

# 6

## Human Settlements



Torrens Island powerstation



Santos, Port Bonython

## Energy

### Trends

- Energy from fossil fuel constitutes 98% of all energy used in South Australia.
- Total energy consumption: **UP** by 10% between 1993/94 and 1998/99<sup>1</sup>, per capita consumption increased by a similar percentage.
- Proportion of the State's power generation capacity that is powered by renewable resources: **INCREASING** from 0.1% in 1998 to approximately 4.6%, when windfarms approved in the past year are constructed.

### Goal

The South Australian Government has four objectives relating to sustainable energy<sup>2</sup>. These are:

- to reduce greenhouse gas emissions;
- to encourage competitive energy markets;
- to stimulate sustainable energy industries;
- to pursue economic development opportunities for the State.

### What are the issues?

Energy is essential to the operation of modern built environments; it ultimately provides goods, services, transport and comfort. Services that depend on reliable energy sources include domestic, commercial and

industrial air conditioning, heating, hot water, lighting, appliances, transport and industrial equipment.

Ultimately almost all of our energy comes from the sun. Some of it has been trapped in nature's storage banks, such as oil, coal and natural gas, for millions of years. These 'fossil fuels' were created from animals and plants that lived millions of years ago. Their remains became buried under sediment at the bottom of ancient lakes and oceans before they decayed. Over time, the remains became buried deeper and deeper, and pressure and heat over millions of years changed the remains into gas, oil and coal.

Fossil fuels provide nearly all of our energy. These fuels are not replaceable in a reasonable timeframe, as much of what we use now began forming before humans even existed.

The burning of fossil fuels can cause air pollution. For example, petrol releases many pollutants as it burns inside the engine of a motor vehicle, such as sulphur dioxide and carbon monoxide. These pollutants can affect human health and the environment. The use of fossil fuel is also the most significant contributor to climate change, as these fuels release carbon dioxide, a major greenhouse gas, when they burn. The extraction of fossil fuels can also cause environmental harm (e.g. mining).

While currently expensive and highly subsidised, clean and renewable sources of energy (such as wind and solar) are increasingly becoming economically viable alternatives to the non-renewable fuels that currently predominate. Renewable energy sources are those replaced within a reasonable time frame by natural processes. The legislative and regulatory frameworks developed for the energy market as well as international agreements such as the Kyoto Protocol will determine the extent and pace of change in this sector.

We can all play a part in reducing energy use by catching a bus, riding a bike or car-pooling where possible, buying more efficient motor vehicles and

<sup>1</sup> Most recently available data.

<sup>2</sup> These reflect the State's obligations under international agreements entered into by the Commonwealth and complement the National Greenhouse Strategy.

home appliances and choosing how the energy we use in our homes is produced by purchasing green power.

Industries and businesses can choose more efficient infrastructure in new developments or upgrades – such as installing more efficient lighting systems – and reap the potential benefits of reduced energy bills and a more environmentally friendly public image. Purchasing green power is also an option for commercial interests (there are presently three commercial green power customers in South Australia).

The State Government has a very significant impact on energy supply and use through the provision and promotion of efficient public transport and energy infrastructure, the encouragement of renewable energy industries, the development of policies and programs for the management of electricity demand and the provision of educational resource material.

See also chapters on **Air quality**; **Climate Change**; and **Transport**.

## Environmental indicators

### PRESSURE INDICATORS

- **The amount of energy derived from non-renewable resources** (reported on in the *State of the Environment Report 1998*)  
Provides an indicator of the sustainability of our present methods of electricity generation.
- **The amount of energy used in total and by sector** (reported on in the *State of the Environment Report 1998*)

Indicates changes in total energy use and determines the principal energy using activities.

### RESPONSE INDICATOR

- **The amount of energy derived from renewable sources** (reported on in the *State of the Environment Report 1998*)  
Indicates progress toward more sustainable methods of energy generation.

## Findings

### Making progress

South Australia has made encouraging progress in the establishment of a renewable energy industry. In 1998 less than 0.1% of South Australia's energy was supplied from renewable resources. It is expected that windfarms approved in the past year (2002) will increase the State's power generation capacity from renewable resources to 4.6%.

While it is too early to judge its effectiveness, the State Government's Energy Efficiency Action Plan, launched in May 2002, demonstrates a commitment to reducing energy use across all Government operations. The Government is a significant consumer of energy, contributing over 5% of overall State electricity demand.

The State Government has established a target to purchase a minimum of 5% of its energy from renewable sources. In June 2002 details were announced of a contract to purchase 32,000 megawatt hours per annum from the Starfish Hill windfarm, which is approximately equivalent to 6.4% of the Government's total annual electricity demand.

### Attention required

Ninety-eight per cent of all energy supplied in South Australia is derived from fossil fuels. Oil – primarily in the form of petrol used for transport purposes – remains our largest single source of energy, supplying around 47% of the State's energy needs.

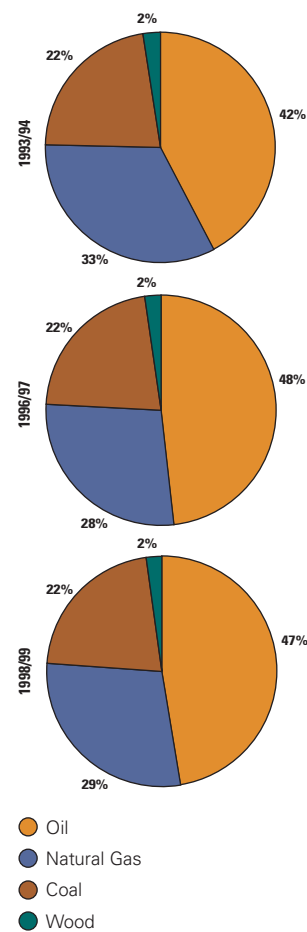
South Australia's energy consumption is close to the national average and is rising each year. Energy consumption increased by approximately 10% between 1993/94 and 1998/99 with a trend toward increasing use of petroleum products, electricity and natural gas.

## What more should we be doing?

The regulation and administration of energy markets now occurs largely at a national level. The State Government therefore cannot exert direct control over energy production in South Australia; however, it can influence other aspects of energy use and supply. In light of this the Environment Protection Authority recommends that:

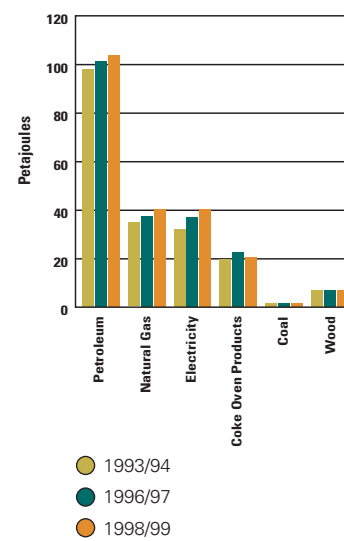
- 6.1 A Sustainable Energy Policy for South Australia be developed and implemented as a matter of priority. This should include consideration of improved energy supply infrastructure to encourage competition and facilitate development of the renewable energy industry; setting renewable energy targets; and encouraging reduced energy consumption through practical demand-side measures.
- 6.2 The Federal Government improve incentives for the production and use of renewable energy.
- 6.3 Progress towards achieving targets set in the Government Energy Efficiency Action Plan is monitored and reported on.

Figure 6.1: Sources of primary energy in South Australia – 1993/94, 1996/97 & 1998/99



SOURCE: ENERGY SA, 2001

Figure 6.2: Final energy sources in South Australia – 1993/94, 1996/97 & 1998/99



SOURCE: ENERGY SA, 2001

### THE NATIONAL ELECTRICITY MARKET

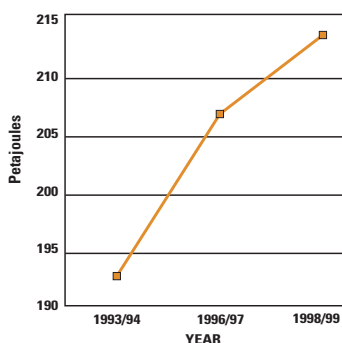
The Victoria-South Australia electricity interconnector was completed in 1990, which allowed electricity trading between the two States. The interconnector now facilitates South Australia's participation in the National Electricity Market (NEM). Despite the increased competition, electricity deregulation and the trading system presently in place for the NEM have caused some aspects of power generation to become less efficient.

The thermal efficiency of power generation dropped approximately 5% nationally and 3% in South Australia between 1991 and 2000. This means that in 2000 in South Australia, 3% more fuel was being used to create each megawatt of electricity than in 1991, with clear implications for air quality and greenhouse gas emissions. The decline in efficiency can be partly explained by the frequent starting and stopping of generators in response to market forces and points to the inability of the market to deliver positive environmental outcomes. The trend towards increased generation from low thermal-efficiency brown coal plants in Victoria is also a key factor.



Goods train

Figure 6.3: Energy consumption in South Australia – 1993/94, 1996/97 & 1998/99



### What is the current situation?

Energy in South Australia is mainly produced using crude oil, gas, coal and wood. These resources may be used in our homes, industries and businesses in this form (e.g. natural gas delivered direct to homes for cooking and heating), or may be converted into other energy products (e.g. using natural gas in a powerstation to produce electricity, which is then distributed to users). The energy resources before they are consumed or converted are referred to as primary energy, while that which we ultimately use in our homes, industries and businesses is called final energy or energy at 'end-use'.

It is important to realise that some energy is lost in the production and distribution of these products to users. An average coal power plant, for example, may have an efficiency rate of approximately 35%. This means that, of the total energy held inside a lump of coal, a power plant may only be able to convert around a third of it into electricity. Similarly, some energy is lost from power lines in the transmission and distribution process, and some gas escapes between the gas fields and the end users. This lost energy is known as dissipated energy and if we could reduce it, less resources would be required to produce each unit of energy we eventually use. Some of the new gas-fired powerstations such as those at Osborne and Pelican Point have higher primary energy conversion efficiencies of around 40% to 60%.

### PRESSURE INDICATOR: The amount of energy derived from non-renewable resources

South Australia's main primary (or raw) energy sources are oil, natural gas, coal and wood. There has been little change in the sources of raw energy supplies in South Australia since 1993/94. Oil remains the single largest source of primary energy (Figure 6.1). Wood, the only renewable energy resource used at significant levels in South Australia, only supplies around 2% of primary energy. The remaining 98% is supplied by fossil fuels.

Energy is then delivered to South Australians as final energy, mainly in the form of petroleum (derived from oil), electricity (derived mainly from gas, coal and the electricity interconnector with Victoria) and natural gas (delivered direct) (Figure 6.2).

The trend is towards the increasing use of petroleum products, electricity and natural gas and fairly static use levels for other fuel types (Figure 6.2). Our heavy dependence on fossil fuels for energy is a key factor in our high per capita greenhouse gas emissions (see chapter on **Climate Change**).

Virtually all of the oil used in South Australia is refined into petroleum products for use in the transport sector. Natural gas has a wide variety of uses

<sup>3</sup> Greenhouse gas emissions from electricity generation in South Australia are less than the Australian average because around one-third of our electricity is generated using natural gas. This is the highest proportion of any State other than the Northern Territory.

including the generation of electricity, as well as for consumption by industry, households and commercial enterprises. In recent years natural gas generation has provided for much of the growth in the South Australian electricity market<sup>3</sup>. Coal is used primarily for steel making at Whyalla and electricity generation at Port Augusta. Turning coal into electricity involves major losses of energy in the generation process.

### PRESSURE INDICATOR: The amount of energy used in total and by sector

South Australia has high levels of energy consumption per capita by world standards, as does the whole of Australia. South Australia's energy consumption is close to the national average and rose approximately 21 petajoules, or 10%, between 1993/94 and 1998/99 (Figure 6.3). To put this in context, one petajoule would light up a 100 watt light bulb for around 320,000 years. Per capita consumption also increased by a similar amount during this period.

The key energy-consuming sectors in South Australia are transport (e.g. private cars, trucks, buses, trains) and manufacturing, together comprising roughly three-quarters of all demand (Figure 6.4).

The manufacturing (up 17%) and domestic sectors (up 20%), however, showed the greatest increase in energy use between 1993/94 and 1998/99.

Domestic energy use comprises 15% of all energy used in South Australia. The main sources of energy used in households are electricity, natural gas and wood (Figure 6.5). Wood is a significant fuel source for heating. Water heating and the running of electrical appliances are the largest domestic energy consumers at around two-thirds of all energy used in the home (Figure 6.6).

### What impact will using fossil fuels for energy have?

Some of the environmental, social and economic effects of energy use are outlined below to illustrate the broader significance for sustainability.

**Contribution to the greenhouse effect.** Most greenhouse gases are generated by the energy sector. In South Australia the consumption and generation of energy contributes around 64% of our total greenhouse gas emissions. The predicted impact of climate change on the environment is through loss of habitat and the associated economic costs, and particularly through lost agricultural production. The costs of using fossil fuels may also increase if the Kyoto Protocol is ratified and international carbon trading commences (for more information see the chapter on **Climate Change**).

**Impact on air quality.** The use of fossil fuels can release harmful pollutants into the atmosphere. These can potentially affect human health and the health of the environment. There are also economic costs associated with treating the health problems caused by poor air quality.

**Coast and marine environments.** These environments may be negatively affected by thermal discharges from powerstations, which warm nearby coastal waters.

## What are we doing about it?

### RESPONSE INDICATOR: The amount of energy derived from renewable sources

Renewable energy includes sources of power that are replaceable or non-depletable within a reasonable time frame. These include power sources derived from wind, solar energy, plant and animal material (biomass) and heat stored underground (geothermal).

#### Wind

South Australia has made some encouraging progress in the establishment of a renewable energy industry since the *State of the Environment Report 1998*, when less than 0.1% of South Australia's energy was supplied from renewable sources compared to the Australia-wide figure of 6%. It is expected that 4.6% of South Australia's energy will be generated from renewable sources when windfarms approved up to the end of 2002 are constructed. The first of these to be approved is the 34.5 megawatt **Starfish Hill windfarm** on the coast north of Cape Jervis.

A number of additional windfarm developments in South Australia are likely as there is a wide range of locations with suitable conditions. However, a major issue for wind generation growth is the cost of connection and the need to upgrade the transmission network. The State Government has developed **Planning for Wind Farms**, a set of guidelines which provide the planning approvals process with specific tools for the assessment of proposed windfarms, where previously none existed.

In early 2002 the South Australian Government committed to the purchase of 6% of its energy requirements from renewable wind sources. This is a significant commitment and provides encouragement for the development of sustainable energy technologies in South Australia. Committing to a larger percentage should be a future goal for the State Government.

#### Solar

Solar energy is obtained directly from the sun. It can be captured and stored as heat energy (solar thermal), or be used to produce electricity from photovoltaic cells (solar electric systems). Solar thermal technologies use the sun's heat in a variety of applications. Solar hot water systems have thus far proved to be the most popular application for solar thermal energy in South Australia. The State Government began assisting this market with the introduction of a **solar hot water rebate** in July 2001. A total of 957 solar hot water rebates were approved in the first twelve months of the program. Due to increased demand for the program, the State Government increased the budget by \$1.3 million in 2002/03 and 2003/04 bringing the total budget to \$2 million per annum for both years. From July 2002 to the end of May 2003, 2118 applications were approved for rebates.

Photovoltaic cells (also known as solar cells) convert light from the sun into useable electricity. While the cost of photovoltaic (PV) technology continues to decrease, the initial capital outlay

required to install a photovoltaic system remains high. The **Photovoltaic Rebate Program**, introduced by the Federal Government and administered by Energy SA, provides assistance to members of the public and community groups interested in installing photovoltaic cells. From January 2000 to June 2003, 785 Photovoltaic Rebate Program applications were approved in South Australia. This equates to 1145 kilowatts of installed photovoltaic capacity and electricity generation of approximately 2090 megawatt hours per annum, with a saving of around 2300 tonnes of CO<sub>2</sub>. Costs for this technology remain high but are steadily decreasing with industry estimating that costs will be comparable with grid power within ten years.

#### Plant and animal material (biomass)

Biomass refers to plant and animal matter, either living or dead. There are many forms of biomass that can be used to produce energy, including wood, sewage sludge, livestock waste, specially grown energy crops, woody weeds, food industry waste and landfill waste. Biomass may be converted into solid, liquid or gaseous fuels by burning, or via a number of other complex scientific techniques.

Wood is the main biomass energy source used at the moment and provides approximately 2% of primary energy in South Australia. There are five landfill gas power plants located at the Wingfield (2 plants), Tea Tree Gully, Highbury and Pedler Creek landfill sites which recover energy from waste dumps; however, these have a combined energy generating capacity of only 12.7 megawatts.

#### Geothermal

Geothermal energy is heat energy stored deep underground. South Australia has extensive reserves of hot dry rocks in the Cooper Basin and there has been considerable investigation into the viability of large-scale geothermal electricity generation in this region. This technology involves drilling deep bores into which water is pumped. The water is heated by the rocks below and converted to steam which is piped back to the surface to drive turbines, producing electricity. The next step for this technology is the construction of a pilot plant to determine if it is a practical energy resource.

#### Policy and programs

The renewable energy market has been stimulated by the introduction of the Commonwealth **Renewable Energy (Electricity) Act 2000**, which sets a **Mandatory Renewable Energy Target (MRET)** to generate an additional 2% of Australia's electricity from renewable sources by 2010. Even though there has been some suggestion that this target may easily have been achieved by the market without legislative enforcement, and that a much higher goal could have been set, the initiative has been instrumental in the growth of the wind and solar water heating industries in Australia and if removed could well see their decline.

Following agreement between Federal and State Governments, new energy efficient standards for the **design and construction of houses** have been included in the Building Code of Australia as of January 2003. New standards for commercial buildings will follow.

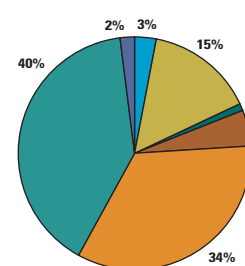
## KEY FACTS

- 98% of South Australia's primary energy is derived from fossil fuels.
- Around one-third of all energy consumed in South Australian households is used to heat water.
- Windfarms approved since the *State of the Environment Report 1998* will provide 4.6% of South Australia's total power generation capacity.
- The Starfish Hill windfarm will provide enough electricity to power 18,000 typical South Australian homes for a year.



Tarong windfarm at Starfish Hill  
Photo: Tarong Energy

Figure 6.4: Energy demand by sector in South Australia – 1998/99



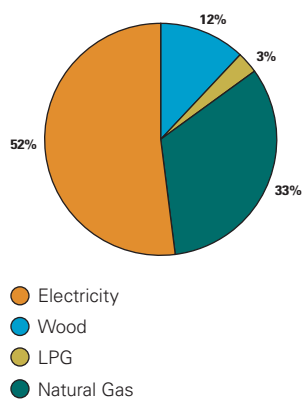
- Agriculture
- Domestic
- Mining
- Commercial
- Manufacturing
- Transport
- Other

SOURCE: ENERGY SA, 2001



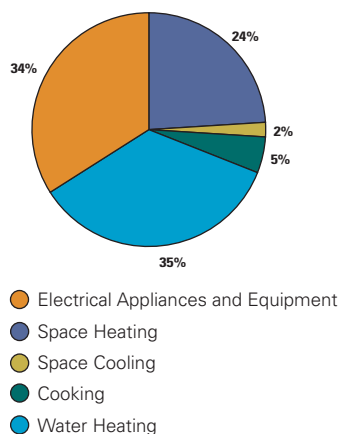
Domestic solar hot water unit  
Photo: Energy SA

Figure 6.5: Energy sources in the South Australian household



SOURCE: ENERGY SA, 2001

Figure 6.6: Energy used by appliance



SOURCE: ENERGY SA, 2001

The introduction of the **Green Power** program by the Commonwealth Government in 1997 has also encouraged the development of renewable energy sources. The program allows electricity retailers to offer customers an accredited renewable energy product. There were around 85,479 Green Power customers nation-wide as at June 2003 and total customer participation increased by around 10% over the previous year. However, just 395 of them were in South Australia.

