VERTICAL THINKING: POPULATION GROWTH AND SCHOOLS

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CONTENTS

FACILITY MANAGEMENT

Publisher
JOANNE DAVIES

Associate publisher
LACHLAN OAKLEY

Editor
TIFFANY PACZEK
tiffany.paczek@niche.com.au

Sub editor
MADELEINE SWAIN

Design
KARL DYER

Subscription enquiries
Tel: 1800 804 160
subscriptions@niche.com.au
www.fmmedia.com.au

Facility Management
is a publication of
Niche Media Pty Ltd
ABN 13 064 613 529.
1 Queens Road,
Melbourne, VIC 3004
Tel +613 9948 4900
Fax +613 9948 4999

Chairman
NICHOLAS DOWER

Managing director
PAUL LIDGERWOOD

Commercial director
JOANNE DAVIES

Financial controller
SONIA JURISTA

ABSTRACT

Australia is experiencing a significant spike in the numbers of people who call the ‘lucky country’ home. This is no secret; we see it on news programs, we hear about it in political speeches and we experience it in our everyday lives as we contend for jobs, for renting and buying homes, and for enrolling our children in overcrowded schools. What does this expanding reality mean for Australians, particularly those who reside in the country’s capital cities, and what does it mean for the infrastructure of said cities? A city’s buildings must be able to adequately support its inhabitants in order for its residents to live and work comfortably and for the nation to prosper and, as a result, we are beginning to witness facilities, particularly schools, growing upwards – just like the population figures.

POPULATION GROWTH

The more the merrier?

There can be no denying that Australia's population is rising steadily and quickly. You can experience it in the swelling cities, you can see it in the brimming schools, you can feel it on the crowded footpaths. It is literally all around us.

Those who fostered worries about population stagnancy and subsequent economic fallout in the mid 1990s and early 2000s, which saw the implementation of schemes such as the baby bonus, can now harbour no shadow of a doubt that the number of people calling Australia home is growing – and is more than making up for its lazy lag in those early Millennial years.

Australia is currently experiencing an influx of new residents – whether born into citizenship or emigrating to our girt-by-sea land – at an unprecedented and unforeseen rate. The Australian Bureau of Statistics (ABS) cites that throughout 2017 the country recorded a population increase of 1.6 percent. The preliminary estimated resident population (ERP) for the year ending 31 December 2017 was 24,770,700 – an increase of 388,000 people since the same date a year earlier.

This stems from two forms of growth: natural increase and net overseas migration (NOM).

The preliminary estimate of natural increase for that same year was 147,500 people (or 0.9 percent), while migration was 240,400 people (or 1.4 percent).

The ABS assumes an increase of one new person every 83 seconds (one minute 23 seconds), based on an average of:

one birth every one minute, 42 seconds

one death every three minutes, 16 seconds

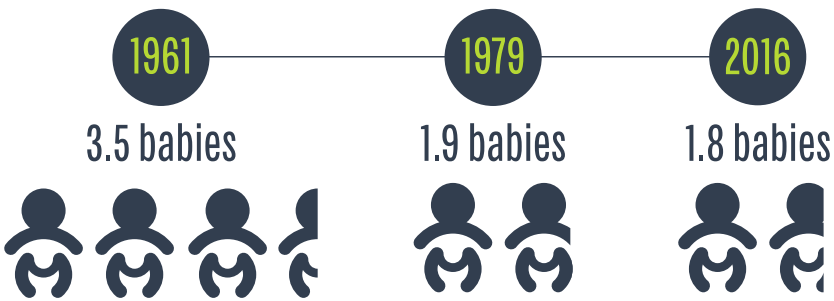
one person arriving to live in Australia every one minute one second.

one Australian resident leaving to live overseas every one minute, 51 seconds.

This figure of a 1.6 percent increase is staggering, particularly when compared to the global population increase of 1.1 percent, as reported by the United Nations. The ABS's 'population clock' projects (at the time of writing) the population of Australia on 3 September 2018 to be 25,027,715 people.

