

FLUID WATER INSIGHT

Predicting a community's reaction to water pricing, usage restrictions, new policies and the like has become a whole lot easier thanks to SimuAlt. By Richard Collins.



Model behaviour: SimuAlt provides a dynamic insight into household water use.

How will people respond to changes in water pricing? What impact will the lifting of restrictions have on demand? What's the best way to communicate conservation? The questions relate to some of the key levers in the policy toolkit, yet the answers are mostly based on best guesses and simplified data models – until now.

Adelaide-based Intelligent Software Development (ISD) has developed a consumer modelling and forecasting tool based on "cutting edge defence technology" that promises greater complexity of insight and accuracy of findings.

SimuAlt has been used to predict consumer behaviour in Ballarat, with validation showing greater than 95 per cent accuracy and tracking of complex trends over eight years.

It was used create a highly detailed micro-simulation of more than 40,000 households, simulating their water use behaviour and reactions to water restrictions, price increases and marketing campaigns.

The model forecast that bounce-back (reversion) of water demand in the region as restrictions ease will be gradual and to lower than pre-drought levels. Consumer water behaviours were likely to be maintained given the long period in which restrictions have been imposed.

Forecasts also showed water consumption in Ballarat was relatively insensitive to a 20 per cent price increase, again due to a high level of persistent behaviour change in the community. That suggests there is limited opportunity for residents to further reduce water consumption.

ISD director Don Perugini told the Water Efficiency Conference in March "that traditional economic analyses of the effect of price increases were unable to

model critical behavioural components that SimuAlt showed significantly affected bounce-back in demand, and were thus unable to accurately predict consumption in this human-centric system".

It uses qualitative and quantitative data, including market research data, end-use studies, demographic data and economic and statistical data, to inform "agent-based modelling", which tries to understand the existing rules that govern human behaviour and then forecasts the *emergent* behaviour of large numbers of individual consumers.

Each agent represents a particular type of consumer, with their characteristics and preferences constructed by integrat-

ing different types of data to describe how they make decisions under different circumstances.

"The SimuAlt demand model is able to consider both qualitative and quantitative factors that influence consumer decision-making, including social, economic, environmental and political factors," Perugini said.

Combined with demographic data and population dynamics, users can test scenarios to

predict the likely impacts of new policies, pricing structures or products on their community.

Decisive micro-simulation

Drought has seen the imposition of severe water restrictions in the Victorian regional centre of Ballarat over many years. Central Highlands Water (CHW) wanted to understand the likely impacts of easing those restrictions and increasing the water

price, as well as quantify the effectiveness of past efforts such as the Project Aquarius retrofit program and Target 150 scheme.

SimuAlt modelled how 40,000 CHW residential customers made water use decisions in the house and garden and how those decisions were influenced by different policies and communication signals.

The model detailed each household area, such as the toilet and laundry, the composition of water-related products and water use behaviours, outdoor water usage and behaviours, and the change in product composition and community behaviours over time in response to demand management programs.

It also considered the influences that may be used to drive behaviour change and alter consumer decisions for usage and product acquisition. Generically, these influences can be categorised as constraints (water restrictions), barriers (financial and other measures including prices, and rebates), obligation (personal and social) and feedback on behaviours (monthly statements and smart meters).

"How influences ultimately result in behaviour change depends on messages received, as well as motivation and actions of individuals," said Perugini.

For CHW, it forecast demand in three future scenarios in Ballarat out to 2018 – wet, normal (baseline) and dry conditions – and associated levels of drought restrictions, increases in water storages and social influences. The impact of a 20 per cent price rise was also investigated.

The Victorian water industry is currently investigating the roll-out of SimuAlt for other water corporations in the state.



Traditional economic analyses of the effect of price increases were unable to model critical behavioural components

– Don Perugini, ISD