



ACT STATE OF THE ENVIRONMENT REPORT 2011

CLIMATE THEME PAPER

Introduction to theme

Human use of resources has changed our climate and will continue to do so. However, not all climatic variability and severe weather events can be attributed to human actions. Nevertheless, there is strong scientific evidence that humans are changing the climate and we need to take action to address this situation.

The ACT Government has committed to respond to the climate change challenge through two main approaches: mitigation to reduce future emissions of greenhouse gases (by both reducing the sources of greenhouse gas emissions and enhancing sinks that store carbon); and adaptation to the expected changes, to moderate potential damage and to benefit from opportunities. Adaptation and mitigation actions can differ significantly, but they need to be aligned and actively supported by business and the wider community if they are to achieve an overall effective response to climate change.

Five Indicator clusters are drawn on for the *Climate* theme:

- Emissions;
- Mitigation;
- Climate vulnerability;
- Adaptation; and
- Climate as a resource.

Context

Only greenhouse gas emissions levels and energy use have been reported in previous State of the Environment Reports. Across the last two reporting period, while recommendations regarding the implementation of climate change strategies have been largely implemented, greenhouse gas emissions and energy use have continued to rise. Despite increases in GreenPower usage, it remains less than 5% of ACT energy use.

This issue remains relevant in this reporting period and recommendations are provided at the end of this paper to assist progress on both mitigation and adaptation actions.

