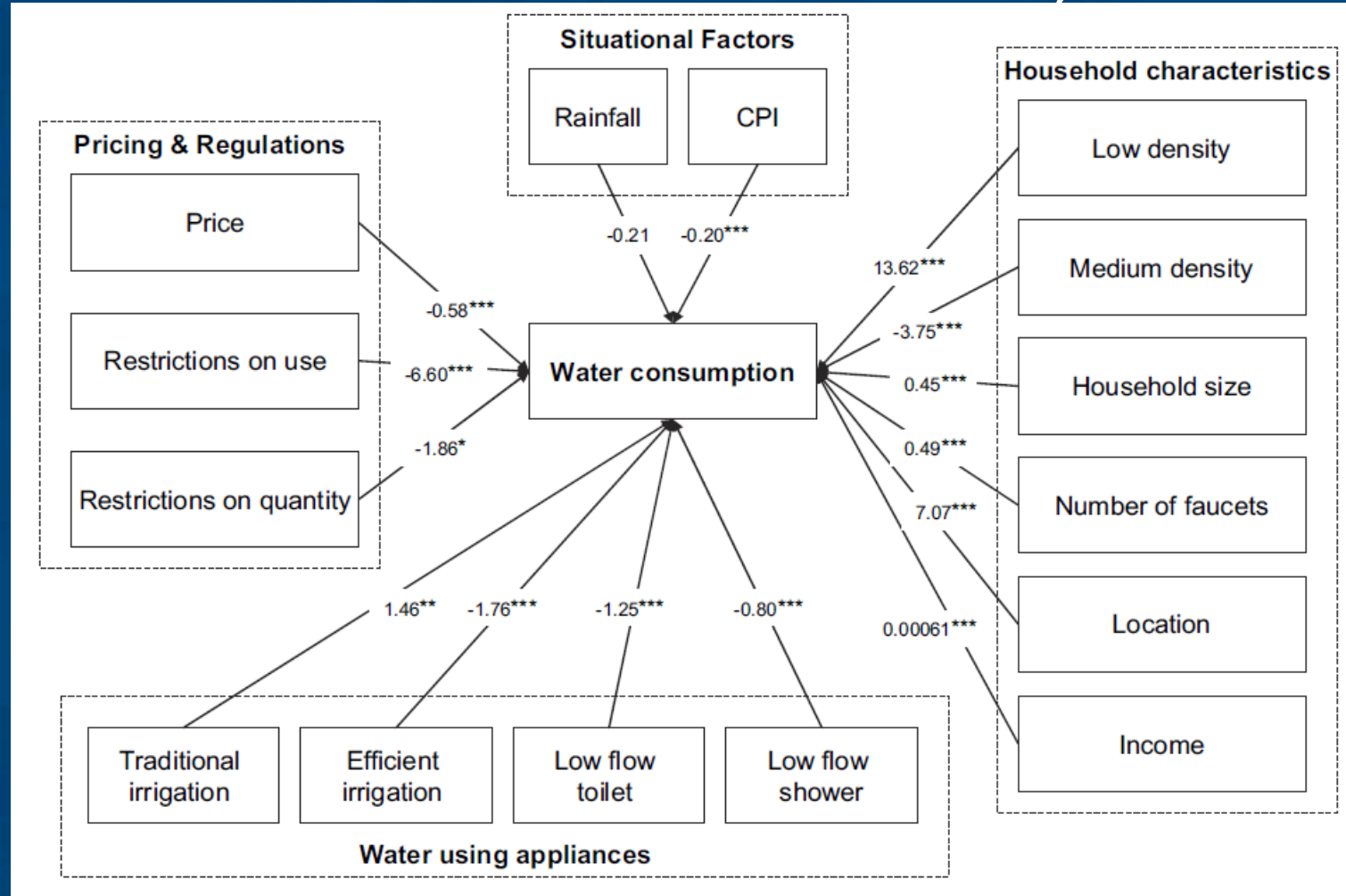
# Property-Level Water Demand

Direct Drivers	Indirect drivers
<b>Climate / seasonal variability</b>	<b>Person characteristics</b> (e.g., attitudes toward water conservation)
<b>Incentives / disincentives</b> (e.g., pricing, rebates)	<b>Institutional trust</b> (i.e., trust in water provider)
<b>Regulations and ordinances</b> (e.g., watering restrictions, planning regulations)	<b>Interpersonal trust</b> (i.e., trust in other consumers)
