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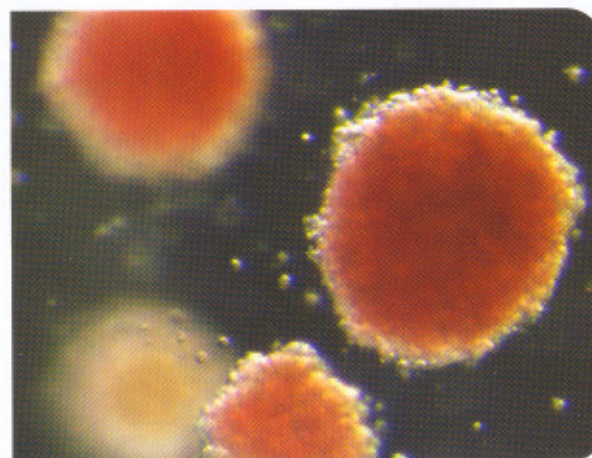




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# Sustaining the suburbs

Australian scientists are pioneering an innovative approach to city planning – entire suburbs that save energy and slash thousands of tonnes of greenhouse emissions through better layout.

On a per capita basis, Australia's consumption of energy, water and space (floor space, private space and open space) ranks among the highest in the world. What's more, the trend appears unlikely to be curbed any time soon.

According to Professor Keith Hampson, Chief Executive Officer of the Cooperative Research Centre (CRC) for Construction Innovation, this has resulted in a pattern of urban sprawl. "Development needs to be more sustainable to avoid unnecessary demand on natural resources," Professor Hampson explains. "Solutions available right now at negligible cost include energy-efficient housing design that reduces the need for heating and cooling systems, and the use of energy-efficient lighting and appliances."

## >> Sustainable subdivisions

The CRC for Construction Innovation is a national research, development and implementation centre focused on the needs of the Australian property, construction and facility management sectors. Established in 2001, it is backed by the most significant commitment ever made to construction research in Australia – a seven year A\$14 million Commonwealth grant and A\$50 million in industry, research and other government funding.

This commitment is channelled into three major industry research programs: Business and Industry Development; Delivery and Management of Built Assets; and Energy Efficient Design in Sustainable Built Assets. As part of this final initiative, CRC and CSIRO scientists are pioneering an international advance in city planning: known as 'Sustainable Subdivisions – Energy Efficient Design', the project creates entire suburbs that

save energy and slash thousands of tonnes of greenhouse emissions through better layout.

While passive solar homes are popular among new homeowners anxious to save money and contribute to a more sustainable environment, their best intentions can be defeated by poor suburb design, says Sustainable Subdivisions project leader Michael Ambrose.

"New building regulations are driving builders and home buyers towards more energy-efficient homes, but we've found that a poorly laid-out urban subdivision can counteract their best intentions, or cost them a lot more to achieve the desired energy efficiency," Ambrose explains. "As such, we decided to see what could be done in terms of improving the planning of the entire subdivision, so its blocks have the best orientation and shape for energy-efficient buildings to be erected on them."



### Wasted energy:

Typical Australian subdivision developments are often poorly laid out, costing homeowners a lot more to achieve desired energy efficiency.



The results were astonishing: a well-designed suburb can save its residents 20% on their regular power bills and, if they use solar hot water, up to two thirds of their total power bills. The greenhouse emissions of the typical Australian home would also be reduced by 700 kilos a year. With solar hot water, this annual figure increases to two tonnes.

## >> Crowded houses

The problem, says Ambrose, is that suburban development is still driven by a desire for maximum 'yield' from the land, by cramming as many blocks into it as possible – regardless of the costs poor layout can impose on builders, home owners and the environment.

"There's good evidence that by doing this, developers get less money for the land, because the building costs devoted to the achievement of the required energy rating are higher," Ambrose says. "There's a strong message from consumers today that they want to live in energy-efficient homes, and both builders and developers are now starting to catch on."

