



21st century city challenges

Urban sustainability experts believe that formidable challenges and vulnerabilities confront our cities and that there is an urgent need for an Australian sustainability framework capable of being operationalised. Rather than having a dark view of the next decades, however, we could see this as a time of great opportunity and innovation ahead – if we are prepared to embrace it. **Hartley Henderson** reports.

Is the population growth and rate of resource consumption in our cities sustainable? How real is the greenhouse threat, and what are the possible consequences if we ignore it? Could our cities run out of water, become too polluted, or be stretched for environmentally neutral energy resources? And what action should be taken to address these issues?

These are just some of the questions on urban sustainability that are now receiving serious attention from authorities in relevant bodies both within Australia and overseas.

Professor Peter Newton, at Swinburne University's Centre for Regional Development in Melbourne, and Program Director at the CRC for Construction Innovation (formerly Chief Research Scientist of the Urban Systems Program at CSIRO), is author of the *Human Settlements* chapter of the recently released *Australia State of the Environment 2006*,¹ and is currently assembling a book titled *Transitions: Pathways towards Sustainable Urban Development in Australia*. His internationally recognised research on urban systems has given him a broad perspective on what he calls the 'looming vulnerabilities' facing our cities as

Sydney cityscape under the Harbour Bridge, Australia. Felix Alim/Istockphoto

populations grow, resource use increases and the climate warms.

But this perspective also affords him a view of what can be done.

'The looming vulnerabilities for cities include a continuing dependence on depleting sources of fossil fuel, which will have a huge future impact on transport and mobility. Our current water supplies, too, are not sustainable in the context of forecast population, urban development and climate change. Waste generation has been increasing in some states as we lack a more comprehensive cradle-to-cradle perspective in relation to waste management. Pollution halos are also increasingly evident off the coasts and in the airsheds of our major metropolitan areas. Beyond that, we have the not inconsiderable threat of sea level rise to our mostly coastal cities to plan for,' Professor Newton summarises.

'The two leading environmental threats are climate change and resource depletion, with oil as the first major casualty. Resource use is simply not sustainable at

¹ <http://www.environment.gov.au/soe/2006/publications/report/human-settlements.html>

our current rate of consumption and pattern of urban development,' he says.

'Population growth in each of Australia's capital city central business districts continues, but in terms of absolute population growth, this is dwarfed by suburbanisation. Between 1991 and 2001 Australia's five leading capital cities added 76 000 people to their inner cities and 1.24 million to their suburbs (6 per cent versus 94 per cent respectively of total population change).

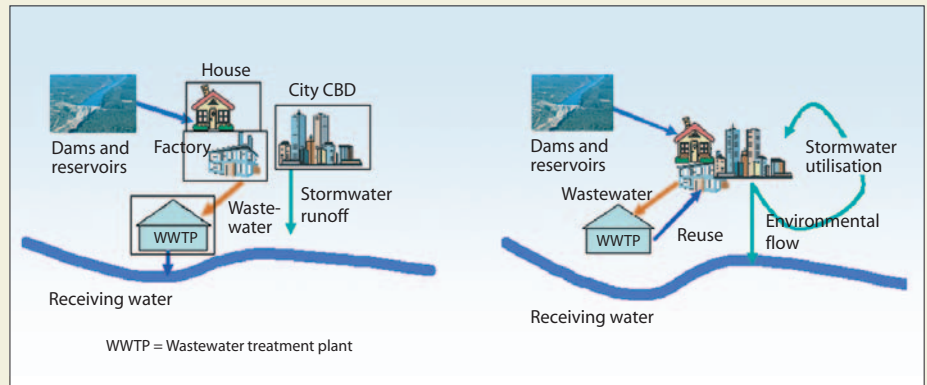
'One of the main reasons for downtown population growth is the increase in supply of apartments due to the boom in high-rise construction,' Newton highlights.

'Australia now imports half of its population growth each year and governments control part of the equation through immigration policy and tourism programs. The way our cities are planned also tends to encourage more, rather than less, consumption. When coupled with high levels of per capita consumption, Australia's total consumption is world leading.

