



“Australia’s population growth, urban expansion and steady economic growth reflect assumptions that water will always be available, and in whatever quantities required ...”

A nation with a long-term strategic view would know the extent to which water, precious to its people, its industries and its environmental integrity, is embodied in each good, service and product that it produces for domestic consumption, for export or that it imports.

B Foran & F Poldy, *Future dilemmas – options to 2050 for Australia’s population, technology, resources and environment*, CSIRO Resources Futures Working Paper 02/01, CSIRO Sustainable Ecosystems, Canberra, 2002, p. 213

In the economic growth scenario, pressures for expansion (particularly in agriculture) will occur at such a level that achieving any form of ecological sustainability in future will be impossible.

PS Lake & NR Bond, 'Australian futures: freshwater ecosystems and human water useage', *Futures*, vol. 39, 2007, p. 303

The arrival of the First Fleet in 1788 added 859 people to the estimated 750 000 Aboriginal and Torres Strait Islander people already present. Since that time the main component of our population growth has been natural increase, contributing about two-thirds of the total growth since the beginning of the 20th century. Natural increase rose sharply in the mid- to late 1940s as a result of the post WWII baby boom, and the immigration of many young people who then had children in Australia. As of June 2005, Australia’s population stood at 20.3 million people.¹

PROJECTED POPULATION

During the last 80 years, Australia’s population has trebled.² According to ABS projections, given the current trends in life expectancy, total fertility rates, overseas migration and current immigration policy, our population will increase to between 24 and 28 million by 2050. Much of this projected increase will occur in our capital cities.³

The dynamics of our population growth are now in a different phase. Over the past

50 or so years, life expectancy at birth has increased while the total fertility rate has fallen. Under such conditions, the setting of net immigration targets can become an important determinant of population trends. Because immigration levels over coming decades have yet to be set, predictions about our future population levels cover a wide range. This makes it difficult to accurately predict future water demand and consequently formulate appropriate water policy.

WATER UNDERPINS ECONOMIC TRANSFORMATIONS

In the fledgling colony, the focus was on the farming of small holdings with the aim of increasing production of staples to meet the colony’s needs. Agriculture slowly expanded beyond subsistence levels, as native grasslands were settled and grazing developed. Timber was also harvested for local use and select timbers were shipped back to England. By 1821, wool was being shipped back to England. Thus the first Australian economy was essentially an agrarian one.



THE DISCOVERY OF GOLD

The Australian economy has grown steadily and has undergone a number of transformations along the way. Each phase has had its distinctive characteristics and measures of success. The first transformation occurred with the discovery of gold. Immigrants arrived in their thousands and this sudden increase in population created strong consumer demand. The new-found wealth meant that Australians could now afford to purchase goods from around the world. Sydney and Melbourne became sophisticated, European-style cities, and country towns like Bathurst, Bendigo, Ballarat and Charters Towers were transformed into cities and centres of commerce and local industry.

THE EXPLOITATION OF COAL & MINERALS

The next major transformation was driven by the commercial exploitation of the country's vast coal resources. Coal provided the domestic economy with a cheap, highly transportable source of energy. Coal was also a resource that could be exported in bulk to the large industrialised nations of the world.

A steady expansion of exploration and mining heralded the next transformation. The availability of vast quantities of minerals and locally mined coal provided a foundation for industrial development. In 1915 BHP commenced construction of its first blast furnace at Newcastle. This marked the next transformation: the arrival of heavy industry

and then dispersed manufacturing into the economy. With government assistance, tariff protection and a growing population and workforce, these industries were able to consolidate and expand.⁴

Water has been an essential and enabling factor in each of these transformations and it will remain a key determinant in our production of minerals, metals, manufactured goods and farm products.

In the second half of the 20th century things began to change. Trade with Europe, and the UK in particular, began to decline. New trade agreements began to develop with Japan, the Middle East and the USA. Australia came under pressure to reduce tariffs, and soon heavy industry and manufacturing faced competition from imports. At the same time another transformation was taking place in the economy. With the development of oil and gas, in addition to coal, Australia became a significant energy exporter and the world's largest exporter of coal.

The current phase, which has unfolded over the last 25 years, has involved the rapid uptake of information technology, the diversification of manufacturing and the rise of the service industries.