A wide range of initiatives aimed at increasing energy efficiency and reducing energy use are being investigated by the State Government in response to recommendations in the **Electricity Demand-Side Measures Task Force Final Report** that was delivered to Government in 2002. Based on international and interstate experience energy use in South Australia can be reduced by at least 20% using cost-effective energy efficiency measures. These include better building design or the implementation of measures to reduce our reliance on the national electricity grid, such as the introduction of solar hot water rebates.

The **State Government** is a significant user of energy, spending more than \$100 million annually on its operations. In 2000/01 Government energy use produced around 675,000 tonnes of carbon dioxide. This amounts to around 2.1% of the State's total greenhouse gas emissions (South Australian Government Energy Use Annual Report 2001/02). The reduction of energy use in the public sector has been made one of the State Government's key goals. In early 2002 the Government committed to the purchase of just over 6% of its electricity requirements from renewable wind sources. A **Government Energy Efficiency Action Plan** was approved in November 2001. This aims to reduce energy use in the public sector by 15% by the year 2010. Progress towards achieving this target is now reported by each agency in their annual reports, and whole-of-Government progress is reported annually in the **Government Energy Use Annual Report**.

Programs for **alternative fuels and reducing emissions from the transport sector** are discussed in the chapter on **Transport**.

For more information on programs and initiatives see the *State of the Environment 2003 Supplementary Report*.

## References

ABARE (2001). *Australian Energy: Projections to 2019 – 20*. Canberra, Australia.

Apelbaum J. (2001). *The South Australian Transport Task, Primary Energy Consumed and Emissions: Part E – Road*. Apelbaum Consulting Group, Report prepared for Transport SA, 27 pp.

Energy SA (2001). *South Australian Energy Flows – 1998/99*.

## Further information

Energy SA

[www.energy.sa.gov.au](http://www.energy.sa.gov.au)

Mandatory Renewable Energy Target Review

[www.mretreview.gov.au](http://www.mretreview.gov.au)

National Electricity Market Management Company (NEMMCO)

[www.nemmco.com.au](http://www.nemmco.com.au)

Renewable Energy Commercialisation Program

[www.greenhouse.gov.au/renewable/recp](http://www.greenhouse.gov.au/renewable/recp)

Renewable Energy Equity Fund

[www.greenhouse.gov.au/renewable/renew4.html](http://www.greenhouse.gov.au/renewable/renew4.html)

# Population and Urban Form

## Trends

- **South Australia's population growth: DECLINING** from 2.4% per year in the 1960s to 0.5% per year between 1996 and 2001.
- **The availability of undeveloped land for new housing development: DECLINING.**
- **The number of new homes being built on redeveloped sites within metropolitan Adelaide: INCREASING.**
- **Average household size: DECLINING** – this will probably continue to increase the demand for housing faster than the growth in population, posing challenges to the natural environment of Adelaide and surrounding areas.
- **Variations in population growth rates at the regional and local level: INCREASING** – creating marked differentials in environmental pressures at the local and regional level in South Australia.
- **The median age of the population of South Australia: INCREASING** – from 30.4 years in 1981 to 37.6 years in 2001.
- **Population density: INCREASING** in the metropolitan area.

## Goal

To plan for and accommodate the changing nature of our metropolitan and regional populations through directing growth which is underpinned by principles of ecologically sustainable development. This means using resources in an efficient manner and includes a more space intensive approach to urban form, recycling resources and being responsive to the changing needs of populations in regional areas.

*Planning SA*

## What are the issues?

The impact that a human society has on the environment has to do with its size, levels of production and consumption (which will influence, for example, the amount of waste produced), the efficiency or otherwise of resource use, technology used to supply goods and services, and the effectiveness of Government and other organisations in preventing or repairing environmental degradation. This chapter will only examine the population component of this relationship, but it must be emphasised that the impact of people on the environment is affected by these other key factors.

Although South Australia's population growth rate in the two decades after World War II was one of the highest in the country, it has slowed significantly since 1966. Since then the growth rate of the State's

population has increased slightly but, at an average of just 0.5% per year over the period 1996–2001, it was the second-slowest of all States and Territories and less than half the nation's growth rate of 1.2%.

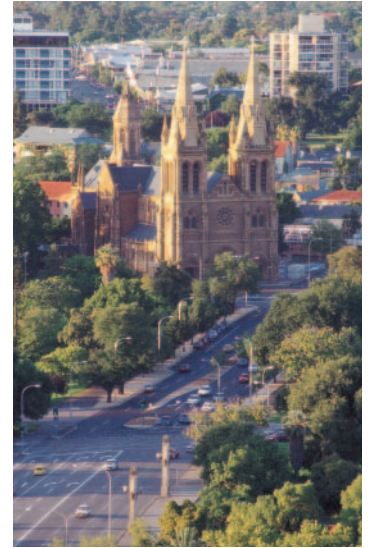
Despite a slowing of the State's population growth as a whole, there are wide variations in regional population growth rates. These create marked differences in environmental pressures in different parts of the State.

The Adelaide and associated peri-urban areas including Mount Barker, the Victor Harbor region and the Barossa are continuing to account for a greater share of the State's population growth (around 81%). This is placing pressure on the availability of land and urban services in these regions and increasing the tension between competing uses of land and environmental resources. Regional centres such as Mount Gambier and Port Lincoln and the Olympic Dam mining centre of Roxby Downs have also shown significant growth.

In contrast, some urban centres such as Whyalla, Port Pirie and Port Augusta are continuing to experience a decrease in population numbers largely associated with the loss of jobs in the local area. This can pose significant problems for the future sustainability of many rural populations.

The number of homes in South Australia is increasing more rapidly than the number of people because the population is ageing (older people are more likely to live alone) and because of changes in lifestyle. This, in combination with the declining availability of land for new housing developments, is rapidly increasing the number of new homes being built on redeveloped or previously used sites. Approximately 30% of building approvals in the greater Adelaide area were built on redeveloped sites in 1999. This trend towards 'urban renewal' and consolidation will continue under the guidance of the metropolitan volume of the Planning Strategy. While this will bring some environmental benefits (reduced greenhouse gas emissions for example) there will also be major environmental implications in terms of the provision of infrastructure and services, the creation and disposal of waste associated with construction and demolition activity, and the way we use open space. This will be a major challenge for the future and, at the same time, will provide opportunities for environmental improvement by redesigning neighbourhoods to provide for more sustainable outcomes, for instance by incorporating water sensitive urban design and development.

See also chapters on **Land Use**; **Waste**; **Energy**; and **Transport**.



*St Peter's Cathedral, Adelaide, South Australia  
Photo: South Australian Tourism Commission*



Adelaide CBD

## Findings

### Making progress

A comprehensively updated Regional Planning Strategy and a selectively updated Planning Strategy for metropolitan Adelaide were released in January 2003. These seek to improve the integration of environmental impact management with planning policy and broader sustainability principles. A more comprehensive update of the Planning Strategy for metropolitan Adelaide has commenced.

In recognition of the importance of outer metropolitan regions a Planning Strategy is being developed for outer metropolitan areas. It is essential that this places a high priority on the protection of the Mount Lofty Ranges Watershed and viable agricultural land and the minimisation of conflict between land use and the environment.

An urban growth boundary has been established to arrest Adelaide's urban sprawl and encourage higher density residential development and redevelopment closer to the city's centre and major transport and service nodes. This is a major policy shift that will require Adelaide to grapple with the notion of denser urban development and its associated environmental and wider sustainability implications.

The Green City program aims to brand Adelaide as an internationally acclaimed green city – recognised for its environmental and sustainability initiatives. Success of the program will depend upon effective partnerships, leading edge sustainable development and community involvement and participation.

### Attention required

The expansion of residential development into the Mount Lofty Ranges raises significant environmental concerns. This is already one of the most populated water catchments in Australia and any further intensive development will place additional pressure on the region's water resources, infrastructure and biodiversity. Development of the Inner Regional Planning Strategy (encompassing the Fleurieu Peninsula, Barossa, Central Hills and the Northern Adelaide Plains) should place a high priority on addressing these issues.

Current policy and programs tend to focus on sustainable development within metropolitan and outer metropolitan areas. There is a need for a State-wide approach to sustainable development that integrates natural resource management principles with planning and development at the regional level. There is also a need for the coordinated and restrained provision of infrastructure, which can, in part, be facilitated through the Metropolitan Development Plan.

Currently in Adelaide the demand for dwellings is increasing faster than the growth in population. This poses potential challenges to the natural environment of Adelaide. In particular, those associated with stormwater and wastewater management, waste management and infrastructure provision.

Despite a slowing of the State's population growth as a whole, there are wide variations in regional population growth rates. These create marked differences in environmental pressures in different parts of the State.

## What more should we be doing?

The Environment Protection Authority recommends that:

- 6.4 Development of the Inner Regional Planning Strategy places a high priority on addressing the environmental issues associated with increasing residential and other development in the Mount Lofty Ranges. There should also be a requirement for all major developments that have the potential to cause environmental harm to undergo an environmental risk assessment before receiving approval.
- 6.5 Further information is collected on the environmental, social and economic costs and benefits of enforcing the current metropolitan urban containment boundary to inform future policy development.
- 6.6 Sustainable development is addressed on a whole-of-State basis, with particular regard for the integration of natural resource management principles with planning and development policy and infrastructure provision at the regional level.
- 6.7 Priority is given to ensuring policies are in place to deal with the current divergence between population growth rates and the demand for private dwellings and the implications of this for sustainability and Adelaide's built environment.
- 6.8 State Government takes a strong leadership role in the Green City Program to ensure its success. The updated Planning Strategy for metropolitan Adelaide should provide an overarching framework for the Green City Program that is solidly based on sustainability principles
- 6.9 Priority is given to determining the environmental impact of any proposed changes to population policy and the implications for development and the planning process.

## Environmental indicators

## PRESSURE INDICATORS

- Changes in population growth (reported on in the *State of the Environment Report 1998*)

Changing population trends impact on the State's environment and natural resources through resource use and waste generation.

- Population density (reported on in the *State of the Environment Report 1998*)

Changing population density has implications for resource use and for urban and social infrastructure.

## What is the current situation?

## PRESSURE INDICATOR: Changes in population growth

## State-wide changes in population growth

The population of South Australia grew by almost 70% between 1947 and 1966 compared with an overall increase of 53% in Australia. As a result South Australia steadily increased its share of the national population from 8.5% in 1947 to 9.4% in 1966 (Table 6.1).

This trend reversed in the late 1960s and by 2001 South Australia's share of the national population had fallen to just 7.8%. Underpinning this decline was a decrease in the State's average annual growth rate from 2.4% per year in the early 1960s to just 0.4% in the 1991-96 intercensal period (period between national censuses). Since 1996 the growth rate of the State's population has increased slightly but, at an average of just 0.5% per year over the period 1996-2001, it is still less than half the nation's growth rate of 1.2% per annum (Table 6.2).

Table 6.1: Population of South Australia and Australia – 1947 to 2001

Census year	Population (persons)		
	South Australia	Australia	SA as percentage of Australia
1947	646,073	7,579,358	8.52
1954	797,094	8,986,530	8.87
1961	971,487	10,508,186	9.25
1966	1,094,984	11,599,407	9.44
1971	1,200,114	13,067,265	9.18
1976	1,274,070	14,033,083	9.08
1981	1,318,769	14,923,260	8.84
1986	1,382,550	16,018,350	8.63
1991	1,446,299	17,284,036	8.37
1996	1,474,253	18,310,714	8.05
2001	1,511,728	19,413,240	7.79

*Note: Population totals 1947-66 are census counts, 1971-2001 figures are estimated resident populations.*  
*Source: ABS Cat. 3218.0 Regional Population Growth, selected years and census publications selected years.*

## Components of population change

The factors that dictate population change are births, deaths and overseas and interstate migration.

Table 6.3 summarises the components of South Australia's population change from 1977 onwards.

The most dramatic change that is directly related to the State's declining population growth rate is a steady decrease in the number of births, which fell by over 13% between 1983/84 and 2000/01. Since 1974 the State's average number of children born per woman has been below 2.1, the level that is required if the parents' generation is to be fully replaced by their children once mortality is taken into account.

Table 6.2: Population growth South Australia and Australia, 1947-54 to 1996-2001

Intercensal period	Population (average annual growth – number persons)		Population (average annual growth rate)	
	South Australia	Australia	South Australia	Australia
1947-54	21,574	201,025	3.0	2.5
1954-61	24,913	217,379	2.9	2.3
1961-66	24,699	218,244	2.4	2.0
1966-71	15,745	231,246	1.4	1.9
1971-76	14,791	193,164	1.2	1.4
1976-81	8940	178,035	0.7	1.2
1981-86	12,756	219,018	0.9	1.4
1986-91	12,750	253,137	0.9	1.5
1991-96	5591	205,336	0.4	1.2
1996-2001	7495	220,505	0.5	1.2

*Note: Population totals 1947-54 to 1966-71 based on census counts, 1971-76 to 1996-2001 on estimated resident population.*  
*Source: ABS Cat. 3218.0 Regional Population Growth, selected years and census publications selected years.*

## KEY FACTS

- South Australia's population is growing at around 0.5% per year – less than half the national growth rate of 1.2%.
- In recent decades, South Australia has regularly lost more people to interstate destinations than it has gained.

Table 6.3: Components of population change, South Australia, year ending 30 June 1977 onwards

Financial year ending 30 June	Births(a)	Deaths(a)	Natural increase	Net overseas migration	Net interstate migration	Population change (b)	Estimated resident population 30 June (c) (d)
1977	19,086	9715	9371	2874	–	12,245	1,286,119
1978	18,964	9768	9196	2638	-1500	10,334	1,296,205
1979	18,403	9748	8655	541	-4000	5196	1,301,109
1980	18,317	9536	8781	3325	-4500	7606	1,308,397
1981	18,960	9806	9154	6655	-5109	10,700	1,318,769
1982	19,076	9894	9182	8520	-4875	12,827	1,331,108
1983	19,445	10,339	9106	6417	-328	15,195	1,345,775
1984	20,118	9799	10,319	3969	553	14,841	1,360,048
1985	19,901	10,204	9697	4329	-2317	11,709	1,371,197
1986	19,657	10,427	9230	5084	-1417	12,897	1,382,550
1987	19,628	10,577	9051	6200	-3977	11,274	1,392,764
1988	19,288	10,799	8489	5952	-1240	13,201	1,404,909
1989	19,445	10,781	8664	6665	-221	15,108	1,419,029
1990	19,573	11,320	8253	5762	-252	13,763	1,432,056
1991	19,841	11,074	8767	4619	1545	14,931	1,446,299
1992	19,655	11,060	8595	2897	-658	10,834	1,456,512
1993	19,819	11,351	8468	1546	-5210	4804	1,460,674
1994	19,381	11,375	8006	1994	-3978	6022	1,466,138
1995	19,475	11,522	7953	2883	-7069	3767	1,469,429
1996	18,839	11,339	7500	3653	-6192	4961	1,474,253
1997	18,576	11,625	6951	3106	-3318	6739	1,481,357
1998	18,330	11,728	6602	3160	-1996	7766	1,489,552
1999	18,399	11,648	6751	2682	-1631	7802	1,497,819
2000	17,896	11,590	6306	3829	-3531	6604	1,505,038
2001	17,414	11,919	5495	2765	-2418	5842	1,511,728

(a) Births and deaths figures used to compile natural increase for population estimates are based on year of occurrence and may differ from births and deaths data based on year of registration.

(b) Population change is equal to natural increase plus overseas net migration plus interstate net migration.

(c) At end of period.

(d) Sum of natural increase and migration may not add up to change in ERP due to intercensal discrepancy.

Source: ABS Publications 3105.0.65.001 *Australian Historical Population Statistics, 3101.0 Australian Demographic Statistics*, ABS consultancy March 2003

Over the same period of 1983/84 to 2000/01, due to the increased proportion of older persons in the population, the number of deaths in the State has increased by over 21%.

As a result of the diverging trends in the number of births and deaths, the natural increase of the population (the difference between the number of births and the number of deaths) has almost halved from 10,319 in 1983/84 to 5495 in 2000/01. It is these demographic dynamics that underlie South Australia's slowing population growth rate and the increased ageing of its population.

Population gains from overseas migration have fluctuated widely over the last 25 years. With annual gains of several thousand people in recent years this component has, in part, compensated for recent declines in natural increase. However, current

Australian immigration policy has the effect of selecting low fertility groups for migration to Australia so an increased immigrant intake is not likely to compensate in the long term for the State's below replacement fertility.

In contrast to overseas migration, net interstate migration has been consistently negative in most years since 1976/77, indicating that South Australia has regularly lost more people to interstate destinations than it has gained. This is one of the major factors responsible for the State's slow population growth rate.

### Regional and intra-regional changes in population growth

Despite a slowing of population growth at the State level, there are wide variations in regional and intra-regional patterns of population growth. This has created marked differences in direct environmental pressures between different parts of the State.

The predominant trend within South Australia over the past twenty years has been a concentration of population within the settled parts of the State with Adelaide and Outer Adelaide (Map 6.1) continuing to account for the vast majority of the State's population and population growth. In 2001 73.3% of all South Australians lived in the Adelaide Statistical Division and 7.5% in the Outer Adelaide Statistical Division.<sup>1</sup> Map 6.2 shows the rate of growth of Statistical Local Areas between 1996 and 2001. The major conclusions are:

- the new areas of housing development in Adelaide's north, far north, far south and in Mount Barker have shown the greatest relative growth rates of more than 10%, along with Light Regional Council to the north of Adelaide, and Victor Harbor and Goolwa on the Fleurieu Peninsula. The establishment of the Woomera detention centre for asylum seekers explains the exceptional but temporary increase of population in the Far North;
- Statistical Local Areas (SLAs) in the remainder of the State, especially the established non-coastal wheat growing and grazing areas, have almost universally shown a significant decline in population numbers.

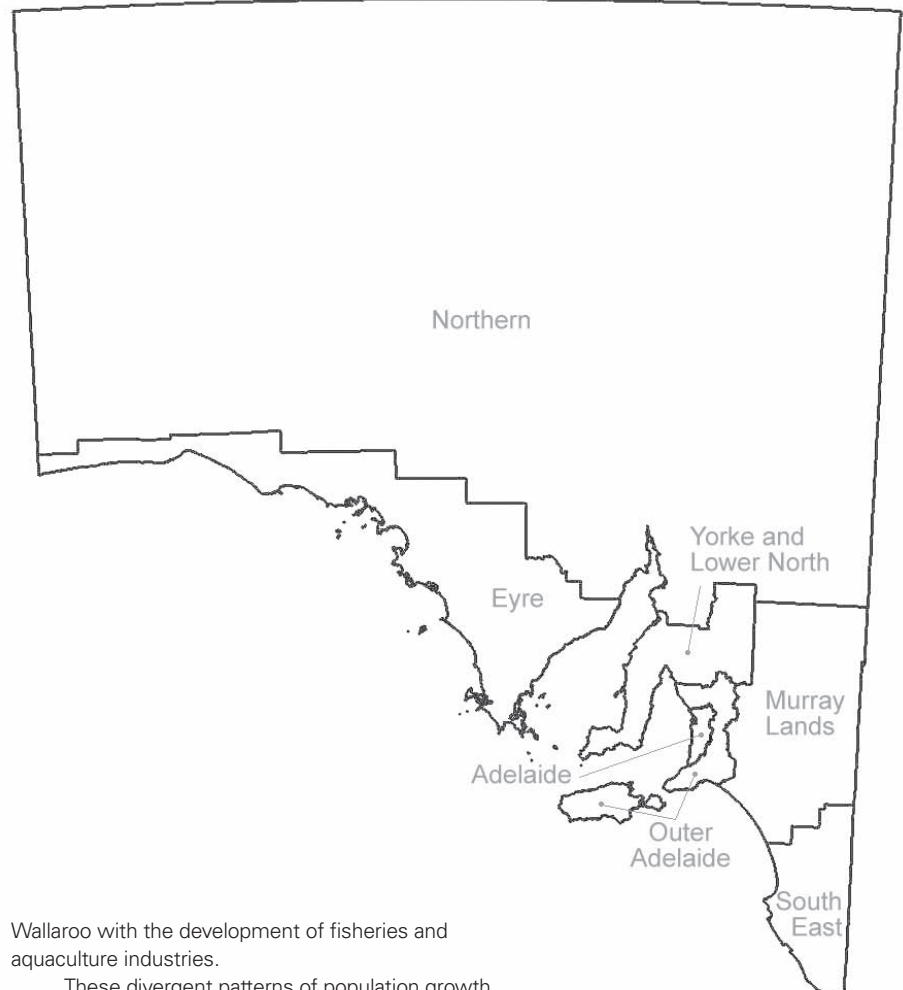
Absolute population change in SLAs across the State is shown in Map 6.3. The major conclusions are:

- a significant number of inner SLAs in the Adelaide Statistical Division have experienced substantial population increases as a result of urban renewal, with higher density housing replacing lower density housing;
- SLAs further from the city centre that have land available for new housing developments, such as Mount Barker, have also experienced increasing populations;
- the only rural SLAs to experience population gains were those on the coast or were regions where export-producing agricultural industries have witnessed recent growth, such as the wine producing region of the Coonawarra in the South East;
- the Northern Statistical Division industrial cities of Whyalla, Port Augusta and Port Pirie have experienced significant population losses as their heavy industrial and mining base has lost much of its workforce through economic restructuring.

