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## **Demand-Side Management of Urban Water Resources in Salt Lake City, Utah**

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The Utah Intermountain Wasatch Front is naturally arid and has experienced periodic drought throughout its history. Because of an ever-growing urban population many policymakers question the long term availability of water resources to meet future needs. The state has only recently experimented with demand side management policies. Many across the world have already studied the effects of similar policy changes, but results of these studies are disparate (Renwick and Archibald 1998).

In Utah, Salt Lake City has begun to recognize the need for increased conservation. In its 2002 Summer Water Management Plan, the city mentions the need for a “more aggressive water rate structure,” but thus far has not drastically changed pricing (SLC DPU). Politically, attempts to change pricing structures are met with hostility from all users, both residential and agricultural<sup>1</sup>.

Elsewhere, alternative demand side management policies have been developed where price increases seem politically infeasible. Salt Lake City has started some of these programs to encourage conservation. It participated in the 2001 statewide public

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<sup>1</sup> The Desert Morning News exemplifies this in “Saving Water Costs Money,” Aug. 28,2003.

water conservation campaign known as “Slow the flow, Save H2O.” This campaign included mailings, television and radio ads, and a webpage. The Utah Division of Water Resources asserts that water use decreased “in every water district studied, a probable result of the campaign (2002).” The city augmented this program with myriad city-wide programs attempting to achieve even larger conservation.

This study will independently assess the efficacy of the city and state’s public information campaign on Salt Lake City. We then offer other alternatives for water conservation and delivery management based on econometric estimates of price elasticity and the influence of other household and property attributes which can be influenced by policy changes and/or market forces. It is generally assumed that demand for water is relatively price inelastic, but conclusions about the elasticity of water demand are highly divergent among cases, and must be analyzed case-by-case (Brookshire et al. 2002)<sup>2</sup>. Exact elasticity measures are vital to designing a pricing mechanism to achieve conservation.

These estimates are obtained using a large panel database (large cross-section/short time series) from the entire population of users with a water connection to Salt Lake City. The wealth of data available to the authors provide a unique opportunity to measure use responsiveness to price and non-price policy variables. In addition, the data represent similar conditions along the Wasatch Front where water use concerns are major policy issues.

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<sup>2</sup> Also see Dalhuisen, et al. (2001) for a meta-analysis of price and income elasticities. The authors found 268 estimates of price elasticity in the literature, which vary between -7.5 and 7.9.

We use a simultaneous equations technique to estimate water demand to account for the joint determination of price (including block price differences) and monthly water use, and account for seasonal climate differences within the pricing-use model. Monthly water usage in Salt Lake City from 1999 to 2002 is estimated from marginal price and the Taylor-Nordin difference variable<sup>3</sup>. Household density, lot size, taxable value of dwelling, zoning specification, average maximum daily air temperature, precipitation, envirotranspiration<sup>4</sup>, and soil characteristics enter the model as non-price influences on water use with a subset of these variables being policy instruments.

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<sup>3</sup> The Nordin (1975) -Taylor (1975) specification is used to assess changes in marginal price to account for the effects of intramarginal rates and fixed fees (Nieswiadomy 1992). Renwick and Green imply that marginal price measured at the current consumption block gives an implicit income tax for a decreasing block rate structure, as in our model (2000). The difference variable takes into account what consumption would have been if the marginal price was charged throughout the billing period. See Renwick and Green, footnote 11 for further clarification.

<sup>4</sup> We use the Blaney-Criddle technique because of the arid characteristics of the Salt Lake Valley.

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