<b>Property characteristics</b> (e.g., lot size, house age, in-ground irrigation)	<b>Fairness</b> (e.g., in decision-making process)
<b>Household characteristics</b> (e.g., household size, demographics)	<b>Environmental values /conservation attitudes</b>
<b>Person characteristics</b> (e.g., knowledge how to conserve water)	<b>Socio-economic factors</b> (e.g., income, age, gender, education, etc.)



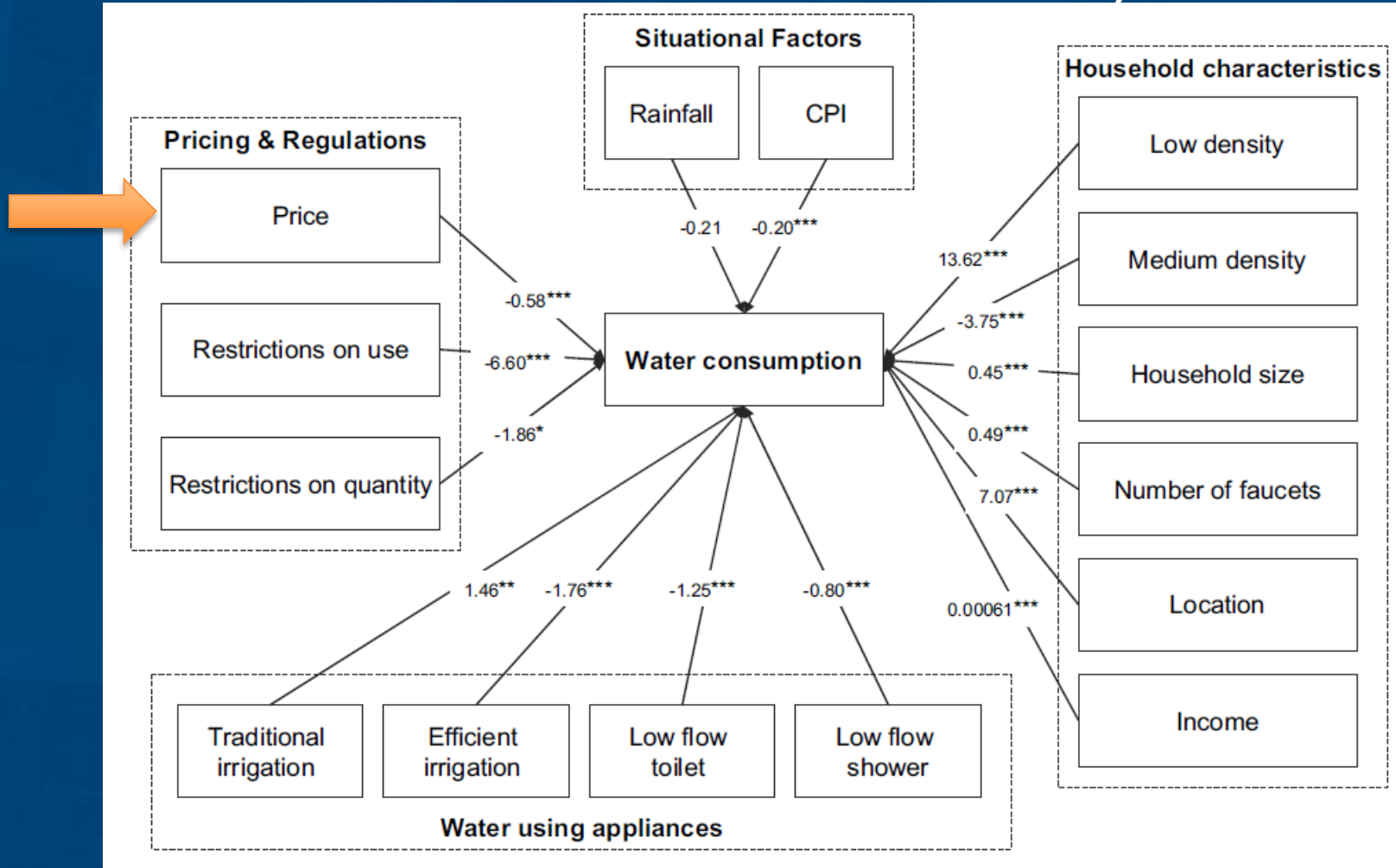
# Example:

