‘What this nation needs is a frank and robust debate about options for population and urban growth on a grand scale and over the long term. It is fair to say that Australia’s role with the rest of the world is likely to remain that of a migrant destination for decades to come, indeed for another century and possibly much longer. If ever there was a need for a nation to naturally develop an inherent field of excellence, it is in the skill of urban planning. We should lead the world in this.’

Bernard Salt
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## 4 ESSAYS

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MADE IN AUSTRALIA
This book concerns the future of Australian cities. It’s horizon is set at the year 2101: not too far out as to be fanciful, and not too close as to be shortsighted. This is also as far into the future that the Australian Bureau of Statistics (ABS) is prepared to go with its population forecasts; and it is around these forecasts that we construct our narrative and model our designs.

The ABS predicts a high population figure of 62.2 million Australians by 2101. This represents an extra 39,402,415 people. To accommodate these extra millions, we would need over 17 million houses – some 14,276 km² of new suburbia. An Australia of 62.2 million would use enough water to fill 115 Sydney Harbours each year and would need 138,220 km² of highly productive farmland to feed itself. The total energy required would amount to an 11,407 km² solar installation, a 136,884-km² wind farm, or 146 nuclear reactors. Based on our current standard of living our ecological footprint would be a whopping 4,851,600 km² and we would need to construct a forest of over 686,000 km² to sequester our carbon emissions.

Despite the likelihood of such growth, Australia’s current collection of major city planning frameworks only accounts for about an extra 5.5 million people. If we accept the ABS’s figure of 62.2 million Australians by 2101 then some 34 million 21st century Australians are missing from the nation’s current forward planning.

Our method for addressing this lacuna is simple. First, we consider the spatial implications of ABS projections for each of Australia’s major cities and argue that by mid-century, if not before, these cities will have reached their limits. Dysfunctional, overcrowded cities are not in anyone’s best interest. Secondly, we subtract the estimated total number of people accommodated in our major cities (and regional centres) by mid-century from the 2101 projection of 62.2 million. This leaves approximately 19.7 million people still unaccounted for. We then explore the question of where these people should best live.

To do this rationally and accountably we conduct an analysis of the national landscape and arrive at major development proposals for the southeast, the southwest and the north of the country. Our speculations are then supported and furthered by a diverse range of short essays and design studies from some of our colleagues around the country.

We don’t claim to have the right answers but we do offer speculations built upon ideologically neutral and methodical explorations. We offer an approach to growth that is environmentally precautious and simultaneously optimistic about the prospect of designing and constructing better cities as the century unfolds. This is not about whether our population
should or should not grow. We acknowledge Australia’s 21st century is likely to be one of rapid and continual growth so as to offset our ageing population and supply our labour market. Our concern is how to best direct that growth.

As the global population stabilises toward the end of the 21st century, so too might Australia’s. Our economy by then might also have had enough time to transform itself into a genuinely sustainable and relatively static system as fossil fuels fade. After 2101 our cities should also demonstrate structural transformations and innovations embodying a more sophisticated and symbiotic relationship with the ecosystems upon which they ultimately depend. By then, after three centuries of trial and error, we may have learned to live with the landscape of this country. We will also have to adapt to the new conditions created by climate change.

However, we are not presenting a utopia. As urban designers we can set the scene and to do so we must make certain assumptions and take certain risks; but we don’t write the script. This book is intended as a resource and a provocation to encourage reasonable and imaginative debate about Australia’s future.

The future doesn’t just happen, it is shaped by vision and discourse, which then translates into what we build. What we build this century will make or break our country.

Professor Richard Weller and Dr Julian Bolleter, Perth, 2012.
The future doesn’t just happen, it is shaped by vision and discourse, which then translates into what we build. What we build this century will make or break our country.
14,276 km²
Suburban area to house an additional 39,402,415 people

Housing Australia’s projected population growth to 62.2 million people in 2101 would require a suburban area of 14,276 km².


