CLIMATE COUNCIL

LOCAL LEADERSHIP: TRACKING LOCAL GOVERNMENT PROGRESS ON CLIMATE CHANGE

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Preface

In Australia, local councils and communities have long been at the forefront of climate action, continuing their efforts, despite periods of instability and inaction at the state and federal climate policy level. In recent times, shires, towns and cities have stepped up their efforts and profile on climate change action both at home and internationally.

This report introduces the Climate Council's Cities Power Partnership program, which highlights the leadership of councils and communities that are switching to renewable energy and building greener, more efficient and resilient communities. The Cities Power Partnership celebrates these achievements, working together and supporting all councils in continuing to step up their efforts. The report also outlines how cities are major contributors to climate change, but can also be innovative centres for climate solutions.

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Key Findings

1

Australian cities, towns and shires are at risk from worsening climate impacts, such as rising sea levels, floods, bushfires and extreme heatwaves.

- Climate change is a major risk facing Australians living in towns and cities.
- Australia's capital cities are experiencing hotter, longer and more frequent heatwaves.
- The *Angry Summer* of 2016/17 set over 200 temperature and rainfall records, affecting major cities and regional centres across Australia.
- Climate change is increasing the risk of bushfires, exposing people and property on the urban-bushland boundary.
- More than 80% of Australians live on the coast, and climate change is driving sea-level rise, increasing the risk of flooding our coastal towns and cities.
- Sydney, Melbourne, Bundaberg and Darwin, for example, are likely to experience very large increases in the frequency of coastal flooding events if we do not rapidly reduce our greenhouse gas emissions.

2

Australian cities, towns and shires are major drivers of pollution, but can also be critical hubs for climate change solutions.

- Urban centres are major contributors to climate change, producing around three-quarters of the world's greenhouse gas emissions, mainly from electricity and energy use in buildings and transport.
- By changing the way we use and produce energy, 70% of emission reductions required to meet the global climate agreement made in Paris can be achieved in cities.
- Solutions already employed by cities include: shifting to renewable energy for electricity generation (e.g. Adelaide); increasing the energy efficiency of buildings (e.g. East Arnhem Land); and supporting more sustainable transport measures (e.g. Gold Coast).

3

Australian councils and communities are leading State and Federal governments on tackling climate change and capitalising on opportunities in renewable energy.

- Australian cities, towns and shires are at the forefront of climate action, despite periods of instability and policy changes at state and federal levels.
- One in five councils surveyed across Australia are aiming for "100% renewable energy" or "zero emissions". Examples include capital cities like Adelaide, Canberra, Melbourne and Sydney as well as smaller councils such as Byron Shire, Lismore, Yackandandah and Uralla Shire.
- Already, investments in renewable energy worth millions of dollars are being rolled out across Australia by local councils and community groups. Examples include the Sunshine Coast Council's 15MW solar farm, Lismore's community owned and council operated solar farms, and Alice Spring's solar city, to name but a few.

4

Australian case studies demonstrate how local governments can:

- Make renewable energy more accessible through programs that encourage landlords, tenants and low-income households to take up solar power generation.
- Partner with other organisations in their local area to purchase renewable energy.
- Set and achieve high renewable energy targets.
- Improve energy efficiency of council buildings, street lighting and set higher standards for new developments and retrofits in their council area.
- Provide new public transport infrastructure and encourage people to shift away from driving to walking, cycling and public transport, and promote electric vehicles powered by renewable energy.

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1. Introduction

In cities, towns and shires, people's activities ranging from electricity consumption to car use are a major source of greenhouse gas emissions. This pollution is driving climate change and worsening extreme weather. Yet these urban centres[1] are also hubs of climate action, building momentum through strong emission reduction targets and encouraging the uptake of climate solutions such as renewable energy, energy efficiency and sustainable transport.

This report highlights the significant and positive role played by many Australian local governments in tackling climate change, often in the face of uncertain and changeable policies at the state and federal level. For more than a decade, Australian local governments have been simply getting on with the job of reducing emissions, pursuing energy efficiency, renewable energy and sustainable transport measures. This report recognises that every shire, town and city has unique characteristics and history that shape the available opportunities and challenges for reducing emissions.

We highlight the ambitions and achievements of councils and communities in Australia and overseas, and outline a suite of actions and examples to encourage and inspire towns and cities that want to take the next step on the climate action pathway.

1 In this report we define urban centres as cities, towns and shires.

1.1 The challenge

Global heat records have been broken again, with 2016 declared the hottest year ever, breaking previous records set in 2015 and 2014. Australia continues to suffer through record-breaking heat, lengthening bushfire seasons, increasing sea-level rise, coastal flooding and supercharged storms. The emissions of greenhouse gases from the burning of fossil fuels (coal, oil and gas) are driving these profound changes to the climate system and need to be drastically reduced. However, the window of opportunity to limit damaging climate impacts is rapidly closing and governments are struggling to meet this challenge at the pace required.

1.2 Local champions

In the face of this challenge, local leaders have emerged (for example, Figure 1). Around the world and across Australia, shires, towns and cities of all shapes and sizes are surging ahead with plans to reduce emissions, switch to cleaner energy sources and build greener, more efficient and more resilient communities. From booming urban centres to small rural townships, local governments and groups of determined residents have demonstrated leadership and innovation in response to climate change concerns.

Already, local councils and community groups are investing millions of dollars in renewable electricity generation. Examples of locally-led renewable energy projects include the Sunshine Coast Council's 15MW solar farm (ABC 2016a), Lismore's community owned and council operated solar farms (Farming the Sun 2017), Canberra's reverse auction approach for sourcing 100% of its electricity from renewables (Climate Council 2016), and Melbourne City Council's renewable energy project (City of Melbourne 2017b), to name but a few. Local governments can influence how new homes and businesses are built, how urban renewal programs are undertaken, how hundreds of thousands of residents and workers travel each day, and just as importantly, they can band together to lobby for state and federal policy change.

Many local governments are leading climate action.

Figure 1 (opposite): 1,000 local government leaders at the Paris Climate Conference in 2015, committed together to tackle climate change.

1.3 Cities Power Partnership (CPP)

The Climate Council's Cities Power Partnership (CPP) program will engage with shires, towns and cities, via local councils, throughout Australia. The CPP will provide incentives for these councils to increase renewable energy and energy efficiency, improve transport sustainability and work together. Members of the partnership will have access to a national knowledge hub and an online analytics tool to measure energy, cost and emissions savings of projects; be buddied with other councils to share knowledge; receive visits from domestic and international experts; be connected to community energy groups; and be celebrated at events with other local leaders. We'll also showcase the incredible achievements of our cities, towns and shires in national, local and social media to millions and share their successes with our community of over 200,000 Climate Council members and supporters. More information about the Climate Council's CPP is provided in Appendix A.

Cities Power Partnership empowers local climate solutions.

2. The challenge: Cities, towns and shires are vulnerable to climate change

Over half of the world's population lives in towns and cities, and this is projected to increase to three-quarters by 2050 (OECD 2014; Weiss 2015). Similarly, Australia's population is highly urbanised, with two-thirds living in capital cities and four out of ten Australians living in the two largest cities, Melbourne and Sydney (Coleman 2017; Table 1). Australia's population is expected to grow from 24 million at present to 40 million by 2050, with a substantial portion residing in large urban centres (Norman 2016).

Table 1: Top 20 Australian cities[2] by population in 2015.

Top 5	Population (2015)	5 year % growth in population
Sydney	4,526,479	8.2%
Melbourne	4,353,514	10.1%
Brisbane	2,209,453	9.4%
Perth	1,958,912	13.7%
Adelaide	1,288,681	5.1%
5-10		
Gold Coast	624,918	9.4%
Newcastle	434,454	5.8%
Canberra	424,666	6.6%
Central Coast	325,082	4.0%
Sunshine Coast	202,122	9.0%
11-15		
Wollongong	292,388	4.7%
Hobart	209,254	2.9%
Geelong	187,417	7.0%
Townsville	180,333	9.9%
Cairns	147,993	7.9%
16-20		
Darwin	123,396	9.2%
Toowoomba	114,622	5.5%
Ballarat	99,841	9.0%
Bendigo	92,888	8.0%
Albury/Wodonga	88,949	6.9%

Source: .id 2016.

2 Figures for cities listed in this table include the population of the entire metropolitan area, comprising many local councils.

Cities are economic powerhouses, generating 80% of the world's economic activity.

Cities are increasingly the focus of global economic activity - production, trade, employment and investment (UN Habitat 2016), generating 80% of the world's Gross Domestic Product (IEA 2016).

Urban populations are major contributors to climate change, producing around three-quarters of the world's greenhouse gas emissions from activities such as heating, cooling and lighting buildings, transportation and industrial activities (UN Habitat 2011; Gouldson et al. 2015; Estrada et al. 2017).

Cities, towns and shires are also highly vulnerable to the effects of climate change. Hundreds of millions of people in urban centres across the world are at risk from rising sea levels, intense rainfall, floods, more powerful storms, and more extreme heat (OECD 2014; Revi et al. 2014). Worsening climate impacts are putting Australian's health and well-being at risk and placing increasing pressure on built infrastructure, energy use and water resources (Klein et al. 2007; Hunt and Watkiss 2011).

The impacts of extreme heat and heatwaves, bushfires, rainfall deficiencies, sea-level rise and coastal flooding are outlined here and in Section 2, although this list of extreme weather events is by no means exhaustive. For more information see our report, "Cranking up the Intensity: Climate Change and Extreme Weather Events" (Climate Council 2017a).

2.1 Worsening extreme weather in Australian cities

All extreme weather events are now occurring in an atmosphere that is warmer and wetter than it was in the 1950s (Trenberth 2012).

While extreme weather events are a natural feature of the climate system, the atmosphere and surface ocean of today contain significantly more heat than in the 1950s. 2016 was the hottest year on record globally, surpassing previous records set in 2015 and 2014. Global average temperature has risen by about 1.1°C above the pre-industrial baseline, with most of the warming occurring over the past 50 years (NOAA 2017). The rate of increase in global average temperature since 1970 is approximately 170 times the baseline rate over the past 7,000 years (Marcott et al. 2013; Steffen et al. 2016; NOAA 2017). This extremely rapid, long-term rate of temperature increase is being driven by the additional greenhouse gases in the atmosphere that have accumulated primarily from the burning of coal, oil and gas.

The rapidly warming climate is driving a range of impacts, many of them related to worsening extreme weather events. The *Angry Summer* of 2016/17 broke over 200 temperature and rainfall records over 90 days, affecting major cities and regional centres across Australia (Climate Council 2017b). Sydney experienced its hottest summer on record with a mean temperature 2.8°C above average (BoM 2017a). Brisbane also experienced its hottest summer on record with a mean temperature of 26.8°C, equivalent to 1.7°C above average (BoM 2017b). Canberra had its hottest summer on record in terms of daytime temperatures (BoM 2017c) and recorded temperatures of at least 35°C on 18 days (BoM 2017d). Adelaide experienced its hottest Christmas day in 70 years at 41.3°C (BoM 2017e) and Perth had its highest total summer rainfall on record (BoM 2017f).

Increasingly intense extreme weather events have significant consequences for Australians living in our larger towns and cities (Coleman 2017). Whilst outside of major cities, Australia's smaller rural and regional towns experience similar climate risks, often made worse by remoteness and the fact that they rely heavily on the agricultural sector, which can be adversely affected by prolonged drought and other climate impacts (Kellet 2016).

Australians living in urban centres are experiencing worsening extreme weather events.

2.2 Urban Heat Island effect

People living in urban environments, particularly in large cities, may be exposed to higher temperatures than those living in surrounding areas, due to a phenomenon called the Urban Heat Island (UHI) effect (Figure 2). The UHI effect results from a combination of dark surfaces, the trapping of hot air between buildings, limited tree cover, and other heat trapping and heat inducing factors, which can increase annual urban air temperatures by at least 1-3°C compared to surrounding areas (US EPA 2008; Adams and Smith 2014; Climate Council 2014a). In the evening, the difference between the urban centre and surrounding areas can be more extreme, reaching as high as 12°C above normal depending on the time of year.

The UHI effect occurs in many Australian cities. As climate change continues to increase temperatures, and as urbanisation advances, the UHI effect will also be affected. In Sydney, for example, due to continuing urban expansion, it is expected that overnight temperatures will show a marked increase in the UHI effect (Argüeso et al. 2013).

Another example of the direct impacts of climate change and rising temperatures are worsening heatwave conditions (Estrada et al. 2017).