Map 6.4 illustrates the relationship between the size of towns and their rates of population change between 1996 and 2001 and how this relationship is influenced by geography. It shows that many of the small towns sited on the coast of Eyre Peninsula (Streaky Bay, Elliston, Tumby Bay and Cowell) and centres on Yorke Peninsula (Port Broughton, Wallaroo, Port Vincent and Edithburgh) have had significant increases in population due to people retiring, tourism, and investment in aquaculture. It also indicates growth in regional centres serving intensive agricultural areas such as Mount Gambier, Renmark, Berri, Naracoorte and Clare, and in centres such as Port Lincoln and

**Map 6.1: Statistical Divisions of South Australia**

SOURCE: PLANNING SA



Wallaroo with the development of fisheries and aquaculture industries.

These divergent patterns of population growth have profound environmental and planning implications. For example, a substantial relocation of people to coastal locations will increase the demands on infrastructure for drinking water, electricity or gas, and sewerage services in these small settlements, a demand that may not be able to be met without substantially increased investment and infrastructure provision. Growing resident populations and increased tourism will also increase the use of beachfront locations, many of which are ecologically fragile (see also chapter on **Land Use**).

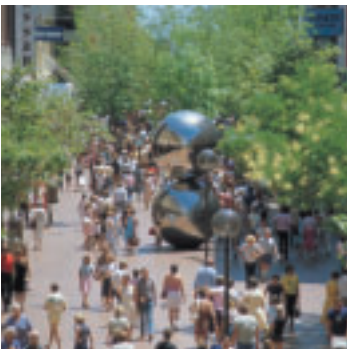
The large decline in population numbers in Whyalla has created unoccupied housing in the city that is now in need of redevelopment. This poses major problems for city planners and may further depress already low land prices with serious consequences for the city's revenue base. Where regional centres do have a decreasing population, decision makers need to be particularly selective of the nature of redevelopment and where it occurs.

Long term and persistent population declines in many small inland towns and among rural farm populations as young males and especially females migrate to seek employment in urban destinations, have created labour shortages and a severe gender imbalance in many farming communities. This selective

<sup>1</sup> At the time of writing the final estimated resident population figures for regions within South Australia were not available. Data for 2001 relies on preliminary figures.

**KEY FACTS**

- **The Outer Adelaide Statistical Division is the fastest growing region in the State.**
- **In 2001 almost 81% of South Australians lived in the Adelaide and Outer Adelaide Statistical Divisions, within an 80 kilometre radius of the Adelaide GPO.**



Rundle Mall, Adelaide, South Australia  
Photo: South Australian  
Tourism Commission

out migration and population decline can pose serious problems for the future demographic sustainability of many rural populations and subsequently the knowledge and labour required for the continuation of land management practices that are capable of maintaining the desired ecological balance.

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**PRESSURE INDICATOR: Population density**


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South Australia has an extremely low population density of 1.5 persons per square kilometre, reflecting its vast inland arid and semi-arid areas that do not sustain large cities or towns. Our urban settlements are among the lowest density in the world. In contrast, population density in the United Kingdom is 247 persons per square kilometre and in Japan it is 337 persons per square kilometre (Population Reference Bureau, [www.prb.org](http://www.prb.org); and ABS).

The vast majority of the State's population (81%) is clustered in the better-watered south-eastern corner along the coastal plains of the Adelaide Statistical Division and in the Adelaide Hills that form the eastern hinterland of the city.

Population projections (Planning SA, 2000) suggest that by 2016 this concentration of population will have increased to almost 83% with large-scale housing redevelopment closer to central Adelaide and residential shift into Gawler and Light Regional Councils to the north, into the District Council of Mount Barker to the east and along the southern coast of Onkaparinga City Council and into the District Council of Victor Harbor. Potential for increased leapfrogging of development may also occur into nearby settlements with good road access to Adelaide such as Murray Bridge, Goolwa and into the Barossa Valley. This is an issue that will be addressed by the new Inner Regional volume of the Planning Strategy.

**Age structure – an ageing population**

Like most developed countries the population of Australia is experiencing changes in its age composition with a significant increase in the proportion of the population in the older age groups (60+) over the last two decades (1981–2001). The population of South Australia has also exhibited this trend that is projected to accelerate over the 2001–2011 decade. If these projections are realised, then the proportion of the State's population comprising elderly persons (aged 65+ years) will increase from 12.9% in 1991 to 16.2% in 2011. However, the most dramatic increases will be after 2011 when those now aged 50 to 64 enter the elderly age brackets.

Without major changes to fertility rates this ageing of the population will continue at a rapid rate for at least the next 25 years with major consequences for future housing demand, the demand for specialised health, transport and welfare services and the duration of time spent in employment.

**Trends in housing demand – more houses for fewer people**

In South Australia there has been a major divergence between the growth in the number of dwellings and the growth of the population. The number of new dwellings has grown at more than twice the rate of

population growth between 1981 and 2001 (ABS Census of Population and Housing 1981–2001).

Several factors have influenced this difference in growth rates. The ageing of the population has played a role in this with an increasing proportion of the population being in the adult age groups most likely to be living outside the parental home. The elderly are also enjoying increased longevity that means more years of life in a household without children and possibly more years of living alone after the death of a spouse. Changes in preferred living styles, such as increased levels of marriage break-up and divorce, have also boosted the demand for private dwellings. First-home-buyer schemes have also encouraged the demand for new housing in the last few years along with low interest rates and low inflation that have improved its affordability. However, recent significant price increases have tempered this affordability.

Although economic conditions may change in the future, demographic and social changes leading to decreased average household size will probably continue to increase the demand for dwellings faster than the growth in population. This poses challenges to the natural environment of Adelaide. In particular, this continued demand for new dwellings will divert resources to the built environment, increase the energy requirements of the State, increase the land occupied by housing and potentially create environmental problems associated with stormwater and wastewater management or, alternatively, opportunities if the use of stormwater and treated wastewater is designed into developments.

**What impact will Adelaide's changing population and urban form have?**

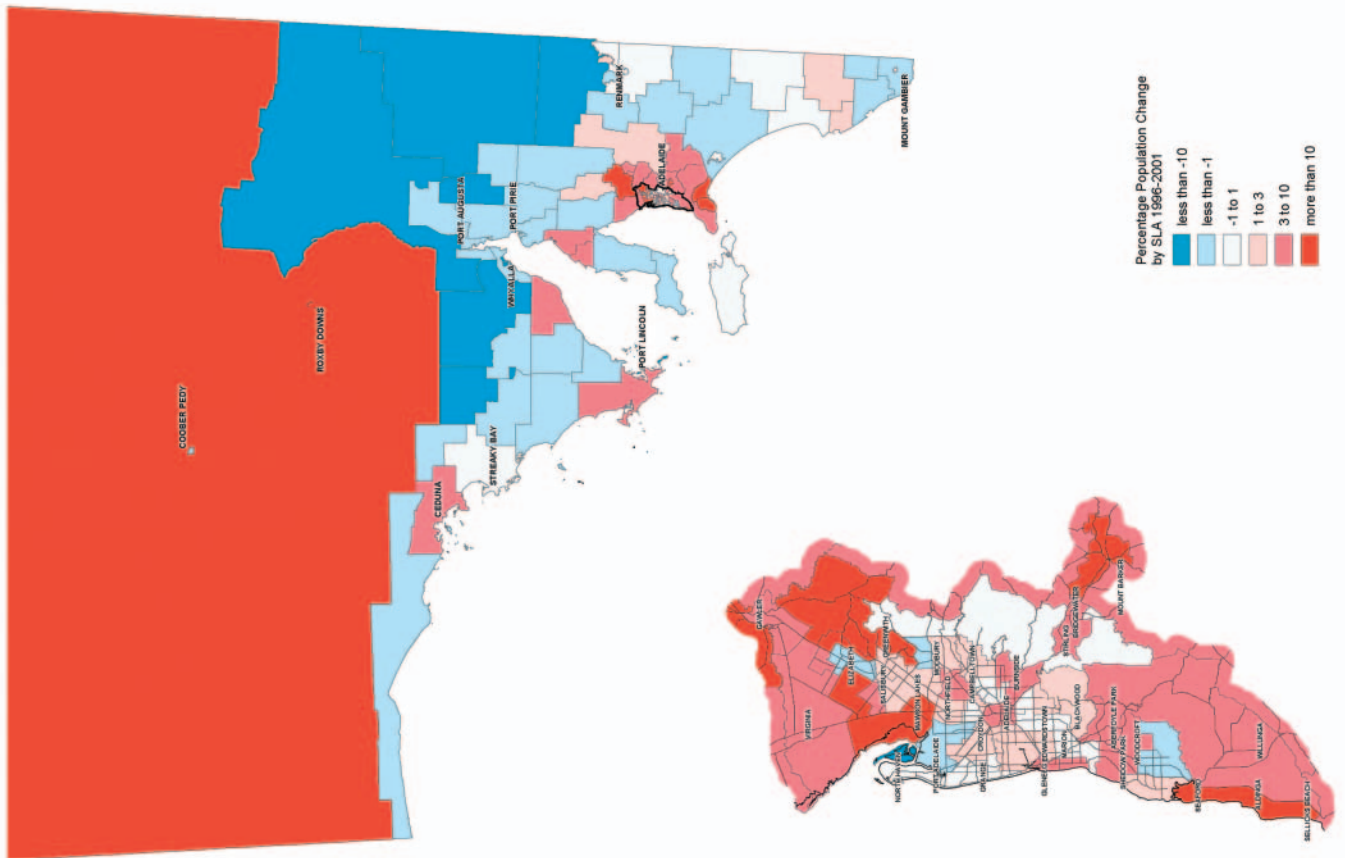
Analysis of the growth of residential development in the Adelaide Statistical Division plus Mount Barker (Map 6.5) highlights the massive growth in the spatial extent of that development in the four decades since 1960. During this period there has been an 89% increase in population in the Adelaide Statistical Division and a 250% increase in the area of residential land.

In 1960 the city was confined to a more or less contiguous core radiating only to a maximum distance of fifteen kilometres from the GPO. Today, residential development has claimed much of the available land on the Adelaide coastal plain and has extended to the edge of the Hills Face Zone. Development has also increased in Stirling in the heart of the Adelaide Hills and most recently further east to Hahndorf and Mount Barker. It now extends as far north as Gawler in the north and as far south as Port Noarlunga and Seaford Rise.

**Adverse effects of urban sprawl.** The expansion of residential development and its associated service industries into the Mount Lofty Ranges raises serious issues of wastewater disposal and increased stormwater run-off and pollution in what is Adelaide's most important potable water supply catchment area. This is already one of the most populated catchments in Australia and any further development will involve increased waste disposal, increased stormwater run-off from expanded residential areas, effluent release from wastewater treatment plants and increased

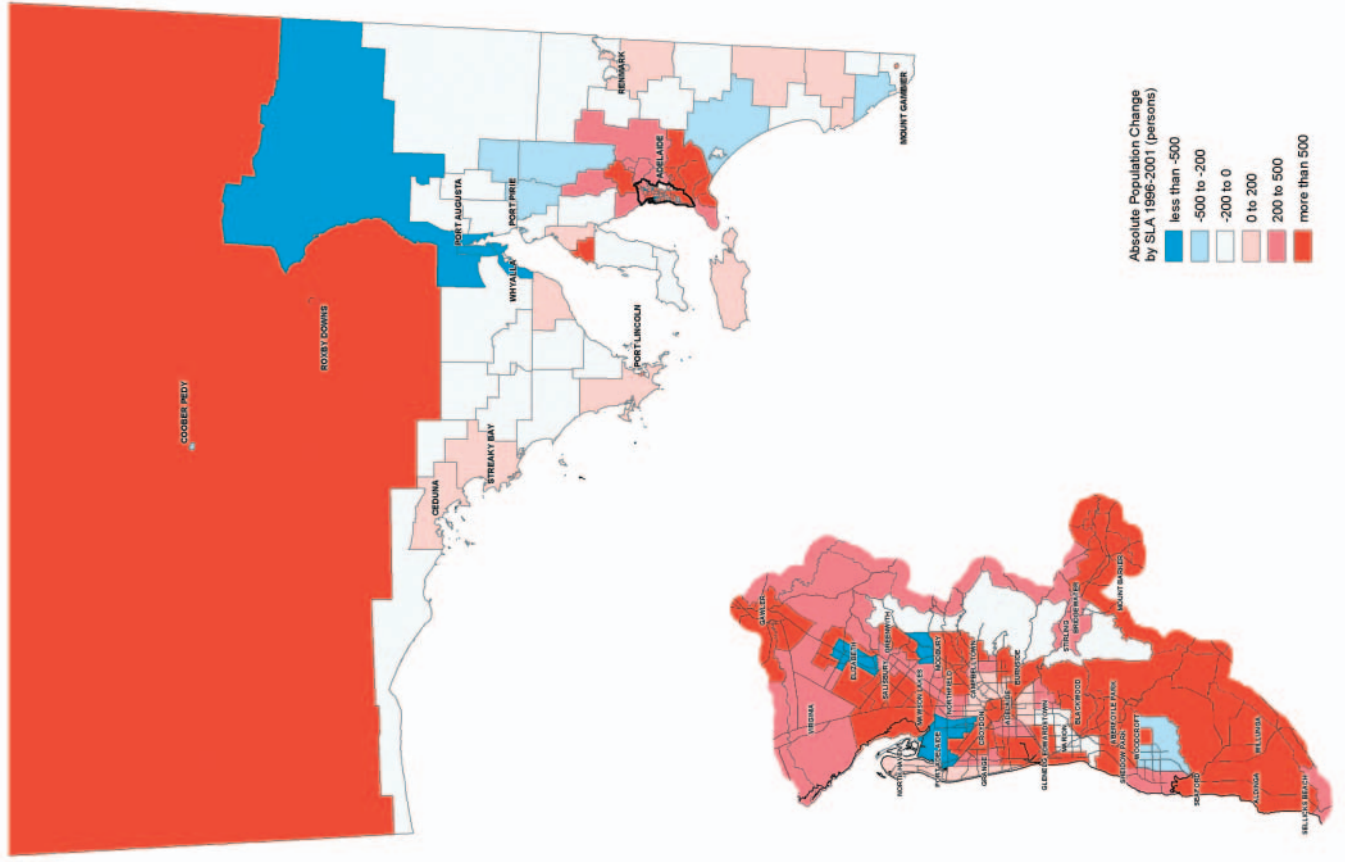
Map 6.2: Percentage change in estimated resident population by Statistical Local Area – Adelaide  
Statistical Division and South Australia 1996–2001.

SOURCE: PLANNING SA



Map 6.3: Absolute change in estimated resident population by Statistical Local Area – Adelaide  
Statistical Division and South Australia 1996–2001

SOURCE: PLANNING SA





Glenelg, Adelaide, South Australia  
Photo: South Australian  
Tourism Commission



Housing constructed 3 metres from  
a watercourse  
Photo: P. Hazell, EPA



Housing Development, Golden Grove  
Photo: Clare Nicolson

clearance of native vegetation to make way for housing (see also chapter on **Land Use**). Urban sprawl also increases the distances that people need to travel. This has implications for greenhouse gas emissions and air quality.

**Attempts at urban consolidation.** An urban growth boundary has recently been established to arrest this urban sprawl and encourage higher density residential development and redevelopment in appropriate locations closer to the city's centre. As a result, the importance of residential demolition sites and infill development – particularly in the inner and middle suburbs – as a source of land for housing is likely to increase.

The broad environmental benefits of urban containment include reductions in greenhouse gases through shorter journeys by car and increased public transport patronage, and reduced pressure on agricultural land and native vegetation on areas at the urban fringe. However, the costs will include higher land prices and an increased reliance on public open space and sporting and recreational facilities as higher density dwellings replace the traditional backyard. As redevelopment in established areas accelerates, the disposal of the rubble from the demolition of about 1500 houses each year will need to be addressed.

Construction and demolition waste comprises 53% of all waste sent to metropolitan landfill (see also chapter on **Waste**). There is also the danger that while the urban growth boundary will contribute to the containment of urban sprawl, its effect may also be to accelerate development within the boundary. What in fact is a greater constraint to growth is infrastructure provision and the land release by the Land Management Corporation.

**Loss of prime agricultural land.** Within the area designated as metropolitan Adelaide, the only large areas of relatively flat and accessible land are beyond the northern and the southern edges of the urban containment boundary. These are currently devoted to intensive high value agricultural production.

The viability of these primary production areas is dependent on the Government maintaining the current policies that protect those areas for agricultural pursuits, such as retaining rural land use zoning. The urban growth boundary rules out future urban sprawl. Without this Government policy, expansion of residential development into either the northern regions around Virginia or to the south around McLaren Vale and Willunga could threaten the survival of agricultural industries that make major contributions to the State's economy.

### What are we doing about it?

The **Planning Strategy**, established under the *Development Act 1993*, provides a tool to improve the integration of a range of policies that influence, or are influenced by, urban development. At the time of writing, revision of the planning strategy is being undertaken within an ecologically sustainable development (ESD) frame of reference. The Strategy has separate volumes for **metropolitan Adelaide** and **regional South Australia** (the Regional Planning Strategy). This update will focus on directions related to urban renewal and regeneration. It will be a major challenge to find new and effective ways to ensure

that population and urban growth is sustainable and provides well designed environments, housing choices and equitable access to services and employment.

In recognition of the importance of the outer metropolitan region, a Planning Strategy is to be developed for the 'Inner Region' of Adelaide. This incorporates the Northern Adelaide Plains, Barossa, Mount Lofty Ranges and the Fleurieu Peninsula. The **Inner Regional Planning Strategy** will place emphasis on protecting the Mount Lofty Ranges Watershed and viable agricultural land, minimising conflicts between land uses and the environment and maximising infrastructure provision in urban areas. Primary Industries and Resources SA has initiated the **Designated Primary Industry Areas (DPIA) program** that will identify significant primary production areas that are at risk from urban development. The protection of these areas will be incorporated into the Planning Strategy.

Via the Planning Strategy, the State Government has implemented an **Adelaide metropolitan urban containment policy** aimed at controlling urban sprawl that otherwise would see 'the country joining the city' and an accelerated loss of some of the State's most productive agricultural land. This is a significant development and enforcement of this boundary will require Adelaide to grapple with the notion of denser urban development and its associated environmental implications.

With the introduction of an urban containment boundary for the metropolitan region, priority will be placed on the orderly staging of development to meet demand, and the coordination of service provision to ensure the efficient and timely delivery of key infrastructure such as roads. The **Metropolitan Development Program** facilitates this by identifying development trends in different sectors of the Adelaide region and providing population forecasts.

