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Targets, real-time feedback can cut water use in the shower

Sumit Agarwal and Sing Tien Foo

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Water is an important and scarce resource in Singapore. One of the key strategic thrusts in its water supply blueprint is long-term self-sustainability.

Singapore has developed a water supply system using the Four National Taps – local catchment areas, imported water, reclaimed water and desalinated water – to satisfy long-term needs.

And, for the first time in 17 years, the Government is looking to increase water prices to cover the cost of maintaining and upgrading water supply infrastructure.

Besides securing an adequate water supply and raising prices, water demand needs to be managed. Singaporeans have to learn to conserve water.

The national objective to reduce the per capita water consumption to 140 litres a day by 2030 is on the right track, as consumption has been declining from 165 litres a day in 2003 to 151 litres currently.

To help achieve this goal, the National University of Singapore Business School and Department of Real Estate collaborated with PUB to lead an international research team to study how to cut households' water use for showers.

In Singapore, showering accounts for almost 30 per cent of an average family's monthly water consumption.

If households can change their behaviour during showers, that can yield substantial savings.

One way to change behaviour is to furnish real-time feedback to users during showers on how well they are conserving water. In Switzerland, an experiment involving households fitted with smart shower devices that can provide real-time feedback on water temperature, volume used and how well water consumption goals have been met led to a 22 per cent reduction in water usage. The savings amounted to 484 kWh of energy and more than 8,500 litres of water a year for a two-person household.

We wanted to find out if such intervention would be effective in Singapore. Some 500 households in HDB flats participated in our study over a period of four to six months. Each household was fitted with smart shower devices where data regarding water consumption can be recorded automatically, giving us data for more than 300,000 showers.

For the first 20 showers, the only information all households received was water temperature. This is to help us measure what is their a priori water consumption.

After 20 showers, households were randomly divided into groups with different water conservation targets and feedback regarding the volume used. They were given water conservation targets of 10, 15, 20, 25 or 35 litres.

These targets correspond to ambitious, moderate and easy goals. For households with targets set, they were encouraged to try keeping their water consumption below it. During showers, besides showing volume used, the smart meter also gave feedback on how they were performing with monitor displays of "Very Good", "OK" or "Too Much" to let them know how well they had met the targets.

Another group of households received only water temperature information with no target or feedback. Another group received real-time feedback on water volume when showering with no feedback on how well they were conserving water.

Our results show that for the first 20 showers prior to providing feedback, Singaporeans use almost 20 litres of water in a single shower that takes about five minutes. This is the average amount of water used per shower.

However, when there is feedback given regarding water usage, we find that water consumption goes down by about 10 per cent per shower, saving two litres daily.

But this saving varies by the targets set. Those who received target and volume feedback reduce their consumption the most. The most effective is when a moderate volume target is set. This is the 15-litre target where 3.9 litres less water was used on average during a shower, giving a saving of about 19 per cent. The ambitious target of 10 litres was also effective, though to a lesser degree, with 2.9 litres of water saved on average during a shower.

Our study concludes that getting households to set targets and giving them feedback on their performance not only promote awareness of the need for water conservation but also result in them using less water.

With appropriate targets and feedback, Singaporean households can be persuaded to be more water efficient. Their behaviour can be modified within a short span of time, and hopefully, over time, attitudes towards water conservation will also change in the direction of a more sustainable lifestyle.

Just as in the case of individuals where goal setting and feedback are keys to performance, households behave similarly even in the often thought ill-disciplined area of water conservation.

Households are also like individuals in that the targets set must be within reach to motivate households to strive hard to attain them. When a target is too ambitious (below 10 litres) or too easily attainable (above 30 litres), it becomes less effective in encouraging households to save water.

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Last August, the monthly utility statement that households receive showed how they performed on two distinct types of utilities – water and electricity – relative to the neighbourhood and national averages. Such feedback, though not in real time, has a social comparison dimension that may encourage water conservation practices.

Additionally, the statement provides feedback such as "Well done. You have consumed less in all your utilities in the recent two months as compared to the previous two months", much like what was furnished in our study.

Real-time feedback is ideal as we've shown in our study. While this may not be feasible for the time being because of infrastructural issues, we can imagine a system where, one day, households can link their spike in water consumption to specific activities such as car washing and, accordingly, make conscious efforts to reduce the frequency or modify the way in which such water-consuming activities are carried out. This will require investment in infrastructure.

Our utilities board will need to weigh the long-run savings against immediate costs. Not all considerations lend themselves to being monetised. But can and should we place a dollar value on saving the earth?

stopinion@sph.com.sg

• Sumit Agarwal is visiting professor at National University of Singapore (NUS) Business School and Sing Tien Foo is Dean's Chair Associate Professor at the Department of Real Estate. This research was conducted together with Davin Wang from NUS, Lorenz Goette from University of Bonn, Thorsten Staake from University of Bamberg and Verena Tiefenback from Swiss Federal Institute of Technology.