## Econometric models of household water consumption in Santa Barbara and Goleta, CA



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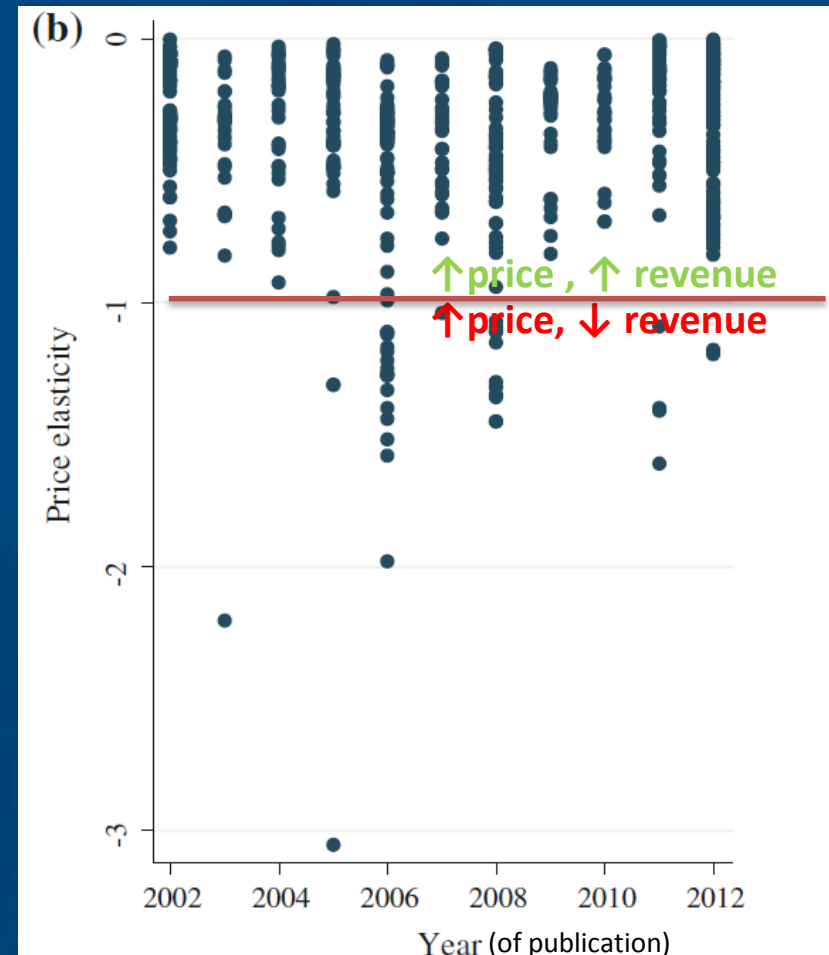


Jorgensen et al. / Journal of Env. Man-t 91 (2009) 227–236;  
Renwick and Archibald / Land Economics 74 (1998), 343–360.