A well laid-out subdivision – where homes face the right way for passive solar heating and cooling, for solar hot water heaters, for natural light, and to take advantage of local breezes – can collectively save its residents millions of dollars in power bills, and save thousands of tonnes of greenhouse gas emissions through reduced electricity use.

The concept is being trialed on new urban developments at Brookwater and Kelvin Grove in Brisbane, Queensland. If all 8,000 of the new homes planned at Brookwater were in a solar suburb, it would save 16,000 tonnes of greenhouse emissions a year – equal to taking 3,000 cars off the roads, Ambrose says.

"A typical Queensland subdivision can achieve a 3.5 star energy rating for the average home, but one laid out for energy saving can achieve 4 or 4.5 stars per home, simply through better planning."



## >> In hot water

The bugbear is the narrow east-west block. According to Ambrose, even a well-designed energy-saver home may have trouble meeting its ratings requirements on such a plot. It will probably need extra insulation and blinds, more cooling and heating, and use more power for hot water.

"In Queensland and the warmer States, the single biggest consumer of energy in the dwelling is for hot water heating," Ambrose says. "The use of solar hot water systems can shift up to 90% of this energy demand from fossil fuels to renewable energy. Integrating solar hot water into home design from the outset is one way builders and developers can contribute to huge reductions in energy use."

According to Mr Dayan Jayasekera, Project Manager of Springfield Land Corporation, one of the joint-venture (JV) partners in the Brookwater project, "the Brookwater JV is committed to helping builders and purchasers arrive at cost-effective and sustainable solutions, while at the same time taking on the stewardship of looking after the environment for generations to come. Our partnership with the Sustainable Subdivisions project will help us meet that commitment."



**Left:** This 5-star rated GreenSmart home combines energy efficiency, water conservation and natural ventilation in its design, together with sun-shading battens

**Far Left:** The solar hot water system on this Rockhampton 'Research House' satisfies 90% of hot water needs, while the photovoltaic array panels supply almost all power

## >> Cool breeze

Besides solar orientation, the CRC team is exploring the use of suburban layout to take better advantage of cooling breezes in summer. While a great deal of research has investigated the harnessing of wind for power generation, little as yet is known about wind patterns in suburban areas and how they can best be used to reduce the use of air conditioning.

The ventilation project is being undertaken in Queensland's subtropical climate and is headed by CRC Construction Innovation and CSIRO researcher Anne Miller. According to Miller, the pattern of energy use in the average Queensland home is quite different to the rest of Australia.

"The single biggest consumer of energy in the average Queensland household is hot water heating, which accounts for some 38% of energy use," she says. "Australia-wide,



**Drink to that:**  
The Rockhampton  
'Research House' is  
also able to capture  
enough rain water  
to meet all its  
water needs



however, space heating and cooling is the main energy consumer in residential dwellings. In contrast, because of its subtropical climate, the average Queensland house uses very little energy to heat or cool spaces."

The average percentage of energy expended on heating and cooling in Queensland is 5%, while for the average Australian dwelling, it is 39%.

However, Anne Miller says the number of air-conditioned homes in Queensland is rapidly increasing. Her research investigates the role natural ventilation plays in cooling residences in sub-

tropical climates and looks at best design practices to capture natural breezes. The research will inform the development of a 'lot rating' methodology for South-East Queensland.

## >> Practical outcomes

According to Professor Hampson, sustainability is at the heart of the future of Australia's property and construction sector.

"This project is the first in a series exploring a broad range of sustainability issues facing new subdivisions," he says. "By working closely with our partners, priorities are determined that enable us to target this research to industry needs. The important practical outcomes generated by the project will be shared with industry through publications and seminars."

*Industry, government and research partners collaborating with CRC Construction Innovation on the 'Sustainable Subdivisions - Energy Efficient Design' project are: Brookwater JV, DEM, Brisbane City Council, Queensland Department of Public Works, Queensland University of Technology and CSIRO.*

*A handbook on sustainable subdivision design for industry has been produced by CRC Construction Innovation.*

**CRC Construction Innovation**

**Website:** [www.construction-innovation.info](http://www.construction-innovation.info)