2. This hypothetical suburb is based on 2.3 people per home, a density of 15 homes per hectare and an allowance of 10% for public open space and 15% roads.
Housing for 62.2 million
Suburban area required to house an additional 39,402,415 people.
Ecological footprint of 62.2 million
Australia’s current ecological footprint is 7.7 global hectares per person. For a population of 62.2 million this results in a combined ecological footprint of 4,851,600 km².
Food for 62.2 million
As per average global agricultural production Australia would require approximately 138,220km² of arable land to feed 62.2 million people.\(^5\)
Water for 62.2 million

At 2005 rates, Australia’s projected 2101 population of 62.2 million people would require 57,639 GL of water per year, or the equivalent of 115 Sydney Harbours.\(^5\)

5 http://www.fao.org/news/story/en/item/9962icode. This figure is calculated on a global average whereby 1 hectare of land can feed 4.5 people.

Solar power for 62.2 million

Australia would need approximately 11,407km² of photovoltaic solar panels to provide the energy needs for a population of 62.2 million.⁷
Nuclear power for 62.2 million
Australia would need approximately 146 nuclear reactors to provide enough power for 62.2 million people. To supply Australia’s current population with energy would require 4,162 km² of solar panels. If this figure is extrapolated to a 2051 population of 62.2 million then 11,407 km² of solar panels would be required. Based on data from Davies, Andrew, and Edward Mortimer. "Keeping the Home Fires Burning: Australia’s Energy Security." edited by Australian Strategic Policy Institute, 17, 2011.

This figure is extrapolated from Professor Barry Brook’s conclusion that Australia would need 50 reactors to replace its current coal fired power stations. Brook, Barry, and Malcolm Knox. “Nuclear Dawn.” The Monthly (2010): 28–34.
Wind energy for 62.2 million
Australia would require approximately 136,884km² of wind turbines to provide power for a population of 62.2 million.
Carbon sequestration for 62.2 million
If Australia continues at its current rate of carbon emissions\textsuperscript{9} by 2101 a forest containing 6,860,843,047 trees\textsuperscript{11} will be required to sequester this output. This forest will be approximately 686,084 km\textsuperscript{2} in area.\textsuperscript{12}


\textsuperscript{10} Australia emitted 399,219,000 tonnes of carbon in 2008.

\textsuperscript{11} This is based on one tree absorbing 0.16 tonnes of carbon per year, from Weller, R., *Boomtown 2050,* University of Western Australia Press, Perth, 2009.

\textsuperscript{12} Presumes trees are spaced at 10 m intervals.
BIG CITIES
BIG IDEAS
BIG AUSTRALIA

Danica May Camacho, the world’s seven billionth person.
(Getty Images)
‘There will be no sustainable world without sustainable cities.’\textsuperscript{1} Herbert Giradet
On 31 October 2011, the United Nations awarded newborn Danica May Camacho of the Philippines the somewhat dubious honour of being the seven billionth human being. Like the majority of the world’s population in the 21st century, Danica May Camacho will in all likelihood live out her life in a big city aspiring to better material conditions. She will be part of the greatest surge of urbanisation ever to occur in human history: every year, 13 cities of over five million citizens each will need to built to absorb the flow.2 By the time Danica celebrates her 40th birthday in 2051, the global population will have reached nine billion, and 10 billion as she celebrates her 80th.3 Shortly thereafter however the global population is expected to stabilise. Why?

Because of cities.

By this century’s end as the majority of the world’s population comes to live in cities – gaining greater access to education and experiencing congestion, competition and consumerism – overall population growth is expected to stagnate and thereafter decline. The population boom that was incubated in the first settlements of the agricultural revolution in 10th century BC will come to a close in 21st century AD.

Typically, this phenomenon is seen in one of two ways: either humanity has triumphed over adversity, or humanity is creating the conditions of its own demise. Both are partially true and interconnected. To wit: before we were here, cyanobacteria covered the planet for two billion years, blissfully unaware that the oxygen they were emitting as a toxic waste product would render their world uninhabitable. The parallel with humanity is obvious as we increasingly spew carbon dioxide into the atmosphere – clever enough to count every molecule, but not clever enough to stop it. At least not yet.