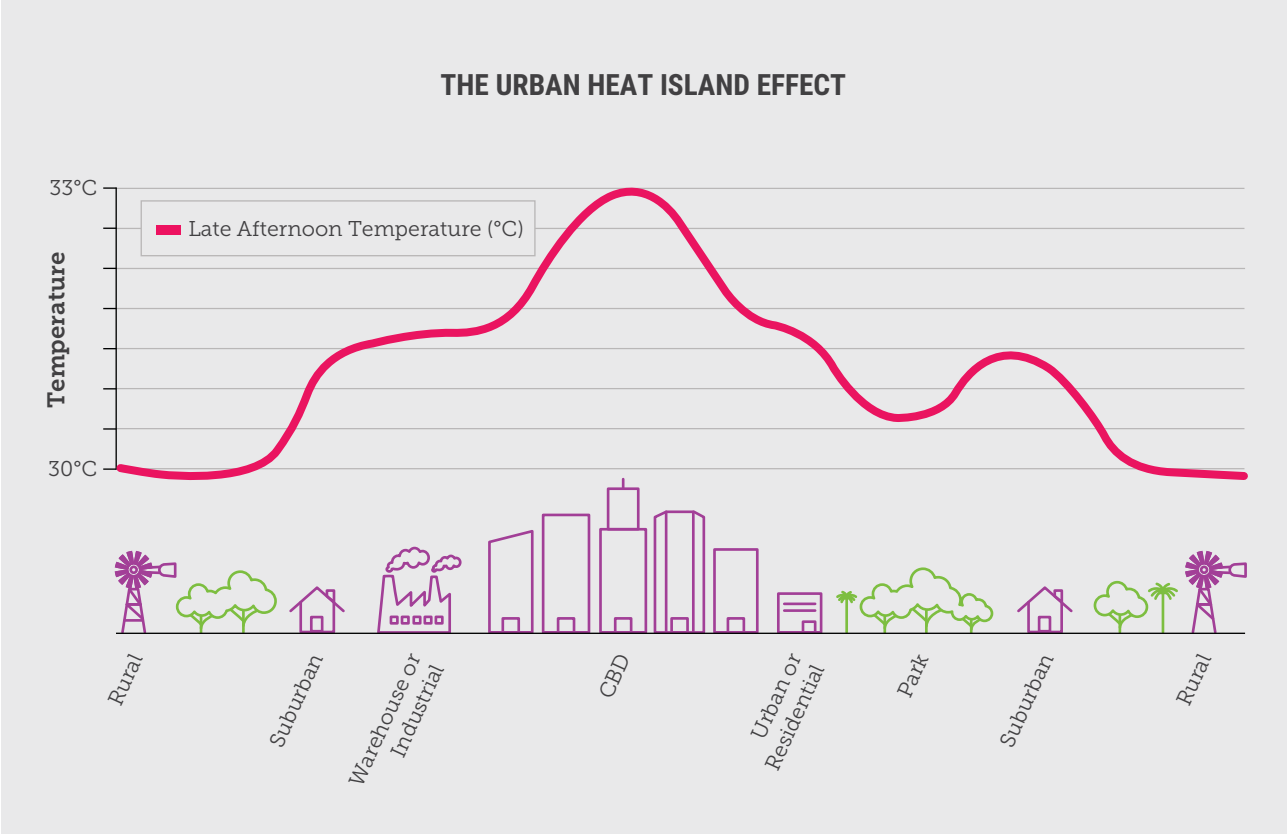


Figure 2: The Urban Heat Island effect. The average annual air temperature in cities (more than one million people) may be at least 1-3°C hotter than surrounding areas. **Source:** Adapted from US EPA 2008 and NASA 1999.

2.3 Heatwaves

Climate change is making hot days and heatwaves more frequent and more severe (Perkins and Alexander 2013; Climate Council 2014a). Australia's climate has warmed by about 1°C from 1910, with most warming occurring since 1950 (CSIRO and BoM 2016). As a result, the number of hot days, defined as days with maximum temperatures greater than 35°C, has increased in the last 50 years (CSIRO and BoM 2016).

Over the period 1971–2008, both the duration and frequency of heatwaves increased over much of the continent, and the hottest days during heatwaves became even hotter (Perkins and Alexander 2013), including in Australia's capital cities (Figure 3).

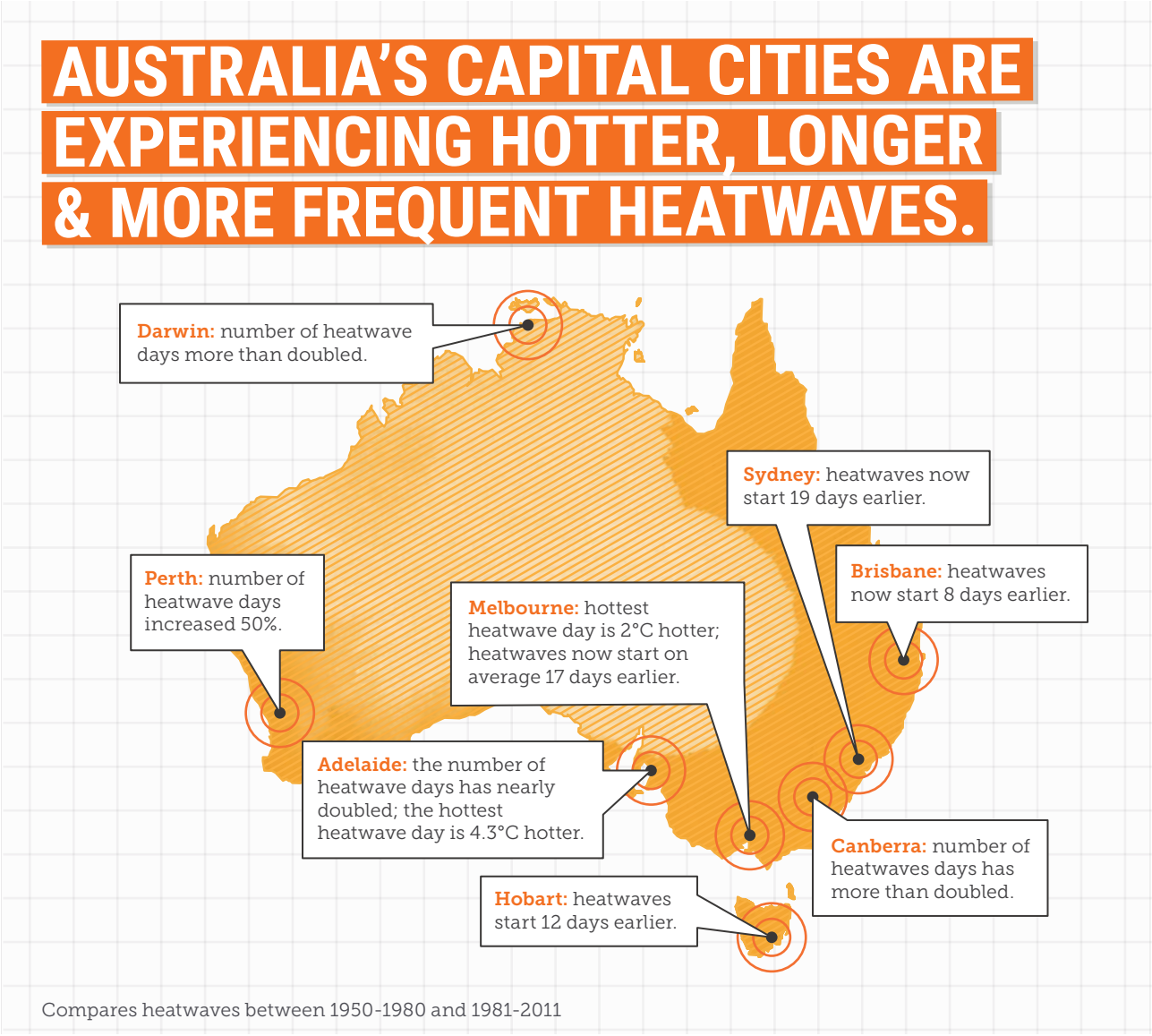


Figure 3: Australia's capital cities are experiencing hotter, longer or more frequent heatwaves, based on a comparison by Perkins and Alexander (2013) of heatwaves during the 1950-1980 period with those during the 1980-2011 period.

Heat-related events have significant health and economic impacts as well as disrupting critical infrastructure, such as the supply of electricity to urban centres.

Major heatwaves in Australian urban centres can cause loss of human life (Woodruff et al. 2005; Coleman 2017; Table 2). Over the last decade, severe heatwaves around Australia have resulted in hundreds of deaths and an increased number of hospital admissions for heart attacks, strokes, kidney disease and acute renal failure. Table 2 provides examples of heat-related health impacts. During severe heatwaves in south eastern Australia in January 2009, Melbourne experienced three consecutive days at or above 43°C. Over this period, there were 980 heat-related deaths, approximately 370 more than would be expected to occur, on average, at that time of year (DHS 2009). During the Brisbane heatwave of 7-26 February 2004, the temperature ranged from 26°C to 42°C. Overall deaths increased by 23% (excluding injury and suicide) compared with the death rate during the same period in 2001-2003, when the temperature ranged from 22°C to 34°C (Tong et al. 2010).

Major heatwaves in Australian cities are deadly.

Table 2: Illustrative examples of the impacts of recent Australian heatwaves on health services and mortality (Climate Council 2015). Note that 'excess deaths' refers to the number of deaths estimated to be additional to those expected during this period without an extreme heat event. **Sources:** DHS 2009; Wang et al. 2009; Nitshke et al. 2011 and Schaffer et al. 2012.

City	Month	Ambulance callouts	Emergency department presentations	Excess deaths
Melbourne	January 2009	46% increase in ambulance callouts	12% increase in emergency department presentations	374 excess deaths were recorded, a 62% increase on the previous year
Sydney	February 2011	14% increase in ambulance callouts, with 116 callouts specifically related to heat	104 people in emergency departments for heat effects, and 236 for dehydration	The number of deaths increased by 13%
Adelaide	January 2009	16% increase in ambulance callouts	13% increase in emergency department presentations	32 excess deaths recorded, with a 37% increase in total mortality in the 15-64 age group
Brisbane	February 2004		More than a 30% increase in emergency department presentations	64 excess deaths recorded within the heatwave period

Heatwaves in Australia during 2013-2014 cost approximately $8 billion through absenteeism and a reduction in work productivity (Zander et al. 2015). Impacts of hot weather include more workplace accidents because of concentration lapses, and poor decision-making ability due to higher levels of fatigue (Morabito et al. 2006; Tawatsupa et al. 2013; Tamm et al. 2014). During heatwaves costly disruption of critical infrastructure can also occur. For example, during the January 2009 heatwave in Melbourne (Figure 4), financial losses were estimated to be $800 million, mainly caused by power outages and disruptions to the transport network (Chhetri et al. 2012).

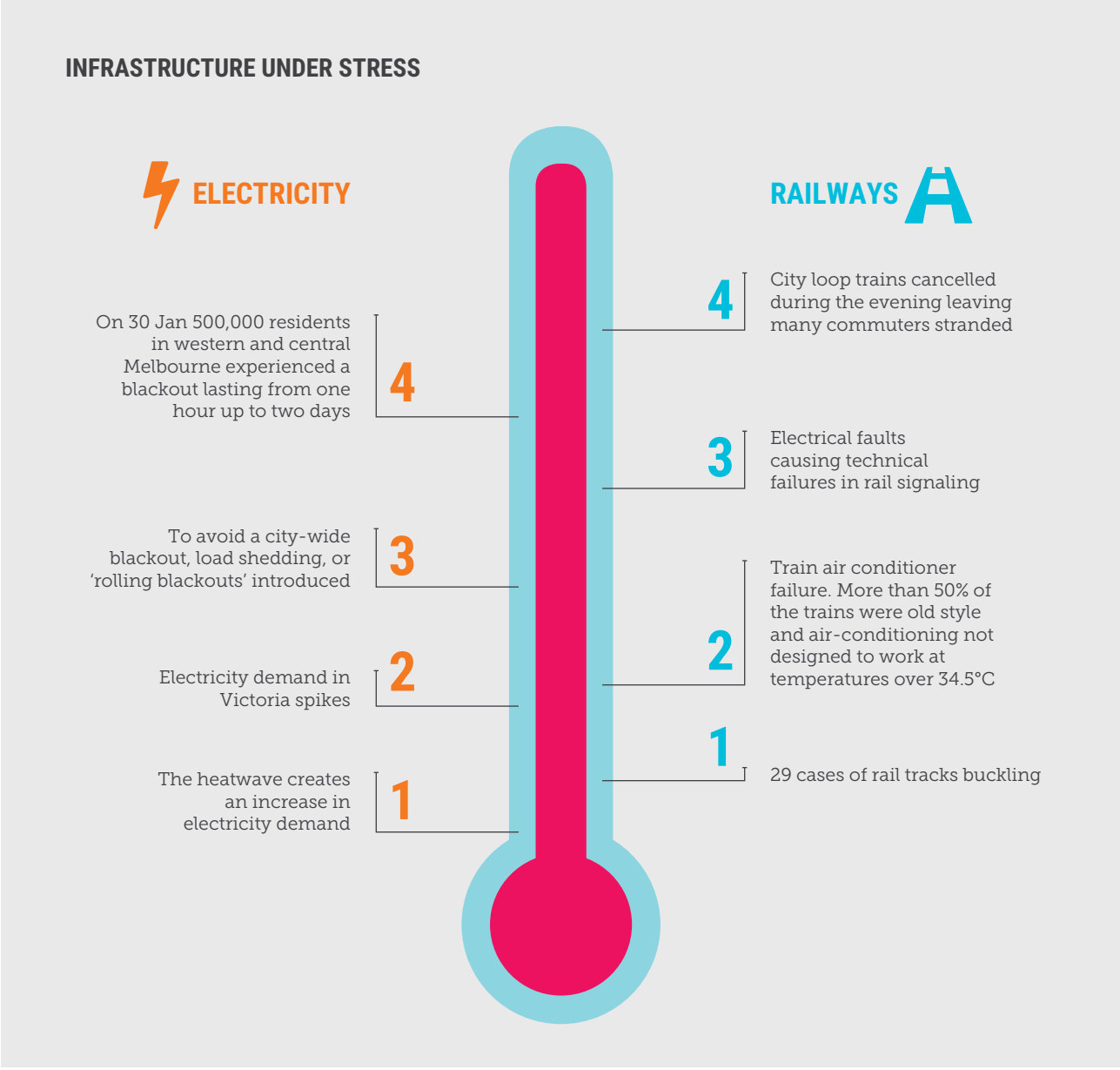


Figure 4: Anatomy of a heatwave—Infrastructure breakdown during the Melbourne 2009 heatwave.