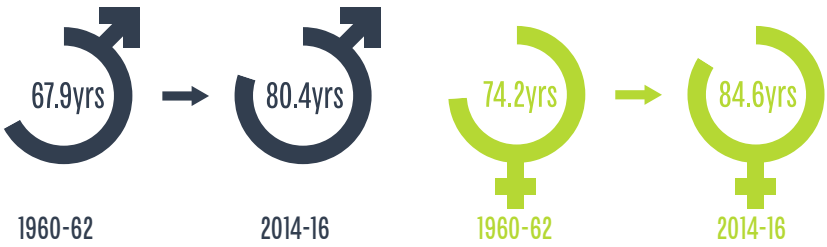
The ABS projects that by 2061 Australia's population could reach up to 48.3 million and in 2101 could reach as high as 70.1 million.

It's been a turbulent time for Australia's childbearing statistics. The nation's total fertility rate (TFR) – the average number of children a woman would bear over her lifetime – has fluctuated, falling sharply from 3.5 in 1961 to 1.9 in 1979. Over the next 20 years it continued to drop at a steady rate, until in 2001 it reached a low of 1.7 babies per woman. That, it seems, was rock bottom and since that time, the TFR began to climb, reaching two children per woman in 2008, although it again dropped slightly to 1.8 in 2016.



Currently, natural increase contributes to 40 percent of the population growth and NOM 60 percent.

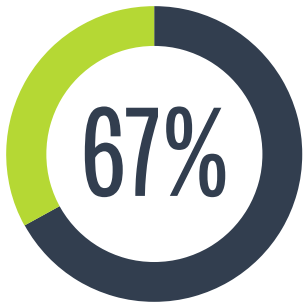
Another contributing factor to Australia's increasing population is that the average life expectancy of said population has increased significantly over the last five decades. In 1960 to 1962 the life expectancy for males was 67.9 years and for females 74.2 years. This has jumped so much that a boy born in the years 2014 to 2016 has a life expectancy of 80.4 years and girl 84.6 years. This puts the combined male and female life expectancy at birth of Australians at 82.5 years – 11.7 years higher than the (latest available) world average of 70.8 years in the period 2010 to 2015.



With its 25 million bodies, Australia places 53rd on the largest population scale, following North Korea and just ahead of the Côte d'Ivoire – a population that accounts for 0.33 percent of the human race. It may not seem like much on a net total global scale, but as Nick Parr, professor of demography at Macquarie University, told *SBS News*, "By world standards, Australia has a relatively rapidly growing population. This is quite unusual for a more developed country."

And it's predicted to rise and continue rising. The ABS projects that by 2061 Australia's population could reach up to 48.3 million and in 2101 could reach as high as 70.1 million (depending on assumptions about future demographic trends relating to fertility, mortality and migration).

According to the ABS, 67 percent of the population are living in one of Australia's capital cities. The populations of Sydney and Melbourne, the country's two largest cities, are increasing at an alarming rate and are currently home to 5.1 million and 4.9 million people, respectively. Victoria's population has the highest growth of all the states and territories, at a rate of 2.7 percent and it's predicted to soon overtake Sydney as Australia's most densely populated city.



of the population are living in one of Australia's capital cities.

INFRASTRUCTURE

Even if you don't build it, they will come

So, with our swelling ranks, what does it mean for the infrastructure of Australian cities and for those living within the ever-expanding city limits? We can already see the effects of this rapid population growth, with still more millions of new Australians to come. Short of buckling infrastructure and claustrophobic city streets, our public transport systems are full to the point of overflowing, our streets are congested bumper-to-bumper with traffic and we are increasingly living on top of each other and calling apartment buildings home. It's a far cry from the lifestyle of just a decade or two ago.

With much of the population growth centred on the eastern states, it creates all kinds of issues that impact people's standard of living. More people means more demand for housing, for accommodating infrastructure, for schools, for transport, for healthcare… The list goes on (and on).