It is, however, the knowledge that we are causal to the ecological crisis that, to some degree at least, distinguishes us from other species that have over-exploited their habitat. Optimistically, then, we can see a stabilised global population of circa 10 billion as the natural outcome of a self-aware species that has the intellect and practical ability to make its own world and rationally engineer a sustainable long-term future for all its citizens. The positive teleology is this: the period of Malthusian growth is over – the period of sustainable development can now begin.

Because cities tend to restrain population growth, their development is in the best ecological interests of the planet, but we must also acknowledge that cities radically expand the ecological footprint of their citizens. For example, the average Australian, living in what are generally considered to be the world’s most liveable cities, requires 7.7 ha of global land to

INTRODUCTION

sustain their lifestyle, whereas the rural, sub-Saharan African requires only 2.5. Australia is only a nation of 22 million people but from the earth’s perspective it might as well be a nation of 70 million sub-Saharan Africans. To put it another way, if the Chinese, the South Americans, the Indians and the Africans lived the lifestyle Australians take for granted (and who is to tell them they shouldn’t?) then we would need three earths to plunder. How to lift billions of people out of poverty and do so with just one earth is the central challenge of this century and probably for several centuries to come.

The symmetry of our dilemma is that while urbanisation is taking us collectively toward population stability, it is doing so in a manner that will deepen the ecological crisis. It is from this very tension that the importance of 21st century creativity will emerge. As Herbert Giradet rightly says, it is in cities that “human destiny will be played out and where the future of the biosphere will be determined. There will be no sustainable world without sustainable cities.”

Of course humans are rat-cunning and will survive almost anything, but survival at the species level is not what this is about. The 21st century of urbanisation questions whether we can design cities that provide not only sustainable, but also equitable systems of food, water, energy, housing and employment for the 70 per cent of the global population that will inhabit them by 2050 and beyond.6

Most of the world’s current population, however, lives far from the good city. Over a billion people live in slums, a billion are malnourished and it is predicted that two billion will not have access to potable water by 2050.7 As global temperatures increase and waters rise, resource wars are expected, not least of all in the catchments of the great world rivers – the Nile, the Indus, the Tigris and the Euphrates – rivers that once flowed from Eden, rivers that layered the rich silts from which cities arose in the first place. Climate-change refugees will be on the move.

In addition to climate change, cities in the 21st century will feel pressure from the imminent exhaustion of non-renewable resources upon which they currently depend. Nearly all the fundamental materials that make our current cities and their associated agricultural lands work will be exhausted some time this century. According to British Petroleum and the British Geological Survey of 2005, we will run out of oil in 42 years, natural gas in 60, uranium in 97 and coal – unfortunately the highest CO2 emitter of all, in 133.8 The ‘world city’ will therefore have to switch to entirely new energy sources in the next century. The infrastructure of urbanity as we know it will have to be reconceived, redesigned and reconstructed accordingly. As Steven Kenway explains we will have to transition our cities from industrial mechanistic systems to postindustrial metabolic systems.

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8 Smith, L., (2010) The World in 2050. Four Forces Shaping Civilization’s Northern Future, New York, USA: Dutton (Penguin group). p. 55. The timelines of non-renewable resource depletion vary according to source and are also subject to change derived from further discovery or technological developments. For example, according to the International Energy Agency the recently developed practice of ‘fracking’ could extend natural gas supplies to 250 years.
Not only will the infrastructure of our cities need to be redesigned and reconstructed, so too will the vast lands upon which they depend. In order to feed the 10 billion people of the late 21st century, without deforestation, we will need to increase the yield from already strained lands twofold.9 Our cities and agricultural lands will need to develop greater synergies, not least to recycle naturally occurring phosphorous, quantities of which will also be exhausted by century’s end.10 The ecological land systems (habitat corridors and riparian zones), which gird the longevity and productivity of agricultural lands, will also increasingly need to be managed and, as Simon Kilbane illustrates, reconstructed on a large scale.11

In this regard it is neither accurate nor helpful to continue to view cities as cultural objects set against and separate from natural backdrops. The nature and culture binary no longer exists: there is only a hybridised, denatured, coevolving world of our own making.12 Cities and their infrastructure have colonised and in some way altered every square metre of the planet. The city is everywhere.