A severe heatwave in early February 2017 affected much of Australia's south, east and interior and caused considerable problems for the South Australian and New South Wales energy systems. In South Australia, 40,000 people were left without power for about half an hour in the early evening while temperatures were over 40°C. The highest temperature in South Australia was recorded on February 8 where the daytime maximum reached 46.6°C at Moomba airport, while Adelaide reached a high of 42.4°C (BoM 2017g, h). As the weather system moved further north, several days later on February 10, New South Wales experienced the same heatwave event with temperatures at Sydney Airport reaching 42.9°C, its hottest February temperature on record (BoM 2017i). With near record all-time peak electricity demand, the state narrowly avoided extensive blackouts. Import of electricity from three interconnections with Victoria and Queensland operated beyond design limits, contributing 12% to meeting peak demand (AEMO 2017). Around 3000MW of fossil-fuel generated electricity was not available – tripping off (400MW), unable to start (760MW), out for maintenance (1000MW) or output-limited due to cooling water limits (600MW). At one point, the Tomago aluminium smelter shed 580MW of load. Careful energy use by consumers, saving 200MW, also helped New South Wales avoid widespread blackouts. This heatwave over the Angry Summer 2016/17 highlights the vulnerability of our ageing, fossil fuel-dependent energy systems to extreme weather.

Australia's ageing electricity system is vulnerable to worsening extreme weather.

CLIMATE PROJECTIONS: HEATWAVES AND HOT DAYS

Irrespective of the eventual level of temperature rise, Australian towns and cities will be affected significantly over at least the next two decades due to the inertia of the climate system. Brisbane, Canberra and Darwin are in line for the greatest proportional increases in the number of days with maximum temperatures 35°C and above. For example, Darwin experienced 11 days in 1995 with the maximum temperature above 35°C: this could rise to as many as 265 days per year by 2090 if greenhouse gases continue to be released at current rates (Table 3). In the 2016/17 *Angry Summer,* Canberra recorded temperatures of at least 35°C on 18 days ((BoM 2017d), already far higher than the 12 days previously projected for 2030 (CSIRO and BoM 2015; Climate Council 2014a, 2017a).

Under a high-pollution scenario for 2100, the average summer temperature in Sydney could become more like current day Port Morseby, increasing from 26.4°C to 29.4°C. Adelaide could be feel more like Kuching in Malaysia with average summer temperature rising from 28.8°C to 32.0°C, while Perth could experience average summer temperatures similar to current day New Delhi, increasing from 31.3°C to 35.2°C (World Meteorological Organization and Climate Central 2017).

Table 3: Average number of days per year with the maximum temperature above 35°C for Australian capital cities. 2030 and 2090 figures are from climate model projections under different RCP scenarios; the 1995 figures are averages of observations for the 1981-2010 period.

Capital Cities	1995	2030	2090	
		RCP4.5	RCP2.6	RCP8.5
Adelaide	20	26	32	47
Brisbane	12	18	27	55
Canberra	7.1	12	13	29
Darwin	11	43	52	265
Hobart	1.6	2.0	2.0	4.2
Melbourne	11	13	14	24
Perth	28	36	37	63
Sydney	3.1	4.3	4.5	11

Source: CSIRO and BoM 2015.

2.4 Bushfires

The most direct link between bushfires and climate change comes from the long-term trend towards a hotter climate (Bradstock et al. 2014).

Since the start of the 21st century, large and uncontrollable fires have destroyed property in cities, towns and shires across Australia. For example, bushfires destroyed 500 houses in Canberra in 2003. The West Australia town of Yarloop, located on the coast south of Perth, experienced one of Australia's worst bushfires in 2016, when 121 homes were destroyed (ABC 2016b). The bushfires of Black Saturday, 7 February 2009, caused the deaths of 173 people, injured 414 people, destroyed 2,029 homes (PoV 2010) and insured losses amounted to $1.3 billion (ICA 2013).

Urban water supplies can also be diminished and damaged by bushfires. Following the 2003 Canberra fires, there was severe disruption to drinking water supplies due to increased erosion and runoff from stripped soils, increasing sediment and nutrient concentrations in the reservoirs (White et al. 2006). The Black Saturday bushfires in 2009 affected about 30% of the catchments that supply Melbourne's drinking water. Melbourne Water estimated the post-fire recovery costs, including water monitoring programs, to be more than $2 billion (WRF 2013).

In addition to fatalities from the fires themselves, bushfire smoke can seriously affect human health (Figure 5). Smoke contains not only respiratory irritants, but also inflammatory and cancer-causing chemicals (Bernstein and Rice 2013). The annual health costs of bushfire smoke in Sydney have been estimated at $8.2 million per annum (adjusted to 2011 values) (Deloitte Access Economics 2014). In Melbourne, cardiac arrests increase by almost 50% on bushfire smoke-affected days (Dennekamp et al. 2011), while an extreme smoke event in the Sydney Basin in May 2016 from fires designed to reduce fire hazard is thought to have caused the premature death of 14 people (Broome et al. 2016).

Figure 5: Bushfire smoke from the Blue Mountains blankets Sydney in 2013.

2.5 Water scarcity

Climate change is likely making drought conditions in southwest and southeast Australia worse (Climate Council 2015). The drying trend is related to the southward shift of the fronts from the Southern Ocean that bring rain across southern Australia during the cool months of the year (winter and spring) (CSIRO and BoM 2015).

Water scarcity in major cities, particularly Melbourne, Sydney and Perth, has been exacerbated by drought and remains an ongoing challenge. Reduced rainfall typically lessens stream flow disproportionately more than the reduction in rainfall. For example, the rainfall decline in southwest Western Australia of 19% since the mid-1970s has reduced the annual average stream flow into Perth's dams by nearly 80% (WC 2012; BoM 2015; Figure 6). In Melbourne, stage 3 water restrictions were implemented from 2007 to 2010, and by 2009 the city's water storage levels fell to a record minimum of 25.6% (Melbourne Water 2013).

Assessments of future impacts of drought on both water supply and urban water demand at the regional and/ or catchment level suggest that water scarcity could increase across Australia. In NSW, under a high emissions scenario along with high population growth and less rapid technological change, water inflows to key Sydney dams such as Warragamba and Shoalhaven could decrease by as much as 25% by 2070 (NSW Office of Water 2010).

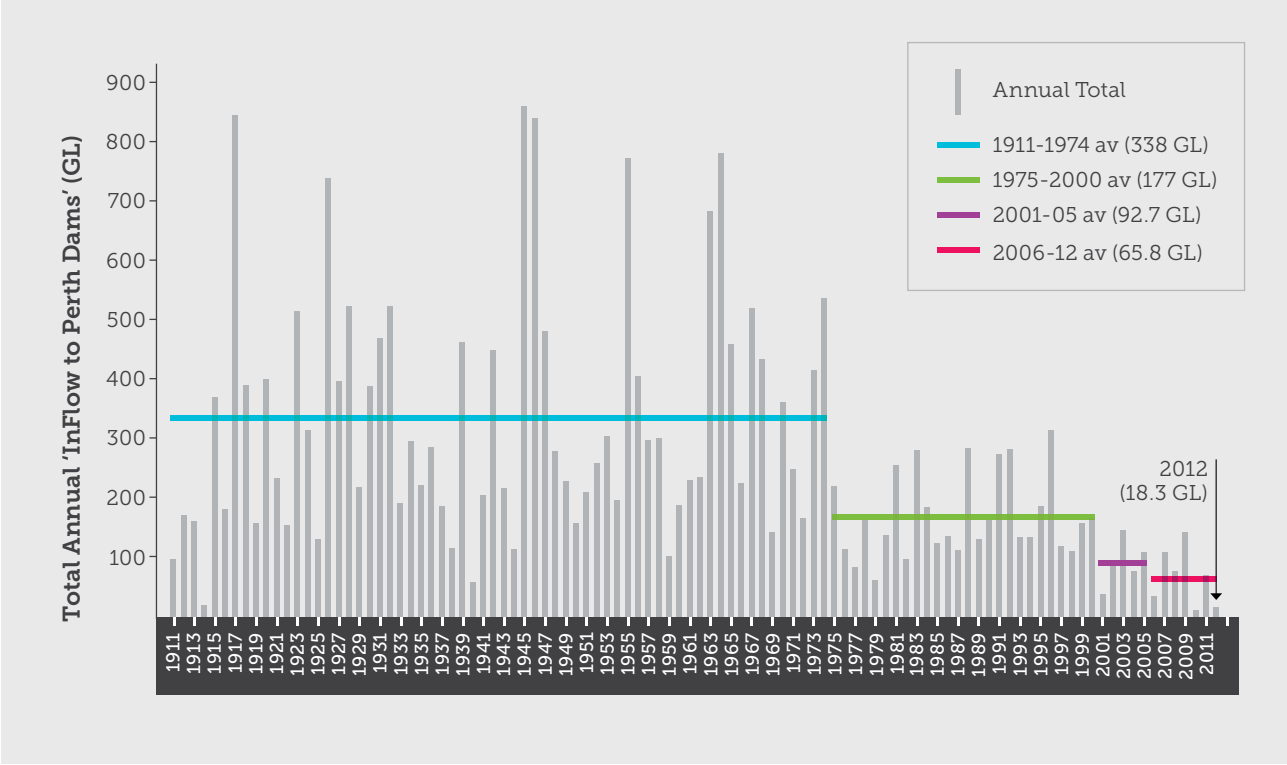


Figure 6: Trend in total annual stream flow into Perth dams 1911–2012. **Source**: Climate Commission 2013.

These declines, coupled with a continued rise in annual demand for drinking water in the residential and commercial sectors, could increase the imposition of water restrictions in the state (NSW Office of Water 2010).

The projected increase in duration and intensity of droughts in southeast Queensland (CSIRO and BoM 2015) is expected to increase the length of time it takes to refill key water storages in the region. An assessment of climate change impacts on water availability in the Moreton catchment (which serves Brisbane, Ipswich and other urban centres) has found a decline in inflow into water storages when it rains, and longer breaks between significant 'storage filling events' (UWSRA 2011).

The pronounced drying trend over southwest Australia, which is projected to continue throughout the 21st century, has significant implications for urban water supplies in Perth (Collett and Henry 2011). The Western Australia Department of Water (2009) predicts a supply-demand annual deficit that is potentially as large as 85 billion litres by 2030 for the Perth, goldfields and agricultural regions and some parts of the southwest. To put this into context, Western Australia's Integrated Water Supply Scheme (IWSS) currently delivers 289 billion litres of water to over 2 million people in the region each year. A deficit of 85 billion litres is equivalent to approximately 30% of current water supply (WA Water Corporation 2014).

2.6 Sea-level rise and coastal flooding

Around 80% of Australians live on the coast, with many of Australia's towns and cities facing increasing risk from sea-level rise and coastal flooding (Climate Council 2014b; Cole 2017). Impacts can include loss of life; disruption of health and social services; inundation of property and coastal infrastructure, such as houses, businesses, ports, airports, railways and roads; and damage to coastal, estuarine, and freshwater ecosystems (DCCEE 2011).

