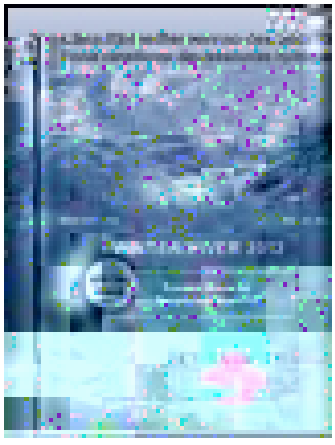

Canadian Water Resources Journal / Revue canadienne des ressources hydriques

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tcwr20

Using demand elasticity as an alternative approach to modelling future community water demand under a conservation-oriented pricing system: An exploratory investigation

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Published online: 26 Jan 2015.

To cite this article: Steven Renzetti, Oliver M. Brandes, Diane P. Dupont, Theresa MacIntyre-Morris & Kirk Stinchcombe (2015): Using demand elasticity as an alternative approach to modelling future community water demand under a conservation-oriented pricing system: An exploratory investigation, Canadian Water Resources Journal / Revue canadienne des ressources hydriques, DOI: 10.1080/07011784.2014.985508

To link to this article: http://dx.doi.org/10.1080/07011784.2014.985508

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D E , B U , S . C , C ; POLIS W S P , C G
S , U V , V , C ; D E , B U , S . C , C ; T
R M Y , N , C ; E , V , C

Water managers lack practical and readily available tools to inform them about what impact price changes (or changes in other drivers of water use) will have on demand – and therefore revenue – over both the short and long term. This paper examines how the concept of demand elasticity can be used to model changes in annual aggregate water use in response to future changes in major demand drivers including water and electricity prices, average income, population, level of business activity and climate. It does so by describing a pilot investigation completed in York Region in Southern Ontario, where a range of assumptions about price elasticities were used to calculate the rate of growth for water demand over a 40-year period. This investigation was deliberately exploratory and the fi

future changes in major drivers including water and electricity prices, average income, population, level of business activity and climate. It does so by describing a preliminary investigation completed in York Region in Southern Ontario, where a range of assumptions about price elasticities were employed to calculate the rate of growth for consumption over a 40-year period.

If the role played by specific drivers of water use, such as price, can be better understood, then managers in local governments and utilities will be in a better position to advise on potential measures, policies and programs to promote efficiency and conservation. Importantly for this research, we also suggest that scenario building based on demand elasticity also offers a novel and simple way to contemplate future community demand, offering a complement, if not a substitute, to the more labour- and data-intensive forecasting methods already available.

The article has four main parts. First, it provides background including discussion of some of the current forecasting methods in use and some of the challenges with them. This section also discusses the concept of demand elasticity and proposes that using this might provide an alternative approach. Finally, background on the York Region case study context is provided. Second, it sets out the methodology. Third, it provides results. Finally, the last section discusses both the potential and the limitations of this method for the future, opportunities for additional research and insights into the implications for conservation-oriented water pricing.

B

Forecasting future water demand

Water managers and practitioners forecast water use for three main reasons:

(1) Strategic forecast: this is the forecast with the longest and broadest perspective. Importantly, this level of forecast can investigate the impacts of structural and technological changes to the economy as well as the impacts of major policy changes. This is the level at which forecasting is completed in the analysis in this paper.
(2) Investment or tactical forecast: this is a more detailed appraisal usually divided by user group and used for medium-term investment decisions.
(3) Operational forecast: this is a very short-term and detailed analysis of alternate facets of water demands that is typically -455e

governments at the retail level. However, over the past several decades, while residential water prices appear to have just kept up with inflation, non-residential prices appear to have actually fallen in real terms. When the effects of inflation have been netted out of price changes, the rate of growth in non-residential prices is actually

The next step involved gathering the best available data on how drivers of water demand may change in the future. This required surveying the economic research literature to find values (or ranges of values) for the demand elasticities for each of the drivers (income, cli-

While the number of scenarios that could be modeled with this approach is virtually limitless, the description is limited to the results of four different scenarios below. Not surprisingly, the results for community water consumption vary greatly depending on the inputs.

Scenario #1: No real price increase (NP)

This simple demand model bases its projection only on growth in demand drivers that are outside of the control of governments in York Region. Thus, it is assumed that growth in residential water use is driven only by changes in population, income and climate. Growth in non-residential water use is driven only by the level of commercial activity. All prices are assumed constant in real terms, and thus do not influence water use. The NP results are broadly similar to the projection from the ARIMA statistical model, at least in order of magnitude (noting again that our projections contain both residential

Electricity prices are assumed to rise at the previously assumed slower rates found in the BAC projection. Assuming all demand drivers except the prices of water follow BAC trends, and that residential and non-residential prices of water follow an aggressive growth rate, comes close to eliminating projected water demand growth in York Region, despite population increase. The percentage change in total water demand over the period is projected to be 6.0% over the next 40 years, assuming medium elasticity values for all parameters. Including the effects of compounding, this involves a significant increase in average water price at the end of the period, so this scenario should probably be considered an illustrative outer “goalpost”

demand. The findings should not be taken as conclusive. Further investigation using appropriate locally sensitive data to develop a clear local price elasticity of demand would be required to forecast the impact that price changes have with greater accuracy.

This investigation was deliberately exploratory, and the findings should be considered indicative and preliminary only. However, the analysis does indicate a practical path towards new tools that can help communities make the transition to a conservation-oriented water pricing model.

A

The authors wish to acknowledge the editorial and technical assistance of Laura Brandes, Communications Director for the POLIS Water Sustainability Project. We also acknowledge the work of Ms. Yang Tang, a graduate student in the Department of Economics at Brock University under the supervision of Professor Renzetti, who completed economic literature research into values for the demand elasticities.

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