There's a whole host of problems that require consideration and planning when it comes to Australia's population growth. The bare bones of them all is that our cities and city structures are simply not equipped to deal with the huge influx of people in such a short time-frame. And this is very much a problem that needs to be addressed and accommodated for now, in order to create a sustainable future for all Australians. Infrastructure Australia advises that, to prepare for the added 12 million people who will join the country's ranks over the coming 30 years, the nation needs to plan and implement change now

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in order to develop sustainable cities that can and will lead us into the new century, and maintain the city-dwellers' quality of life. In its report 'Future cities: planning for our growing population', Infrastructure Australia provides advice to Australian governments on improving the productivity and liveability of the largest cities as they expand both population wise and geographically.

The paper models long-term growth scenarios for Melbourne and Sydney, and assesses their performance across a range of indicators, including the transport network, access to jobs, access to and demand for social infrastructure, environmental performance and access to and demand for green space.

"Unplanned growth delivers the worst outcomes for Australia's fastest growing cities," the report states. It finds crucial considerations to be:

- public transport and accessibility
- cars, congestion and road networks
- the efficient use of existing infrastructure
- coordination and prioritisation of additional or upgraded infrastructure between and within governments
- job accessibility
- land use and infrastructure planning, and
- green public space and its importance to a city's liveability.

"A central finding of the scenario analysis is that the unplanned growth of Australia's four largest cities, meaning the delivery of growth without a significant step change in the structure and operation of these cities, will deliver the worst outcome for both current and future residents," Infrastructure Australia concludes. "In practice, this means that the planning, policy and

regulatory frameworks that underpin our cities will need to be updated to successfully accommodate materially larger populations."

Philip Davies, chief executive of Infrastructure Australia, says, "The type of city we choose to live in today will have a dramatic impact on our journey to work, congestion on our roads, cost of housing and access to public transport, schools, hospitals and our public parks in the future."

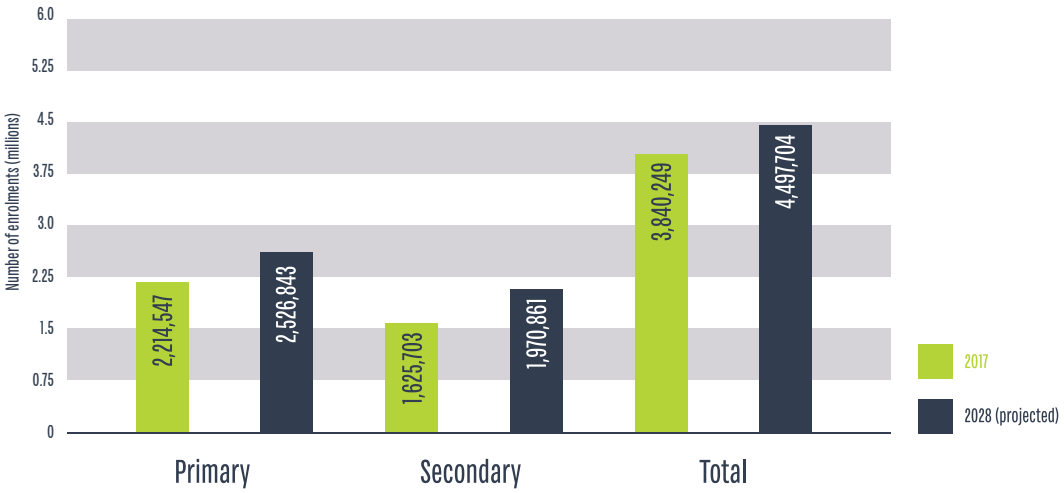
SCHOOLS

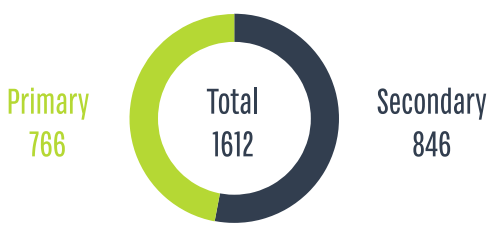
A thirst for knowledge (and room)

While the Australian experience of population growth is and will be incremental over the coming years, key decisions and preparation need to occur immediately to cater for the change already happening. The urban sprawl is bleeding not only out, but also up. With limited land space at our immediate disposal, vertical facilities are popping up in developments where we may least expect them. Schools and aged care facilities, for example, are the latest to reach for the sky, at odds with their traditional sprawling grounds and low-level buildings. It's a necessary change, though, for there simply isn't enough room to accommodate the projected number of people on Australian cities' limited landmass.