For coastal areas around Australia's largest cities, a sea-level rise of 0.5 m, which lies near the lower end of the estimates for 2100 compared to 1990, would result in substantial increases in the incidence of extreme flooding events, typically by a factor of several hundred and in some places by as much as one thousand (Church et al. 2008; Hunter 2012; Figure 7). A multiplying factor of 100 means that an extreme event with a current probability of occurrence of 1-in-

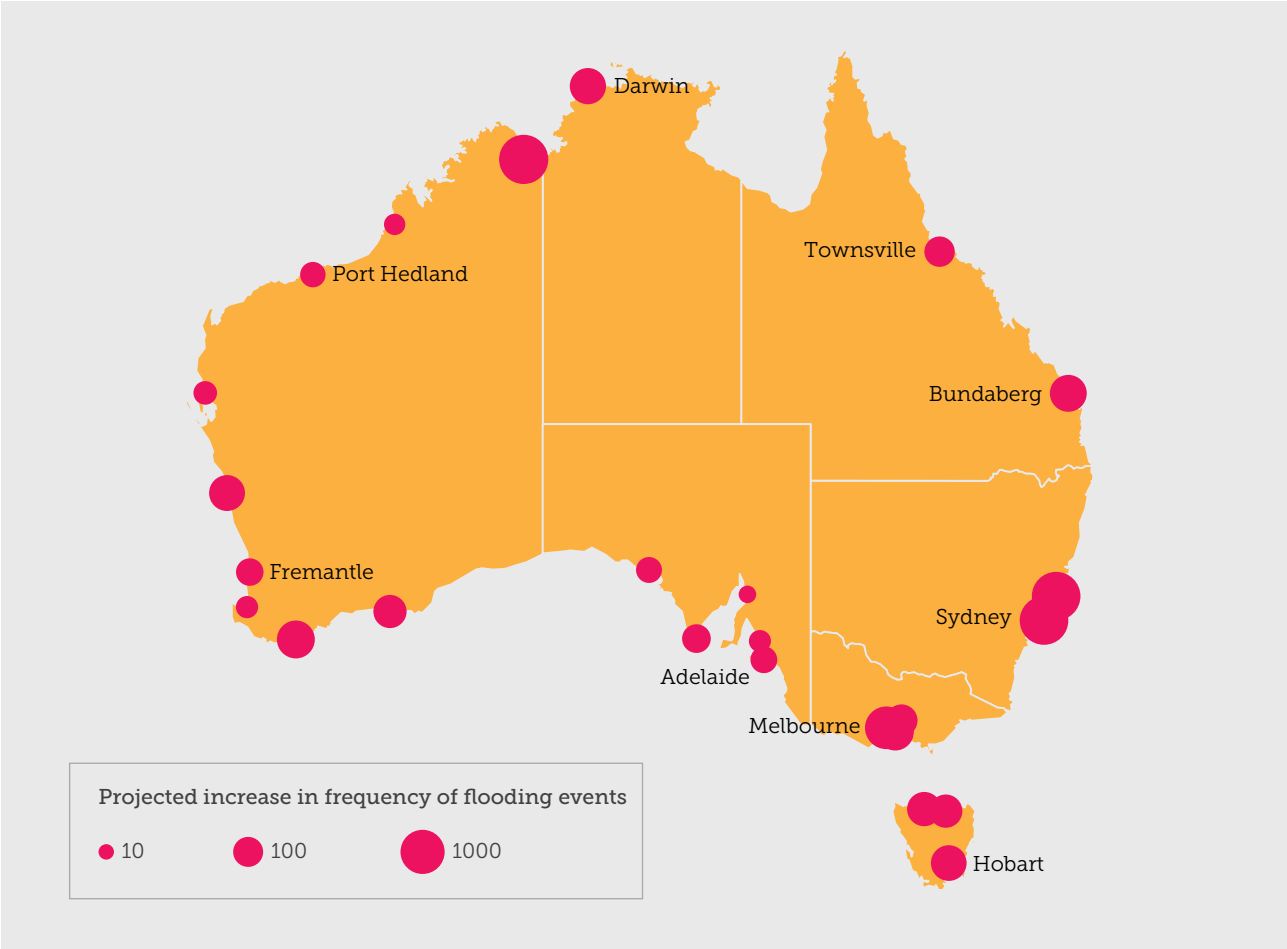


Figure 7: A sea-level rise of only 0.5m would lead to very large increases in the incidence of extreme coastal flooding events in Australian coastal towns and cities, typically by a factor of several hundred (Hunter 2012).

Coastal cities are increasingly vulnerable to sea-level rise.

100 – the so-called one-in-a-hundred-year event – would occur on average every year. A multiplying factor of 1,000 implies that the one-in-a-hundred-year inundation event would occur almost every month. For more details, see the Climate Council's report "Counting the Costs: Climate Change and Coastal Flooding".

Climate change is increasing global sea levels through both the thermal expansion of a warming ocean and the flow of water into the ocean from melting of continental glaciers and polar ice sheets. Sea levels have risen about 20 cm since the mid-19th century (IPCC 2013). A recent study estimates that the pace of sea-level rise has nearly tripled since 1990 (Dangendorf et al. 2017). For major Australian coastal cities, it is likely that sea levels will rise by about 0.25 m and 0.6 m above the 1995 baseline by 2050 and 2090 respectively for a high-emissions scenario (RCP 8.5; Table 4).

A coastal flooding (or "high sea-level") event is caused by wind driven waves or a storm surge, generally exacerbated by a high tide. A storm surge is a rise above the normal sea level resulting from strong, mainly onshore winds and/or reduced atmospheric pressure. Storm surges accompany tropical cyclones as they make landfall but can also be formed by intense low pressure systems in non-tropical areas, such as east coast lows in the Tasman Sea. Storm surges can cause extensive flooding of coastal areas (Climate Council 2014b). The area of sea water flooding may extend along the coast for hundreds of kilometres, with water pushing several kilometres inland if the land is low-lying.

As the sea level continues to rise, these storm surges are riding on a higher base sea level and thus becoming more damaging as they are able to penetrate further inland. Some of the most devastating coastal flooding events are caused by a "double whammy" of concurrent high sea-level events and heavy rainfall events in the catchments inland of coastal settlements. That is, coastal settlements can be inundated by water from both i) a storm surge, a high tide and a higher sea level, and ii) flooding rivers from the catchments behind the settlements.

The health impacts of storms and floods on people living in coastal settlements are diverse, ranging from injuries, depression, anxiety, and poor physical health. Human health can be affected by, for example i) direct exposure to storms; ii) hazards from blackouts; iii) exposure to contaminated drinking water; iv) disruption of public services; v) mental health effects from traumatic or stressful experiences during and after the storms and vi) health and safety risks from clean-up and recovery activities (Lane et al. 2013).

The exposure of coastal assets to sea level rise influenced strongly by climate change is very large and the risks are set to increase. In Australia, more than $226 billion (2008$) in commercial, industrial, road and rail, and residential assets are potentially exposed to flooding and erosion hazards at a sea level rise of 1.1 m (a high-end scenario for 2100). For example, Brisbane has 150 - 250 light industrial buildings at risk from coastal flooding at a sea level rise of 1.1 m, the Gold Coast has 300 – 400 km of roads vulnerable to flooding and erosion, while in Newcastle and Melbourne 70 – 150 and 50 – 100 commercial buildings are at risk, respectively (DCCEE 2011).

Table 4: Estimates of mean sea-level rise for major Australian cities relative to 1986-2005 levels, for a high emissions scenario.

Cities	Sea-level rise
Brisbane	Up to 0.26 m sea-level rise by 2050, and up to 0.64 m by 2090*
Sydney	Up to 0.27 m sea-level rise by 2050, and up to 0.66 m by 2090
Melbourne	Up to 0.24 m by 2050, and up to 0.59 m by 2090
Adelaide	Up to 0.25 m by 2050, and up to 0.61 m by 2090
Perth	Up to 0.24 m by 2050, and up to 0.61 m by 2090
Hobart	Up to 0.66 m by 2090
Darwin	Up to 0.25 m by 2050, and up to 0.62 m by 2090

* Based on model simulations for sea level rise in Mackay, the nearest city to Brisbane.

Sources: CSIRO and BoM 2015; McInnes et al. 2015; Webb and Hennessy 2015.

At a sea-level rise of 1.1 m, more than $226 billion in commercial, industrial, road and rail, and residential assets are at risk from flooding.

2.7 Coping with climate extremes

The more we know about climate change, the riskier it looks. This conclusion underscores the need for emissions from human activities, such as the burning of coal, oil and gas for electricity, to be trending sharply downwards by 2020 to protect Australians from climate extremes. Transitioning urgently to a new, low carbon economy is critical.

Preparing cities, towns and shires for climate impacts is vital if we are to protect the well-being of urban populations (Norman 2016). There are a number of resources available to predict the impacts and help Australians respond to climate change.

Examples include:

- **New South Wales**
  NARCliM has produced an ensemble of robust regional climate projections for southeastern Australia that can be used by the NSW and ACT communities to plan for the range of likely future changes in climate.

  www.climatechange.environment.nsw.gov.au/Climateprojections-for-NSW/About-NARCliM

- **Victoria**
  The climate change adaptation navigator is a web-based tool to assist the local Victorian government with climate change adaptation and planning.

  www.adaptation-navigator.org.au

- **Western Australia**
  The Western Australian Local Government Association has developed a toolkit to help local governments adapt to climate change.

  www.walgaclimatechange.com.au

- **Climate projections for Australia (CSIRO and Bureau of Meteorology)**
  www.climatechangeinaustralia.gov.au

  This website provides access to a wide range of tools, datasets and guidance material.

- **NCCARF CoastAdapt**
  https://coastadapt.com.au/tools

  CoastAdapt contains a wealth of material to support coastal adaptation in Australia, including data, guidance materials, decision support and tools.

3. Buildings and transport systems drive energy use and pollution

Cities, towns and shires can play a key role in becoming more energy efficient, increasing reliance on renewable energy, and moving to more sustainable modes of transport (IEA 2016).

Cities and towns account for over two-thirds of global energy demand and around three quarters of the world's greenhouse gas emissions (Gouldson et al. 2015; The Guardian 2015 IEA 2016). Buildings and transport systems are the key drivers of energy use and greenhouse gas emissions in cities and towns (ARUP 2016). Greenhouse gas inventories averaged for 30 cities worldwide found emissions are mainly associated with:

- Buildings (electricity and energy use in buildings accounts for over half of total emissions, divided about equally between commercial and residential buildings)
- Transport, particularly cars and trucks (accounts for around a third of total emissions, Figure 8)
- Other sources such as waste and manufacturing (making up the remaining emissions, around a sixth) (ARUP 2016).

Buildings and transport are the main drivers of energy use and emissions in cities and towns.

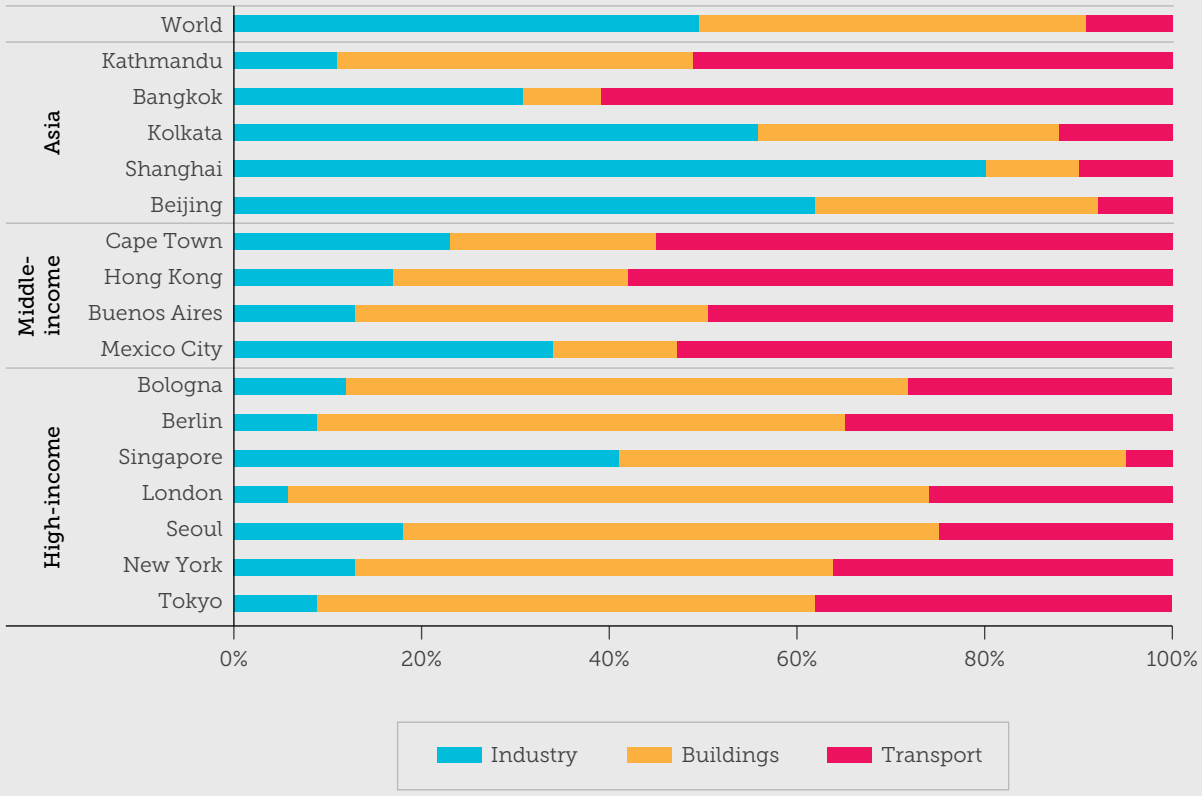
Figure 8: In cities, transport makes up around a third of emissions.