But this book is not about the challenges of the world city – this book is about one nation and its cities within that global context. Fittingly, it is one of the world’s most (sub)urbanised nations: Australia.13

---

10 The Global Phosphate Research Initiative reports that mined phosphate supplies, essential to food production will be exhausted some time this century. Sustainable Phosphorus Futures, <http://phosphorusfutures.net/>.
12 This is something the visionary James Lovelock has been trying to explain to us since ‘The Gaia Hypothesis’ was first published in the 1970s. See most recently, Lovelock, J., The vanishing face of Gaia: a final warning, Basic Books, New York, 2009.
13 Eighty-seven per cent of Australians live in urban areas, Major Cities Unit, Infrastructure Australia, State of Australian Cities 2010, Department of Infrastructure and Transport, 2010, Canberra.
Projected population increase to 2056
Map shows the projected (Series A) population increase for major centres. The red circle indicates the percentage population increase relative to their current population. This is as far forward as the Australian Bureau of Statistics (ABS) is prepared to go in regard to Australia’s major cities.
On 30 October 2012 the resident population of Australia was 22,797,585. Australia’s population is currently increasing at the rate of one person every 1.47 minutes. The Australian Bureau of Statistics (ABS) forecasts that by 2101 the population of Australia could reach 62.2 million people. As illustrated on page 21, this means we would need to build nine Sydneys, 10 Melbournes, 20 Brisbanes, 24 Perths or 115 Canberras in the next 87 years.

While there is no overarching strategic plan for this growth, the subjects of urban planning and urban design are receiving increasing attention in Australia. For example, a panel from the Council of Australian Governments (COAG) recently reviewed Australia’s capital city planning schemes and declared at the outset of its report that:

Australia is at a watershed point for its capital cities and their strategic planning. Population growth, demographic change, increasing energy costs and the shift to a knowledge economy have changed the assumptions underpinning the shape and development of Australian cities...this must also include reconsideration of Australia’s settlement patterns.

Despite opposition from some prominent Australians and the Stable Population Party, most commentators recognise that Australia needs growth to supply the nation’s labour market and bolster its economy against an aging population. The anti-growth lobby argues that economic rationalism overlooks environmental, social and infrastructural pressures associated with population growth. But those who wish to stop the growth are obliged to explain how an economy such as Australia’s will function in relative stasis.

On a recent visit to Australia, eminent population biologist Professor Paul Ehrlich of Stanford University claimed, ‘What’s crystal clear is Australia should have a shrinking population. Australia’s already in deep trouble, way beyond its carrying capacity and I’m afraid that not only are we not going to see 40 million or 100 million Australians, we are likely to see many fewer than 20 million and many may have to evacuate.’ In contrast, the developer Harry ‘high-rise’ Triguboff has urged that Australia should become a nation of 100 million and its wayward rivers should be re-engineered to ensure food supplies. And so it goes: both views are inflammatory.

If the notion of an Australia of 62 million in 2101 is hard to imagine, consider the situation in reverse. In 1913 Australia’s population was a mere five million. In the 20th century the nation’s population quadrupled, whereas in the 21st it will probably only triple. Despite

‘What’s crystal clear is Australia should have a shrinking population. Australia’s already in deep trouble, way beyond its carrying capacity and I’m afraid that not only are we not going to see 40 million or 100 million Australians, we are likely to see many fewer than 20 million and many may have to evacuate.’

Professor Paul Erlich
‘I’d like to see 100 million, because I believe we will have many things to do here besides drilling holes and selling coal. Our agriculture has to be huge. Our desalination must be fantastic. Our rivers must flow the right way. It will all have to be developed.’

Harry Triguboff

population growth being the historical norm for Australia, it is now couched in terms of crisis. Instead of population growth and immigration being cast as a creative opportunity for nation-building (as it was for the United States in the early 20th century) it is generally portrayed as a threat to Australia’s suburban bliss and its natural environment.

It is both ironic and tragic, that the white settlement of this country began in 1788 with the slogan ‘terra nullius’ – the false notion of a land devoid of people; and now, for some at least, it greets the early 21st century with the bumper sticker: ‘fuck off we’re full’ emblazoned over a map of Australia. Australian xenophobia or heartfelt nationalism, as the case may be, is in part a consequence of the nation being a relatively unpopulated resource-rich island just south of Asia but it is also a reaction to Australia’s increasingly congested cities.