Planning SA has initiated the **Development Plan Improvement Program** to review the system of development. This is the first holistic review of Development Plans since 1982 and will forge stronger links with the Planning Strategy. A simplified approach to Development Plans will allow the focus to remain on priorities, including those relating to environmental protection and management.

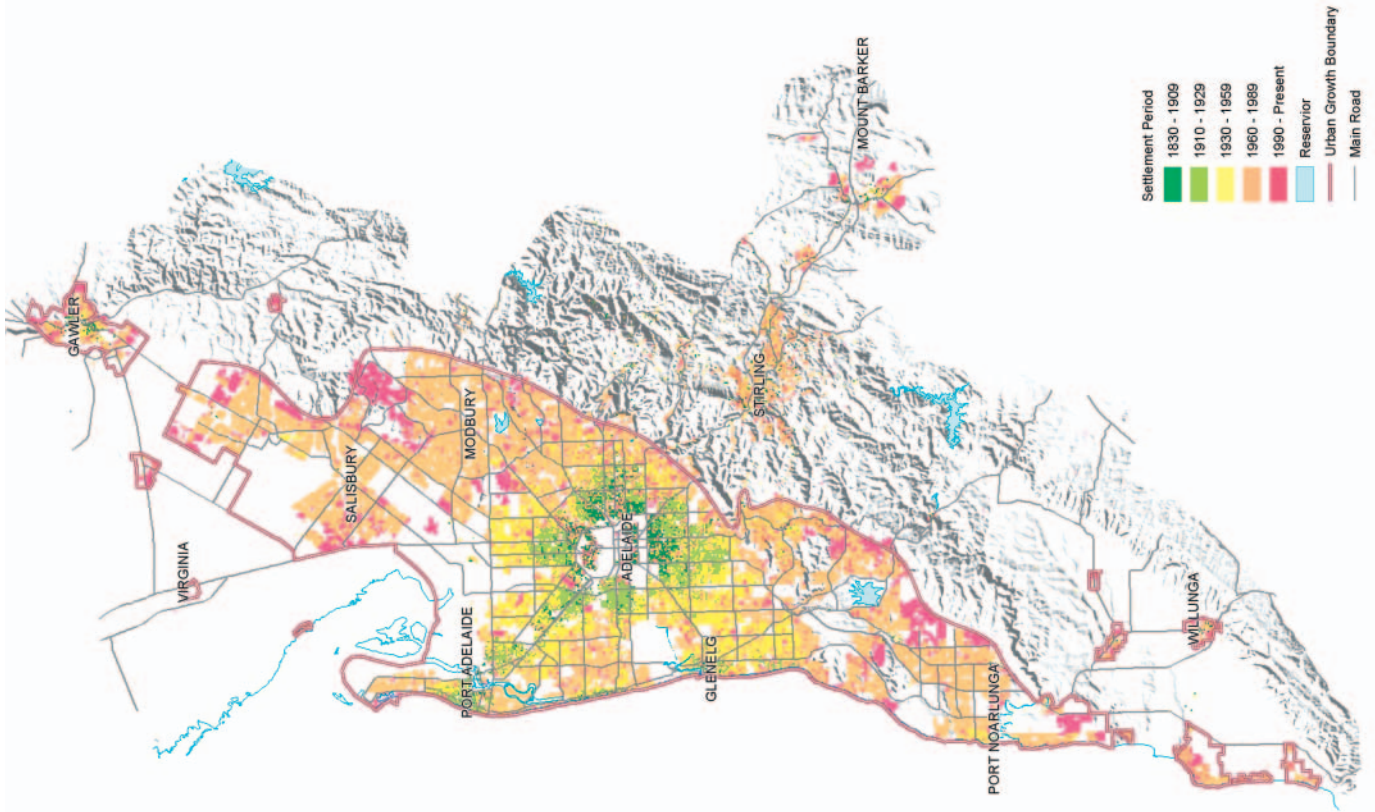
The draft **State Housing Strategy** and the draft **State Transport Plan** have been released in 2003. These are fundamentally linked to sustainable urban development and represent a significant step towards integrating urban design principles with transport and housing.

The South Australian Housing Trust has embarked on an **Urban Renewal Program** that aims to regenerate communities and provide improved standards of housing and better environments for living. A number of projects have commenced including Mitchell Park, Hawksbury Park, Hillcrest and Westwood.

The **Green City Program** aims to brand Adelaide as an internationally acclaimed green city – recognised for its environmental and sustainability initiatives. Success of the program will depend upon effective partnerships, community involvement and leading edge sustainable development in the fields of transport, energy, green buildings, water conservation,

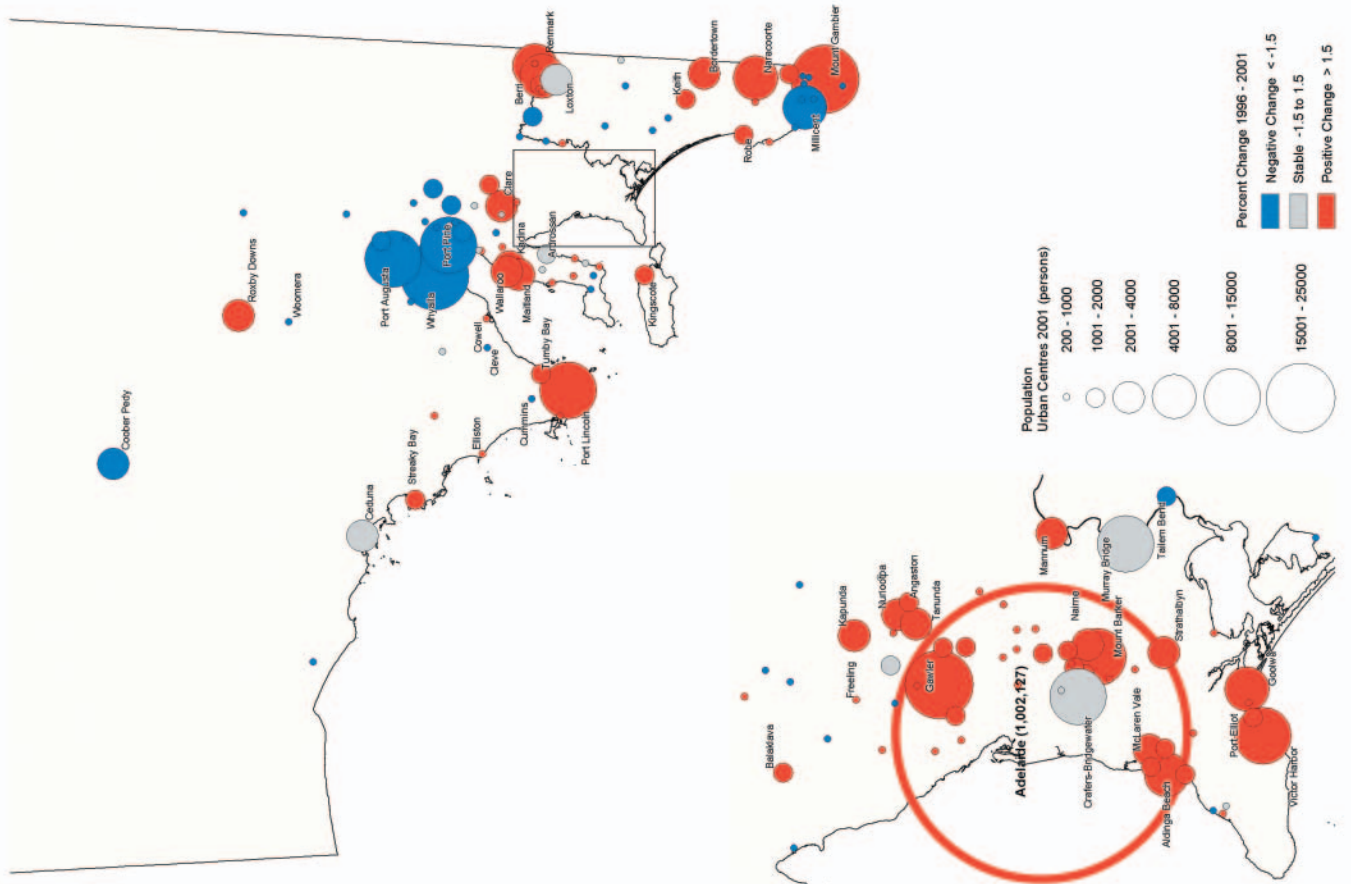
Map 6.5: Residential development of Adelaide and environs 1830 to present

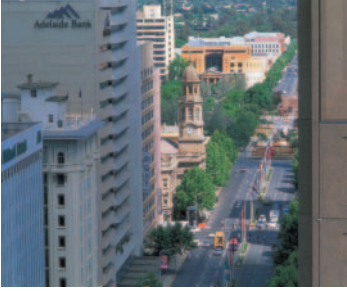
SOURCE: PLANNING SA



Map 6.4: Population of urban centres and rural localities 2001 and percentage change 1996-2001

SOURCE: PLANNING SA





King William Street, Adelaide, South Australia

Photo: South Australian Tourism Commission



Adelaide CBD golf course

waste minimisation and urban biodiversity. The new **ESD-based metropolitan Planning Strategy** will provide the overarching framework for the Green City Program. It is important that Government takes a strong leadership role in the Green City Program to ensure its success. The appointment of a 'Thinker in Residence' is a good example of innovative initiatives in this area.

**Urban green space** is critical for the well-being of people who live in urban areas. It provides a visual contrast to the built environment and allows the establishment of recreation and conservation areas adjacent to urban settlements. The **Metropolitan Open Space System (MOSS)** was developed in 1991 to establish a second generation of parklands around Adelaide and includes land in both public and private ownership. A number of new initiatives intend to build on the MOSS network including the **Parklands 2036** initiative, **Green City, One Million Trees**, the **Greater Mount Lofty Ranges–Yurrebilla Project**, **Naturelinks** and the **Urban Forest Biodiversity Program**. When completed these programs combined will provide a continuous open space across Adelaide and the Mount Lofty Ranges that will enhance and protect natural heritage and scenery, provide much needed wildlife corridors and contribute towards biodiversity values.

For more information on programs and initiatives see the *State of the Environment 2003 Supplementary Report*.

#### Further information

Metropolitan Open Space System  
[www.planning.sa.gov.au/open\\_space/index.html](http://www.planning.sa.gov.au/open_space/index.html)

Parklands 21  
[www.planning.sa.gov.au/parklands21/index.html](http://www.planning.sa.gov.au/parklands21/index.html)

Planning SA  
[www.planning.sa.gov.au](http://www.planning.sa.gov.au)

Urban Forest Biodiversity Program  
[www.urbanforest.on.net](http://www.urbanforest.on.net)

Yurrebilla  
[www.yurrebilla.parklands.sa.gov.au](http://www.yurrebilla.parklands.sa.gov.au)

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<sup>2</sup> This reference should be referred to in order to update the preliminary Statistical Division and Statistical Local Area estimated resident population data available when this chapter was drafted

# Transport

## Trends

- **Trips by car in metropolitan Adelaide: UP by 12% on weekdays, 5.7% on Saturdays and 0.3% on Sundays between 1986 and 1999.**
- **Passenger kilometres travelled by car: UP by 150 million kilometres between 1997/98 and 2000/01.**
- **The number of vehicles per 1000 persons: UP from 661 in 1997 to 699 in 2002.**
- **Vehicle registrations: up 3% between 1998 and 2002.**
- **Road freight tonne-kilometres travelled: UP by 0.762 billion tonne-kilometres between 1997/98 and 2000/01.**
- **The number of people using public transport: INCREASED 6% between 2000 and 2002 following a decade of decline.**
- **Age of South Australia's vehicle fleet: SLIGHT DECLINE from 12.1 years in 1998 to 11.9 years in 2002 – still above the national average of 10.5 years.**

## Goal

South Australia's Draft Transport Plan<sup>1</sup> outlines the following targets:

- no rise in greenhouse gas emissions and other pollution despite the rise in transport demand;
- double walking and cycling trips by 2018;
- increase the use of public transport to 10% of passenger travel by 2018;
- ensure safe and reliable access for regional, rural and remote South Australia;
- eliminate the road maintenance backlog by 2018;
- ensure more efficient freight movement, with 75% of interstate freight to go by rail and sea by 2018;
- reduce fatalities and serious injuries 50% by 2018;
- make better decisions through transparency and efficiency.

## What are the issues?

Transport is an essential component of human settlements. It influences settlement patterns and liveability, is essential for economic performance and provides opportunities for people to participate in social, economic and recreational activities. Transport can be broadly divided into two categories: passenger transport, which involves the movement of people using vehicles such as cars, bikes, buses, trains, boats and on foot; and freight transport, which moves goods through several stages from the producer to the consumer by road, rail, sea or air.

While transport provides a wide range of social and economic benefits, it is also a significant contributor to environmental pollution. It causes air and noise pollution and is a major source of greenhouse gas emissions, particularly road transport. Rubbish thrown from cars is a major source of litter along roadsides. Urban stormwater carries oil and other vehicle and industrial pollutants from the roads to rivers, streams and the sea, impacting on water quality. Oil spills from shipping can have a significant impact on marine life and degrade beaches, while ballast water (particularly from international shipping) can introduce pest species into Australian waters. Recreational boating contributes to water pollution through fuel spillage and the discharge of other wastes.

The level of environmental impact varies depending upon the type of transport that is used. Road transport, in particular the private car, is a major contributor to pollution, particularly air pollution. From a South Australian perspective this makes our high dependency on the private car and our relatively low use of public transport a major environmental concern. Adelaide's urban sprawl to the north and south contributes to greater car use as travel distances increase.

A key issue in minimising the environmental impact of transport is to reduce the need to travel and, where travel is necessary, to encourage more sustainable forms of transport. Personal mobility is important for all South Australians, therefore decreasing the use of the private car while maintaining personal mobility is a significant challenge. Adequate provision of, and easy access to, alternative transport services such as public transport, walking paths and cycling routes, as well as the introduction of technical innovations to improve the efficiency and effectiveness of vehicles are key strategies that will lead to more sustainable transport use.

Information in this chapter focuses primarily on the effects associated with road based transport, which is the major contributor to environmental pollution.

See also chapters on **Air Quality; Climate Change; Energy; Health of the Marine and Coastal Environment; Introduced Species; and Water Quality.**

## KEY FACTS

- **The private car accounted for 79% of weekday passenger trips made in 1999.**
- **South Australia has the second-oldest vehicle fleet in Australia.**
- **Freight transport by road produces 74% of total greenhouse gas emissions from freight transport, while comprising 46% of the total tonne-kilometres travelled.**
- **The number of people using public transport has steadily increased since 2000 following a decade of decline.**
- **Adelaide has the world's highest percentage of Compressed Natural Gas (CNG) buses in a metropolitan fleet.**



Public bus  
Photo: Transport SA



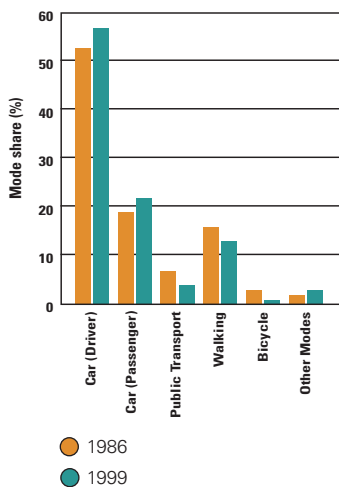
Congested traffic  
Photo: Transport SA



Locomotive freight train

<sup>1</sup> At the time of writing the Draft Transport Plan was undergoing community consultation.

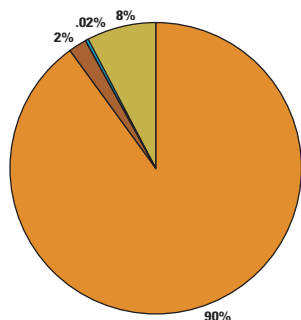
Figure 6.7: Mode share (%) weekday, metropolitan Adelaide – 1986 & 1999



Note: 'Other modes' includes trucks, motorcycles and taxis; public transport includes trains, trams, metro buses, school buses and other buses.

SOURCE: TSA, 1986; TSA, 1999

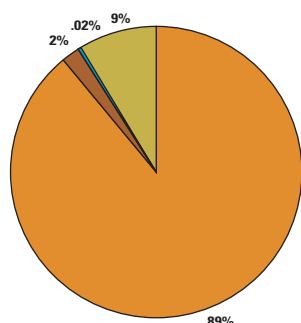
Figure 6.8: Proportion of total domestic passenger-kilometres travelled by road, rail, air and sea – 1997/98



● Road  
● Rail  
● Sea  
● Air

SOURCE: APELBAUM, 2003

Figure 6.9: Proportion of total domestic passenger-kilometres travelled by road, rail, air and sea – 2000/01



● Road  
● Rail  
● Sea  
● Air

SOURCE: APELBAUM, 2003

## Findings

### Making progress

Improved services and enhancements to the public transport system have resulted in public transport patronage increasing by 6% between 2000 and 2002 following a decade of decline.

A Draft Transport Plan for South Australia has been released for consultation. This identifies a vision for a more sustainable and integrated transport system.

Approximately 28% of the Adelaide metropolitan bus fleet is powered by Compressed Natural Gas (CNG) – the highest rate in the nation. The Passenger Transport Board's Greenfleet project aims to plant enough trees to offset carbon dioxide emissions (a major greenhouse gas) from public transport.

### Attention required

South Australia remains a car-dependent society with 79% of all weekday trips made by the car in 1999.

Car ownership per capita has slightly increased since 1995 and remains above the national average. South Australia also has the second-oldest vehicle fleet in Australia with an average age of 11.9 years, compared to the national average age of 10.5 years.

Road freight transport is projected to increase substantially. This type of freight transport emits the highest amount of greenhouse gases, and creates urban noise and amenity problems.

## What more should we be doing?

The Environment Protection Authority recommends that:

- 6.10 Transport management policies, programs and measures are developed and implemented that focus on an integrated approach to transport planning that takes account of land use and urban form. New residential developments should incorporate integrated transport networks that minimise environmental impacts while meeting the transport needs of the community.
- 6.11 Strategies and incentives are developed that focus on managing the demand for transport and shifting transport use from the car to public transport, walking and cycling. This will require significant improvements to the public transport system and cycling facilities.
- 6.12 Policies are developed and implemented to reduce the age, improve the fuel efficiency and emissions performance of South Australia's motor vehicle stock. There should also be investigation of the feasibility of the greater uptake of electric and fuel cell vehicles to reduce transport emissions.
- 6.13 Policies are developed that encourage the greater use of rail and sea for freight transport to reduce our reliance on road freight transport which is less efficient and more polluting. Policies should also be developed to assist freight transport operators to adopt cleaner fuel types and modern engine technology in trucks.
- 6.14 Policies and programs are developed and implemented to protect the community living near major transport corridors from unacceptable noise and air emissions.

## Environmental indicators

### PRESSURE INDICATORS

- Proportion of trips undertaken by private and public transport (reported on in the *State of the Environment Report 1998*)

Changes in the proportion of passenger trips by private and public transport reflect changing transport trends. The environmental effects of transport depend on the mode of transport. Cars are generally the most, and walking and cycling the least, environmentally damaging.

- Total annual passenger-kilometres travelled by private and public transport (reported on in the *State of the Environment Report 1998*)

The greater the distance travelled the greater the resource use and environmental impact.

- Motor vehicle ownership and registrations (reported on in the *State of the Environment Report 1998*)

Higher levels of car ownership are generally associated with lower levels of public transport use.

- Freight tonne-kilometres travelled (new indicator)

Road freight emissions are a major and increasing source of air pollution and greenhouse gas emissions.

### RESPONSE INDICATORS

- Public transport patronage (reported on in the *State of the Environment Report 1998*)

Increases in the number of trips made by public transport, rather than by car, has environmental benefits.

- Access to public transport stops and service frequency (new indicator)

The extent to which public transport is used depends on the level of service provided as well as the ease with which the service can be accessed.