Cities and towns could deliver 70% of required emission reductions.

Different cities and towns can have varying emissions from buildings, industry and transport depending on their individual characteristics (IRENA 2016; Figure 9).

Under the Paris Agreement, world leaders including those from Australia agreed to limit global temperature rise to well below 2°C above pre-industrial levels, and to pursue eforts to limit temperature rise to only 1.5°C. While 2°C may not sound like much, this level of temperature rise will have serious impacts on the lives and livelihoods of people all over the world. Already at only about 1°C temperature increase from pre-industrial levels, climate change is intensifying extreme weather events.

Towns and cities have a significant role to play in tackling climate change (Betsill and Bulkeley 2007). Transforming the way energy is used and generated in cities and towns worldwide has the potential to deliver 70% of the total emissions reductions needed to stay on track for the 2°C limit set under the Paris Agreement (compared to expected emissions based on policies currently in place) (IEA 2016).



Note: data refers to a year between 1998 and 2005. Source: UN Habitat (2008).

Figure 9: Energy use breakdown in global cities. **Source:** IRENA 2016.

The main strategies cities and towns (and their respective local governments) can employ to reduce their greenhouse gas emissions include:

- Avoiding the need for energy and fuel use through more energy efficient buildings, scaled up public transport, and promotion of walking and cycling
- Shifting to renewable energy for heating and electricity generation
- Moving to electric forms of transport powered by renewable energy

Given the unique characteristics of Australian shires, towns and cities - their varying population levels, urban density, history of development, education, and income level of inhabitants - each has a unique set of opportunities and challenges for pursuing energy efficiency, renewable energy and sustainable transport measures. In existing urban areas, retrofitting solutions within the existing built environment and working within its constraints will also be necessary (IRENA 2016).

Local governments can deliver emissions reductions through their policies, strategic and statutory planning processes, local laws, procurement for and management of public facilities and council assets and via their close connection to the local community. Local land use planning in particular, can influence energy use and emissions.

For example, urban development can be sprawling and inefficient, leading to high car dependency and high energy use and associated emissions; or it can be compact, connected, and powered by renewable energy (Global Commission on the Economy and Climate 2016; IRENA 2016).

Local governments in high density cities have the opportunity to make large gains through, for example, renewable energy-powered electric public transport systems, and other climate solutions such as energy efficiency. Lower density cities and towns will be able to pursue distributed solar PV (on larger rooftop areas) and renewable energy-powered electric cars (IRENA 2016). In addition, the pattern of urban development in low density cities (such as Canberra) can be improved by building high quality public transport systems, which support higher density, energy efficient housing and commercial development along transit corridors.

Expanding cities and towns can pursue growth through land use planning for example, encouraging higher density development around quality public transport, and maximising the uptake of renewable energy, energy efficiency and sustainable transport in new developments. In urban areas, green infrastructure - the integration of trees, shrubs, grass and open spaces - can increase the liveability and climate resilience of urban areas (Norman 2016; Alexander et al. 2017; US EPA 2017). For example, green

Local climate solutions include renewable energy, energy efficiency and sustainable transport systems.

open space can counter the Urban Heat Island effect (Section 2) by shading buildings, deflecting radiation from the sun, and releasing moisture into the atmosphere (US EPA 2017). Green infrastructure also provides space for local renewable energy initiatives such as solar farms and supports biodiversity by providing habitat (Alexander et al. 2017).

States and federal governments can also benefit from councils and communities taking the lead on climate solutions. For example, cities can be innovation hubs for testing ideas and ironing out issues on a smaller scale before rolling these out more widely (IEA 2016).

Actions assessed as having the greatest potential for reducing greenhouse gas emissions in cities and towns (globally) are summarised in Table 5.

Choices made today by local, state and federal governments about long-term infrastructure and planning for cities and towns will determine the extent and impact of climate change, our ability to achieve emission reductions, and our capacity to adapt to changing conditions (OECD 2014).

Table 5: High impact actions to reduce cities' greenhouse gas emissions.

Energy	Transport	Buildings	Urban planning
Encouraging clean energy on buildings (largely solar PV and solar heating) through planning and incentives Encouraging larger-scale clean energy Introducing fuel switching (to lower carbon alternatives) and industrial efficiency programs	Introducing rapid public transport services Introducing travel demand management schemes (car sharing, congestion charging, parking restrictions and cycle hire) Encouraging residents, businesses and councils to choose low emissions cars and trucks Improving freight systems	Creating incentives for commercial and residential building retrofits Requiring data collection and disclosure (e.g. energy efficiency) for residential, commercial and municipal buildings Establishing building energy codes for all new and existing buildings Retrofitting council and community buildings	Linking land use planning decisions to climate action (both mitigation and adaptation) Shaping compact, connected and coordinated urban areas

Source: Arup 2016.

4. Local governments and communities are leading on renewable energy, energy efficiency and sustainable transport

Globally, local governments and communities are already leading on climate action, often continuing their efforts despite instability and inaction at the state and federal climate policy level.

Cities, towns and shires are advancing climate solutions, implementing risk assessments, and establishing strong greenhouse gas emission reduction targets (Rosenzwieig et al. 2010; the World Bank Group 2011). Cities, towns and shires are also "laboratories and incubators" for piloting and testing climate solutions (Morsch 2015). Local government partnerships are creating networks and alliances (such as the 100 Resilient Cities and The C40 Cities Initiative) to jointly tackle climate change (for example, Table 6).

Cities, towns and shires can test innovative climate solutions.

Table 6: Organisations and alliances working with local governments in Australia and internationally on climate and energy.

Australian organisations working with local government	
Cities Power Partnership-Climate Council	www.citiespowerpartnership.org.au
Zero Carbon Communities-Beyond Zero Emissions	http://bze.org.au/zero-carbon-communities/
Compact of Mayors - Oceania ICLEI	http://mayors.oceania.iclei.org/
Commonwealth Smart Cities and Suburbs Program	https://cities.dpmc.gov.au/smart-cities-program
Generation Yes	www.generationyes.com.au
Community energy groups	
Community energy groups Coalition for Community Energy	http://c4ce.net.au/
Community Power Agency	http://cpagency.org.au/
Embark	http://www.embark.com.au/display/WebsiteContent/Home
Australian local government climate alliances and foundations	
Moreland Energy Foundation	https://www.mefl.com.au/
Yarra Energy Foundation	http://www.yef.org.au/
Victorian Greenhouse Alliances	http://www.victoriangreenhousealliances.org/
Victorian Government Take2 Program	http://www.sustainability.vic.gov.au/services-and-advice/community/take2
Queensland Climate Resilient Councils	http://qcrc.lgaq.asn.au/
Consultants	
ClimateWorks Australia	https://www.climateworksaustralia.org/
Starfish Initiatives	http://starfish-initiatives.org/
Energy for the People	http://www.energyforthepeople.com.au/
Z-NET Zero Net Energy Town	http://z-net.org.au/
Institute for Sustainable Futures	https://www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures
International	
Global Covenant of Mayors	http://www.globalcovenantofmayors.org/
C40 Cities Initiative	http://www.c40.org/
Carbon Neutral Cities Alliance	https://www.usdn.org/public/page/13/CNCA
European Union's World Cities Program	http://world-cities.eu/
UN Global Compact Cities Program	https://citiesprogramme.org/
Carbon Disclosure Project	https://www.cdp.net/en/info/about-us

Note the list of organisations and alliances in this above table is not exhaustive.

4.1 Local governments and communities leading on the global stages

In December 2015, more than 1,000 mayors, local representatives and community leaders came together at the Paris climate talks in support of an international climate agreement based around the 2°C target. At the Climate Summit for Local Leaders in Paris, 1,000 mayors, including several from Australia, signed a declaration supporting a transition to 100% Renewable Energy (French Government 2015). A further demonstration of leadership occurred when mayors, officials and industry leaders from 90 cities met in Mexico in December 2016 to share and highlight best practice climate action. Globally, cities anticipate US$ 375 billion in investment in climate action by 2020, with the majority focused on transitioning to renewable energy and sustainable transport (Japan Times 2016).

Local governments have further demonstrated their climate leadership following President Trump's decision to withdraw the United States from the Paris Climate Agreement (The Guardian 2017; The White House 2017). In June 2017, more than 250 mayors responded to the US President's decision by committing to reaching 100% renewable energy for their communities by 2035 (The Guardian 2017; UNFCCC 2017). Further, a group of mayors, state governments and companies from the United States are preparing a plan to meet the United States' emissions reductions targets in the absence of the Federal Government (The New York Times 2017).

At critical times, local leaders have stepped up to support global climate action.

4.2 Australian local governments are leading in climate and renewable energy

In Australia, towns, cities, local councils and communities have long been at the forefront of climate action, continuing their efforts over the last two decades, often during periods of instability and inaction at the state and federal climate policy level. For example, between 1997 and 2009, 233 councils across Australia (representing 84% of the population) joined the Cities for Climate Protection campaign, an initiative of the International Council for Local Environmental Initiatives (ICLEI). Participating local councils planned and implemented actions to reduce greenhouse gas emissions across council operations, households and businesses (ICLEI 2016). The Cities for Climate Protection program reduced carbon dioxide emissions in Australia by 18 million tonnes and saved councils and communities $95 million through reduced energy costs (noting that while positive, the amount of emissions saved are small in the context of Australia's emissions) (ICLEI 2008). Emissions reduction initiatives implemented by councils

Figure 10: Adelaide Airport solar panels.

included: energy efficiency measures and solar PV for council buildings; behaviour change programs (for example, encouraging residents to switch to efficient electrical appliances); energy efficient street lighting; and sustainable transport solutions such as councils choosing more efficient fleet vehicles and encouraging people to walk, cycle or take public transport.

In recent years, a number of cities, towns, and shires around Australia have adopted strong targets - aiming for "100% renewable energy" or "zero emissions".

The majority of Australian capital cities have now committed to policies and targets to increase renewable energy, energy efficiency and sustainable transport uptake and to reduce emissions (however not all targets are supported by detailed implementation plans).

Capital city targets include:

- **Canberra** - 100% renewable electricity by 2020 (on track) with zero net emissions by 2050 at the latest (ACT Government 2016).
- **City of Adelaide** - Carbon neutral by 2020 (Figure 10).
- **City of Sydney** - 50% renewable electricity by 2030; Net zero emissions by 2030 (RenewEconomy 2016a).
- **City of Melbourne** - 25% renewable electricity by 2018; Net zero emissions by 2020 (City of Melbourne 2017a; RenewEconomy 2014).
- **City of Brisbane** - Council operations to be carbon neutral by 2017 (Brisbane City Council 2016).
- **Perth, Darwin and Hobart** - No target.

In 2016, a survey by Beyond Zero Emissions found one in five councils had adopted either a zero emissions or 100% renewable energy target (RenewEconomy 2016b; for example, Table 7).

Table 7: Examples of strong targets for Australian cities, towns and shires.

Towns and cities aiming for 100% renewable energy, "zero net emissions" or "carbon neutral"	
Yackandandah	100% renewable energy by 2022
Lismore	100% renewable energy by 2023
Uralla	100% renewable energy in 5 to 10 years
Newstead	100% renewable energy by 2017
City of Darebin, and Moreland and Yarra city councils in Melbourne	Aiming for "zero net emissions" or "carbon neutral"
Byron Shire	Aiming for "zero net emissions" or "carbon neutral"

Source: RenewEconomy 2016b; Beyond Zero Emissions 2017.

5. Case studies: International and local examples of city leadership

This section provides case studies of cities in Australia and overseas that are implementing plans to increase use of renewable energy, improve energy efficiency, and/or encourage sustainable transport options. Further Australian local government examples and case studies are listed in Appendix A.

5.1 Renewable electricity

INTERNATIONAL CASE STUDY 1 – RENEWABLE ENERGY

Georgetown, Texas – 100% renewable government buildings

The city leadership decided to switch to renewable power sources in response to residents' concerns about gas power price spikes, rising electricity bills, and the impact of fossil-fuelled power on the local water supply (Georgetown Texas 2016).

Georgetown (population 48,000) is now powered by two large-scale renewable energy plants - a wind farm and a solar plant (projects that bid the lowest electricity prices) (Georgetown Texas 2016).

INTERNATIONAL CASE STUDY 2 – RENEWABLE ENERGY

San Francisco, California – 100% renewable electricity and mandatory renewable energy on new buildings

San Francisco's Climate Action Strategy includes the following key actions:

- Sourcing 100% of residential electricity and 80% of commercial electricity from renewable sources by 2025 (Figure 11).
- Improving energy efficiency, to reduce reliance on gas.
- Shifting 50% of all trips to public or active transport (e.g. walking or cycling) modes by 2017 and 80% by 2030 and shifting all buses and taxi fleets to electric vehicles powered by renewable energy (San Francisco Department of the Environment 2013).