Anti-growth sentiment gains greater legitimacy through reference to the nation’s environmental carrying capacity. Many have tried to determine Australia’s ultimate population in this manner. In 1921 Griffith Taylor, Foundation Professor of Geography at Sydney University, foresaw a nation of 65 million, a figure he later revised to 20 million.8 In 1975, using agricultural
# ABS population projections by Australian city to 2056

<table>
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<tr>
<th>Capital city/balance of state</th>
<th>AT 30 JUNE ['000]</th>
<th>AT 30 JUNE 2026 ['000]</th>
<th>AT 30 JUNE 2056 ['000]</th>
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<tr>
<td></td>
<td>Observed</td>
<td>Series A</td>
<td>Series B</td>
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<td>2007 (b)</td>
<td>2026 (c)</td>
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<td>1 399.1</td>
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<td>Australia (d)</td>
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<td>21 015.0</td>
<td>28 723.0</td>
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| Australia (d)                 | 20 697.9          | 21 015.0               | 28 723.0               | 27 236.7               |

\[42 510.4\]

\[42 510.4\]

\[30 906.1\]
ABS national population projections to 2101

<table>
<thead>
<tr>
<th>ASSUMPTIONS</th>
<th>Total fertility rate (b) [babies per woman]</th>
<th>Net overseas migration (c) [persons]</th>
<th>Life expectancy at birth (a) [years]</th>
<th>PROJECTED POPULATION 2056 [million, by June 30]</th>
<th>2101 [million, by June 30]</th>
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<tbody>
<tr>
<td>Series A</td>
<td>2</td>
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<td>Males 93.9 96.1</td>
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<td>Series B</td>
<td>1.8</td>
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<td>Femaes 85 88</td>
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<td>1.6</td>
<td>140 000</td>
<td></td>
<td>30.9</td>
<td>33.7</td>
</tr>
</tbody>
</table>

An extra 39,402,415 people =

115 Canberras

or 24 Perths

or 20 Brisbanes

or 10 Melbournes

or 9 Sydneys
COME IN
THERE'S HEAPS OF ROOM

f**k off
we're full
productivity as the determinant, Roger Gifford and his colleagues at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) concluded Australia could support 80 million people with a low-protein diet. Other agricultural scientists have since reached figures ranging anywhere from 96 to 206 million.10 Professor Tim Flannery, the first to bring a deep ecological perspective to the calculation, weighed into the debate in 1994 arguing that the fragile Australian land could only support between 8 and 12 million. Flannery then retracted and eventually fell into line with the Australian Academy of Sciences, agreeing that an Australia of 23 million was about right.11 This figure has since been adopted by the Stable Population Party and will be reached within two years.

Determining the carrying capacity of a given environment is further complicated and to an extent effaced by globalisation. So long as its supply chains are cheaply fuelled, the ‘world-city’ is now liberated from place. Flows of capital can now sprout instant cities in deserts. Be that as it may, the resilient cities of the 21st century will be those which are both globally well connected and attuned to their local ecological conditions.

Australia appears to be a big underdeveloped country but its land is notoriously deceptive. Only six per cent of the Australian landmass is arable and its cycles of flood and drought are unforgiving.12 Sixty-one per cent of the continent is grazed and this, in combination with its various broadacre food bowls, yields a 26 billion dollar agricultural export industry. Australia currently produces enough food for 60 million people. To the detriment of the nation’s waterways, this productivity is only made possible by the addition of 200 million tons of fertiliser to the nation’s poor soils per annum. The over-allocation of water in the nation’s southeastern food bowl has put the ecosystem of the Murray-Darling River in a state of palliative care. Similarly, the Western Australian wheatbelt (some 154,000 km² of cropland) is clotted with salt due to vegetation loss. On a per capita basis Australia is not water-stressed, but much of the water is in the wild north whereas the big cities are in the south. The diagram on page 46 includes, among other things, a history of schemes and pipedreams to join the two.