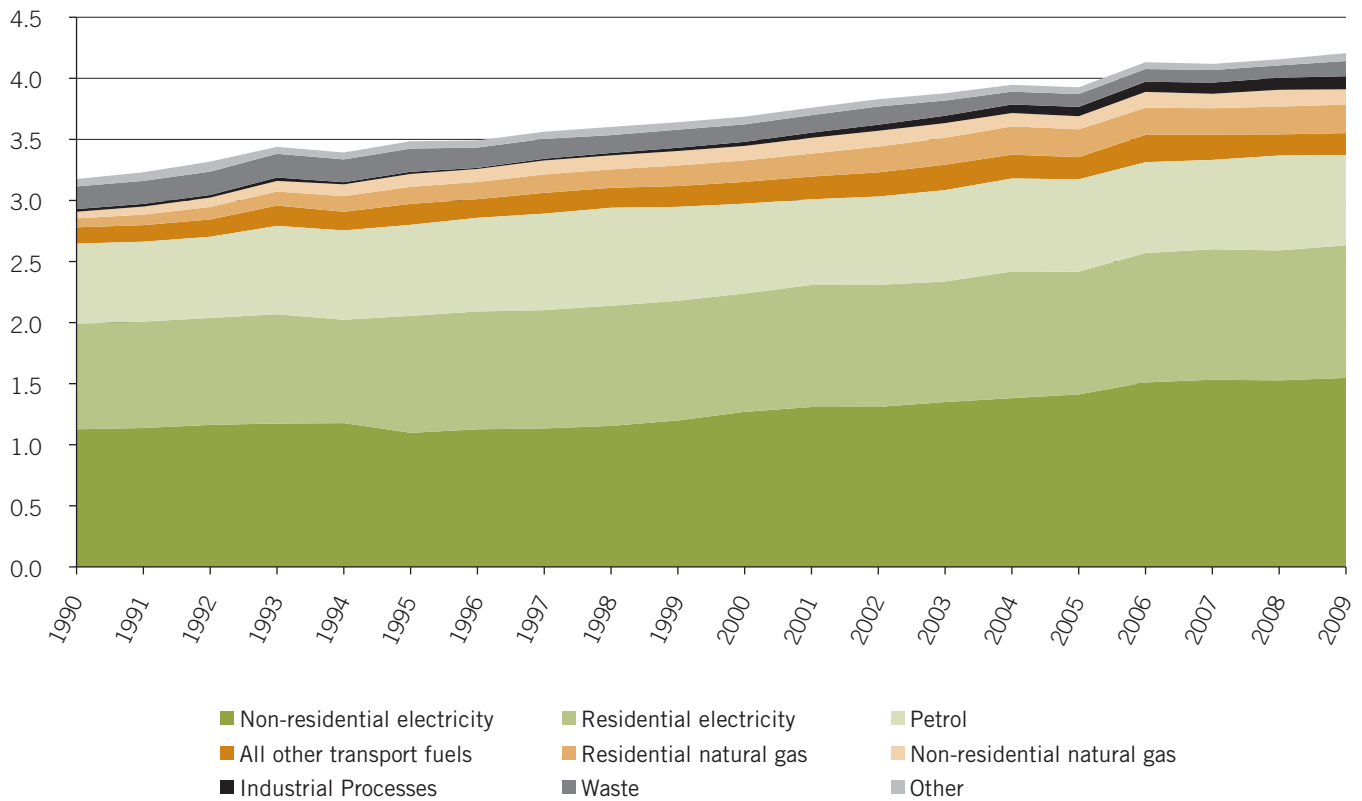
Theme summary: Key issues and outcomes

Atmospheric concentrations of global greenhouse gases are increasing globally at an unprecedented rate. Atmospheric carbon dioxide concentrations have never increased by more than 30 parts per million (ppm) over a 1000 year period according to studies, yet that is the rate of increase that has been observed over the 17 years to 2007 (IPCC 2007).

This global increase in greenhouse gas concentrations has been paralleled in the ACT, where calculated long-term trends indicate a continuing increase in our greenhouse emissions (Figure 1).



Figure 1: ACT greenhouse gas emissions



Source: ICRC 2011

Electricity produced from burning fossil fuels is the largest contributor to ACT greenhouse gas emissions, followed by use of petrol (Figure 2). The ACT imports and consumes goods and services produced by transport through other states, and electricity generated elsewhere provides most of the stationary energy used within the ACT. The ACT Government has accepted accountability for emissions generated from those external sources. It is clear that significant emission reduction efforts need to focus on these sectors if the ACT is to meet the Government’s greenhouse gas reduction target of zero net emissions by 2060 without being heavily reliant on offset strategies.

Climate vulnerability

In the coming decades impacts from climate change are likely to become increasingly prevalent in the ACT. The most likely future climate scenario for the ACT includes (Webb 2011):

- the strong likelihood of mean temperatures continuing to increase, along with more frequent and severe heatwaves for the ACT and region; and
- a high probability of changes in the pattern of rainfall from that observed during the period of instrumental records, with some risk of a decline in long-term average rainfall; and in addition, the likelihood of an increase in rainfall intensity with more extreme rainfall events.

Small changes in average values of climate characteristics such as air temperature and rainfall can lead to large changes in the frequency and intensity of extreme events such as heatwaves, storms and fires.

Climate change is likely to put additional pressure on the Territory’s water resources and biodiversity, and may significantly change the patterns of bushfire and extreme weather events. These in turn will have impacts on our health, biodiversity and food availability as well as other indirect impacts on our society.



Water resources

Water security has been, and will continue to be the key water issue facing the ACT. There is increasing pressure on the Territory's three main catchment areas because the water supply is almost entirely rainfall dependent. Changes to rainfall patterns since the 1990s have resulted in a decrease in surface runoff feeding the ACT's supply reservoirs. Projections indicate the trend towards warmer conditions in the ACT will almost surely continue, coupled with a risk of continuing drier conditions, although there is much uncertainty surrounding rainfall projections.

Bushfires

The risks of bushfires and the number of days of high fire danger are predicted to increase as a result of the projected hotter and drier conditions. Many ACT residents live on the border of, or close to, bushland, putting them at increased risk of being affected by bushfire. Changes to fire risk may also affect our biodiversity through changes to species distribution and populations (Webb 2011).

Extreme heat events

The average number of days above 35°C and 40°C is also expected to increase (Table 1).