- Kilometres of bicycle network (new indicator)

Provision of an adequate and safe bicycle network encourages cycling.

What is the current situation?

**PRESSURE INDICATOR: Proportion of passenger trips undertaken by private and public transport**

Passenger transport includes the movement of *people* by either private or public transport, as opposed to freight transport, which involves the movement of *goods*. Private transport includes cars, motorcycles, bicycles and walking, while public transport includes taxis, trains, trams and buses. Around 89% of all passenger trips are undertaken by road, whether by private or public transport.

The car is the most common form of passenger transport. In metropolitan Adelaide, 79% of all weekday trips made in 1999 were by private car. Walking accounted for 12.6% of trips, public transport for about 4.6% of trips and the bicycle for 1.2% of trips. Our use of the private car has remained relatively stable over the last decade with a slight increase between 1986 and 1999 for an average weekday. However, the number of trips made by public transport, walking and cycling has significantly declined (Figure 6.7). Analysis of car use on the weekends versus weekdays indicates that our use of private cars in 1986 compared to 1999 has increased by 12% on weekdays, 5.7% on Saturdays and 0.3% on Sundays (Transport SA, 1986 & 1999). This reflects changes that have occurred in the community's work and recreation patterns.

Our reliance on the motor car to meet most of our transport needs contributes to air, noise and water pollution. Adelaide's urban area, which is increasingly sprawling to the north and south, is increasing our dependence upon cars as travel distances increase. The size of South Australia and its relatively low density of settlements also increases our reliance upon the car as a major mode of travel.

**PRESSURE INDICATOR: Total annual passenger kilometres travelled by private and public transport**

Road based transport accounted for nearly 89% of the total domestic passenger-kilometres travelled by passenger vehicles in South Australia in 2000/01. The remainder was by air (9%), rail (2%) and sea (less than 1%) (Apelbaum, 2003). These figures are similar to those from 1997/98 (Figure 6.8 and 6.9).

There is an increasing trend in the total distance travelled by passenger vehicles. Between 1997/98 and 2000/01 the total number of kilometres travelled by all types of passenger vehicles in South Australia increased by 0.53 billion passenger-kilometres (Figure 6.10). Road transport accounted for 0.21 billion passenger-kilometres, of this increase, 0.14 billion passenger-kilometres can be attributed to the private motor vehicle.

**PRESSURE INDICATOR: Motor vehicle ownership and registrations**

The number of vehicles using South Australia's roads is rising at a rate of around 1% per year. The number of vehicles registered between 1998 and 2002 increased by 3%, or 32,000 vehicles (Figure 6.11). Cars are the most common type of vehicle comprising approximately 80% of all registered vehicles.

The number of registered vehicles per person is also increasing. The total number of motor vehicles registered per 1000 persons in South Australia has increased from 661 in 1997 to 699 in 2002. This is consistently above the national average (Figure 6.12).

South Australia has the second-oldest vehicle fleet in Australia with an average age of 11.9 years. This has declined slightly since 1998 when the average age was 12.1 years, but is still above the national average of 10.5 years. An ageing vehicle fleet has implications for vehicle efficiency and emissions from fuel use. Newer model cars tend to be more fuel efficient and less polluting than older vehicles. Given that changes in motor vehicle age are gradual, any new technological developments to reduce the environmental impact of vehicle usage will also be gradual.

**PRESSURE INDICATOR: Freight vehicle tonne-kilometres<sup>2</sup> travelled**

Freight transport is the mechanism by which goods from the producer are delivered to a distributor or consumer. Freight transport is critical to South Australia's economic development. Our contribution to national exports is significant as wine, motor vehicle, grain and aquaculture industries continue to grow.

In Adelaide, as in most other large urban centres, the diverse range of goods, origins and destinations, short distances and the urgency of deliveries, means that road transport is the favoured method for deliveries. Within Adelaide virtually all freight movement occurs by road. Rail transport is used more for interstate freight transport and to a lesser extent between regional locations, while international freight is transported mainly by sea or, for some commodities, by air.

Figure 6.13 indicates that while the total freight tonne-kilometres travelled since 1997/98 has fallen, the freight task by road has increased. This has significant implications for greenhouse gas emissions because within the freight transport sector, road transport is the single largest contributor to greenhouse gas emissions. While domestic freight transport by road contributed 46% of total freight tonne-kilometres travelled in 1997/98, it contributed 74% of total greenhouse gas emissions (Figure 6.14).

It is clear that to reduce greenhouse gas emissions from the road transport sector as a whole it

Figure 6.10: Total domestic passenger – kilometres travelled (billions)

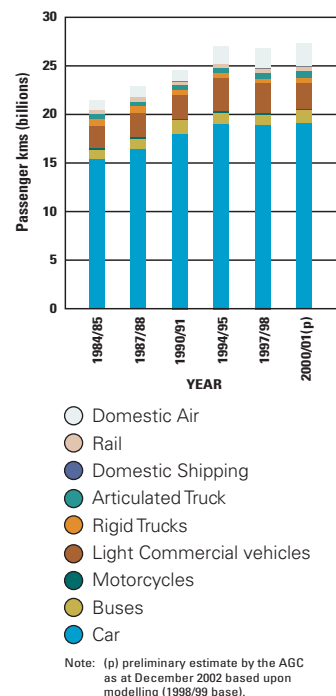


Figure 6.11: Total number of motor vehicle registrations all vehicle types – 1971–2002

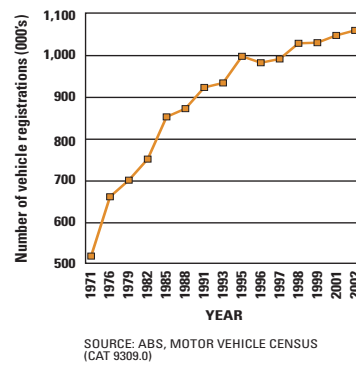
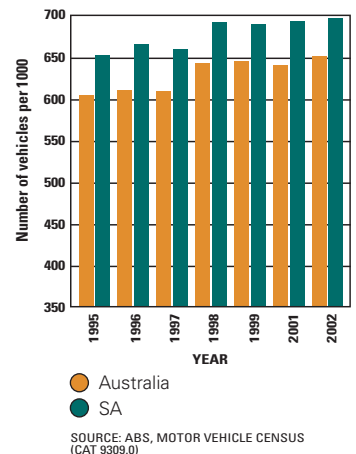
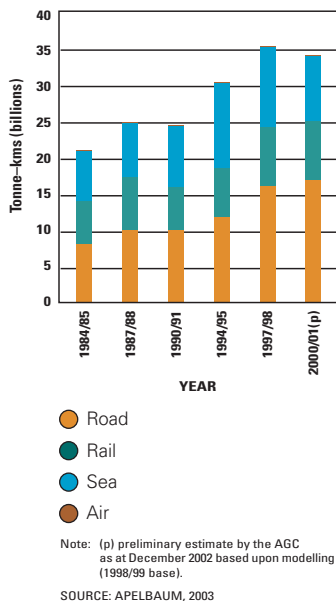


Figure 6.12: Total motor vehicles per 1000 population, Australia and South Australia



<sup>2</sup>The unit 'tonne-kilometre' is formed by multiplying freight carried (tonnes) with the distance it is carried (kilometres). For example, 20 tonnes of freight carried 200 kilometres equates to 4,000 tonne-kilometres.

**Figure 6.13: Tonne-kilometres travelled by domestic freight – road, rail, sea & air**



is imperative that alternative modes of transport are used for carrying freight over longer distances wherever feasible – such as rail and sea – coupled with a move to cleaner fuel types and modern engine technology in trucks. Effective strategies have to ensure a level playing field with regard to cost. At present, roads are funded by the general community and are freely available to most road freight transport, while rail, shipping and air are priced to deliver profits to the providers of this infrastructure, therefore making it more expensive and less likely to be used to transport goods.

### What impact does our continued reliance on road transport have?

Some of the environmental, social and economic effects associated with our continued reliance on road transport are outlined below.

**Air pollution and climate change.** Road transport is a significant contributor of greenhouse gas emissions. Transport is consistently the largest energy consuming sector in South Australia and remains the largest single source of air pollution. In 2001 the transport sector contributed 23% of South Australia's greenhouse gas emissions (see the chapter on **Climate Change**).

**Pollution of water resources.** Stormwater run-off from urban roads can pollute the marine and freshwater environments. Urban stormwater carries a range of pollutants from roads including tyre and metal fragments and harmful organic compounds. These can affect aquatic plant and animal communities and reduce water quality. Oil from commercial shipping, and fuel spillages and other waste from recreational boating also causes water pollution.

**Impact on human health.** Although the motor car has revolutionised how people get around, it has negative impacts on the quality of life through pollution, odour, noise, loss of amenity, and safety. Our heavy reliance on the car means that we are becoming more physically inactive, which also has an adverse impact on our health.

**Impact on social equity.** A city designed to allow for easy access to goods, services and employment means shorter travel distances, greater choice of modes of transport, a more equitable society (i.e. improved accessibility for those without access to private transport), and a greater choice of residential locations. Not having to provide the infrastructure to support a car-dependent community translates into a more equitable use of land – such as more land for recreational purposes.

**Economic costs of road transport.** Economic costs associated with motor vehicles include accidents, congestion, noise, costs associated with effects on human health, pollution control and repair, and the future mitigation and adaptation costs of climate change. Private costs associated with vehicle use include car purchase and maintenance, the costs of parking, as well as petrol. Cycling, walking and public transport are more cost-efficient alternatives than using private transport.

**Noise.** Transport also causes noise pollution, which can have a wide variety of consequences ranging from

sleep disturbance to educational and learning difficulties. Transport noise above World Health Organisation standards affects around 14% of people in Adelaide (DTUP, 2003).

### What are we doing about it?

#### RESPONSE INDICATOR: Public transport patronage

In the 1970s public transport in South Australia was highly patronised due to a large increase in public transport subsidies and rising oil prices. Since then it has suffered a long term decline (Figure 6.16), an issue also highlighted in the State of the Environment Report 1998. This decline was temporarily interrupted in 1990–91 due to the introduction of free travel for school children, however, during this period there were also a number of public transport service reductions, including a significant lowering of night and weekend services. Between 1995 and 2000, patronage decreases levelled off (with one exception of a significant decrease in 1998/99).

Since 2000 there have been a number of initiatives to increase the use of public transport, including service improvements, better marketing and improved infrastructure. Subsequently patronage increased by 6% between 2000 and 2002. The use of public transport in South Australia in the twenty-first century, particularly in Adelaide, has to compete with factors such as higher incomes, busier lifestyles, increasing car ownership and continuing urban sprawl, which is increasing travel distances.

The Draft Transport Plan for South Australia aims to increase the use of public transport to 10% of weekday passenger travel by 2018 (in 1999 the aim was around 5%).

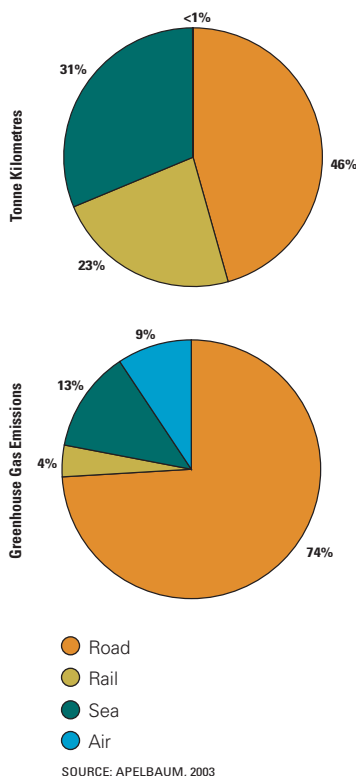
#### RESPONSE INDICATOR: Access to public transport stops and service frequency

In South Australia the Passenger Transport Board (PTB) is responsible for overseeing Adelaide's metropolitan public transport network to ensure it provides services that are safe and efficient, responsive to the transport needs of the community and are also environmentally friendly. The PTB endeavours to ensure that public transport services are within reach of as many of Adelaide's residents as possible, as well as ensuring adequate public transport links to major centres.

While the *coverage* of public transport services in Adelaide is regarded as relatively good it is only regarded as satisfactory in terms of *service frequency*. It is estimated that about 95% of suburbs are provided for in terms of service coverage, while about 80% of suburbs are satisfactorily served in terms of frequency. Those suburbs adjacent to 'Go Zones' receive much higher standards of service.

Go Zones were first introduced in April 2000 and have services at least every 15 minutes from 7.30 am to 6.30 pm on weekdays. There are now eighteen Go Zones operating within the Adelaide metropolitan area. The increase in patronage along routes that have

**Figure 6.14: Comparison of domestic freight tonne-kilometres for 1997/98 travelled by road, rail, sea, and air and greenhouse gas emissions (CO<sub>2</sub> equivalents)**



had an increase in the level of service frequency is significantly higher than non-improved service routes.

There are opportunities for improving public transport services in Adelaide for both service coverage and frequency – particularly in lower density suburbs where improvements are desirable for social inclusion and equity.

**RESPONSE INDICATOR: Kilometres of bicycle network**

In the period 1998 to 2002, the amount of off-road bike paths in Adelaide increased from 171 kilometres to 220 kilometres. Similarly, on-road bike lanes increased from 165 kilometres to 257 kilometres. In 2002 the total on-road and off-road bike network amounted to around 480 kilometres in the metropolitan area. Figure 6.17 indicates trends in the growth of bicycle networks in Adelaide over the last decade.

Although Adelaide has a substantial network of cycling lanes on roads, the network is of inconsistent standard and has missing links. It is important to complete the cycling network and ensure an urban environment that is safe and convenient to encourage cycling. It is also important to ensure that urban design can accommodate bike riding. The design of some low density residential developments in the 1990s was unsuitable for cycling and walking due to curvilinear roads and the extensive use of cul-de-sacs (DTUP, 2003).

The Draft Transport Plan for South Australia aims to double the number of walking and cycling trips by 2018.

**Policy and programs**

There has been a wide range of initiatives and programs since the *State of the Environment Report 1998* that have focused on reducing the environmental impact of transport, particularly road transport. This is a very positive development. However, more needs to be done to achieve a transport system that adequately meets the needs of all users, while at the same time minimising the impact on the environment and ensuring economic performance.

In April 2003 a draft State Government Transport Strategy was released by the Department of Transport and Urban Planning for consultation. This is the first since 1968. It identifies a framework and long term vision for South Australia's transport future. The **Transport Plan for South Australia** aims to improve freight efficiency and personal mobility, reduce greenhouse gas emissions and promote a lifestyle where everyone has equal access to employment, leisure and education opportunities.

To ensure the integration of land use planning and transport the **Planning Strategy for Metropolitan Adelaide** and the **Planning Strategy for Regional South Australia** provide a basis for the integration of economic, environmental and social strategies. Consideration of the needs of pedestrians, cyclists, public transport passengers and commercial freight delivery in urban design is recognised in the discussion paper **Transport Choice and Urban Design** (Planning SA, 2000), which is concerned with urban rehabilitation and the need to promote transport choice.

Due to our consistently high level of road transport use it is essential to implement strategies to reduce emissions through alternative fuel technologies. South Australia is committed to action under the **National Strategy for Lowering Emissions from Urban Traffic (2000)**. The Strategy focuses on actions to reduce greenhouse gas emissions from passenger transport in urban areas. A strategy to reduce emissions from freight vehicles has commenced.

The Commonwealth Government's **alternative fuels programs** are designed to reduce greenhouse gases and other vehicle emissions from Australia's road transport sector. The programs incorporated within this strategy include the **Alternative Fuels Conversion Program (AFCP)**, **Compressed Natural Gas Infrastructure Program (CNGIP)** and the **Diesel and Alternative Fuels Grants Scheme (DAFGS)**.

The **Environmental Strategy for the Motor Vehicle Industry** aims to significantly enhance the environmental performance of the automotive industry. A mandatory **fuel consumption labelling scheme** and the **Fuel Consumption Guide** have been developed by the Australian Greenhouse Office to help consumers make informed choices about new car purchases that will help reduce greenhouse gas emissions, while returning an economic benefit through lower fuel running costs. The Federal Government is also currently negotiating with industry to set **National Average Fuel Consumption (NAFC) targets** for new passenger vehicles for 2005 and 2010.

National programs are in progress to reduce the environmental impact of freight transport, in particular road freight. The former National Road Transport Commission has become the **National Transport Commission** and will deal with both the road and rail transport sectors. Already there are national programs to encourage the shift of long distance freight from road to rail, and these are supported in South Australia by Government programs for establishing 'intermodals' where freight can be loaded from large trucks on to rail and vice versa.

Public transport in South Australia must be improved considerably. The Draft Transport Plan (DTUP, 2003) acknowledges that we have the most run-down public transport system in Australia and that it is currently unable to meet changing land use, work and shopping patterns.

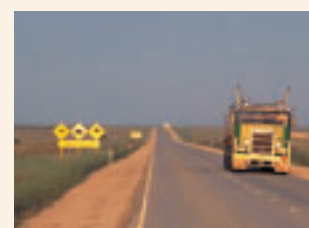
The Passenger Transport Board is determined to achieve a **carbon neutral public transport system**. Adelaide has the world's highest percentage of Compressed Natural Gas (CNG) buses in a metropolitan fleet. Together with alternative fuel technologies, carbon neutrality will be achieved by planting trees to offset carbon emissions from the public transport vehicle fleet.

Several initiatives and strategies have been implemented in an attempt to change travel behaviour including the implementation of **Smart Stops**, which are currently being tested. Smart Stops 'talk' to waiting passengers telling them when the next bus, train or tram is due. It is anticipated that public transport patronage will increase by 5% with the widespread introduction of Smart Stops.

**TravelSmart SA** aims to reduce greenhouse gas emissions, manage travel demand and promote healthier lifestyles and communities.

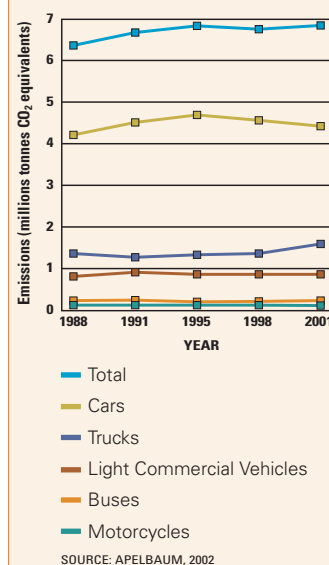
**GREENHOUSE GAS EMISSIONS FROM ROAD TRANSPORT IN SOUTH AUSTRALIA**

Greenhouse gas emissions from the transport sector as a whole have declined by around 1% since 1995, however, emissions from road vehicles (cars, trucks, buses, motorcycles) have increased by 7.6% over the 1988 to 2001 period. Emissions from road vehicles account for 87% of all transport emissions, more than six times all other sources put together. Cars account for 64% of all emissions from road vehicles (Figure 6.15). Emissions from cars peaked in 1995 and have since fallen slightly, possibly due to increased fuel efficiency. Between 1998 and 2001 there was a sharp increase of 18% (230,000 tonnes) in emissions from trucks – from articulated trucks more than from rigid trucks. For more information see the chapter on **Climate Change**.



*Eyre Highway, the Nullarbor, Eyre Peninsula, South Australia  
Photo: South Australian Tourism Commission*

**Figure 6.15: Road vehicle greenhouse gas emissions (CO<sub>2</sub> equivalents) – 1988–2001**





Bike riding on the outskirts of Adelaide  
Photo: Transport SA

To increase alternative methods of transport and realise the health benefits a **walking strategy** for South Australia is currently being developed, and at the national level the **Australian Cycling National Strategy** provides the framework for the delivery of programs designed to increase participation in cycling. The cycling strategy aims to double the use of bicycles for transport and recreation and to enhance the well-being of all Australians. In South Australia **Bikedirect** provides a network of cycling facilities, maps and signs to assist cyclists to plan their trips across the Adelaide metropolitan area.

For more information on policy and programs see the *State of the Environment 2003 Supplementary Report*.