The intertwined issues of population growth and urban planning periodically flare up in the media but debate is superficial and state and federal governments have largely swept the issues under the carpet. Notable exceptions include a 1994 report from the House of Representatives Standing Committee for Long Term Strategies, which concluded that a high growth rate of between 30 and 50 million by 2045 was ‘reasonable’.13 The committee stressed that ‘[t]he single most important management decision associated with that growth relates to settlement patterns’.14 Then, in 2002 CSIRO found that there is enough land, water and
Arable land as a percentage of total landmass
energy in Australia to provide a ‘moderate’ lifestyle for 50 million people up to 2100. What exactly constitutes a ‘moderate’ lifestyle is not explained. Apart from noting that Sydney and Melbourne might become megacities of 10 million people there is no discussion of where or how the extra millions of people could sustainably be accommodated.

In 2010 the then prime minister of Australia Kevin Rudd famously said that climate change represented the greatest moral challenge of our times. In almost the same breath he declared his enthusiasm for a ‘big Australia’:

Australia’s rapid population growth will have profound implications for our destiny as a nation. The century ahead stands to be the greatest century of economic growth and nation-building in Australian history. I have said before that I believe in a big Australia. This is good for our national security. Good for our long-term prosperity. Good in enhancing our role in the region and the world. The time to prepare for this big Australia is now.17

Rudd’s ‘big Australia’ was based on the ABS (Series B) figure of 35 million people by mid-century. In response, the then treasury secretary Dr Ken Henry asked, ‘Where will these [extra 13 million] people live – in our current major cities and regional centres, or in cities we haven’t even started to build?’18

The answer is: all of the above. The expansion of Australia’s existing towns and cities will have to be carefully planned and designed but, as we explain in chapter 3, Australia should also actively explore the possibility of new cities. We argue that Australia’s existing cities should not become megacities of 10 million or more citizens: alternatively, new urban development should be distributed through south-eastern and south-western megaregions.

To its credit the Rudd government moved quickly to establish a federal understanding of and some control over Australia’s rapid urban growth. Through COAG and the newly formed agency Infrastructure Australia, urban planning is on the agenda. COAG has mandated that all Australian cities have ‘robust, transparent, long-term planning systems in place to manage population and economic growth, address climate change, improve housing affordability and tackle urban congestion’.19 We review the urban growth policy settings of these planning systems in chapter 2.

Infrastructure Australia has been putting together a national perspective on water, energy, freight, ports, telecommunications and Indigenous development20 and distributing funds for specific infrastructural projects on the condition that applicants meet specified federal criteria. Simultaneously, Infrastructure Australia’s subsidiary, The Major Cities Unit – represented in this
‘Australia’s rapid population growth will have profound implications for our destiny as a nation. The century ahead stands to be the greatest century of economic growth and nation-building in Australian history. I have said before that I believe in a big Australia. This is good for our national security. Good for our long-term prosperity. Good in enhancing our role in the region and the world. The time to prepare for this big Australia is now.’ – Kevin Rudd
book by Sara Stace and Dorte Ekelund – has been building a national urban design policy. The unit has issued several reports about the sustainability and liveability of Australian cities including an urban design protocol intended to help set basic design standards across the nation.21 Important as these initiatives are, they all lack spatial planning. Apart from listing the top 18 growth centres (cities over 100,000 people), the recent reports related to Australia’s urban growth lack scenarios for where and how extra millions of Australians can live.22

Reference to settlement patterns is also conspicuously absent from the Government’s much anticipated 2011 ‘Sustainable Population Strategy for Australia’ report.23 There is currently no nationally coordinated research into the fundamental question of what Australia’s most ‘sustainable’ and productive 21st century settlement patterns might be.24 Without a national spatial plan of some description, Infrastructure Australia’s efforts remain fragmented and rely on each Australian state to develop its own forward planning.


22 Australia’s 18 major cities are: Launceston, Wollongong, Adelaide, Hobart, Albury Wodonga, Newcastle, Sydney, Geelong, Canberra-Queanbeyan, Melbourne, Toowoomba, Brisbane, Perth, Darwin, Sunshine Coast, Townsville, Gold Coast-Tweed Heads and Cairns.


Historical progression

- Settlement
- Abandoned settlement