It is projected that, in the next 10 years, the enrolment growth across all sectors of the Australian education scene (government, Catholic and independent schools at both primary and secondary levels) will surge significantly. As a result, the need for many more schools across all major cities is extremely pressing. The Independent Schools Council of Australia reports that, following the data collected and projected by the ABS, the country will need more than 1500 new schools to accommodate the influx of new school-goers.

ATTENDANCE IN ALL SCHOOL SECTORS





Equivalent number of required schools.

**Independent Schools Council of Australia*

Much of Australia's education system is already at breaking point, with many schools stretched beyond their limit, either at capacity or over. This can be seen in Melbourne and Sydney, with classrooms packed with students beyond both the ideal physical limits of the rooms and the teaching limits of the educators. For example, Port Melbourne Primary in Melbourne's south-western suburbs was built to accommodate 300 students, but its current enrolments exceed 800. In Wyndham, Tarneit College – a school 25 kilometres west of Melbourne's CBD – opened five years ago with 250 students on its books. In a few short years, this number has swollen to almost 1600.

Also in suburban Melbourne, South Melbourne Primary, which opened in early 2018 and is Victoria's first vertical state school, was built with a capacity for 525 students. Before it had even opened its doors it had already reached this limit and was obliged to send rejection letters to many hopeful families. *The Age* reports that, should this pace of applications continue, the school will have to make room for an additional 200 students living within its catchment zone.

Sydney is experiencing similar issues. Earlier this year, *9News* reported Sydney's public education system to be "at crisis point", with figures revealing hundreds of schools are at or exceeding student capacity levels.

"NSW Education enrolment data for 2018, released to *9News* under freedom of information laws, reveals 636 schools in NSW have between 100 percent to 150 percent of student places filled.

"That's the equivalent to almost a third (31 percent) of all public schools in NSW – or an even greater proportion of those in Greater Sydney," the news program reported.

Change and planning for this crowded future needs to be addressed immediately. And in doing so, it seems that vertical facilities, particularly within the inner cities, will be the way of the future.

"Despite school ovals, car parks and play areas being filled with demountables and temporary classrooms set up in halls, libraries and gymnasiums, there are more kids than official places in many suburbs of Sydney."

And this strain will only increase as the country's student population continues to grow. Infrastructure Australia's report says that the city of Sydney will come under "significant pressure" in the future, and will see a 70 percent rise in the demand for schools by 2046. Melbourne is the country's fastest growing capital city and it is expected that, in the next five years, the number of school-aged children will surge by 90,000.

The only way is up

As we speed headlong into a future that will include more Australians than ever before, and where student growth is outstripping the capacity of the major cities' schools, change and planning for this crowded future needs to be addressed immediately. And in doing so, it seems that vertical facilities, particularly within the inner cities, will be the way of the future.

A change in a building's structure brings a change in the building's function. School blueprints will require reassessment of the use of the institutions' grounds and their buildings – for when faced with a school that spreads up rather than out, what happens to typical school components? Gone are the days, it seems, of multiple sports fields, jungles of playground equipment and separate structures for different year levels, libraries, halls, gymnasiums and canteens. Does it mean these facilities won't exist in schools anymore?

Unlikely. It simply means they will be incorporated into the grounds in different ways. Victorian Education Minister James Merlino claims that this is the future for schools in Melbourne's inner-city suburbs. "The land lots are smaller, so [we] need to go vertical to cater for the student numbers," he told *ABC News* in March this year. "We need to accommodate 90,000 additional students over the next five years – just incredible enrolment growth."