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Planning SA (2000). *Transport Choice and Urban Design: Design Issues for Accessible Neighbourhoods*. Government of South Australia.

Planning SA (2003). *Planning Strategy for Metropolitan Adelaide January 2003*. SA Government, Adelaide.

### Further information

Alternative Fuels Conversion Program (AFCP)  
[www.greenhouse.gov.au/transport/afcp/index.html](http://www.greenhouse.gov.au/transport/afcp/index.html)

Australian Greenhouse Office  
[www.greenhouse.gov.au](http://www.greenhouse.gov.au)

Department of Transport and Regional Services  
[www.dotars.gov.au](http://www.dotars.gov.au)

Planning SA  
[www.planning.sa.gov.au](http://www.planning.sa.gov.au)

South Australia's Transport Plan  
[www.dtup.sa.gov.au/transport\\_plan/index.html](http://www.dtup.sa.gov.au/transport_plan/index.html)

Transport SA – Bikedirect  
[www.transport.sa.gov.au/personal\\_transport/bike\\_direct/index.asp](http://www.transport.sa.gov.au/personal_transport/bike_direct/index.asp)

Transport SA  
[www.transport.sa.gov.au](http://www.transport.sa.gov.au)

TravelSmart Australia  
[www.travelsmart.gov.au](http://www.travelsmart.gov.au)

Figure 6.16: Patronage by mode – 1988–89 to 2001–02

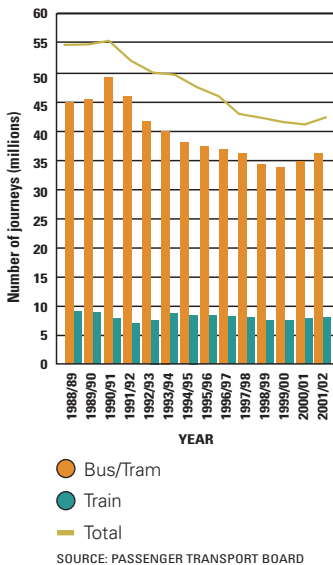
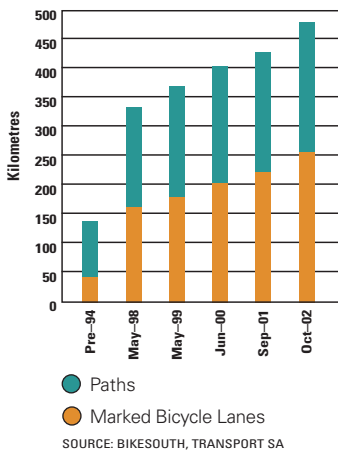


Figure 6.17: Length of bike lanes & paths in the metropolitan area



# Waste

## Trends

- **Amount of solid waste sent to landfill:** approximately 1 tonne of solid waste for every person in 2001/02.
- **Liquid waste (subject to levies under the Environment Protection Act):** UP 6% since 1997/98.
- **Household participation in recycling of domestic waste:** UP from 1996 to 2000 particularly for clothing and rags (up 19%), plastics (up 14%) and garden waste (up 9%).
- **Litter:** UP 3% since 1998 after a downward trend from 1998 to 2000.
- **Amount of hazardous waste collected and treated:** UP 60% since 2000.
- **Industry adopting eco-efficiency practices has INCREASED** since 1998.
- **Beverage container return rates: STEADY** since 1998.

## Goal

To minimise waste and resource use in accordance with the waste hierarchy, with a long term vision for zero waste.

*Environment Protection Authority*

## What are the issues?

A growing economy and increasing population create a rising demand for goods and services provided by businesses, industries and Governments. The main drivers of waste generation in South Australia are economic growth, urban consolidation, household formation trends with fewer people in more dwellings, under-provision of garden waste and other recycling services, and community attitudes. Our consumption patterns tend to be linear: we consume natural resources to make products or provide services and waste is generated as an end result. Waste is material discarded, used up or left over in the course of industrial, commercial, domestic or other activities.

The majority of our solid waste (waste that is not in liquid form or hazardous) is sent to landfill depots for disposal – an expensive and traditional approach. The rate at which we are sending waste to landfill is increasing. Hazardous wastes – including radioactive material – pose a risk to human health and the environment and require special handling and disposal. The rate at which we are producing this waste is also increasing. If managed improperly, waste can pollute the land, air and water.

We need to minimise the waste we generate and recycle as much as possible. Community participation in recycling is increasing as a result of the recycling services provided by Local Government as part of 'kerbside' weekly waste collection. Some level of recycling also occurs in the industrial and commercial

sectors, but these efforts must be increased. In an effort to end our dependency on landfill, South Australia is now moving towards developing improved strategies for waste minimisation and waste avoidance and the cleaner operation of businesses and industries.

See also chapter on [Land Use](#).

## Environmental indicators

### PRESSURE INDICATORS

- **Annual amount and composition of solid waste consigned to landfill** (reported on in the *State of the Environment Report 1998*)

The large amount of solid waste disposed to landfill generates pollution and is potentially wasteful of resources.

- **Amount and composition of litter** (reported on in the *State of the Environment Report 1998*)

Amount and composition of litter provides useful insights into consumer habits.

- **Quantity, composition and disposal of hazardous wastes** (reported on in the *State of the Environment Report 1998*)

Recording the volume, nature and source of hazardous wastes is important in helping to protect the environment from contamination.

- **Amount of liquid wastes collected and treated** (new indicator)

Recording the volume, nature and source of liquid wastes is important in helping to protect the environment from contamination.

### RESPONSE INDICATOR

- **Amount of waste materials recycled** (reported on in the *State of the Environment Report 1998*)

Recycling plays an important role in solid waste management, and should be encouraged to reduce the need for disposal, and protect further virgin materials being extracted, processed and used.

## What is the current situation?

### PRESSURE INDICATOR: Annual amount and composition of solid waste consigned to landfill

The amount of solid waste we are sending to landfill in the metropolitan area has increased over the last five years (Figure 6.18). In 2001–02 about 1,115,000 tonnes of solid waste was sent to landfill in Adelaide – approximately one tonne of solid waste per person in the metropolitan area. This is a 14% increase since the *State of the Environment Report 1998* when approximately 980,000 tonnes of solid waste (or 0.8 tonnes per person) was sent to landfill (1997–98 figures). It is noted, however, that prior to 2000–01 the amount of waste disposed to landfill was largely reported using an estimate based on vehicle size. This system underestimated the actual quantity of waste disposed to landfill. From 2000–01 waste disposed to landfill is more accurately reported on the basis of

## KEY FACTS

- **53% of the waste we send to landfill is from construction and demolition activity.**
- **The amount of solid waste sent to landfill in the metropolitan area continues to increase.**
- **71% of material we put in our garbage bins and send to landfill is recyclable.**
- **The amount of litter is not declining, despite public education campaigns.**

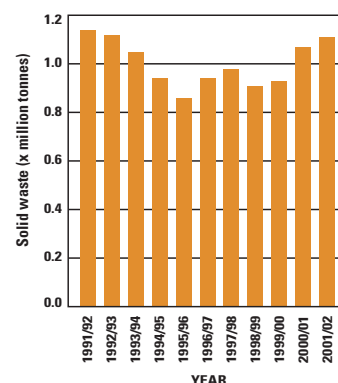


Waste transfer station



Balefill landfill

Figure 6.18: Metropolitan solid waste disposed to landfill – 1991/92 – 2001/02



Note: Figures exclude cleanfill.  
SOURCE: EPA

### CASE STUDY: The contents of a domestic garbage bin

A survey by Recycle 2000 (1998) found that, in 1998, the average contents of a domestic garbage bin (measured by weight) consisted of food (28.7%) and garden waste (37.2%), followed by paper and cardboard (11.3%). A key finding of the survey was that around 72% of the waste found in our domestic garbage bins could have been diverted from landfill.

In 2002 nearly 50% by weight of materials in our domestic garbage bins was organic – 26% food and 22% garden waste – and a further 21% was potentially recyclable via kerbside recycling (EPA, 2002). This means that in 2002 approximately 71% of material in our garbage bins could have been diverted from landfill – there has been virtually no improvement since 1998.

## Findings

### Making progress

A new waste management body – Zero Waste SA – has been announced to continually reduce the amount of waste going to landfill by working closely with State and Local Governments and relevant stakeholders to encourage everyone to recycle.

Although service standards differ, all of the metropolitan Adelaide Councils and 17 non-metropolitan Councils now provide bottle, can, paper and cardboard recycling services meaning that around 86% of South Australians have access to recycling services.

Container Deposit Legislation (CDL) continues to be very effective in reducing beverage litter. New regulations have broadened the range of CDL beverage containers in an effort to further reduce this kind of litter.

A Radioactive Material Audit has been undertaken to determine the quantity, location and security of storage of radioactive material, including waste, in South Australia.

### Attention required

Despite an increase in the number of people recycling, the amount of waste going to landfill is increasing. Around one tonne of solid waste per person went to landfill in the Adelaide metropolitan area in 2002. This is despite the fact that approximately 70% of the total waste discarded to landfill could be recycled and converted into valuable products, re-used or composted. Information on treatment and re-use of liquid wastes is scant, although some recycling is undertaken.

Uptake of recycling practices remains low, predominantly due to solid waste landfill being a cheaper option than recycling (although the cost to dispose to landfill has increased) and low revenue being generated from recycling some waste materials.

Approximately 50% of waste materials going to landfill arise from construction and demolition activity. This material includes soil, clay, concrete and clean fill. Without waste minimisation strategies in place the amount of this waste will increase as a result of urban regeneration.

The amount of hazardous waste collected and treated in South Australia varies considerably from year to year, but has risen by 60% since 2000, with major increases in the amount of contaminated soil and asbestos. Management practices for the storage and treatment of industrial hazardous waste at high priority sites have been audited, but there is a need to ensure long-term best practice management for these and other priority sites.

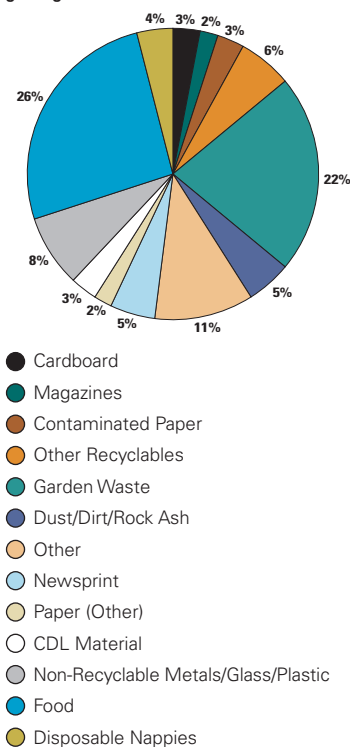
KESAB Litter Surveys have shown an increase in the amount of litter items counted for 2002, after a downward trend in 2000 and 2001. Cigarette butts remain the main item recorded (44% of total items counted) despite an increase in butt bins and community education.

## What more should we be doing?

The Environment Protection Authority recommends that:

- 6.15 Priority is given to the development of a Waste Management Strategy for South Australia, covering both liquid and solid wastes, which ensures the establishment of waste recovery infrastructure, appropriate pricing regimes, and development and promotion of viable markets.
- 6.16 Kerbside service standards are implemented that achieve a minimum recycling yield of 2.5 kilograms per household per week, that limit the maximum weekly waste bin capacity to 140 litres and that provide for bin-based green waste collection in metropolitan areas, in accordance with the recommendations from the Kerbside Waste and Recycling Audit (EPA, 2002).
- 6.17 State Government formulate a policy on the avoidance, reduction, re-use and recycling of waste arising from its own business activities within the broader framework of sustainability and Greening of Government (i.e. waste, energy, water).
- 6.18 Programs are developed to further enhance the awareness and uptake of eco-efficient practices by industry, with the aim of improving environmental sustainability.
- 6.19 Government considers increasing the level of the deposit and the range of items eligible for CDL, beyond beverage containers, thereby avoiding greater waste disposal to landfill.
- 6.20 The construction and demolition sector be required to place greater emphasis on waste minimisation and the recycling of materials. This will require improvements in infrastructure to support the recycling and re-use of these materials.
- 6.21 Household hazardous waste collection services are improved significantly to minimise the illegal and inappropriate disposal of household chemicals. Industrial hazardous wastes are managed and regulated in accordance with international best practice.
- 6.22 South Australia's radioactive waste management is improved based on the findings of the Environment Protection Authority Radioactive Materials Audit.
- 6.23 Technological developments and strategies are supported to advance the on-site remediation of contaminated soils thereby reducing the amount requiring off-site treatment and disposal to landfill.

Figure 6.19: Contents of a domestic garbage bin – 2002



Note: 'Other' includes dry-cell batteries, household chemicals, pharmaceuticals, medical/hygiene, oil (motor and food), timber, ceramics, textiles, other glass and broken glass.  
'Other recyclables' includes all non-CDL metal, glass and plastic.

SOURCE: EPA, 2002

weighbridge data. Also, the increase in economic activity and the resultant increase in building and demolition works over the last few years has increased the amount of waste being generated.

A landfill audit conducted in 1998 (EPA, 2000) revealed that 53.1% by weight of the waste we send to landfill is generated from construction and demolition activity including clean fill. Waste materials in this category include concrete, bricks, tiles, steel, glass, metal, wood, asphalt and plastic. Domestic waste comprised 27.5% by weight of waste sent to landfill and commercial and industrial waste comprised 15.7% by weight. Around three-quarters of commercial and industrial waste is comprised of mixed waste in garbages, food/kitchen waste, cardboard, paper, wood, and plastic bags/film – all potentially recyclable.

In non-metropolitan areas it is estimated that a total of 217,000 tonnes of solid waste was sent to landfill in 2001/02, a 6% increase over the previous year of 204,000 tonnes. Since 1997/98 the amount of solid waste sent to landfill in non-metropolitan areas has remained relatively constant at an average of 212,000 tonnes per year. (See **Case Study**)

**PRESSURE INDICATOR: Amount and composition of litter**

Litter is a highly visible and offensive component of the waste stream. The continuing presence of litter in the South Australian environment is a concern for both Government and the community.

The KESAB Litter Index provides information on the type of waste that ends up as litter on a seasonal basis in South Australia. Litter items are counted quarterly at a number of sites that represent areas commonly subject to littering (e.g. residential areas, beaches, industrial sites, car parks, shopping centres, retail areas, recreational parks and highways). Data collected since 1998 (Table 6.4) indicates that the amount of litter is not declining, despite public education campaigns.

**Table 6.4: Total number of litter items counted in May KESAB litter counts 1998–2002**

	1998	1999	2000	2001	2002
Total number of items counted	20,754	21,327	17,109	19,374	21,327

*Source: KESAB Environmental Solutions*

Cigarette butts remain the most numerous litter item found, representing an average 41% of litter recorded since 1998. The contribution of cigarette butts to total litter counts shows an increasing trend from 37.7% of all litter items counted in 1998 to 43.9% in 2002. Litter is most often found along highways, followed by car parks and retail areas (Figure 6.20).

**PRESSURE INDICATOR: Amount of liquid wastes collected and treated**

Liquid wastes received by treatment facilities include waste oil, oil/water mixtures, grease trap waste (generally sourced from restaurant waste), paint

sludges and waste solvents. Levies are payable for liquid wastes that require treatment under the *Environment Protection Act 1993*. Waste oils and waste solvents are normally recycled and so do not attract a levy payment. Figure 6.21 shows the amount of liquid wastes collected and treated by facilities in South Australia which are subject to levies payable under the Act. This information shows that the amount of liquid waste collected and treated has increased by 6% between 1997/98 and 2001/02.

The EPA also collects general information on liquid wastes<sup>2</sup>, which includes waste oil and waste solvents collected as well as those subject to a levy. In 2001/02 the total amount of liquid waste tracked was approximately 55,000 kilolitres, the predominant sources being waste oil/water mixtures (approximately 40% of the total), grease trap waste (approximately 25%) and waste oil (approximately 20%).

Liquid waste is treated via a number of techniques including filtration and neutralisation. This waste may be recycled, composted, disposed to landfill or incinerated.

Limited information currently exists on the amount of waste recovered and re-used. Some initiatives have been undertaken such as composting treated grease trap waste and treating and re-using waste oils as secondary grade fuels, such as that used to fuel industrial boilers. Recycling of waste oils is currently promoted by a national financial incentive scheme managed through Environment Australia. More information, however, is required to identify the quantity and types of other liquid wastes (such as septic wastes) and further analyse the re-use and recycling opportunities and markets for treated liquid wastes.

**PRESSURE INDICATOR: Quantity, composition and disposal of hazardous wastes**

Hazardous wastes are substances that pose a risk to human and environmental health and require special disposal techniques to make them harmless or less dangerous. They include inorganic chemicals, paints, resins, inks and dyes, organic solvents, pesticides, asbestos and clinical and pharmaceutical wastes. Hazardous wastes are generated mainly by the commercial, industrial and trade sectors, including hospitals, food outlets, food-processing plants, and chemical, paint and plastics manufacturers.

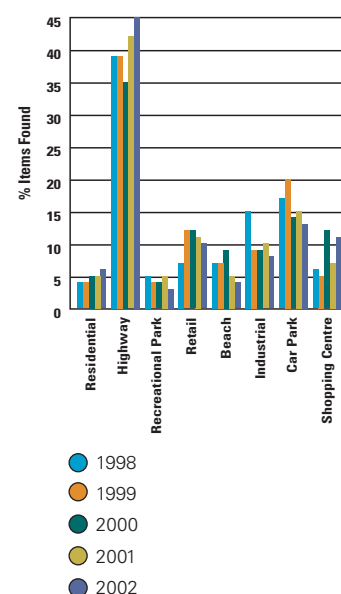
The amount of hazardous waste collected and disposed of in South Australia for 2002 increased by 60% over 2000 levels (Figure 6.22). This is due to a larger than usual amount of waste collected and treated in 2002. This included low-level contaminated soil and asbestos from former industrial land, which was produced as a result of remediation and development of the land into residential uses. Clinical and pharmaceutical waste was the next biggest contributor comprising 10% of all hazardous waste in 2002. Hazardous waste is recycled, incinerated or treated prior to being consigned to landfill.

<sup>2</sup> Information sourced from the EPA's Waste Tracking (Manifest) System for the 2001/2002 financial year. Information is regarded as approximate only.



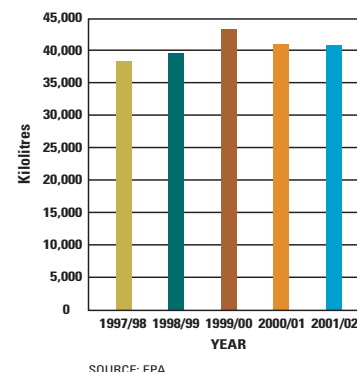
*Litter clogging a street drain on West Terrace, Adelaide  
Photo Tony Jones, courtesy KESAB Environmental Solutions*

**Figure 6.20: Distribution of litter by location**



SOURCE: KESAB ENVIRONMENTAL SOLUTIONS

**Figure 6.21: Liquid waste collected and treated in South Australia, which is subject to levies payable under the Environment Protection Act 1993 – 1997/98 – 2001/02**



SOURCE: EPA



Prior to the 2000 Olympic Games, 3000 bags of litter were collected along the Dukes Highway

Photo: Tony Jones, courtesy KESAB Environmental Solutions

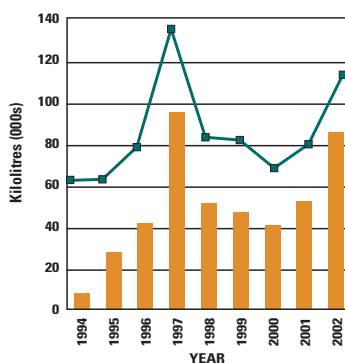


Hazardous waste



Domestic recycling

**Figure 6.22: Generation of hazardous waste substances in South Australia – 1994–2002**



— Total Amount of Hazardous Waste Generated (Kilo litres)

● Wastes Requiring Special Handling (inc. Contaminated Soils, Friable and Non-friable Asbestos)

SOURCE: EPA

A certain amount of hazardous waste is still being disposed of in domestic garbage bins. This includes dry cell batteries, household chemicals, pharmaceuticals and motor oil. The uncontrolled storage and disposal of hazardous wastes can pose a significant threat to public health and safety and to the environment. While some Councils and the EPA provide household chemical collection and disposal days, which are an extremely effective way of managing domestic hazardous waste, it is clear that services for the recovery of domestic hazardous waste must be improved.