While the City of San Francisco (population 840,000) sources much of its renewable power from outside the urban area, it is also supporting increased solar PV and other small-scale renewable energy installations within the city through incentives, technical assistance and streamlining the permits process. Community renewable energy projects also enable renters to access the benefits of renewable energy.

In 2016, the city of San Francisco established a new law requiring all commercial and residential buildings to install solar panels, solar hot water or a combination of these technologies (San Francisco Examiner 2016).

Figure 11: San Francisco, solar panels installed on a water reservoir.

AUSTRALIAN CASE STUDY 1 – RENEWABLE ENERGY

Adelaide, South Australia – aims to be carbon neutral

The city of Adelaide, South Australia aims to be carbon neutral by 2025 (Figure 12). The city's strategy for reducing its emissions includes encouraging greater uptake of renewable energy and installation of battery storage, and signing up business and community Founding Partners with shared aspirations (Adelaide City Council 2015).

Adelaide City Council's Sustainability Incentives Scheme offers grants for installing solar PV and battery storage systems, electric vehicle or bicycle charging, energy efficiency and water saving upgrades (Adelaide City Council 2017).

As a Commonwealth Smart City Smart Suburbs Program Participant, the City of Adelaide has trialled smart LED CBD public lighting with inbuilt sensors that automatically dim on detection of movement or any ambient lighting from other sources such as shop-front land temporary festival lighting.

The trial delivered significant energy and maintenance savings. Maintenance turn around times were also reduced via real time monitoring with automated fault detection alerts and programmable remote controls.

Figure 12: Adelaide solar lights.

AUSTRALIAN CASE STUDY 2 – RENEWABLE ENERGY

City of Darebin, Victoria – Solar Saver financing mechanism for low income households

The City of Darebin in Melbourne's northern suburbs has endorsed a zero net emissions target for the community by 2020. The Solar Saver program was designed to remove the financial and trust barriers to allow pensioners, low-income households and not-for-profit organisations to become solar owners and reduce their electricity bills (Embark 2015). Under the innovative 0% interest financing scheme, the City of Darebin pays upfront for the panels to be installed and gets the money back over 10 years through a small additional charge to the home owner's land rates.

A second round of Solar Savers partnered with housing co-operatives that work with low-income social housing renters. The cost of the solar panels was recouped through a small rent increase to the residents that received the solar panels.

Close to 500 properties and 9 community centres have participated in the program since 2014, with 1,071kW of solar PV installed. Most households have made savings of $100 per year (after making repayments) for the first 10 years and $400+ savings per year for the remainder of the life of the system (Slezak 2017).

Future expansion plans of the Solar Saver program aim to help deliver the City's targeted 100% increase in installed renewable energy capacity to 36MW by 2023.

AUSTRALIAN CASE STUDY 3 – RENEWABLE ENERGY

Cockburn, Western Australia – renewable energy for council and community buildings

The City of Cockburn in Western Australia is powering ahead with renewable energy on council and community buildings (City of Cockburn 2017). Since 2009, the City of Cockburn has installed over 1,000 solar panels across 13 community buildings. In 2015, the council awarded a $3.5 million contract for a geothermal system to be installed for an aquatic and indoor/outdoor sporting facility for completion in 2017. This geothermal energy system will reduce greenhouse gas emissions by nearly 500 tonnes of CO_2 per annum, a 72% reduction compared to traditional boilers for heating. The council is also supporting the use of solar powered electric vehicles by providing two charging stations, with more to come in the near future. Solar panels on buildings in Cockburn generate power to offset the electricity used by the electric vehicle charging stations.

AUSTRALIAN CASE STUDY 4 – RENEWABLE ENERGY

City of Newcastle, New South Wales – Solar PV on heritage listed museum site

The City of Newcastle's 2020 Carbon and Water Management Action has a target of 30% of its electricity to be generated from low-carbon sources (City of Newcastle 2017).

Recently the City of Newcastle installed solar on top of the heritage listed Newcastle Museum. Before solar PV could be installed on the roof of the Museum, heritage assessments had to be carried out and the design and installation of the system carefully considered. The 99.75 kW system is the largest solar photovoltaic (PV) system installed by Council to date and brings the total amount of solar PV installed on Council-owned buildings to 442 kW across sports grounds, libraries, city works depot and art gallery.

The Newcastle Museum system is estimated to generate 146,000 kWh of energy and reduce grid consumption by 27% per year and is a useful benchmark for installing solar onto a heritage listed building (City of Newcastle 2017).

AUSTRALIAN CASE STUDY 5 – RENEWABLE ENERGY

Melbourne, Victoria – joint tendering for renewable energy to power the city and large organisations

The City of Melbourne has partnered with other large organisations (businesses, universities, cultural institutions and other inner urban councils) to purchase large-scale renewable energy. This collective tendering process is called the Melbourne Renewable Energy Project. The group will purchase 110GWh of renewable electricity from large-scale facilities, an amount equivalent to the power generation from approximately 15 wind turbines or 250,000 solar panels (City of Melbourne 2017). The City of Melbourne's share in the project will enable it to achieve its target of 25% renewable electricity by 2018.

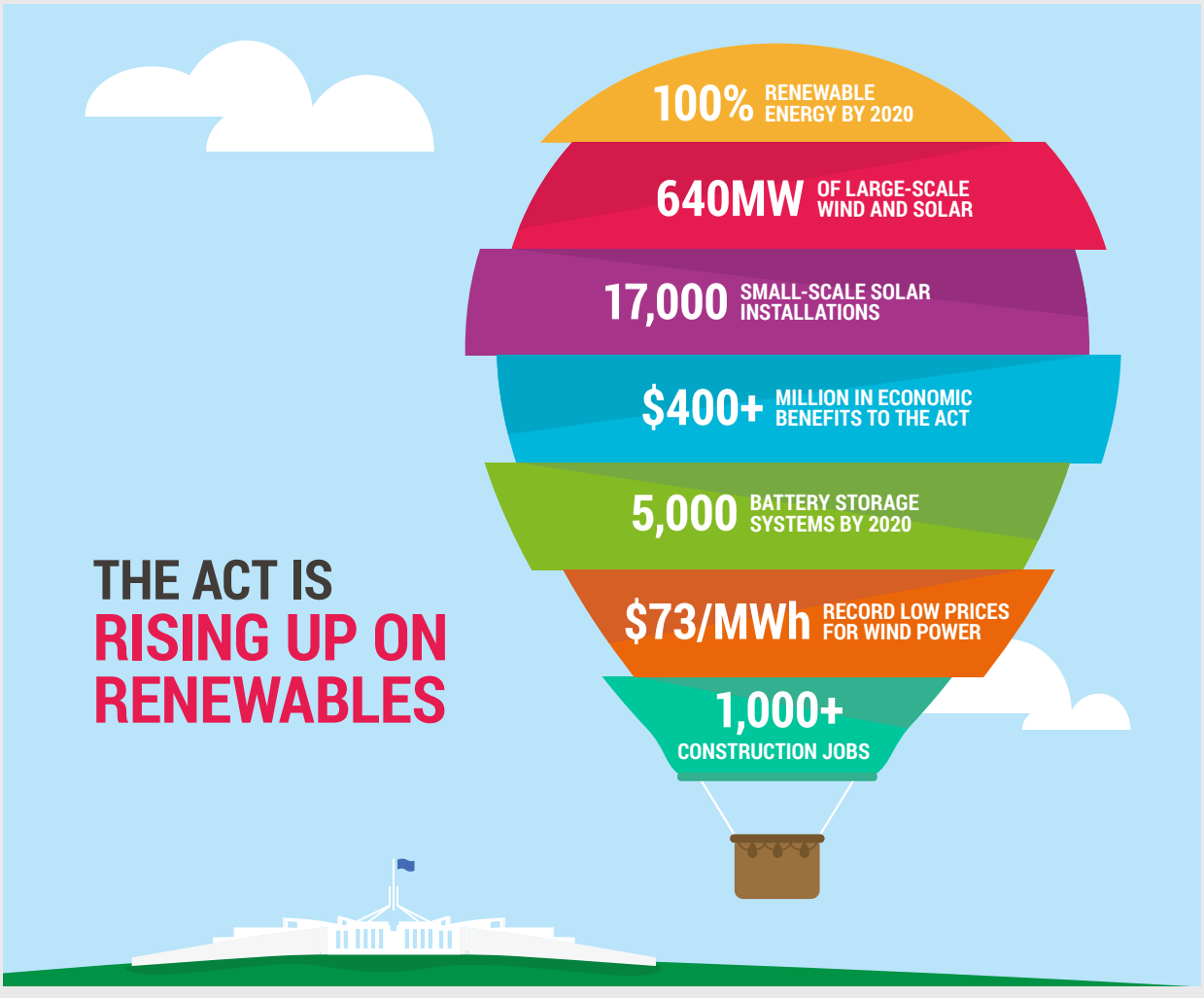
AUSTRALIAN CASE STUDY 6 – RENEWABLE ENERGY

Canberra, Australian Capital Territory – on track to meet 100% renewables by 2020

Canberra is on track to source 100% of its electricity from renewable energy by 2020. The ACT Government has used a reverse auction process to purchase electricity from renewable energy suppliers supporting the development of 640MW of solar and wind projects, capable of producing enough electricity to meet Canberra's needs. The scheme has been designed to deliver social and economic benefits for the city (Figure 13). The reverse auction process used by the ACT Government has since been adopted by the Victorian and Queensland governments as the preferred means to achieve their renewable energy targets. This example illustrates how cities can road-test policies and programs capable of being adopted by state and federal governments.

For more information on Canberra's renewable energy policies, refer to the Climate Council report "Territory Trailblazer: How the ACT Became the Renewable Capital of Australia".

Figure 13: Benefits of Canberra's renewable energy target scheme. **Source:** Climate Council 2016.



AUSTRALIAN CASE STUDY 7 – RENEWABLE ENERGY

Alice Springs, Northern Territory – solar city supported by all levels of government

Alice Springs has made the most of its hot, sunny climate by becoming a solar city with community support for investing in solar power. The Alice Springs Town Council was a key player in the development of a funding bid to the Solar Cities program run by the Australian Government, which saw the launch of the Alice Solar City project which ran from 2008 until 2013 (Alice Solar City 2013). The project was driven at a grass roots level and delivered by the Alice Springs Town Council (who invested over the $1 million into the project), and was also supported financially by the Australian Government and Northern Territory Government.

Key outcomes of the project (Alice Springs Town Council 2017) were:

- 700 solar systems installed on homes and businesses.
- Solar panels and solar hot water systems accounted for 46% and 28% reduction in greenhouse gas emissions, respectively.
- Development of the 1MW Uterne Solar Power Station and four other large-scale projects.
- The Alice Springs Town Council also invested in solar power and rooftop water heating for its own facilities, including on the civic centre and the Aquatic and Leisure Centre.

AUSTRALIAN CASE STUDY 8 – RENEWABLE ENERGY

City of Kalgoorlie-Boulder, Western Australia – Oasis Recreation Centre Alternative Energy Project

As part of the City of Kalgoorlie-Boulder's ongoing commitment to sustainability, the Oasis Recreation Centre has undergone a green energy transformation. With the help of federal and state government funding, the city has installed a solar PV system and a solar thermal system on the Oasis roof, and a ground source heat pump system underground.

Together, these installations will offset 8,309 GJ of natural gas and 206,000 kWh of electricity per year that would otherwise be used to warm the pools and heat and cool the centre. The savings in natural gas consumption translates to savings of nearly $260,000 a year. This will reduce the city's CO_2 emissions by over 500 tonnes a year which is the equivalent of offsetting the electricity use of 75 average households or taking 104 passenger vehicles off the road permanently (City of Kalgoorlie-Boulder 2017).

The Oasis Alternative Energy Project received funding through the Federal Government's Community Energy Efficiency Program, administered by the Department of Industry.

5.2 Energy efficiency

INTERNATIONAL CASE STUDY – ENERGY EFFICIENCY

Chicago, Illinois – energy efficiency retrofits for large buildings

In 2012, the city of Chicago, Illinois (population 2.7 million) developed its Sustainable Chicago 2015 Action Agenda (City of Chicago 2015). The plan included an ambitious set of goals including:

- Accelerating energy efficiency measures
  - Improving public and active transport infrastructure
  - Providing nearly 5,000 shared bikes parked in solar powered stations (Figure 14)
- Expanding train capacity and improving bus services
- Closing coal plants, and ensuring public facilities no longer purchased coal-fired electricity
- Providing sustainability-focused internships for over 2,000 high school students
- Rebuilding and refurbishing green spaces and playgrounds
- Encouraging the establishment of manufacturing plants for new sustainable products.

Dramatically improving the energy efficiency of existing buildings is a particular focus of the Chicago plan, with the city benchmarking energy use of over 1,800 buildings in three years, and launching a retrofit program to lift the energy efficiency performance of municipal, commercial and residential buildings.