'A sustainable human environment requires greater attention to urban planning and design and a reduction in consumption and waste. There is an urgent need for an integrated and properly coordinated approach to the various challenges we are facing, as well as strong leadership.'



A city tram in Melbourne. Public transport use increases while energy use decreases with denser inner city living. David Freund/stockphoto



Compared to today's water provision infrastructure (left), water engineering in our urban areas will become smarter, more conservative and more distributed (right). Peter Newton/CSIRO

Water resources

His concerns are not new. According to the Water Services Association of Australia (WSAA), although the population of Australian capital cities is projected to increase by 35 per cent by the year 2030, the variability of rainfall and potential climate change impacts are decreasing water yields by up to 25 per cent in some of the water supply catchments serving our cities. That sets up a huge, fundamental challenge.

As WSAA Executive Director Ross Young says, 'Whether the current dry period we are experiencing is due to climate change or just normal climate variability is really an academic question – the real question is how to supply water to our cities when there is reduced flow into our dams.'

'A central requirement is to clearly identify the risks going forward for the water supply industry and to diversify water sources so that our cities are not totally dependent on dams. Options include greater use of ground water, inter-basin transfers, water trading between rural and urban users, recycled water, stormwater and desalination.'

Here, Young concurs with Peter Newton, who has been widely communicating the need for smarter and much more efficient, distributed urban water systems.

'Another major factor that must be taken into account,' Young continues, 'is the interdependence between water and energy. Desalination, wastewater treatment and recycling all require significant inputs of energy.'

'Urban planning can also play an important role in containing total water consumption. There is a trend towards new development in the future being in

established areas rather than greenfield developments on the outskirts of our cities. Apartments and units are becoming more prevalent, resulting in less water being used outdoors.

'Appropriate water policy is required at the national level, and Commonwealth and State governments and the water utilities must work together cooperatively to ensure adequate water supplies for our growing cities,' he says.

CSIRO's Urban Water Research Theme is part of the Water for a Healthy Country National Research Flagship. Theme Leader, Alan Gregory, says that while the concepts of supply diversification and demand management have been actively embraced across Australian cities, the implementation of new water system configurations is generating an array of new research questions.

'Key areas of research include developing technologies for real-time measurement of water end use and water quality; reducing the energy requirements for desalination and recycling; using aquifers to store, treat and recycle stormwater and wastewater; and quantifying the public health and environmental risks of rainwater, stormwater, greywater and indirect potable recycling.

'In addition, we are developing predictive techniques for optimising the management of existing and "integrated" water assets, as well as techniques for mitigating the contamination of surface and groundwater systems.

'Underpinning this is critical research to help water planners and managers understand how the land use and water system choices we make today will influence the future sustainability of our cities in terms of the availability of water, greenhouse emissions, water ecosystem health,

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community acceptance and economic impacts', Gregory says.

Although much remains to be done, many important projects are already underway, particularly in the area of water recycling.

For example, according to the Director of City Projects at Adelaide's Salisbury Council, Colin Pitman, several significant stormwater recycling projects are being developed, including the Parafield and Edinburgh Park stormwater recycling schemes. 'These two schemes combined will replace potable water with 26–30 gegalitres of recycled street stormwater per year. In addition, a unique project has been implemented at Mawson Lakes whereby, in a world first, recycled stormwater is mixed with recycled wastewater to water gardens and flush toilets in homes at the Mawson Lakes housing estate,' Pitman says.

Energy

As emphasised by Peter Newton in the *Australia State of the Environment 2006*, more industries and greater numbers of people are using more energy, but only 6 per cent comes from renewable energy sources.

Transport is the single biggest user of energy, consuming almost 40 per cent of the energy used in Australia. Industry and construction (residential and commercial) are the biggest sector users. Patterns of energy use are also changing. For example, the commercial and residential air conditioning load alone has grown by 20 per cent in just the last five years.

