Being waterwise in spaceship suburbia

Imagine an urban development in which every house has a rainwater tank, a composting toilet and a garden sprinkler connected to a local wastewater treatment plant. Such waterwise developments may be the way of the future if various barriers to implementation can be overcome.

'When we send people into space, they handle their water system entirely in the tin can they're floating around in,' says urban hydrologist Dr Grace Mitchell of CSIRO Manufacturing and Infrastructure Technology.

'While space is not exactly Planet Earth, it is technically possible for many non-standard water servicing techniques to be implemented in the suburbs, and we've been looking at ways developers can provide water supply, stormwater and wastewater services in a significantly more sustainable manner.'

For the past 18 months, Mitchell and her colleagues from CSIRO Urban Water and the Brisbane City Council have been assessing four scenarios for the provision of sustainable water services to a 226-hectare mixed residential and industrial greenfield development in Brisbane.

Each scenario was given a rating, measured against a 'base case' or standard development scenario, based on its environmental outcomes, total infrastructure life cycle costs, public acceptance and technical feasibility.

Under the base case scenario, potable water was piped in to meet all water demands, sewage was transported to a regional wastewater treatment plant, and stormwater was discharged to a local watercourse. The total infrastructure cost (capital, operating and maintenance) for a year was calculated to be $11 000 a hectare for the residential section of the development, and $8300 a hectare for the industrial section.

The other three scenarios aimed to save water, to varying degrees.

For example, the 'moderate' scenario investigated the impact of using rainwater tanks and a local stormwater store as a supplementary source of water, while still connected to the main water supply.

The 'innovative' scenario incorporated these principles, but included the construction of a local wastewater treatment plant that also provided recycled water to the site.

One step beyond this, the 'major change' scenario included not connecting the site to the water mains and sewer system, as well as the addition of composting toilets.

The study found that the 'major change' scenario achieved the best environmental outcomes. However the annualised infrastructure costs for such a system was higher than for any other.

'The increased cost decreases the present marketability of the residential and industrial allotments, so from a developers point of view, this scenario fails to provide a widely marketable product,' Mitchell says.

Under the 'innovative' scenario, however, the amount of potable water piped to the site was reduced by 80%, and the amount of wastewater and stormwater leaving the site by 28% and 27% respectively.

Mitchell says these environmental benefits could be achieved at an additional annualised infrastructure cost of $1050 per gross hectare of residential development and $2350 per gross hectare of light industry.

Market analysis undertaken for the council has shown that many alternative water-saving measures are acceptable to the public. But cost is still a major disincentive to a blanket uptake.

In addition, issues of reliability of water supply, public health, the fire-fighting capabilities of the system, and questions about where the responsibility for infrastructure maintenance should lie, still need to be addressed.

Despite these barriers, the technical aspects of installing more water efficient developments are feasible.

'We haven't suggested any technologies that aren't freely available. All we're doing is being smart about how we use the current technology, to get the best sustainable outcome and cost,' Mitchell says.

The insights gained from this study are enabling Mitchell and her colleagues to put together a refined development scenario for the case study site that better balances environmental impact, infrastructure costs and market acceptability.

'We are anticipating that the refined scenario will be acceptable, able to be implemented and once externalities are accounted for, cost competitive with traditional practice,' Mitchell says.

'There are trade-offs between minimising environmental impact and costs, and providing a development that is widely acceptable to all parties involved. But the way forward is through making incremental changes and continuously striving to improve the water we provide through urban water services.'

Contact: Grace Mitchell, (03) 9252 6125, email: grace.mitchell@csiro.au.

Wendy Pyper