Figure 14: Chicago solar-powered bike parking complete with showers and lockers.

In three years, retrofits of 60 government buildings, 50 commercial buildings, and more than 20,000 homes were completed. By providing cheaper and more streamlined approval processes, the city encouraged the installation of over 600kW of solar PV.

The city plans to eventually expand its benchmarking and retrofit program to cover all large buildings (with a floor size greater than 4,600 square metres), accelerate the use of efficient street lighting and complete a smart grid rollout across the city.

By 2020, the City of Chicago aims to:

- Retrofit half of all commercial, industrial and residential buildings, reducing energy use by 30%.
- Expand appliance energy efficiency upgrade programs.
- Update building codes to meet the latest international standards and require all renovations to meet energy efficient standards.
- Increase rooftop gardens and green spaces (City of Chicago 2016).

Figure 15: Refrigerated food distribution facility in Chicago with leading energy efficient design and onsite renewable energy.

AUSTRALIAN CASE STUDY 1 – ENERGY EFFICIENCY

Lismore, New South Wales – energy efficiency

Lismore, in the Northern Rivers region of New South Wales (with a population of around 30,000) has undertaken a number of upgrades of local buildings and street lighting to improve energy efficiency with assistance from the Australian Government's Community Energy Efficiency Program (id 2016; Lismore City Council 2017).

The council has improved the energy efficiency of:

- Two swimming centres–the Lismore Memorial Baths (Figure 16) and Goonellabah Sports and Aquatic Centre by improving pool pump motors, upgrading to LED lighting and installing solar water heating;
- Council offices by improving the efficiency of air conditioning, painting roofs with heat reflective paint, and upgrading to LED lighting.
- 13 council facilities by installing solar hot water systems.

Lismore is the first local government in Australia to install a standalone (off-grid) hybrid wind and solar powered streetlight (Lismore City Council 2017).

The city council is also partnering with a local community group (the Lismore Community Sustainability Forum) to educate the broader community on energy efficiency (Lismore City Council 2017).

The energy efficiency measures undertaken are expected to save the council nearly $150,000 in electricity bills every year (Lismore City Council 2017). The Council has a target to self-generate all of its power from renewable sources by 2023 (Lismore City Council 2017).

Figure 16: Lismore Memorial Baths.

AUSTRALIAN CASE STUDY 2 – ENERGY EFFICIENCY

Gosnells, Western Australia – Gosnells' Green Star-rated Civic Centre

The City of Gosnells (2017) in Western Australia retrofitted its Civic Centre to incorporate innovative energy technologies, achieving five out of six stars by the Green Building Council of Australia. The retrofit includes 156 solar panels for electricity, solar water heating as well as a cool energy storage tank that is charged overnight and releases cold air during the day. The innovative design also incorporates water efficiency measures to reduce water use and a filtering system to collect and clear stormwater before entering the Canning River to improve the river's health.

The retrofit has led to substantial water and energy savings, reducing water use by 35%, gas use by 55% and electricity use by over 300MWh a year (Green Building Council of Australia 2010).

AUSTRALIAN CASE STUDY 3 – ENERGY EFFICIENCY

East Arnhem Land, Northern Territory – identifying barriers to energy efficiency in low-income Aboriginal households

The Manymak Energy Efficiency Project has helped low-income Aboriginal households in East Arnhem Land, Northern Territory, identify barriers to energy efficiency (PowerWater 2016).

The Manymak project ran from May 2013 until June 2016 in six remote indigenous communities in East Arnhem Land: Milingimbi, Galiwin'ku, Yirrkala, Gunyangara, Gapuwiyak and Ramingining. To increase energy efficiency, the project focused on energy efficiency and water conservation, retrofits and upgrades in homes, such as stove timers or ceiling insulation, and installation of a data collection device to measure the household's daily energy use. Yolŋu 'ambassadors' helped the project team to ensure culturally appropriate, respectful and productive methods when engaging with and educating residents in local language.

Almost all (95%) houses approached chose to participate in the project. Across the six communities, over 600 electricity data devices were installed, and nearly 500 energy efficiency upgrades completed, such as installing ceiling insulation, energy efficient light bulbs and stove timers.

The project was a partnership between Indigenous Essential Services, the Centre for Appropriate Technology, Charles Darwin University, the East Arnhem Regional Council and the Northern Territory and Australian Government.

AUSTRALIAN CASE STUDY 4 – ENERGY EFFICIENCY

Ipswich, Queensland – energy efficient street lighting

Ipswich City Council (2017) is undertaking a large-scale trial of energy efficient LED street lighting across the local government area partly funded by the Federal Government (Figure 17). The project involved converting over 2,600 traditional street lights to LED lights (approximately 12% of all street lights in Ipswich). The project will reduce emissions by over 500 tonnes of CO_2 per year, and significantly reduce the council's electricity use.

Figure 17: Ipswich street lighting.

AUSTRALIAN CASE STUDY 5 – ENERGY EFFICIENCY

Western Sydney Regional Organisation of Councils, New South Wales – Light Years Ahead

Public street-lighting accounts for 55% of the Western Sydney Regional Organisation of Councils' (WSROC) energy costs and around 5% of total budget expenditure. Nine Western Sydney councils participated in the Light Years Ahead LED street lighting upgrade in stage 1 (2014-2016), which delivered a 77% energy saving to councils and represented 4.4 million kWh per year of energy reductions (WSROC 2017).

The $8 million program was partially funded by the Commonwealth Government ($5.2 million) with the remaining $2.8 million covered by WSROC and the nine councils.

The total cost savings for councils is estimated to be $19.4 million over 20 years. Councils have indicated that they are prepared to consider re-investing these savings in continuing the rollout (WSROC 2017).

5.3 Sustainable transport

INTERNATIONAL CASE STUDY – SUSTAINABLE TRANSPORT

Washington, D.C. – transport targets and actions

Washington DC (population 643,000) is the capital of the United States and its 24th largest city (Office of the Mayor 2016). In 2012, the city embarked on an ambitious and comprehensive plan, "Sustainable DC", to tackle the city's key sustainability challenges of jobs and economic growth; health and wellness; equity and diversity; and climate and environment (Sustainable DC 2016). The plan includes a target for 50% of city's power use (both council operations and the community) to come from renewable energy sources by 2032.

Transportation was identified as one of the Sustainable DC plan's seven key areas. Specific targets were set for trips within the city by 2032 - with car travel to decrease to less than 25% of trips, public transport trips to increase to 50%, and biking and walking to increase to 25%. The goals and targets were underpinned by a detailed action plan (Table 8).

As a result of its actions, 2016 saw Washington DC become the equal first out of 50 US cities (tied with Boston) for the proportion of commuters walking or cycling, and second best (after New York) when public transport was included (Alliance for Biking and Walking 2016). The city was one of two major cities (with Portland, Oregon) to make a significant gain in the share of commuters biking and walking (Alliance for Biking and Walking 2016).

Nearly 40% of Washington DC residents now commute by public transport, nearly 13% walk and 4% ride (Alliance for Biking and Walking 2016). These shares are significantly higher than the average mode shares for Australian cities–14% by public transport, 3.8% walk and 1.3% ride on average (Australian Government 2013).

Figure 18: Washington DC Capital bike share scheme.

Table 8: Sustainable DCs Transportation Goals, Targets and Actions.

Goals	Targets	Actions
Improve connectivity and accessibility through efficient, integrated, and affordable transit systems	Increase use of public transit to 50% of all commuter trips	› Complete 60 kilometres of tram networks › Improve transit connections to employment and activity centers from underserved areas › Define and secure permanent funding for transit planning and improvements › Design transit systems for resilience to extreme weather events
Expand provision of safe, secure infrastructure for cyclists and pedestrians	Increase biking and walking to 25% of all commuter trips	› Develop a citywide, 100-mile bicycle lane network › Expand the Capital Bikeshare program by 200 stations › Partner with community organizations to deliver bike and pedestrian safety education › Collect data to improve understanding of cyclist and pedestrian travel patterns › Program crosswalks and traffic lights for improved safety and convenience of pedestrians and cyclists
Reduce traffic congestion to improve mobility	Reduce commuter trips made by car or taxi to 25%	› Implement an expanded Performance-Based Parking program › Expand car-sharing programs to low-income residents using financial tools › Encourage private businesses to offer incentives for employee travel by transit, walking, or biking › Encourage and promote telecommuting and alternative work schedules for employees › Study the feasibility of a regional congestion fee for travel during peak hours
Improve air quality along major transportation routes	Eliminate all "unhealthy" air quality index days, including "unhealthy for sensitive groups"	› Strictly limit idling engines. › Require District Government, and encourage private businesses, to purchase clean fuel, low-emission fleet vehicles. › Expand electric vehicle charging infrastructure throughout the city › Offer incentives to avoid driving and other emission-generating activities on predicted Code Red and Orange air quality days › Track and report mileage data from clean fuel, low-emission, and electric vehicles

Source: Sustainable DC 2016.

AUSTRALIAN CASE STUDY 1 – SUSTAINABLE TRANSPORT

Moreland, Victoria - integrated transport strategy

The city of Moreland in inner urban Melbourne has developed an integrated strategy for transport that aims to achieve a shift to more environmentally sustainable travel behaviour; support transport access for all parts of the community; and improve safety and support development around transport hubs (with access to trains, trams, bicycle and walking paths).

Moreland supports car sharing services for residents who don't own a car. In 2012, the council installed Victoria's first electric vehicle charging station. It now has three charging points in the city, and is integrating electric cars into its council fleet (Figure 19). The council also has strategies to encourage walking, cycling and public transport (City of Moreland 2017).

Figure 19: One of Moreland City Council's electric vehicle charging points.

AUSTRALIAN CASE STUDY 2 – SUSTAINABLE TRANSPORT

Gold Coast, Queensland – public transport

Expanding access to high quality public transport is a proven way to reduce car use and its associated emissions. People who live in communities with accessible public transport tend to own fewer vehicles and drive less.

The City of Gold Coast funded a new 13-kilometre light rail project comprising 16 stops from Broadbeach to Gold Coast University Hospital, in conjunction with state and federal governments (Figure 20). The council recoups its funding for the project through rates and a public transport levy (Bourke 2017).

The Gold Coast Light Rail, which opened in July 2014 and is dubbed "the G" reached almost 640,000 passengers a month – far exceeding expectations - and continues to grow (Gold Linq 2016). Further stages of the project are in development, to be completed prior to the Commonwealth Games in 2018.

In addition to the benefits of improved public transport access for Gold Coast residents and visitors, research has found that the new light rail has increased property values near the project (Bourke 2017).

Figure 20: Gold Coast Light Rail, "the G".

AUSTRALIAN CASE STUDY 3 – SUSTAINABLE TRANSPORT

City of Hobart - electric vehicle charging and bicycle sharing

The City of Hobart (2016) has installed electric vehicle charging in the Hobart Central Carpark, is installing a further chargepoint at the Argyle Street Carpark, and is investigating the further roll-out of electric vehicle charging stations.

Hobart City Council (City of Hobart 2017) also supports "Artbikes" - a series of free bicycles available to ride around Hobart, and bike parking facilities at key cultural and art institutions. The bicycles come with free helmets, locks and a map (Figure 21).

Figure 21: "Charlie the Bike Rack" Hobart City Artbikes.

Appendix A: Cities Power Partnership Pledge

CITIES POWER PARTNERSHIP

Snapshot

The Climate Council's Cities Power Partnership (CPP) will engage with shires, towns and cities, via local councils, throughout Australia and to provide incentives for these councils to increase renewable energy and energy efficiency, improve transport and working together. Members of the partnership will also be given access to a national knowledge hub, an online analytics tool to measure energy, cost and emissions savings of projects, be buddied with other councils to knowledge share, receive visits from domestic and international experts, connected with community energy groups and celebrated at events with other local leaders. We'll also showcase the incredible achievements of cities in national, local and social media to millions and share their successes with our community of over 200,000 members and supporters.

The CPP involves three stages:

1

STAGE ONE:
Become a Power Partner

Becoming a power partner requires local councils to sign up to be a power partner by contacting the Climate Council to indicate their interest and with confirmation of participation from the Mayor. Some councils may also choose to pass a motion confirming support for council to participate in the program. Once signed up, councils will be provided with access to the CPP website that includes an energy and emissions analytics tool, a national knowledge hub and an online profile of each members council. Power partners are buddied with two other councils to knowledge share and are also profiled in national and local media, online and to our 200,000 members and supporters.

2

STAGE TWO:

Power Up

Partners have six months to select five key actions from the partnership pledge. For some councils these key actions may line up with projects and plans that are already in the pipeline. Partners will have ongoing access to the knowledge hub, analytics tool, international and domestic experts as well as communications and advocacy training where required. Councils who join the partnership in the first round may also have access to grants and renewable energy incentives as they become available. Councils will continue to be profiled in the media and online and CPP experts will travel to communities across Australia.

3

STAGE THREE:

Power On

Partners report on their progress against key actions in a six monthly survey, they are celebrated at the 2018 Power Partners Summit and awards ceremony, connected with other member councils and council success stories will continually be celebrated in the media and online.