As part of CSIRO's Energy Transformed Flagship program, an Energy Futures Forum (EFF) was established in 2003 to develop an overview of Australia's energy

market, and produce an all-inclusive technology roadmap to transform our approach to energy needs.

Paul Graham, based at the CSIRO Energy Centre in Newcastle, led the Forum, where 19 leading energy companies, unions, government, and social and environmental community groups explored a wide variety of prospective scenarios for the future of energy in Australia. Their research took into account uncertainties regarding possible future Australian responses to key issues such as climate change and energy security. Alternative technologies and policies were evaluated against criteria such as economic viability, physical feasibility, and environmental and social acceptability.

A final report, 'The heat is on: the future of energy in Australia',² was recently released by the EFF. It concludes that 'addressing climate change will require an enormous transformation of infrastructure and society's use and relationship with, not just energy, but a broad range of products and services.'

The report also says that 'all technologies have varying degrees of advantages and disadvantages from economic, social or environmental perspectives.' A greater mix and integration of energy sources is likely in the future. This includes varying contributions from the low cost coal and gas resource base, some hydropower, wind power, solar thermal, solar voltaic, geothermal, harnessing of wave power, and development of hydrogen and biofuels, especially for transport needs.

Transport

Not only do automobiles consume enormous amounts of non-renewable energy,

they are also a huge cause of air pollution and associated health problems in the community.

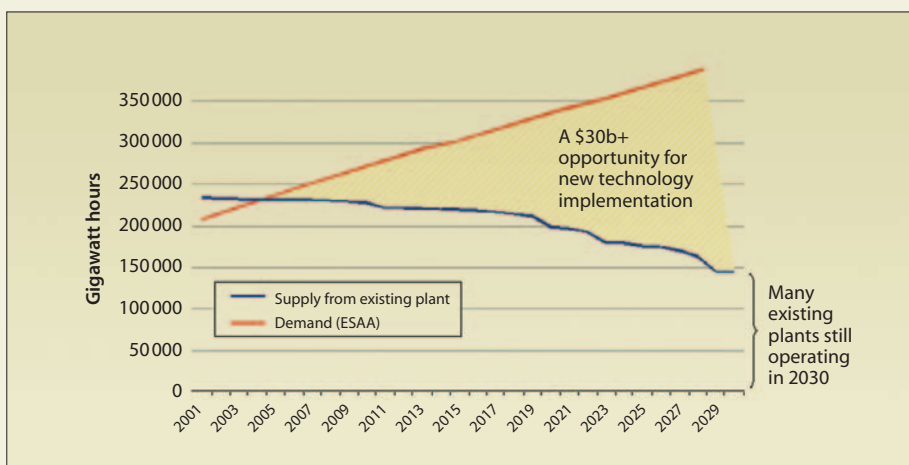
Peter Newton indicates policies are now being designed to minimise the sprawl of outer suburbia and to encourage higher density residential development around key activity centres and routes served by public transport. Despite these, the suburban sprawl of Australia's cities continues, supported by large investments in road infrastructure relative to public transport. Urban land use and transportation are poorly integrated, and the result is continued growth in vehicle kilometres travelled – and, therefore, increased energy use, greenhouse gas emissions and air pollution.

A study led by Professor Newton at CSIRO, in conjunction with the Australian Housing and Urban Research Institute, titled 'Reshaping cities for a more sustainable future',³ suggests several strategies to reduce energy use and greenhouse gas emissions, while improving air quality, involving changes to urban planning strategies and public infrastructure provision. Some of the more prospective scenarios involved an increased focus on development in urban corridors or edge cities supported by upgraded public transport. Other strategies included minimisation of material and energy consumption and emissions in the construction and operation of buildings – these have already begun to be concertedly addressed.

Waste generation

Waste generation and disposal are also key challenges identified by Professor Newton as impacting on the sustainability of our cities. 'Most waste is a potential resource, but across many waste stream categories there remains an attitude of "manufacture – use – dispose", which bypasses the key steps of the waste minimisation hierarchy: waste avoidance, recycling, reprocessing and recovery', he says. 'Total volume of waste disposal to landfill across Australia remains high at approximately one tonne per person per year, but the amount is decreasing in some states.'