Facilities involved in the storage and treatment of industrial waste require close attention and management. The consequences of accidents at these sites can be substantial and long lasting. A recent example is the chemical fire at an industrial waste treatment facility in Bellevue, Western Australia, in February 2001. Continued efforts are necessary to ensure the storage and treatment of industrial hazardous waste is managed in accordance with best practice standards.

While it is difficult to identify trends for particular hazardous waste types due to changes in the way that these substances have been reported, it is apparent that more work needs to be done to reduce the volume of hazardous waste being generated.

### Radioactive waste

Radioactive waste is generated from the use of radioactive materials in medical, research and industrial processes. Australia's radioactive waste is categorised as low-level waste, short-lived intermediate-level waste and long-lived intermediate-level waste (DEST, 2002a). At present, this waste is in temporary storage at numerous locations around South Australia and Australia, including at hospitals and universities. Australia does not generate any high-level radioactive waste.

In 2002/03 the EPA conducted an audit of radioactive materials, including radioactive waste, stored in South Australia. The findings and recommendations will be presented to the State Government for its consideration.

On 9 May 2003 the Commonwealth announced a preferred site for the disposal of Australia's low-level and short-lived intermediate level radioactive waste. This site is located on a pastoral lease to the east of Woomera. The South Australian Government opposes the location of a national radioactive waste repository or store in South Australia, and Parliament has passed legislation to prohibit its establishment.

### What impact does disposing our waste to landfill have?

Some of the environmental, social and economic effects associated with the disposal of waste to landfill are outlined below.

**Pollution of land, air and water resources.** Poor waste management practices can lead to the pollution of surface and groundwater resources, air pollution, the generation of greenhouse gases (methane is a major greenhouse gas that is released by landfill sites), site contamination and the generation of odours.

**Hazardous waste.** The improper disposal of hazardous waste to landfill, stormwater drains, surface and underground water resources or sewerage systems can harm the environment, cause injury or harm to humans and other organisms.

**Increased consumption of virgin materials.** Not recycling waste materials increases the consumption of virgin materials.

**Cost of landfill.** A common misconception is that it is still cheaper to dispose of waste materials to landfill rather than recover, re-use and recycle. However, as suggested by the Bureau of Industry Economics (1993), it is widely recognised that the cost of providing landfill in Australia is undervalued when the full costs associated with disposal, closure, monitoring and other social and environmental factors are considered.

**Economic benefits of recycling.** A study undertaken in 2001 examined the financial, environmental and social costs and benefits of kerbside recycling in Australia. It found that by including an expression of the benefit to the environment in dollar-terms (based on conservative estimates) together with recycling and collection costs, an average net benefit of \$42 dollars per household per year was gained from kerbside recycling (NOLAN-ITU, 2001).

**Impact on communities.** The impact of the disposal of solid waste to landfill on the community includes reduced property values adjacent to landfill sites, the risk of fire, unsightliness, litter and nuisance associated with birds, dust, odours, pests and vermin.

### What are we doing about it?

#### RESPONSE INDICATOR: Amount of waste materials recycled

#### Disposal of waste to landfill

A number of initiatives have been implemented since 2000 that have directly or indirectly increased the cost of waste being disposed to landfill. This has the effect of enabling greater viability for recycling practices. Such initiatives include:

- the introduction in mid-2000 for weight-based charging as the basis for payment of levies to dispose of solid waste to landfill;
- improved landfill design standards for new and upgraded landfills ensuring better environmental performance;
- legislation being passed to close the Wingfield landfill by the end of 2004;
- legislation being passed in 2003 to effectively double the solid waste levy.

#### Non-domestic recycling

The actual amount of construction and demolition materials being recycled is unknown, however, a significant amount (primarily concrete and asphalt) is recycled either on-site or by diverting loads to recycling facilities (EPA, 2001b). Similarly, the amount of commercial and industrial waste that is recycled is unknown, although it is recognised that a significant amount of recycling occurs within industry. Many industries in South Australia have already responded to the challenge of waste minimisation and resource

recovery through the adoption of cleaner production methods and recycling and re-use.

### Domestic recycling

Participation in recycling is dependent upon community attitudes and education, as well as the provision and type of collection services by Council. All metropolitan Councils, and 17 non-metropolitan Councils, provide some form of domestic recycling service for bottles, cans, paper and cardboard. The average participation rate of residents who have a recycling service for bottles, cans, paper and cardboard is approximately 64%. However, only 12 of the 19 metropolitan Councils, and one non-metropolitan Council (Mount Gambier) provide for the collection of garden waste. The participation rate for households that are provided with a green waste recycling service is approximately 35%. Garden waste comprises around 22% of total domestic waste, so there is further scope to reduce the amount of this material going to landfill. Newspapers comprise around one-third of all waste materials recycled (Figure 6.23).

A comparison of recycling figures from 1992, 1996 and 2000 shows that participation in recycling has increased for all surveyed materials (Figure 6.24). There is no data available on the quantities of materials recycled.

In addition to kerbside recycling, Container Deposit Legislation (CDL) has been effective in reducing litter and diverting most beverage container waste from landfill (around 3% of waste found in our domestic garbage bins comprises CDL materials). Changes to South Australia's Container Deposit Legislation in January 2003 mean that now an even broader range of drink containers carry a refundable deposit.

### Policy and programs

Approximately one tonne of solid waste per person per year is still being disposed to landfill despite a number of innovative approaches being introduced. It is clear that there must be an improvement in the way that waste is managed in South Australia if we want to see a reduction in the amount of waste sent to landfill.

In an effort to bring about waste management reform in South Australia, the State Government has established **Zero Waste SA**. This new waste management body will work with the community, State and Local Governments, and the recycling and waste disposal industries to develop an integrated waste reduction strategy that will underpin efforts to achieve zero waste to landfill. This will involve legislative change and an increase in the waste disposal levy to fund reforms.

The **Environment Protection Authority** will continue to provide a regulatory basis for waste management reform in South Australia and will work with Zero Waste SA to achieve the State's long term vision for waste management. The Environment Protection Authority (EPA) is developing an **Environment Protection Policy (EPP)** for waste that will establish specific standards and guidelines for waste management.

The EPA led an interagency audit in 2002 of high priority sites responsible for managing **industrial hazardous waste**. Agencies responsible for occupational health and safety and Government

emergency response were part of the interagency audit team. The audits were primarily aimed at identifying the potential for major incidents and resulted in a number of recommendations on issues such as labelling, storage and contingency planning, as well as, the need for effective coordination between the responsible agencies in the event of an incident. The recommendations have been approved and are currently being implemented.

There is a growing movement among South Australian businesses towards eco-efficiency, which means producing goods and services with less energy and fewer raw materials, resulting in less waste, pollution and cost. The increasing support for eco-efficiency means a challenge to the belief that economic objectives and environmental sustainability are incompatible. The number of attendees and businesses at eco-efficiency workshops conducted by the EPA has been steadily increasing since 1998.

The Government also completed a major review of **licensing arrangements under the Act** in 2003, with a number of reforms implemented. The reforms will be made available to all licensees including the introduction of financial incentives to encourage improved environmental performance and achievement of best practice environmental management standards. Under the reforms, licensees will be offered licence fee reductions in exchange for entering into environment performance agreements with the EPA that commits them to sustained reductions in emissions of pollutants and generation of waste.

Implementing a certified **Environmental Management System** is a commitment to preventing pollution and improving environmental performance. Since the commencement of the international standard for Environmental Management Systems (ISO 14001) in January 2003, at least 60 businesses in South Australia have achieved the certification of one or more of their sites. There are also a significant number of businesses in South Australia that have an Environmental Management System but do not have formal ISO certification.

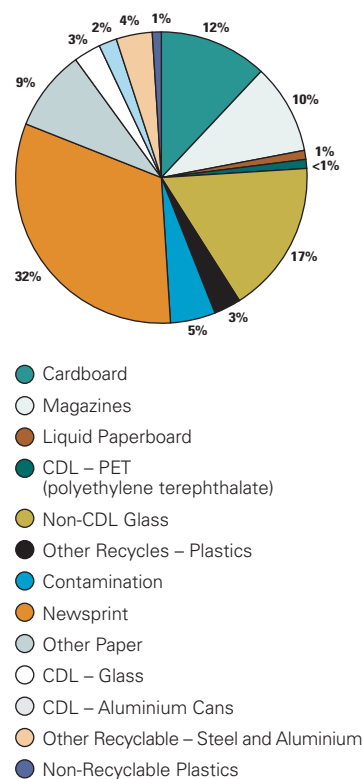
The **National Packaging Covenant**, established in 1999, is a national agreement for managing packaging waste. It aims to minimise the environmental impact of packaging waste, close the recycling loop and develop economically viable and sustainable recycling collection systems. A total of 68 South Australian companies have signed the National Packaging Covenant as at 30 June 2002, a significant increase from the previous year of only eight signatories. Over half of the signatories come from South Australian winery organisations, indicating a strong commitment from that sector to address its packaging wastes.

For more information on programs and initiatives see the *State of the Environment 2003 Supplementary Report*.

### KEY FACTS

- Around 64% of South Australians participate in recycling.
- The South Australian Government has a long term vision of 'zero waste' for South Australia.

Figure 6.23: Contents found in the domestic recycling stream – 2002



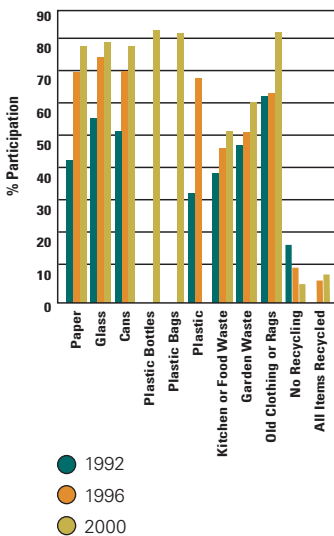
\*HDPE\* is High Density Polyethylene drain pipe.  
\*PET\* (polyethylene terephthalate) is the plastic that is commonly used to make soft drink bottles.

SOURCE: EPA, 2002



Recycling depot

**Figure 6.24: Participation in recycling for South Australia – 1992, 1996 & 2000**



SOURCE: ABS, 2000

### References

- Australian Bureau of Statistics (ABS) (2000). *Environmental issues: People's views and practices*. Cat. No 4602.C.
- Bureau of Industry Economics (1993). *Occasional paper 12 – Waste management and landfill pricing: a scoping study*. Australian Government Publishing Service, Canberra.
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- EPA (2001b). *Re-use and Recycling of Clean Fill and Building and Demolition Waste*. Consultancy report prepared for the EPA by NOLAN-ITU Pty Ltd.
- EPA (2002). *Survey and Audit of Kerbside Waste and Recycling Practices and recommended Kerbside Service Standards*. Consultancy report prepared for the EPA by NOLAN-ITU Pty Ltd.
- NOLAN-ITU Pty Ltd (2001). *Independent Assessment of Kerbside Recycling in Australia*. Report commissioned by the National Packaging Covenant Council.
- Recycle 2000 (1998). *1998 Metropolitan Waste Analysis*. Report prepared by APrince Consulting Pty Ltd.

### Further information

- Australian Waste Database  
[www.civeng.unsw.edu.au/water/awdb/awdb2.htm](http://www.civeng.unsw.edu.au/water/awdb/awdb2.htm)
- Clean Up Australia  
[www.cleanup.com.au](http://www.cleanup.com.au)
- Environment Protection Authority – Waste to Resources  
[www.environment.sa.gov.au/epa/waste.html](http://www.environment.sa.gov.au/epa/waste.html)
- KESAB Environmental Solutions  
[www.kesab.asn.au](http://www.kesab.asn.au)
- Waste Management Association of Australia (WMAA)  
[www.wmaa.asn.au/index.html](http://www.wmaa.asn.au/index.html)
- WasteNet  
[www.wastenet.com.au](http://www.wastenet.com.au)

# Water Consumption in Urban Settlements

## Trends

- **Per capita water consumption in the Adelaide metropolitan area: remains STEADY at 460 litres per day in 1997/98 and 445 litres per day in 2001/02.**
- **Consumption of treated water for agricultural use: UP by 50% between 1997/98 and 2001/02.**
- **Consumption of treated water for industrial use: UP by 42% between 1997/98 and 2001/02.**
- **The quality of mains water supplied to the Adelaide metropolitan area: CONTINUES TO COMPLY with the national drinking water quality guidelines.**
- **Re-use of treated wastewater: UP from 7.6% in 1995 to 15% in 2002.**

## Goal

Drinking water should be safe to use and aesthetically pleasing. Ideally it should be clear, colourless and well aerated, with no unpalatable taste or odour, and it should contain no suspended matter, harmful chemical substances, or pathogenic micro-organisms.

*Australian Drinking Water Guidelines 2001*

To increase wastewater re-use at metropolitan wastewater treatment plants to 30% of available effluent by 2005;

To increase wastewater re-use at country wastewater treatment plants to 24% of available effluent by 2005.  
*SA Water Environmental Policy 2002*

## What are the issues?

This chapter focuses on the consumption, sources and quality of drinking-standard water in South Australian urban settlements. Potable water, as distinct from water extracted from bores, wells and streams, is typically treated water that is delivered via mains pipes to households, industry and commercial enterprises. The term 'mains water' and 'drinking water' will be used interchangeably in this chapter. The consumption and quality of water extracted from bores, wells and streams is discussed in the chapters on **Water Quality** and **Water Use**.

Fresh water is one of the world's most valuable resources, it is essential to human life and the natural environment. South Australia is the driest State in the driest inhabited continent in the world. We therefore face unique challenges in terms of our water consumption, water storage, water sources and how we ensure good water quality for consumers.

Water supplied to the urban settlements of South Australia is extracted from the River Murray, surface water reservoirs (mostly in the Mount Lofty Ranges), groundwater in the South East, northern and western areas of the State and, more recently, extracted from the sea. Our reliance on the River Murray for urban water supplies, either as a direct or a supplementary source of water, is placing additional pressure on the River and adding to its degradation. In an average year, around two-thirds of Adelaide's water comes from the River Murray.

South Australians continue to use approximately half of their mains treated water supply to maintain gardens. Improved watering practices could reduce this demand, while alternative sources such as urban run-off or treated wastewater could provide a substitute for mains water for uses other than drinking.

Large domestic water supply reservoirs in the Mount Lofty Ranges are depriving downstream rivers and streams of water flows, which is affecting the health of aquatic ecosystems. The use of some rivers and streams as aqueducts to transport water from the River Murray to reservoirs is degrading water quality and changing natural flow regimes.

In an effort to reduce the impact on inland rivers and streams and the marine environment, some of the treated wastewater produced by wastewater treatment plants is re-used for irrigation. Treated wastewater is sewage that has been treated to remove most solids, rendering the final product 99.9% water. Some stormwater collected in the urban stormwater system is used for environmental flows, re-used to irrigate parks and gardens, and for industrial use, although the majority of stormwater and treated wastewater is still discharged to the sea.

Providing mains water of good quality from relatively poor quality water sources is a major challenge for South Australia. The raw water supplying reservoirs must be protected from pollution, be appropriately treated and not be contaminated during distribution to consumers. A major concern is that most reservoir catchment areas do not have sufficient restrictions on surrounding land uses that may affect water quality through pollutant and sediment run-off. Intensive farming, forestry, horticulture, transport and urban activity occurs in most catchments. This ongoing and increasing activity continues to risk the quality of water resources. The continued deterioration of water entering reservoirs could mean that additional forms of water treatment are required, subsequently increasing the cost of supplying good quality drinking water to consumers.

See also chapters on **Health of the Marine and Coastal Environment; Land Use; Water Quality; Water Use**.

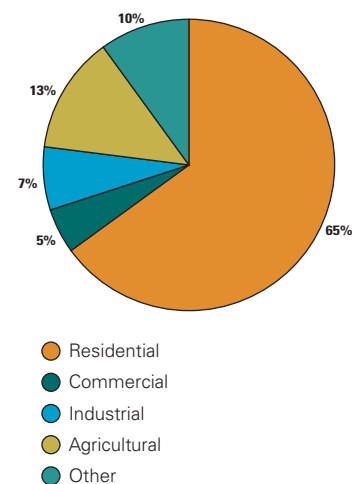
## KEY FACTS

- **The availability of a sustainable, reliable and economical source of water underpins South Australia's future environmental health, economic development and quality of life.**
- **Providing good quality water from relatively poor quality water sources is a key challenge for South Australia.**



*Domestic hose*

**Figure 6.25: Percentage of mains water used by sector – 2001/02**



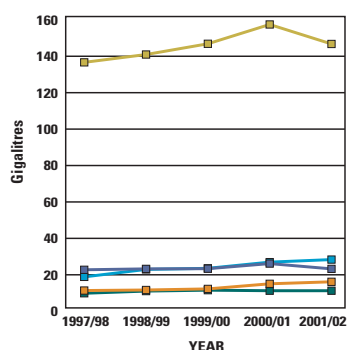
Note: 'Other' includes consumption by public institutions, vacant land, public utilities, irrigation and recreation.

SOURCE: SA WATER



Hope Valley reservoir

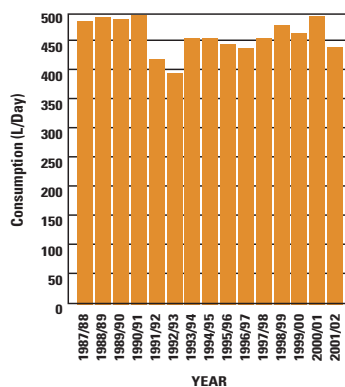
**Figure 6.26: Annual mains water consumption (gigalitres) by sector – 1997/98 – 2001/02**



— Residential  
— Commercial  
— Industrial  
— Agricultural  
— Other

SOURCE: SA WATER

**Figure 6.27: Average daily per capita consumption, Adelaide metropolitan area – 1987/88–2001/02**



SOURCE: SA WATER

## Findings

### Making progress

Over the last five years there have been significant improvements in the quality of mains water supplied to communities along the River Murray, in the Adelaide Hills and on Kangaroo Island.

The use of alternative water sources such as treated wastewater and stormwater for uses other than drinking is gaining acceptance and there have been some significant achievements in this regard over the last five years. There is now greater acknowledgement that a more integrated approach to water management by Government, industry and community groups is required.

### Attention required

The Adelaide metropolitan area is dependent upon the Mount Lofty Ranges and the River Murray for water supply, while potential alternative water sources remain under used. In 2003/04 the flow of River Murray water to South Australia could be as low as 59% of our entitlement flow under the Murray-Darling Basin Agreement due to the drought. This has serious repercussions for water supplies for urban settlements, industry and irrigated agriculture as well as the health of the river. Drought is a normal occurrence in the Australian environment and this should be taken into account in water management practices.

Per capita mains water consumption in the Adelaide metropolitan area has remained steady since 1997/98. In 1997/98 daily per capita water use was 460 litres per day and in 2001/02 it was 445 litres per day. However, use remains above the level that we should be aiming for – approximately three-quarters of our current daily use.

It is estimated that over half of drinking-standard water consumed by typical households is used to maintain the garden, therefore significant potential exists for reducing our mains water consumption by using alternative water sources outside.

Only around 15% of stormwater and 15% of treated wastewater is being re-used to supplement more traditional water supplies. Every year around 110 gigalitres of urban stormwater is discharged to the sea, around the same volume that is piped from the River Murray to supplement Adelaide's water supplies.

