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Water Conservation Program Planning: Will Customers Pay More for Less?

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The Dilemma of Conservation Programs

- Water utilities and municipal planning agencies face a dilemma in encouraging water conservation
  - By selling less water, agencies have to raise rates to cover their costs
  - Customers are essentially being asked to ***pay more for less*** water
  - The revenue or commodity-basis for the sale of water is insufficient to meet the operational costs of delivering less water, as required by water conservation planning and drought conditions

Demand Management Programs

- Current response of agencies/municipalities to the need for increased demand management (water conservation):
  - Increase measurement of consumption:
    - “Unaccounted for water”
    - Unit demand accounting
    - Baseline demand analysis
    - Population & land use basis for future water demands
  - Outreach to increase customer awareness
  - Develop/implement a suite of water conservation Best Management Practices (BMPs)
  - Deploy education/outreach/improved technologies
  - Deploy financial incentives
  - Deploy financial penalties

Drought Response Programs

- Drought also sells less for more
- Current response of agencies/municipalities to accommodate effects of drought:
  - Analysis of water supply reliability is increasingly becoming a part of utility planning
  - Identification of drought conditions stimulates a predetermined “staged” program generally moving from voluntary to mandatory restrictions on water use
  - Agencies must determine their appropriate level of need & investment for:
    - Drought response planning (typical)
    - Drought prediction & prevention (more costly & less common)

Drought Response Programs

- True drought planning requires a broadly-based monitoring and forecasting system with coordination among agencies across a broad geography
- However, current drought response generally results in delivering less water at higher costs
- Priorities of use are established and cut-backs implemented sequentially
- Financial penalties are generally imposed to modify water use behavior

Current State of Water Conservation Programs

- Current state-of-the-art of conservation uses the following:
  - Behavior modification: Through education and/or punitive rates
  - Technology advantages: More intelligent / efficient /effective equipment that uses water more sparingly
  - Attention to maintenance: To find unaccounted for water and system leaks and make repairs
  - Supply substitution: To develop alternative supplies for non-potable use as a substitute for the use of potable water.

Current State of Water Conservation Programs (Continued)

- While many customers throughout the arid west and other areas suffering water shortage appreciate the requirements for water conservation, their individual preferences, and therefore daily actions, may not lead to level of conservation desired/required by the agency

- Past studies have shown that water use is inelastic with respect to price

- Clearly the customer must be considered more directly in terms of their Willingness-to-Pay for water conservation and acceptance of different conservation measures.

Improving the Design of Water Conservation Programs

- Agencies and utilities have good information on some aspects of water conservation.
  - Information on the cost of conservation BMPs.
  - Information on the potential savings (performance) of water, given a conservation measure
- Agencies and utilities lack information, however, on what customers want or are willing to pay for water conservation measures
- Stated preference, or customer preference studies, can provide important information to agencies and utilities that can improve the design and effectiveness of conservation programs

CHANGE IS REQUIRED TO ACHIEVE DURABLE RESULTS

- **Regardless of the motive to manage water demand (conservation or drought) customer behavior "typically" reverts to pre-conservation/drought levels once supply conditions change**
- **Planning horizons for conservation and drought need to be perpetual to be most effective**
- **Therefore, a new way of approaching demand management can be implemented to have durable results to water utilities and municipal planning agencies**
- **This approach should be consistent with the service area customers Willingness-to-Pay and sufficient to meet their capital and operational costs**

Stated Preference Studies

- "A tool used in economics, psychology, and market research to obtain information on the preferences of a population."
- In economic applications, objective is to measure willingness-to-pay (WTP) for a good, a policy, or a program.
  - WTP is equal to the well-being people receive from a good, a policy, or a program.
- Conducted in a survey setting, using standard statistical sampling procedures and best-practice survey methods.
  - Usually conducted using an interviewer-assisted survey format.
  - Requires well developed background information and significant understanding of the range of policies/programs or "good" (conservation) to be conveyed during the survey.

Types of Stated Preference Studies

- Contingent valuation studies assess preferences for a specific change in a good, a policy, or a program
- Attribute-based methods assess preferences for the attributes that comprise a good, a policy, or a program.
  - Based on the hypotheses that the value of a good, a policy, or a program is the sum of the value of its component attributes
- Many researchers currently favor attribute-based methods due to their greater flexibility and ability to assess how attributes can be traded off

Choice Experiments

- An attribute-based method that is often favored because of how it reflects an individual's preference to actually choose between goods, policies, or programs.
- Involves having respondents choose between competing alternatives.
- Each alternative is composed of attributes, that are provided at different levels of service, or levels of performance.
- A price, or payment, attribute is usually included.
- A status quo alternative is also usually included to reflect the respondent's current state of being.

Choice Experiment Results

- Data from choice experiments enables the calculation of the marginal utility of the water conservation attributes.
  - Marginal utility is equivalent to the well-being respondents receive from an attribute.
- The ratio of marginal utilities of attributes is equal to the marginal rate of substitution (MRS) between two attributes.
  - The MRS provides information on how respondents would trade one attribute off to obtain another attribute.

Willingness-to-Pay (WTP)

- The MRS between an attribute and the payment attribute can be used to obtain the marginal WTP of an attribute.
  - Equals the amount of money the respondent would pay to obtain an additional unit of the attribute.
  - Marginal WTP can be used to find the WTP for discrete changes in the service level of attributes.
- The marginal WTP of different attributes can be combined to obtain the total WTP of respondents for a good, a policy or a program.

Example – Improving the Design of Conservation Programs

	Conservation Programs		
Attributes	***Program A***	***Program B***	***Status Quo***
Mandatory frequency of water use restrictions	2 months per year	1 month per year	3 months per year
Indoor water conservation measures	Low flow toilets subsidized by water company	No indoor water conservation Measures	No indoor water conservation measures
Level of mandatory water use restrictions	No outdoor water use permitted	Water use permitted during evening hours	No indoor water conservation Measures
Payment method	Monthly increase to water bills	Annual payment to conservation fund	No additional conservation payment
Change in annual bill	Increase of $30	Increase of $15	No change

How the Results Could be Used

- Obtain the marginal WTP for various water conservation measures.
- Estimate the total service area WTP for water conservation programs consisting of a given set of attributes at given levels of provision.
- Customer profiling – determining the demographics of customers that prefer different water conservation methods.
- Market simulations – forecasting the percentage of customers that would choose different programs, when given a choice among competing options.

How the Results Could be Used (Continued)

- Determine costs/benefits of making changes to an agency's water conservation program based on WTP data.
- Monitor and report on results to fine tune implementation and achievement of water conservation goals.
- Expand the current tool kit for conservation BMPs.
- Obtain customer feedback and overall program performance consistent with agency rate/revenue and budgeting programs.

Example – Market Simulations

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Market share	**39%**	**28%**	**33%**

Conclusions

- Agencies/municipalities are currently focusing on demand management solutions to meet water conservation goals and drought response.
- Customer preferences need to be considered; price signals are not enough.
- Agencies/municipalities currently lack information on customer preferences in regards to conservation measures.
- Stated preference methods offer a promising approach to obtain information on WTP for, and acceptability of, water conservation measures.
- Choice experiments, a stated preference method, could be applied to obtain information crucial to the mission of water agencies and municipalities.