Comparing Price and Non-price Approaches to Urban Water Conservation

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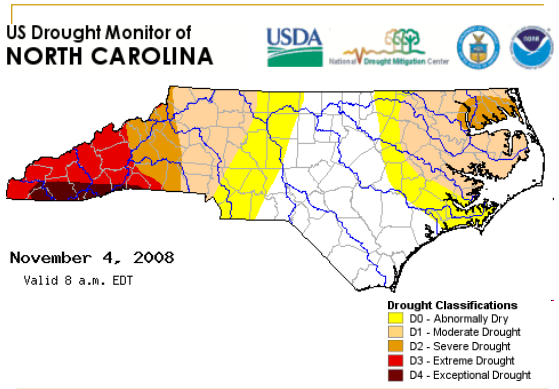
Outline for today's presentation

- Scarce water and the market
- Comparing price and non-price approaches to conservation:
  - Cost-effectiveness
  - Predictability
  - Equity considerations
  - Monitoring and enforcement
  - Political considerations
- Clearing up some common misconceptions

Scarce resources and the market

- In North Carolina and elsewhere, there are competing demands for water and a limited supply.

Scarce resources and the market



Scarce resources and the market

- In North Carolina and elsewhere, there are competing demands for water and a limited supply.
- During periods of scarcity, how should water resources be allocated?

- *"…Many residents continue to heed the governor's calls for water conservation. More than 3.14 million people, or 73 percent of the people who receive water from systems the state tracks, must adhere to voluntary or mandatory water use restrictions."*

State of North Carolina, Office of the Governor
Press release, 10 November 2008

Scarce resources and the market

- In North Carolina and elsewhere, there are competing demands for water and a limited supply.
- During periods of scarcity, how should water resources be allocated?
- Other scarce resources are allocated by markets, in which prices transmit information about a good's scarcity, and other aspects of its value.
- But for many reasons, the development of unregulated water markets is neither likely nor desirable.

Why water is a "special" commodity

- Mobility
- Bulkiness
- Economies of scale
- Solvent properties (ability to assimilate wastes)
- Variability in supply
- Sequential use
- Complementarity
- Social and cultural values

Public aspects of water resource management

- Regulation (water pollution control, legal enforcement of water rights, water pricing)
- Public infrastructure investment (flood control, irrigation, hydroelectric power)
- Public ownership and operation (municipal water treatment, distribution)

Water pricing then and now…

- "Nothing is more useful than water, but it will purchase scarce anything; scarce anything can be had in exchange for it."
  - Adam Smith, *The Wealth of Nations*, 1776
- "Two hundred years later, I can refill an eight-ounce glass with tap water 2,500 times for less than the cost of a can of soda."
  - Robert Stavins, *The New York Times*, 1999

Water demand and prices

- On average, a 10% increase in the price of water reduces residential demand by 3 to 4% in U.S. cities (in the short run).
- The sensitivity of residential water demand to price increases is similar to that of residential electricity demand.
- On average, the response of water demand to price increases is stronger under higher prices.

Water Demand and Non-price Conservation Policies

- Many non-price conservation policies do reduce water demand, though effectiveness varies.
- More stringent, mandatory policies (when well-enforced) tend to have stronger effects than voluntary policies and education.
- Water savings from policies that promote water-conserving fixtures may be smaller than expected, due to behavioral responses.

Comparing price and non-price conservation policies

- Cost-effectiveness
  - Ability to minimize the costs of reaching a water conservation target.
- Predictability
- Equity considerations
- Monitoring and enforcement
- Political considerations

Cost-effectiveness

- Strong economic evidence that "market-based" environmental policies are more cost-effective than prescriptive approaches.
  - Market-based approaches encourage conservation through market signals (like prices)
  - Prescriptive approaches enforce explicit directives regarding abatement levels or methods.

