

## LECTURE NOTES Water Conservation

### Learning objectives

1. **Describe** approaches water utilities use to encourage water conservation.
2. **Identify** the tariff structure a customer faces.
3. **Specify** factors that influence the effectiveness and adoption of conservation approaches.
4. **Discuss** how the above will effect your PBL-1 design.

### 1. Conservation approaches

- A. Metering
- B. Pricing
- C. Tariff structures

Total charges and prices as a function of water volume consumed for common rate structures are shown in Figures 1 to 4.

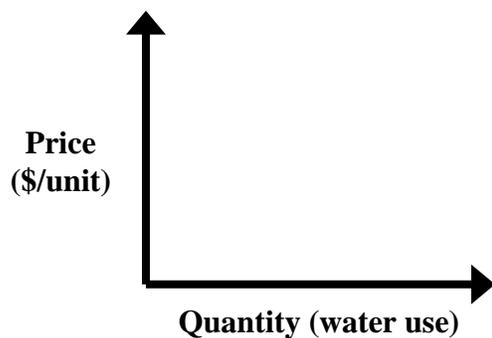
Rate structures differ by utility (Table 1).

**EXAMPLE 1:** What tariff structures were in place in Phoenix, AZ in 1907?

The city charged:

- \$1.50/month for domestic water supply to dwelling houses,
- \$1.50/month for barber shops with one sink and chair; \$0.50/month for each additional chair
- \$2.50/month for saloons (bars).

Price elasticity of demand (Economist's plot of water demand):



**Elasticity** = unitless = change in quantity associated with a 1% change in price.

**Inelastic:**

**Elastic:**

D. Technological change – indoor and outdoor retrofits

For which conservation approaches can we apply this and last week's demand forecasting methods to estimate water savings?

E. Educational Campaigns

How do cities and water utilities try to educate customers?

How were the effects of educational campaigns measured?

F. Operation and maintenance

- a. Pressure regulation (reduce leakage)
- b. Fix leaks
- c. System (re)-design – gravity fed, low pressure, etc.
- d. Optimize flows

G. Regulations and legislation

- a. Plumbing codes
- b. Water appliance standards
- c. Water use restrictions (uses, time-of day, day of the week, etc.)

**2. Factors influencing effectiveness and adoption**

A. Many of the demographic, income, technological, climate and other variables we already discussed.

B. Offsetting behavior. What is this?

C. Cumulative effects of

D. Willingness to adopt conservation actions

**3. Discussing these effects in PBL-1**

- What tariff structure does your PBL-1 client face?
- What conservation actions are you considering?
- What type of approach (metering, pricing, technology change, etc. from Section 1) is each action?
- What factors will influence the accuracy of your water and cost savings estimates? From where do uncertainties in your estimates stem?
- What factors/uncertainties should your client care about?