There is also a wealth of incredible international and Australian programs that complement the Cities Power Partnership and boost local government efforts to slash emissions and ramp up renewables. See Tables 9 - 11 for a list of these existing programs. There are also a range of organisations working with communities and councils on the ground to help them set, meet and beat emissions reduction or renewable energy targets, see Table 6 (Section 4) for examples. This strong suite of programs and organisations connect to form a powerful network that supports the growth of cleaner, sustainable and more resilient cities, towns and shires, across the country.

"Local government has and will continue to be an important driver for climate change action. The Cities Power Partnership provides Council with the ability to connect with other local governments from around Australia to share knowledge and to enhance our own local programs."

- Mayor Kristy McBain, Bega Valley Shire, NSW.

"Of all the levels of government it is at the local level that we are seeing the strongest leadership on the challenge of climate change. We are pleased to be a founding partner of the Cities Power Partnership that will see local governments share ideas and experiences to reduce our emissions."

- Mayor Brad Pettitt, City of Fremantle, WA.

"Bundaberg Regional Council is pleased to join a select group of councils in the Cities Power Partnership who are determined to demonstrate their leadership and provide direction for an environmentally conscious and resilient future – for this generation and future generations to come."

- Mayor Jack Dempsey, Bundaberg Regional Council, QLD.

The Partnership Action Pledge

Participating councils that join the partnership will have six months to select five key actions from the options below.

RENEWABLE ENERGY

1. Use strategic and statutory planning processes as well as procurement policies to promote renewable energy - both at the residential, commercial and larger scale.

2. Provide council resources to educate and support the uptake of renewable energy, such as by hiring an internal renewable energy support officer or establishing an independent body (such as the Moreland and Yarra Energy Foundations).

3. Install renewable energy (solar PV and battery storage) on council buildings such as childcare facilities, libraries, street lighting, recreation centres, sporting grounds, and council offices.

4. Support community facilities accessing renewable energy through incentives, support or grants.

5. Power council operations by renewables, directly (with solar PV or wind), or by purchasing Greenpower (from electricity retailers). Set targets to increase the level of renewable power for council operations over time.

6. Encourage local businesses and residents to take up solar PV, battery storage and solar hot water heating. This can be done through providing incentives (such as solar bulk buy schemes or flexible payment options) or streamlining approvals processes (such as removing planning and heritage barriers to solar PV).

7. Support community energy projects (with location and planning support) so that residents (such as renters) can band together and invest in community renewable energy projects.

8. Opening up unused council managed land for renewable energy, for example landfills, and road reserves.

9. Facilitate large energy users collectively tendering and purchasing renewable energy at a low cost.

10. Set minimum renewable energy benchmarks for new developments, for example Denman Prospect, ACT requires every new house to install a minimum solar PV system.

11. Electrify public transport systems (for example buses operated by council) and fleet vehicles and power these by 100% renewable energy.

12. Lobby electricity providers and state government to address barriers to renewable energy take up at the local level (whether these be planning, technical, economic or policy related).

ENERGY EFFICIENCY

1. Set minimum energy efficiency benchmarks for all planning applications.

2. Adopt best practice energy efficiency measures across all council buildings, and support community facilities to adopt these measures.

3. Public lighting can use a large proportion of a city's energy budget - roll out energy efficient lighting (particularly street lighting) across the municipality.

4. Provide incentives (for example rate reductions) for best practice developments such as streamlined planning processes, and support for retrofitting energy efficiency measures for existing buildings.

5. Incentivise the deployment of energy efficient heating and cooling technologies.

TRANSPORT

1. Ensure Council fleet purchases meet strict greenhouse gas emissions requirements and support the uptake of electric vehicles powered from renewable sources.

2. Provide fast-charging infrastructure throughout the Council area at key locations for electric vehicles.

3. Encourage sustainable transport use (public transport, walking and cycling) through Council transport planning and design. Substantial savings in transport energy use can be achieved by designing more compact cities with access to high quality public and active transport services and facilities.

4. Ensure that new developments are designed to maximise public and active transport use, and are designed to support electric vehicle uptake.

5. Provide for adequate cycle lanes (both space and connectivity) in road design and support cyclists through providing parking, and end-of-ride facilities (covered, secure bike storage, showers, bicycle maintenance and incentives). Provide options such as cargo bike libraries.

6. Reduce or remove minimum car parking requirements for new housing and commercial developments where suitable public transport alternatives exist. Support car share schemes through parking spaces, rate reductions and promotion.

7. Lobby state and federal governments for improvements to planning legislation to promote sustainable transport options, and increased investment in and provision of public transport services.

8. Consider disincentives for driving high emitting vehicles such as congestion pricing, or a tiered payment system for residential car parking permits where high emitting vehicles pay more.

WORK TOGETHER AND INFLUENCE

1. Set city-level renewable energy or emissions reduction targets and sustainable energy policies to provide a common goal and shared expectations for local residents and businesses.

2. Lobby state and federal government to address barriers to the take up of renewable energy, energy efficiency and/or sustainable transport, and to support increased ambition. For example, working to lobby on the Smart Energy Communities policy.

3. Set up meetings and attend events, such as the Community Energy Congress, where like-minded Councils can address common concerns and learn from others' experience.

4. Implement an education and behaviour change program to influence the behaviour of council officers, local residents and businesses within the municipality to drive the shift to renewable energy, energy efficiency and sustainable transport.

5. In those communities reliant on a local coal industry, local government can lobby for state and federal support for a just transition for workers, families and the community and encourage local economic development and opportunities based on a low carbon economy.

6. Ensure that the practices of local government contractors and financing such as banking, insurance, and super are aligned with Council goals relating to renewable energy, energy efficiency and sustainable transport. Set appropriate criteria for Council procurement.

7. Promote knowledge sharing and strengthen the local community's capacity and skills in renewable energy, energy efficiency and sustainable transport.

EXAMPLES: RENEWABLE ENERGY ACTIONS

Table 9: Renewable energy actions.

Action		Examples	Link
Promote renewable energy - both at the residential, commercial and larger scale	Use land use planning measures to encourage uptake, such as streamlining approvals processes and removing barriers	Moreland City Council, Victoria has a planning guide to protect existing solar panels from overshadowing.	http://www.moreland.vic.gov.au/globalassets/areas/strategic-planning/solar-panels---advisory-note-as-endorsed-by-council-13-july-2016.pdf
	Set minimum renewable energy benchmarks for new developments	Denman Prospect in the ACT requires every new house to install a minimum-sized solar system. City of Nedlands, WA requires a minimum of 1.5kW onsite solar or wind for all new homes and renovations.	http://www.actewagl.com.au/About-us/Media-centre-and-reports/2015/10/09/Denman-Prospect.aspx http://reneweconomy.com.au/new-build-houses-must-install-solar-wind-in-wa-suburb-27550/
	Hire an internal renewable energy support officer or establish an independent body tasked with promoting renewable energy	Examples include: Moreland Energy Foundation, Victoria Yarra Energy Foundation, Victoria	http://www.mefl.com.au/ http://www.yef.org.au/
	Encourage local businesses, community facilities and residents to take up renewable energy by providing incentives (such as grants, solar bulk buy schemes or flexible payment options)	Adelaide City Council has a Sustainability Incentives Scheme for local residents.	http://www.adelaidecitycouncil.com/your-council/funding/sustainable-city-incentives-scheme/
Power council operations by renewable energy	Set targets to increase the level of renewable power for council operations and the broader community over time.	Canberra set a goal of 100% renewable energy by 2020 delivered by a series of reverse auctions for renewable energy.	https://www.climatecouncil.org.au/act-report
	Power operations directly by renewable energy (with solar PV or wind)	Sunshine Coast Council in QLD developed the Valdora solar farm to power council operations. Cockburn in WA is using geothermal heating for its sporting complex.	https://www.sunshinecoast.qld.gov.au/Council/Planning-and-Projects/Major-Regional-Projects/Sunshine-Coast-Solar-Farm http://www.cockburn.wa.gov.au/Council_Services/Environment/Renewable_Energy/

Table 9: Renewable energy actions, continued.

Action		Examples	Link
Power council operations by renewable energy	Install renewable energy (solar PV and battery storage) on council buildings such as childcare facilities, libraries, street lighting, recreation centres, sporting grounds, and council offices	Bathurst in NSW has installed solar systems across nine council buildings. Leichardt Council in NSW installed solar systems on 17 council buildings. Solar and battery storage installed on government buildings in Adelaide.	https://www.bathurst.nsw.gov.au/environment/energy-sustainability/solar-power-on-council-buildings.html http://www.leichhardt.nsw.gov.au/Environment---Sustainability/Projects-and-Programs/Council-Solar-Panels http://www.premier.sa.gov.au/index.php/tom-koutsantonis-news-releases/896-zen-energy-to-install-1m-battery-storage-on-government-owned-buildings
	Opening up unused council managed land for renewable energy	Campbelltown in SA is supporting a community-owned solar project using the rooftops of local government buildings	http://www.campbelltown.sa.gov.au/cos
Collective tendering	Facilitate large energy users collectively tendering and purchasing renewable energy at a low cost	The Melbourne Renewable Energy Project involves bringing together a number of large energy users to collectively tender for renewable energy.	http://www.melbourne.vic.gov.au/business/sustainable-business/Pages/melbourne-renewable-energy-project.aspx
Powering electric vehicles with renewable energy	Electrify transport systems such as council buses and fleet vehicles and power these by 100% renewable energy	Adelaide, SA solar-powered "Tindo" bus Moreland City Council in Victoria is integrating electric cars into council's fleet.	http://www.adelaidecitycouncil.com/assets/acc/Environment/energy/docs/tindo_fact_sheet.pdf http://www.moreland.vic.gov.au/parking-roads/transport/electric-vehicles/
Lobby to address barriers	Lobby electricity providers and state government to address barriers to renewable energy take up at the local level (whether these be planning, technical, economic or policy related)	Victorian councils called for planning protection to prevent solar panels from overshadowing.	http://www.heraldsun.com.au/leader/east/calls-for-statewide-protection-of-solar-panels-from-overshadowing-from-multi-storey-development/news-story/4f28125a5d0db4dc22c7200aed4e8736

EXAMPLES: ENERGY EFFICIENCY ACTIONS

Table 10: Energy efficiency actions.

Action		Examples	Link
Promote energy efficiency - both at the residential, commercial and larger scale	Hire an internal energy efficiency support officer or establish an independent body	Examples include: Moreland Energy Foundation, Victoria Yarra Energy Foundation, Victoria	http://www.mefl.com.au/ http://www.yef.org.au/
	Encourage local businesses, community facilities and residents to take up energy efficiency measures by providing incentives (such as grants, solar bulk buy schemes or flexible payment options)	Adelaide City Council in SA has a Sustainability Incentives Scheme for local residents.	http://www.adelaidecitycouncil.com/your-council/funding/sustainable-city-incentives-scheme/
Energy efficiency in council operations	Adopt best practice energy efficiency in council buildings	City of Gosnell's, WA community facility incorporates environmentally sustainable design. City of Wollongong updated an ageing building to achieve a 5 Star Green Star rating.	http://new.gbca.org.au/showcase/projects/mills-park-community-facility/ http://new.gbca.org.au/showcase/projects/wollongong-city-council-administration-building/
	Public lighting can use a large proportion of a city's energy budget - roll out energy efficient lighting (particularly street lighting) across the municipality	Victor Harbour, SA has installed hybrid (wind and solar) street lighting with battery storage, and potential to power gophers, solar bollards.	https://www.victor.sa.gov.au/solar

EXAMPLES: SUSTAINABLE TRANSPORT ACTIONS

Table 11: Sustainable transport actions.

Action		Examples	Link
Promote sustainable transport options in the community	Provide fast-charging infrastructure (powered by 100% renewable energy) throughout the city at key locations for electric vehicles	City of Moreland has installed a network of public electric car charging stations.	http://www.moreland.vic.gov.au/parking-roads/transport/electric-vehicles/
Promote sustainable transport options within council	Ensure council fleet purchases meet strict greenhouse gas emissions requirements and support the uptake of electric vehicles (powered by renewable energy)	Manningham's Climate 2020 action plan targets 100% of fleet cars to be green electric vehicles by 2020.	http://www.manningham.vic.gov.au/climate-and-energy
	Provide fast-charging infrastructure throughout the city at key locations for electric vehicles	Cockburn, WA has installed 100% solar powered electric vehicle charging stations.	www.cockburn.wa.gov.au/council_services/environment/renewable_energy/
	Provide for adequate cycle lanes (both space and connectivity) in road design and supporting cyclists through providing parking, and end-of-ride facilities (covered, secure bike storage, showers, bicycle maintenance and incentives)	Melbourne City Council has a detailed bicycle plan outlining a number of actions to increase cycling's mode share.	http://www.melbourne.vic.gov.au/SiteCollectionDocuments/city-of-melbourne-bicycle-plan-2016-2020.pdf

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