## What more should we be doing?

The Environment Protection Authority recommends that:

6.24 To ensure the wiser use of water, consideration should be given to the regulation of best practice water conservation principles.<sup>1</sup> Water conservation should also be encouraged on a larger scale through:

- improved urban and water supply planning;
- the development of different water pricing structures that encourage water re-use;
- the future replacement of water supply infrastructure that accommodates re-use;
- the development of re-use targets;
- the incorporation of water sensitive design principles into the Building Code of Australia;
- better coordinated education and advice to businesses and the general public.

6.25 A coordinated approach to water management is adopted through the integration of water management authorities.

### Environmental indicators

#### PRESSURE INDICATORS

- **Total mains water consumption by sector** (reported on in the *State of the Environment Report 1998*)

Quantifies the volume of mains water used per year by major water users.

- **Per capita consumption of mains water** (reported on in the *State of the Environment Report 1998*)

Increased water consumption places pressure on the environment as it further reduces the amount of water available for ecosystems.

#### CONDITION INDICATORS

- **Quality of mains water assessed against water quality guidelines** (reported on in the *State of the Environment Report 1998*)

Access to good quality drinking water is an important aspect of the environment as experienced by the inhabitants of human settlements.

- **Freshwater algal blooms in water sources** (new indicator)

A measure of the increased stress on water supplies from pollution from surrounding land uses.

<sup>1</sup> These are: avoid, reduce, recycle, appropriate disposal and adaptive management.

**RESPONSE INDICATORS**

- **Re-use of treated wastewater versus amount generated** (reported on in the *State of the Environment Report 1998*)

Wastewater re-use can reduce the dependency on freshwater reserves and reduce the impact from discharges to the sea.

- **Urban stormwater re-use versus amount generated** (reported on in the *State of the Environment Report 1998*)

Urban stormwater re-use can reduce our dependency on freshwater reserves and reduce the impact from discharges to the sea.

**What is the current situation?****Urban water sources**

Ninety-five per cent of South Australians rely on mains water (tap water) as their primary water source for all uses, with other sources being rainwater tanks (52%) and bottled water (24%) (ABS, 2001). Regarding water for *drinking*, around 33% of South Australians source their water from rainwater tanks (three times the national average), and 16% use bottled water (more than double the national average). One in ten South Australians claim they do not drink tap water at all due to the taste (ABS, 2001).

The Adelaide metropolitan and outer metropolitan regions (north and south) are dependent on both the River Murray and surface water stored in reservoirs in the Mount Lofty Ranges Watershed<sup>2</sup> predominantly for urban uses. Based on a five-yearly average, around 61% of metropolitan Adelaide's urban water supplies come from the River Murray and around 39% from the Mount Lofty Ranges. In a dry year up to 90% of Adelaide's water is taken from the River Murray.

In 2003/04 the flow of River Murray water to South Australia could be as low as 59% of our entitlement flow under the Murray-Darling Basin Agreement due to the drought. This has significant ramifications not only for domestic water supplies but also for industry, manufacturing, irrigated agriculture and the environment. In order to cope with the low flows, the State Government imposed water restrictions from 1 July 2003, aimed at achieving a 20% reduction in water taken from the River Murray.

The South East and Eyre Peninsula regions are almost exclusively dependent upon groundwater sources. As from December 2002 water restrictions have applied on the Eyre Peninsula due to insufficient rainfall to refill groundwater supplies. The Upper South East, northern Spencer Gulf, Mid North and Yorke Peninsula regions rely heavily on River Murray water transported through major pipelines. The remainder of water sourced in these areas is from groundwater. The Riverland region is completely supplied from the River Murray.

<sup>2</sup> The Mount Lofty Ranges Watershed is a management area that is regulated to protect water supplies to metropolitan Adelaide.

**PRESSURE INDICATOR: Total mains water consumption by sector**

Mains water is supplied to households, commercial enterprises, industry, agriculture, public institutions, vacant land and public utilities. Figure 6.25 shows the percentage of total mains water used by major sectors in 2001/02 for South Australia. This indicates that around 65% of all mains water supplied to urban settlements is used in households.

Between 1997/98 and 2001/02 annual mains water consumption for the residential, commercial, agricultural and industry sectors increased, although by varying amounts (Figure 6.26). The greatest increase occurred in the agricultural sector (50%). Mains water, as indicated in Figure 6.25, represents only a small portion of the total water used for agriculture, most of which is extracted from underground bores and surface water (see the chapter on [Water Use](#)).

**PRESSURE INDICATOR: Per capita consumption of mains water**

Adelaide's water consumption per capita is among the lowest when compared with other Australian capital cities, but is relatively high compared to world standards.

Figure 6.27 illustrates the changes in daily per capita consumption over the last 15 years for all sectors combined in the Adelaide metropolitan area. The figures for average per capita consumption have remained relatively steady. In 1997/98 the average daily per capita consumption was 460 litres per day, for 2001/02 this slightly decreased to 445 litres per day.

**CONDITION INDICATOR: Quality of mains water assessed against water quality guidelines****Metropolitan mains water quality**

Metropolitan Adelaide is supplied with water from six major water treatment plants: Anstey Hill, Barossa, Happy Valley, Hope Valley, Little Para and Myponga. These plants treat water stored in ten reservoirs, which is sourced from both the Mount Lofty Ranges and the River Murray. Water quality is measured by a number of microbiological, physical and chemical indicators and assessed against the Australian Drinking Water Guidelines (ADWG) (NHMRC, 2001). South Australia's water supplies undergo extensive customer tap sampling, and monitoring shows that most indicators are within the limits imposed by the national guidelines (SA Water, 2002).

The most common and widespread health risk associated with urban water in South Australia is the presence of micro-organisms (e.g. *E. coli*, *Cryptosporidium* and *Giardia*) that can cause disease. These organisms are usually the result of contamination, either directly or indirectly, by human and animal faeces and farm chemicals. Over the period 1997/98 to 2001/02 the levels of *E. coli* measured in the supply system did not exceed the ADWG.

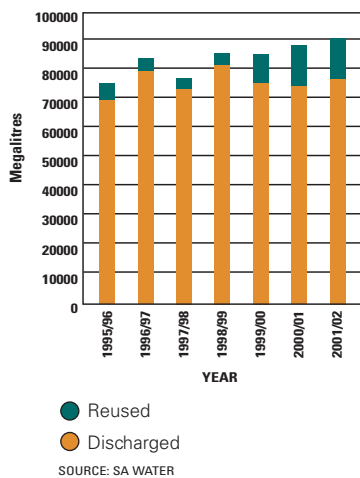
**KEY FACTS**

- One in ten South Australians claim that they do not drink tap water due to the taste.
- A typical South Australian household uses approximately 50% of its mains water to irrigate the garden and in summer this may rise to as much as 80%.

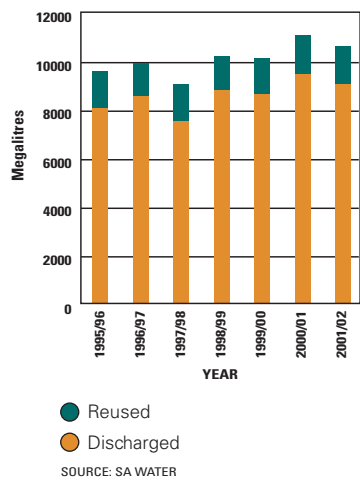


Reservoir

**Figure 6.28: Wastewater re-use from metropolitan WWTPs – 1995/96–2001/02**



**Figure 6.29: Wastewater re-use from country WWTPs – 1995/96–2001/02**



With regard to physical quality, minor exceptions in hardness in the Hope Valley system and manganese in the Myponga system were recorded. Hardness can make the water difficult to lather and manganese may affect the taste of the water and cause staining.

Chemical water quality indicators generally complied with national guidelines with the exception of Trihalomethane (THM) concentrations, which exceeded national guidelines on isolated occasions in the Anstey Hill system, although not in 2001/02. Trihalomethanes are formed as a by-product of chlorine disinfection. The exceedences at Anstey Hill are a result of the supply of chlorinated River Murray water extracted at Mannum. The additional chlorination causes the occasional exceedence in THM concentration.

### Country mains water quality

Mains water quality in some country areas is of poorer quality than that of the Adelaide metropolitan area. However, since 1997/98 major treatment initiatives have resulted in substantial improvements in the quality of mains water supplied to communities along the River Murray and in the Adelaide Hills as well as to Penneshaw on Kangaroo Island.

The percentage of samples free of *E.coli* complied with the ADWG during the period 1997/98 to 2001/02.

THM concentrations have exceeded guidelines on occasions in the Eyre Peninsula, Outer Metropolitan South, rural Murray Mallee and Kangaroo Island (part of the Outer Metropolitan South) regions.

With regard to physical indicators, turbidity (cloudiness) is an issue for some small country townships, especially those in the Riverland and Murray Mallee regions, which rely on an unfiltered and disinfected supply from the River Murray. Hardness and salt concentrations are common issues in the South East region, due to the nature of groundwater in the area. Compliance levels for these measures in the Eyre region have also been poor.

Some water supplies in remote areas of the State have been declared 'non potable' by the SA Water Corporation and the Department of Human Services due to very poor source water quality. It is considered uneconomical to treat these supplies so that they comply with the ADWG.

### CONDITION INDICATOR: Freshwater algal blooms in water sources

Cyanobacteria or blue-green algae are naturally occurring organisms that, under certain conditions, can increase in numbers to produce a freshwater algal bloom. Most reservoir catchments do not have sufficient restrictions on surrounding land uses that can have an affect on the quality of source water. For example, the Mount Lofty Ranges catchments are intensively developed with farming, forestry, horticulture and residential activity. These activities give rise to elevated levels of nutrients that increase the risk of algal blooms.

During the period 1997 to 2002, the most common blue-green algal species of concern, *Anabaena circinalis*, was detected 621 times in the reservoirs that service the metropolitan area with 92% of detections being low cell counts, and 270 times in

the River Murray with 96% of detections being low cell counts. The growth of *Anabaena* was restricted to levels below that of concern to human health.

### What impact does not conserving water have?

The consequences of not conserving water stem not only from how much is consumed but also how it is used and how it is disposed of. The uncertainties associated with climate change and the potential for decreased water supply from catchments means that water conservation must become a priority in the future. Some of the environmental, social and economic consequences of not implementing water conservation practices are listed below.

#### Pollution of freshwater and marine environments.

Most of the water used by households ends up in stormwater drains or the sewerage system. Most stormwater is directly discharged to watercourses and ultimately enters the marine environment, while sewerage system water is treated and then discharged to the sea. This has a significant impact on the health of freshwater and near-shore marine environments. This impact is particularly significant in metropolitan gulf waters, which contain significant fish breeding and nursery areas. Greater re-use of urban stormwater and treated wastewater would reduce this impact.

**Water restrictions.** Continued over-use of water may result in water restrictions being enforced more frequently and more severely, which will have an economic and social impact on consumers.

**Expansion of the water supply system.** With increasing demand for water, expansion and upgrading of dams, reservoirs, pipelines and water treatment infrastructure will eventually be required, with increased costs to consumers and reduced environmental flows.

**Impact on the River Murray.** Increasing demand on water from the River Murray will place additional pressure on the health of aquatic plant and animal communities, wetlands, rivers and streams. It will also impact on water quality. This will, in turn, increase water treatment costs for consumers and require the greater use of chemicals in reservoirs.

**Implications for climate change.** Increasing water consumption will mean increasing requirements for pumping and water treatment. The energy required to achieve this using traditional power methods will result in increased greenhouse gas emissions.

**Increased costs for consumers.** Water costs money and requires energy for heating. Reduced use will therefore reduce costs to consumers in terms of savings made on water and energy bills.

### What are we doing about it?

#### RESPONSE INDICATOR: Re-use of treated wastewater versus the amount generated

Re-use of urban stormwater and treated wastewater, primarily for irrigating parks, gardens, vineyards and horticultural crops and industry, provides

opportunities to reduce the demand on more traditional sources of water.

### Metropolitan area

In 2001/02 Adelaide's four major metropolitan wastewater treatment plants (WWTPs) treated 91,000 megalitres of effluent – enough to fill 45,000 Olympic-sized swimming pools. Around 15% of this treated wastewater was re-used, the rest (around 77,000 megalitres) was discharged into the sea.

The re-use of treated wastewater from Adelaide's metropolitan WWTPs is gradually increasing, up from around 8% in 1995 to the current level of 15% (Figure 6.28). Considering that South Australia is an international leader in developing the technology to re-use treated wastewater and stormwater more opportunities must be taken in this regard to see our level of re-use increase.

SA Water, in cooperation with State Government and the private sector, has installed a new wastewater re-use scheme at Bolivar WWTP, the largest of its kind in Australia. Twenty-one per cent of all treated wastewater produced from the Bolivar WWTP is now piped to the Virginia region to supplement, and possibly ultimately to substitute, currently over-used groundwater resources. This is a significant development.

The Glenelg WWTP incorporates around 9% re-use and the Christies Beach WWTP around 18% re-use. The treated wastewater from the Christies Beach WWTP is piped by a privately-funded irrigation pipeline to the Willunga Basin to supplement the area's depleted groundwater supplies. The Port Adelaide WWTP, with zero re-use, is due to be shut down in 2005. After 2005 the lower salinity sewage from the area will be separated and a new pumping station (commissioned at Queensbury) will transfer this sewage to the Bolivar WWTP for treatment and potential re-use. The more saline sewage from the Port Adelaide area will be transported and treated in separate facilities at Bolivar in order to avoid increasing the salinity of the re-use effluent.

### Country areas

South Australia's 19 country-based WWTPs treated a total of 10,317 megalitres of effluent in 2001/02. In total, around 15% was re-used, 57% discharged to sea and 28% discharged to inland rivers and streams. Re-use of treated wastewater from country WWTPs has stayed relatively consistent since 1995/96 with 14–15% re-use (Figure 6.29).

One hundred per cent of the treated wastewater produced from the Gumeracha, Mannum, Murray Bridge and Myponga WWTPs is re-used for various purposes including irrigation and wetland development. Summer re-use at Millicent became operational in 2001/02. A summer re-use scheme at the Bird-in-Hand WWTP was commissioned in late 2001 and a re-use trial is currently being undertaken at the Angaston WWTP. Wastewater from other country WWTPs is discharged into either the sea or inland rivers and streams.

### RESPONSE INDICATOR: Stormwater re-use versus amount generated

On average, South Australia generates 130 gigalitres of stormwater per year, 85% of which is generated in metropolitan Adelaide. Much of this is discharged to sea, with only 20 gigalitres, or 15%, currently being re-used, largely because of technical and economic barriers to its storage for later use.

South Australia is an international leader in the use of Aquifer Storage and Recovery (ASR) technology in confined aquifers and it has been used increasingly since the early 1990s to manage excess quantities of stormwater, often when existing infrastructure is inadequate. ASR involves capturing large quantities of stormwater (and less frequently, treated wastewater) and storing it in underground aquifers.

In some parts of Adelaide the urban stormwater stored in ASR facilities is used to provide an alternative source of water for the irrigation of parks and gardens and for other uses. Most new urban sub-divisions, such as Regent Gardens, Northgate and New Haven, now incorporate ASR facilities. At the Mawson Lakes development both wastewater and stormwater will be treated using advanced treatment technologies for re-use in homes and gardens. The City of Salisbury and G.H. Michell & Sons have worked together on an innovative project to re-use stormwater for industrial purposes (See [Case Study](#)).

The South Australian Government, CSIRO, Universities, Catchment Water Management Boards, Local Government and industry are driving these re-use initiatives. ASR technology has the potential to relieve the pressure on more traditional water resources, including the River Murray. While we have made significant progress over the last five years, more opportunities must be taken to use ASR to provide a cost-effective alternative to supplying water for irrigation and industry.

### Policy and programs

The **State Water Plan 2000**, **Water Resources Act 1997**, **Catchment Water Management Plans** and **Water Allocation Plans** provide a coordinated approach for managing both water extraction and environmental flows. The **River Murray Act 2003** will provide a further framework for sustainable management of the River.

The **River Murray Urban Users Committee (RMUUC)** is a community group working in partnership with Government agencies, other community groups, non-Government organisations, individuals and businesses to reduce the dependency of metropolitan Adelaide on water from the River Murray. The RMUUC is involved in a number of projects in partnership with Government agencies and community organisations. This includes the **Water Conservation Partnership Project (WCPP)**. This project encourages water use efficiency and the sustainable use of alternative water supplies with Local Government and the community. It is a joint initiative between Local and State Governments, catchment water management boards, industry and the community. The project partners have recently released draft **best-practice water conservation principles** for Local Government, which have already been adopted by

### KEY FACTS

- The South Australian Government and industry are world and national leaders in developing water re-use technologies, yet we only re-use around 15% of treated wastewater and stormwater.
- In 2001/02, Adelaide's four major metropolitan wastewater treatment plants treated 91,000 megalitres of effluent – enough to fill 45,000 Olympic-sized swimming pools. 77,000 megalitres of this was discharged into the sea.
- In the driest State in the driest inhabited continent, 110 gigalitres of urban stormwater is discharged to sea every year – around the same amount that is piped from the River Murray to supplement Adelaide's water supply.



Bolivar sewerage treatment tanks

### CASE STUDY: Parafield Partnerships Urban Stormwater Initiative (PPUSI) – Salisbury

This project is a partnership between the City of Salisbury and G.H. Michell & Sons – Australia's largest wool processing company – with significant funding contributions provided by State and Commonwealth Government. The company uses large volumes of water to wash wool (about 1 billion litres per year) and also produces large quantities of effluent and sludge wastewater.

The City of Salisbury has developed a series of reed bed ponds on Parafield airport land (appropriately bird-proofed) where once ocean-bound stormwater is diverted for filtration and cleaning before supply to Michell & Sons. Surplus water is stored in an aquifer for use during summer. This should save 1100 megalitres of water per year, which otherwise would have been pumped from the River Murray to meet Michell's demands. Sludge generated from Michell & Sons is being combined with green waste collected from residential properties to produce a high quality fertiliser for the horticultural and wine industries.



The Paddocks wetlands at Salisbury  
Photo: City of Salisbury

some Councils in South Australia to help reduce their dependency on River Murray water.

The **Waterwise** program is another partnership project that is currently focusing its activities on reducing water use by industry.

On a wider basis, **Catchment Water Management Boards** and **Local Action Planning Groups** work cooperatively to educate the community about water conservation principles and practices.

In the Adelaide metropolitan area, the **WaterProofing Adelaide Strategy** seeks to provide a long term, integrated strategy for ensuring that water use in Adelaide and adjacent areas is sustainable. It will take into account changes to traditional water sources and consider the broader issues associated with the re-use of urban stormwater and treated wastewater, environmental flows and water efficient urban design.

To ensure the provision of high quality drinking water and the protection of public health, **SA Water's Drinking Water Quality Policy** is a commitment to effective water supply management.

Setting an appropriate price for water can contribute to solving many water related environmental problems. Water pricing is a powerful mechanism that can be used to encourage water efficient practices and the use of alternative sources. The State Government has put in place a **water pricing review** to determine a pricing structure that will lead to economic, social and environmental benefits.

The **Metropolitan Local Government Chief Executive Officer's Association** and **Local Government Association (LGA)** have been considering structures and funding arrangements for managing stormwater in the Adelaide metropolitan area. Following work by the two bodies the LGA has made recommendations about both short and longer term actions. The emphasis in the short term is on alleviating flooding while also addressing environmental issues and re-use opportunities. For the longer term the focus is on a more structured sustainable approach with the integration of stormwater into other aspects of water management.

The State Government has initiated a **rebate scheme** for South Australians who elect to purchase water-saving devices like tap-timers, water efficient shower heads and flow restrictors. The State Government will pay a standard rebate of \$10 per item up to a maximum of \$50, or \$20 per item to a maximum of \$100 for SA Water and/or Family and Youth Services concession cardholders. The rebate will give people an incentive to install water efficient shower heads and flow restrictors on household taps while a rebate for tap-timers will assist with water conservation in the garden. The rebate scheme will be capped at \$1 million, an amount which will be reviewed in one year.

For more information on programs and initiatives see the *State of the Environment 2003 Supplementary Report*.

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