'It should be recognised that the amount of solid waste recycled has increased to an average of 36 per cent across Australia, and most states and territories have implemented waste reduction policies that are broadly successful. In the Sydney region for example, of the waste



2005/6 was expected to be a cross-over point in electricity demand and supply for Australia. Peter Newton sees the shortfall as a golden opportunity for innovation. Peter Newton/CSIRO

² <http://www.csiro.au/resources/pfnd.html>

³ Available through <http://www.ahuri.edu.au>

generated from building activity on an annual basis, some 10 million tonnes are now recycled or reused. Product stewardship programs are also being used by industry and governments to bring the key players together to understand and correct market failures in the life cycle of products and materials such as packaging, newsprint, plastic bags, refrigerants, farm chemicals, motor oil and polyvinyl chloride.'

'However, despite such efforts, some 96 per cent of Australia's waste ends up in landfill. In 2006, the Productivity Commission found that waste management policy in Australia needs to be re-focused, and the attitudes of both policy makers and the community need to be guided by rigorous analysis of costs, benefits and risks in order to secure the best returns for the community.'

Professor Neal Menzies, at the University of Queensland and the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment, also believes that much greater emphasis must be placed on turning waste into resources.

'Reusing waste can cost less than disposing to landfill. Landfill costs money, so there is an incentive for companies to look



Transport increases in our cities could pose real problems for livability and health unless broader planning is addressed. Felix Alim/istockphoto

change and the mitigation of emissions.

'A wide variety of potential sustainability measures need further investigation, ranging from strategies such as pricing signals to education and training. We also need to delineate what measures most appropriately belong in the building system and which belong in planning, and

brought together in an integrated way, involving all levels of government.

'This nation has four major asset categories: economic, environmental, social and governance, and sustainability is all about better managing these assets to produce community dividends. A sustainable communities commission needs to be established to develop a national action plan with funds allocated to the states, territories and local government regions,' Verwer suggests.

'Proposals could be put forward to build community capacity to address the priority areas such as water, health and transport. In addition, COAG could establish policy performance targets. The community has a better chance of understanding and supporting public policy if it is presented in terms of targets.'

His view underlines that there is a range of complex, interrelated factors influencing the future sustainability of our cities, and that they need to be addressed in a properly coordinated way if we are to make what Peter Newton refers to as 'the transitions'. Everyone acknowledges these are major step changes that will come at a cost, but what are the alternatives?

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at other ways of dealing with waste. Also, it is becoming harder to dispose of waste due to EPA requirements, which can also mean added costs for companies,' says Menzies.

Developing a challenges framework

As Peter Newton and others have highlighted, a sustainability framework, together with appropriate policies and action plans, is needed to successfully take our cities into the future. Leadership by the current House of Representatives Inquiry into a Sustainability Charter for Australia, expected to be released in the second half of 2007, will be important here.

CEO of the ACT Planning and Land Authority, Neil Savery, believes that initiatives to date are fragmented, and that there is an urgent need for a national urban policy on, for example, climate

ensure that there is a seamless interface between the two,' he says.

'Another concern, at the Council of Australian Governments (COAG) level, is the potentially competing agenda items relating to climate change on the one hand, and the national reform agenda aimed at reducing regulations on the other. Whilst there is enormous potential for a proliferation of regulations aimed at tackling under-performance in design and construction in the built environment, the opportunity exists between a number of responsible bodies at the national level to develop an appropriate suite of measures that improve national consistency whilst limiting duplication.'

According to the CEO of the Property Council of Australia, Peter Verwer, there is a wide range of issues that must be

More information:

'The heat is on: the future of energy in Australia': <http://www.csiro.au/resources/pfnd.html>

Australia State of the Environment 2006: Human Settlements: <http://www.environment.gov.au/soe/2006/publications/report/human-settlements.html>