Economic performance is conventionally measured every three months. At the present time we are in another phase of economic expansion with 41 successive quarters of economic growth; compared with 31 and 28 for the 1970s and 1980s respectively.⁵



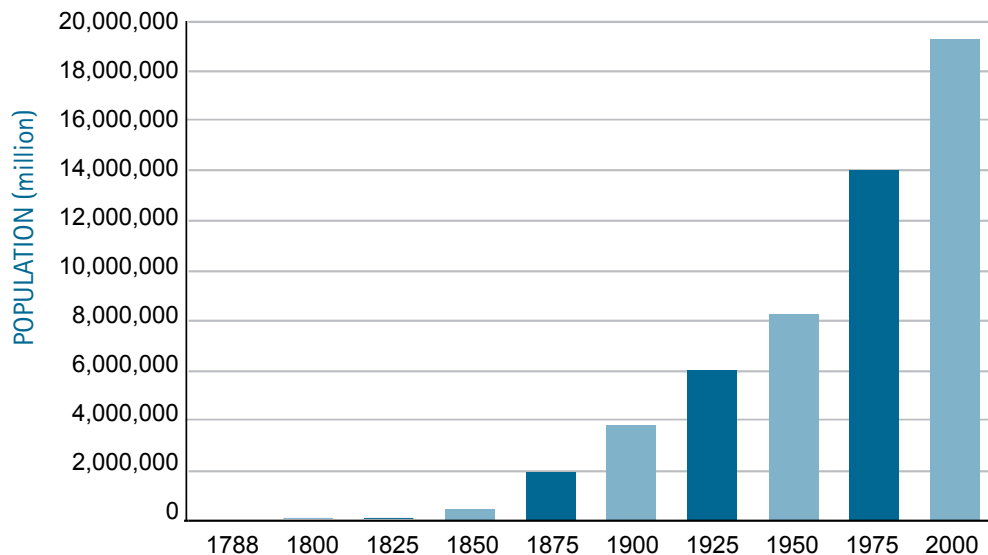


Figure 1. Australia's population growth since the arrival of the First Fleet in 1788

The first significant population expansion occurred between 1850 and 1875, largely with the discovery of gold. After Federation, individual states competed to attract people for their burgeoning economies. Post-WWII saw another rise. After 1950, the population more than doubled to its present size.

Source: Australian Bureau of Statistics, *Australian historical population statistics*, cat. no. 3105.0.65.001, ABS, Canberra, 2006.

THE GLOBALISATION OF TRADE

Broadly, the Australian economy consists of a small domestic market for food, goods and services with a high-volume export component. We rely upon international trade in resources and services to earn the hard currency to enable us to pay for imports.

International trade in the resource and services sectors accounts for about 75% of Australia's international trade. In 2005–06 the value of exports totalled nearly \$152 billion. The value of exported commodities was \$81 billion, with coal, minerals and refined metals accounting for \$54.6 billion of this.⁶

Thus we are linked into global trade as a major supplier of resources. We are significant suppliers of food, fibre, minerals, metals and energy and we have rapidly expanding markets for these commodities in Asia (and particularly China). We also export services and various elaborately transformed goods to niche markets around the world. In fact, there has been 12.4% growth between 1985 and 2001 in the export volumes of these manufactured products, compared with 7.5% for services, 6.4% for minerals and metals, and 3.4% for farm products.⁷

Essentially, Australia relies on international trade, and these arrangements are unlikely to change for some time. Strategic policy decisions, taken by successive governments since 1983, mean that Australia will remain a major exporter of commodities. All these commodities require significant water inputs.

WATER'S LINK TO POPULATION

It's not just these trade patterns that require significant water inputs, however. As we have already outlined, Australia's population is projected to increase substantially until at least 2050. This translates into increased domestic demand for housing, services, urban expansion and manufactured goods – all of which increase demand for water.

Issues of sustainable ecological development, limits to economic and population growth were raised for debate from the early 1990s on. The Population Inquiry of the early 1990s took place when the national population stood at about 17.5 million people. This inquiry was the culmination of a series of sophisticated analytical papers produced for the Federal Government's Bureau of Immigration Research. Although the 1992 report stemming from the inquiry dealt mainly with the dynamics and determinants of Australia's future population, it recognised the critical nexus between population levels and water.⁸