The design of these vertical schools will be extremely important in ensuring that their students want for nothing that traditional school grounds provide. Australia, meet the all-in-one school facility.

There are many design and logistical considerations for vertical schools, says Vinh Le, electrical project engineer at Wood and Grieve Engineers.

Le worked on both the Haileybury and Prahran vertical schools, and he told the Property Council of Australia (PCA), "Vertical schools squeeze everything – sports facilities, teaching space and administrative functions – into one building.

"We are used to single- or two-storey buildings with football fields and playgrounds outside. In this environment, you don't need to allow for air-conditioning, for example. But that doesn't work in a vertical school, as [these facilities are now housed indoors and] temperatures need to be carefully managed in both winter and summer."

Good design of these new schools, from the very bones right through to the final fitout, is essential. After all, it does no one any favours if students are

The design of these vertical schools will be extremely important in ensuring that their students want for nothing that traditional school grounds provide.

hindered by the buildings of their learning institution or educated within a concrete jungle.

Green spaces for children are important, especially for the current and new generations who spend much more time indoors (or distracted by devices) than any generations that have come before.

Le says, “At Prahran, students will have access to an outdoor learning area and gymnasium on level four, terrace balconies overflowing with greenery and an open atrium at the centre to let in lots of light.”

Similarly, Haileybury’s campus houses 2500 square metres of outdoor recreation space on its third and fourth levels, and it’s apparently a favourite feature of the student body.

The development of vertical schools is already underway all around Australia – not just in Sydney and Melbourne, although there’s no denying that the need is most pressing within the country’s two largest cities. Among these are:

Sydney

- Parramatta Public School: four storeys, scheduled to open 2019
- Arthur Phillip High School: 17 storeys, scheduled to open 2019
- Surry Hills High School: 14 storeys, planned completion 2020
- St Patrick’s Cathedral College: five storeys, scheduled to be open by 2020

Haileybury City Campus
Image courtesy of Haileybury school

Melbourne

- Haileybury City Campus: 10 storeys, opened January 2017
- South Melbourne Primary: five storeys, opened 2018
- Richmond High School: four storeys, scheduled to open 2019

Brisbane

- Inner City North State Secondary College: seven storeys, planned completion 2020

Adelaide

- Adelaide Botanic High School: seven storeys, scheduled to open 2019

Newcastle

- West End: 12 storeys, construction to begin 2018

Vertical limit

Vertical schools may sound like the much needed solution to a rather overcrowded problem, but they themselves are not without their own challenges. Robin Sweasey, director of project management at Turner and Townsend and who has spent the last two decades delivering education projects across the tertiary and schools sector, has told the PCA that vertical schools "are often sensitive undertakings". And, of course, they do come at a considerable cost.

Quantity surveying and cost estimating firm Slattery, in its report 'Counting the cost of vertical schools', found that an additional cost when compared to single-storey schools would be in the order of 60 percent. The report's author, Sarah Slattery, cites these additional costs for vertical schools to include building elements (such as lifts, ramps, staircases and atrium spaces), structural requirements (such as car parks, access to natural light and waste collection) and sophisticated building services (such as waterproofing, acoustic treatment, fences and safety measures).

"As schools go up, structure becomes more substantial and the façade more complex," Slattery says.

A point of difference between the traditional schools of the past and the vertical schools of the future is the water facilities and water delivery within the institutions. As these schools rush headlong into a future involving hundreds of thousands of additional students, they can and should stop to reassess

While traditional schools typically utilise corridor drinking fountains and playground bubblers, vertical schools can consider superior water features such as water-filtering installations.

the methods of water delivery to the buildings and the occupants. Given the reimagining of the structure of educational institutions, these facilities have the opportunity to improve on water delivery and drinking services for students and staff.