# Water demand response to price changes

Price elasticity = % change in quantity /  
% change in price

- 100 studies published in 2002 – 2012, 638 price elasticity estimates
- 10% ↑ price => 3.7% ↓ water use (median; range: 0.0% - 30.5%)
- Utilities can increase revenues by increasing the price
- Price change: achieving water conservation and cost-recovery objectives

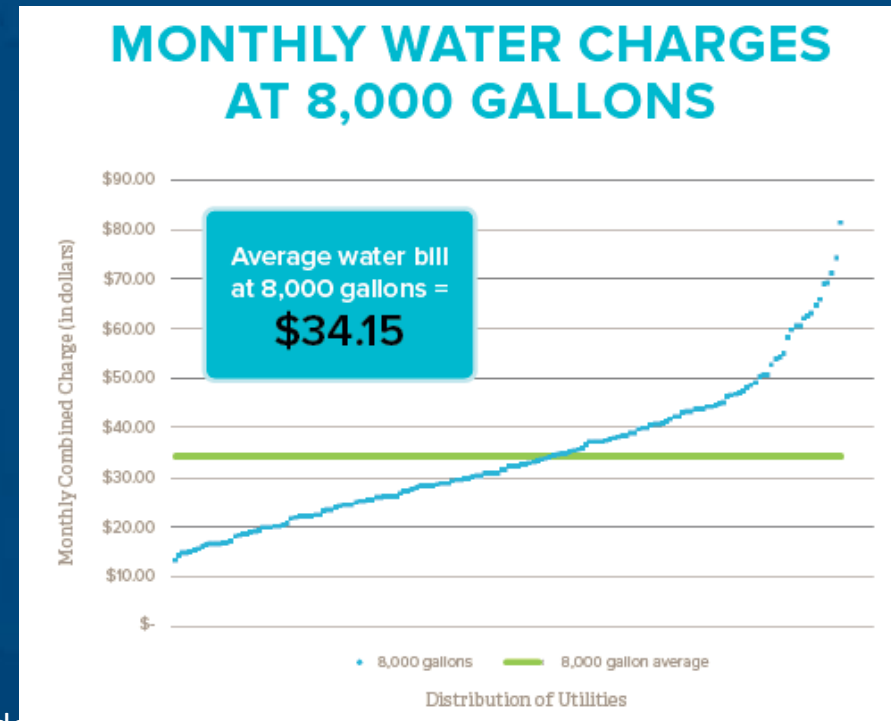


Sebri, M. (2014) A meta-analysis of residential water demand studies, *Environment, Development, and Sustainability*, 16, 499–520.



# Research Questions

- Demand forecast methods used by different Florida utilities
  - Comparison; Opportunity to refine?
  - Residential, commercial, industrial
- Improving demand forecasting models
  - Responses to significant price increase?
  - High-resolution modeling
    - Indoor vs outdoor demand
    - Hourly / daily demand (smart meters)
  - Additional data on households and property characteristics
    - socio-demographics, landscape attributes, attitudes toward water use, etc.
- Effects of price and non-price water conservation strategies on water use and utilities revenues
- Value of water in residential use
  - (compared to agricultural and in-stream uses?)



Raftelis Financial Consultants Inc., 2014  
Florida Water and Wastewater Rate  
Survey

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# Policies: Water Withdrawal and Allocation

- What is the value of water in alternative uses?
  - Public supply
  - Agricultural use (water demand, value, and costs of water use reduction)
  - In-stream use (ecosystem service provision)
- Innovative policies
  - Water farming: paying for increasing groundwater recharge
  - Paying others to offset increases in water use
  - Fee for water withdrawal
- Optimal level of groundwater withdrawal
  - Withdrawing water today versus leaving it for tomorrow



# Water suppliers: cost-recovery, conservation, and investments in alternative supply sources

- Balancing cost-recovery and water conservation objectives
  - Pricing to encourage conservation and delay investments in more expensive sources



Optimist



Half Full

Accountant



We can treat the empty space as future water receivables, or we can move the current water to a future period.....

Pessimist



Half Empty

[http://www.dailygloom.com/cartoons/optimist\\_pessimist\\_accountant/](http://www.dailygloom.com/cartoons/optimist_pessimist_accountant/)

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# Connect. Explore. Engage.

## Food and Resource Economic Department (FRED)



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# Example: Water demand and household size

- Studies published in 2002 – 2012
- 23 studies, yielding 70 estimates of sensitivity (elasticity) of water demand to household size
- For a family of 4, increase in household size by 1 person will result in
  - 0.3% - 35.3% increase in water use
  - mean of 8.9% increase