The report noted that while irrigation was the major user of water in Australia, large urban settlements, particularly on the southeast coast, placed significant pressures on available water resources. The city of Adelaide was already understood to be experiencing 'serious problems with water supply.'⁹ Unchecked, urban water demands would 'soon lead to strong competition with agricultural users for water supplies.'¹⁰



population & economy

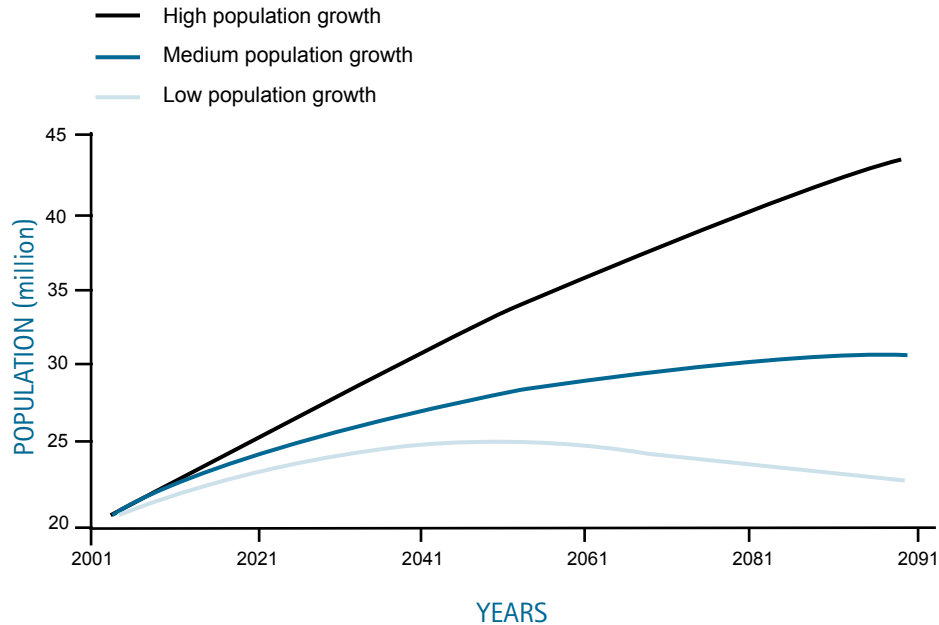


Figure 2. Three projections of possible population growth for Australia as shown in the *State of the environment report, 2006*

These population projections are based on the mathematical models used by the Australian Bureau of Statistics. The end of each curve points to the number of people likely to be living in Australia by 2101. The final population numbers differ slightly from those of Foran and Poldy because different assumptions are made in their respective models.

Source: Australian State of the Environment Committee, *Australia state of the environment report*, Department of the Environment and Water Resources, Canberra, 2006, p. 8.

The report argued that the 'low-density nature of urban development in Australia plays an important role in growing water demands' and that a 'more dense settlement pattern would reduce per-capita water consumption, allowing greater populations to be handled with a given water supply'.¹¹ Comment was also made about the large volumes of partially treated raw sewage being discharged at that time through, for example, Sydney's ocean outfall plants.

Two years later, the House of Representatives Standing Committee, chaired by Barry Jones MP, explored in greater detail the links between population and environmental impacts. The committee's unanimous report, *Australia's population 'carrying capacity': One nation – two ecologies*, expressed the need for an in-depth examination of Australia's future population levels and proposed that levels should be set taking account of geographical, environmental and resource-diversity considerations.¹²

All these observations continue to have currency, especially when we acknowledge that all Australian mainland capital cities (except Darwin) and regional population centres now face water restrictions, and the signs are that future water supplies will be more precarious still.

The future supply of adequate water to the populations in our cities will present some significant challenges over the next two to three decades.

Except for Perth and Adelaide, most of the fresh water used in our cities is surface water. With the effects of climate change, the volumes of surface water available to all cities (other than Darwin and Hobart) are predicted to decline significantly.¹³ However, by 2030 an extra 4.5 million people are projected to be living in our cities, with capital-city populations predicted to increase by between 8% and 69%.

Faced with this conundrum, state and territory governments have responded by developing a Water Resource Strategy for each of the capital cities, the Gold Coast and Hunter Valley. With the exception of Hobart and the Lower Hunter, the strategies emphasise increasing water supply by implementing a diverse range of actions, not simply building more dams.¹⁴

This imperative of factoring water use into the economy, including the domestic water component, is best illustrated by a recent detailed CSIRO analysis of the three possible population targets that are achievable from this point.¹⁵

- The low-population scenario: net immigration would be set at zero and the population would stabilise at around 20 million people by 2050.
- The base-case scenario (medium population growth): net immigration would be set at 70 000 persons per year, resulting in a population of about 25 million people by 2050.



- The 0.67% scenario (high-growth scenario): with this level of net immigration, Australia's population will reach 32 million by 2050 and 50 million by 2100.