While traditional schools typically utilise corridor drinking fountains and playground bubblers, vertical schools can consider superior water features such as water-filtering installations. These additions can provide clean, filtered water to students via a hygienic appliance, which removes sediment, chemicals, bacteria and cysts while retaining the beneficial minerals. Traditional drinking fountains do not have this advantage, which can affect the taste and the sanitation of the water. As filtered water systems remove impurities and odours in the water, they can make the water more pleasant to drink and, therefore, can encourage students to drink more. This keeps students hydrated, which has a proven positive impact on brain function and concentration. Water filtration systems can eliminate the risk of contamination and germ sharing between students, as well as soothe and deter any potential parental concerns over the sanitation of the school's water providers.

Instant filtered boiling, chilled and sparkling water provider Billi reports that, in addition to the health, hygiene and taste benefits for schools, a water filtration system can provide the increased service of offering the options of chilled, sparkling and boiling water. By providing these alternatives to tap water, the filtered water systems promote an increased consumption of water by catering for differing individual preferences – particularly when both chilled and sparkling water are available, says Billi's marketing manager Adrian Cugnetto. And children drinking more water (especially instead of sugar-laden

alternatives) is always a good thing. “Better hydration equals better brain function,” Cugnetto says. Additionally, by providing a boiling water option in staff facilities, these water systems can assist with time management and staff productivity as teachers have access to a much faster alternative to a kettle during short breaks.

Billi and Cugnetto envision for the future of schools that all students can share in the convenience and the joy of having filtered water readily accessible to them, and to assist in improving the health and well-being of Australia’s future generations. The company has already set about working with schools, installing filtered water systems in Melbourne’s Glenvale School in its multiple locations across the city.

Cugnetto says that implementing Billi’s dispenser in Glenvale’s campuses was a straightforward process, as installing the unit itself is uncomplicated and relatively simple. The challenge that arose stemmed from the fact that, traditionally, water dispensers in schools take the form of ‘on-wall’ or bubbler units – that is, drinking fountains attached to the corridor walls. As architects and designers were familiar with this concept, they were unaware of Billi’s under-bench water filter alternative and generally designed to cater for the traditional style units. Billi is combatting this by extolling the benefits of the under-bench units and, as Cugnetto elaborates, “Through building relationships with architects and specifiers, and educating them on our under-bench range, it provides them with more options to fulfil the water access requirements of a project,” as well as increases the awareness of their ease of use and multiple benefits. The under-bench units reduce the Occupational Health and Safety (OH&S) issues of bubblers and kettles and meet the energy efficiency requirement for Greentag certification. Billi filters are also tested to

the strictest health standards and are certified by the globally-recognised NSF (National Sanitation Foundation) public health and safety organisation, which ensures the highest level of drinking water is available.

Just as the outer design of schools themselves is changing and being modernised, so too are the methods of dispensing drinking water to the schools' users.

CONCLUSION

Onwards and upwards

The numerical expansion of the human race, in our current existential state, is inevitable. The global and national populations continue to multiply as we as a species live longer, reproduce at an increased rate and change the countries we call home. Australian capital cities are groaning under the strain of playing host to more than an extra one million people since 2006. More than looking down the barrel of population explosion, that bullet is already making its way towards us at a faster-than-anticipated speed.

As the national population expands and therefore student numbers increase, schools must accommodate for the increased and projected increase in pupils. Thus, they must alter their infrastructure, which also means adapting the nature of water delivery within educational institutions for the better. Vertical schools have the opportunity to implement cleaner and more efficient drinking facilities and therefore enact positive change and improve the health and well-being of Australia's younger generations.

There have been calls and debates to control population growth and limit the immigration numbers, or at the very least temper them. But regardless of whether any such limitations are put in place, the reality is that Australia's population is booming and will continue to do so – and whether the projected limits arrive in 30 years or in 80 years, Australian cities and infrastructure need to be prepared.

After all, too much space is preferable to too little. That old adage they teach in school 'it's better to be safe than sorry' is not wrong. And as true as it is that, for progress, the only way is forward, so too we are seeing that the only way is up.

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