Cost effectiveness: empirical evidence

- Prices relative to technology standards
  - A modest water price increase is more cost-effective than low-flow toilet requirements using data from 13 California cities (Timmins 2003).
- Prices relative to rationing water consumption
  - For 11 cities in the U.S. and Canada, a "drought price" would result in economic savings of about $81/household, relative to a 2-day/week outdoor watering restriction. (Mansur and Olmstead 2008).
  - Mandatory water restrictions 2004-05 in Sydney, Australia resulted in economic losses of about $150/household (Grafton and Ward 2008).
  - Sprinkling restrictions in Perth, Australia have economic costs of $100/ household per irrigation season (Brennan et al. 2007).

Predictability in achieving conservation goals

- A price elasticity estimate for a particular service area provides a good measure of expected effects of a price increase.
- Statistical evaluation of water savings attributable to a non-price conservation policy provides a good measure of expected effects of a similar policy.
- In the absence of statistical analysis, neither policy has an advantage over the other in terms of predictability.

Monitoring and enforcement

- Non-price policies require significant monitoring and enforcement to achieve full compliance.
  - In a study of 85 California utilities during the 1990s drought:
    - More than ½ of customers violated quantity-of-use restrictions
    - Compliance with type-of-use restrictions was also low.
- Non-compliance in the context of pricing requires that households consume water "off-meter", much more difficult to achieve.

Equity and distributional issues

- With price increases, low-income households tend to contribute a greater share of aggregate water demand reductions than they do under non-price policies.
- This does NOT mean that price-based approaches are regressive in *income;* progressive price-based approaches can be designed.
- The impact of non-price programs on distributional equity depends on how non-price programs are financed.

Political considerations

- Raising water prices (like the elimination of any subsidy) can be politically difficult.
- But once the real economic costs of policies are considered, non-price conservation policies are actually more costly.
- Does the prevalence of non-price conservation policies demonstrate:
  - Failure to demonstrate the full costs of non-price approaches?
  - Traditional interest-group politics?
  - Constraints faced by water suppliers in the ability to raise water prices?

Political considerations, cont.

- Non-price policies also create political liabilities in the form of water utility budget deficits.
  - Non-price demand management policies increase total utility costs, and decrease total revenue (if demand reductions ensue).
    - Price increases may be needed following "successful" conservation programs.
  - At current estimates of price elasticity, utilities that increase water prices will *increase* total revenue.

Common misconception #1

- Water prices are low, thus price cannot be used to reduce demand.
  - The 300+ published estimates of the sensitivity of water demand to prices are based on 50 years of low water prices.
  - Water demand is "inelastic" (a 1% increase in price causes a <1% decrease in demand); NOT unresponsive to price.

Common misconception #2

- Water customers are unaware of prices, thus price cannot be used to reduce demand.
  - Consumers studied over the past 50 years act "as if" they are aware of water prices.
  - The 300+ published price elasticity estimates are based on consumers billed monthly, quarterly, and even less frequently.
  - Providing more information about prices and demand may boost the impact of price increases.

Common misconception #3

- Increasing-block pricing provides an incentive for water conservation
  - *High prices* provide an incentive for water conservation.
    - A study of 85 MA communities suggests that IBPs, *per se*, have no impact on demand, controlling for price levels.
    - If the only way to increase price is to increase the price on some fraction of consumption, this is better than nothing.

Common misconception #4

- Where water price increases are implemented, water demand will always fall.
  - Price elasticity estimates measure the reduction in demand for a 1% price increase, *all else held constant*.
  - Population growth, changes in weather or climate, income increases, etc. can increase demand.
  - If a price increase is followed by an increase in demand, these other factors are at work (and the price increase has reduced the rate of growth in demand).

Implications of inefficiently low water prices

- Short run
  - Consumers use too much water – more than efficient amounts.
  - Water conservation takes place only under "moral suasion or direct regulation."
- Long run
  - Inefficient prices alter land-use patterns, industrial location decisions, household landscaping and appliance choices.

A recommendation

- When possible, apply benefit-cost analysis to water conservation policies.
  - Specific non-price conservation policies can only be compared to price increases if we have a measure of the benefits of non-price conservation policies.
    - Costs of non-price policies often calculated.
    - Costs and benefits of price increases often calculated.
    - Benefits of non-price policies are less well-understood.