The scenarios imply significant population growth and indicate that more water will be required for domestic consumption. For example, a population of around 20 million in 2050 would have an urban requirement of around 5000 GL per year; a population of 25 million would require 6000 GL; while a high-growth scenario of 32 million by 2050 would require an additional 7500 GL per year.¹⁶

Whichever population projection proves accurate, it's possible that we could be using 40 000 GL of water annually versus around 24 000 GL at present – a figure which incorporates both urban requirements and the need to export commodities to sustain our domestic consumption of imports.

The same CSIRO study has explored the link between increasing water efficiency and reducing the amount of water needed. It found that efficiency gains could be substantial. The research suggests that with an increase in water efficiency of 30%, by 2050 the expected high-growth population of 32 million would lower its annual water requirement from 7500 GL to 6000 GL. The base-case scenario (involving a population of 25 million) would reduce its requirement from 6000 GL to 5000 GL. Further, the total annual water requirement could be reduced from 40 000 GL to 30 000 GL.¹⁷

Australia's population levels will be a major determinant of the quality of life of future generations. The compelling data on the links between human activity and global warming,¹⁸ and the predicted changes in regional climate systems, present us with substantial challenges. A further challenge is that while our population is growing, it's also significantly aging.

Where would the projected additional 12 million people live? According to the same CSIRO research, adoption of the high-population scenario would require us to decide whether to grow our current cities on their margins or to develop new ones. The projected population increase would require the equivalent of 90 cities the size of Canberra to be located, established and serviced.¹⁹

In outlining these scenarios, the CSIRO research concluded that the most critical issue for the future of water in Australia was not finding or acquiring water. Instead, it was the plethora of side-effects associated with our current use of water, such as irrigation salinity, river salinity, depletion of inland fisheries, maintenance of economic and social vitality in regional areas, heavy-metal and pesticide contamination and the beauty and amenity of our urban areas.²⁰

In arriving at this conclusion, it should be noted that the CSIRO research took account of the earlier predictions by the Inter-governmental Panel on Climate Change for an average rise in global temperatures by 2030 of 0.85°C. The latest prediction is well above this figure.²¹

Table 1. Projected population and water consumption in our major cities

CITY	CURRENT POPULATION (000s)	PROJECTED POPULATION IN 2030 (000s)	% INCREASE	ADJUSTED UNRESTRICTED CONSUMPTION (ML/YR)
Adelaide	1090	1182	8%	190 383
Brisbane	931	1509	62%	196 095
Canberra	357	486	36%	51 208
Darwin	101	168	67%	35 142
Gold Coast	472	800	69%	69 899
Hobart	188	215	14%	40 679
Lower Hunter	496	585	18%	72 231
Melbourne	3497	4573	31%	498 295
Perth	1453	2177	50%	262 359
Sydney	4189	5592	33%	647 158
Total	12 774	17 287	35%	2 063 448

Across Australia, state and territory governments have developed strategies to supply water to urban communities from diverse sources. With the current immigration policy settings that are in place, by 2030 (just 23 years away), our major cities will need to supply water to an extra 4.5 million people. For the south and east of the country the extra demand will be lowest in Adelaide (8%) and highest on the Gold Coast (69%).

Source: Water Services Association of Australia, *Testing the water*, Position paper 01, WSAA, 2005, p. 14.



Table 2. Net water consumption (in GL) by major use sectors in the Australian economy in two time periods: 1993–94 to 1996–97 and 2000–01 to 2004–05

SECTOR	1993–94	1996–97	2000–01	2004–05
Agriculture (including forestry and fishing)	12 159	15 503	14 989	12 191
Mining	591	570	321	413
Manufacturing	736	728	549	589
Water Supply	2065	1707	2165	2083
Household	1704	1829	2278	2108
Other	2235	2370	3421	3219

Water use can vary from year to year in any sector of the economy, depending on factors such as rainfall and drought. In particular sectors it can also vary from year to year depending on the state of the local or global economy.

Note: volumes of water used by various water-use sectors, and reported by the ABS, differ from volumes published in other reports (e.g. the National Land and Water Resources Audit reports). This is explained by the fact that the different reports give figures for different years and/or periods of time and, in addition, the ABS covers a wider range of water-use sectors.

Source: Australian Bureau of Statistics, *Water account, Australia, 2004–05*, cat. no. 4610.0, ABS, Canberra, 2006, <www.abs.gov.au>.

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