Table 1: Mean annual number of days above 35°C or above 40°C in 2050 if there is a 2°C global warming

	Current climate*	Most likely future climate	Worst case scenario
Mean annual number of days above 35°C	5 days	20 days	21.5 days
Mean annual number of days above 40°C	Around 0.1 day	2 days	2.7 days

Source: AECOM 2010

*Note: The "current climate" annual number of days >35°C and >40°C is the 1939–2010 mean for Canberra Airport.

Increases in average temperatures and heatwaves increase the consumption of potable water, placing additional pressure on our water resources. Heatwaves can exacerbate existing health vulnerabilities. The greatest threat from heatwaves arises when there are consecutive days that are much hotter than usual, with hot nights, occurring early in the summer period (McInnes et al. 2008).

Renewable energy in the region

The ACT has the opportunity to take a regional approach to planning for climate change, and for using climate as a resource. The Australian Capital Region (which comprises the ACT and 17 nearby local government areas in NSW) has significant potential for solar, hydro- and particularly wind-generation of power. Much of the region experiences high wind-speeds that cannot often be matched within the ACT itself. A number of renewable energy power stations, particularly using the wind, have been developed across the Australian Capital Region during the reporting period, and the construction of a number of further stations is either approved or underway (NSW Planning and Infrastructure 2011).

The level of solar radiation in the ACT area means that around 0.6 hectares of solar cells would produce enough electricity to meet the yearly demand of a small office building¹. The close proximity of the city centre to potential large-scale solar-power generation sites is an advantage for Canberra compared to other capitals, because transmission losses would be minimised.

1 Based on an ACT building with 2000 m² of office area and a 3-star NABERS energy rating.



The ACT Government has encouraged expansion of the solar industry in the ACT through a feed-in tariff scheme to encourage micro- and medium-scale generation of solar energy. The tariff is designed to encourage investment in renewable electricity generation by paying small-scale generators a premium rate for the gross amount of electricity they generate (Engineers Australia 2009). The popularity of this scheme indicates the ACT's support for renewable energy options. However, a recent report by the Grattan Institute found that rebate programs such as this have lifted sales in some products, while only reducing emissions a little and expending large amounts of government money. Further, the resulting boom-bust cycles can disrupt development of industry capacity and undermine investor confidence (Grattan Institute 2010). Although the feed-in tariff is not government-funded, the benefits to emission reduction as well as the benefits to the renewable energy industry should be assessed before future renewable energy policy initiatives are approved.

The ACT Government has also been exploring opportunities for a solar power facility in the ACT. The Government's current position is that any such facility will be privately developed. Those proponents interested in establishing large-scale renewable energy facilities in the ACT can bid for access to a feed-in tariff for a total of up to 40 MW. Bidders will be responsible for financing, constructing, owning and operating any proposed facility. Under this arrangement the ACT Government will be responsible for developing appropriate legislation to provide a supported price payment for generated electricity.

Community groups in the ACT are also increasingly focused on climate change; for instance, SEE-Change and Canberra ♡ 40% are taking on community leadership in solar energy and emission reduction activities.



Source: ACT Government

Responses and effectiveness

Mitigation

In 2010, the ACT Government legislated the following targets to reduce greenhouse gas emissions in the ACT (ACT Government 2010):

- 40% below 1990 emissions by 30 June 2020;
- 80% below 1990 emissions by 30 June 2050; and
- 0 net emissions by 2060.

In May 2011, the ACT Government also legislated the following renewable energy targets for the ACT (ACT Government 2010): renewable sources to provide:

- 15% of total electricity usage by 2012; and
- 25% of total electricity usage by 2020.

To date, no pathway for reaching these targets has been set out. The second action plan under *Weathering the Change* – the ACT climate change strategy, is currently being developed and is expected to outline this path. The targets are ambitious, and significant action and behaviour change will be needed to reach them.



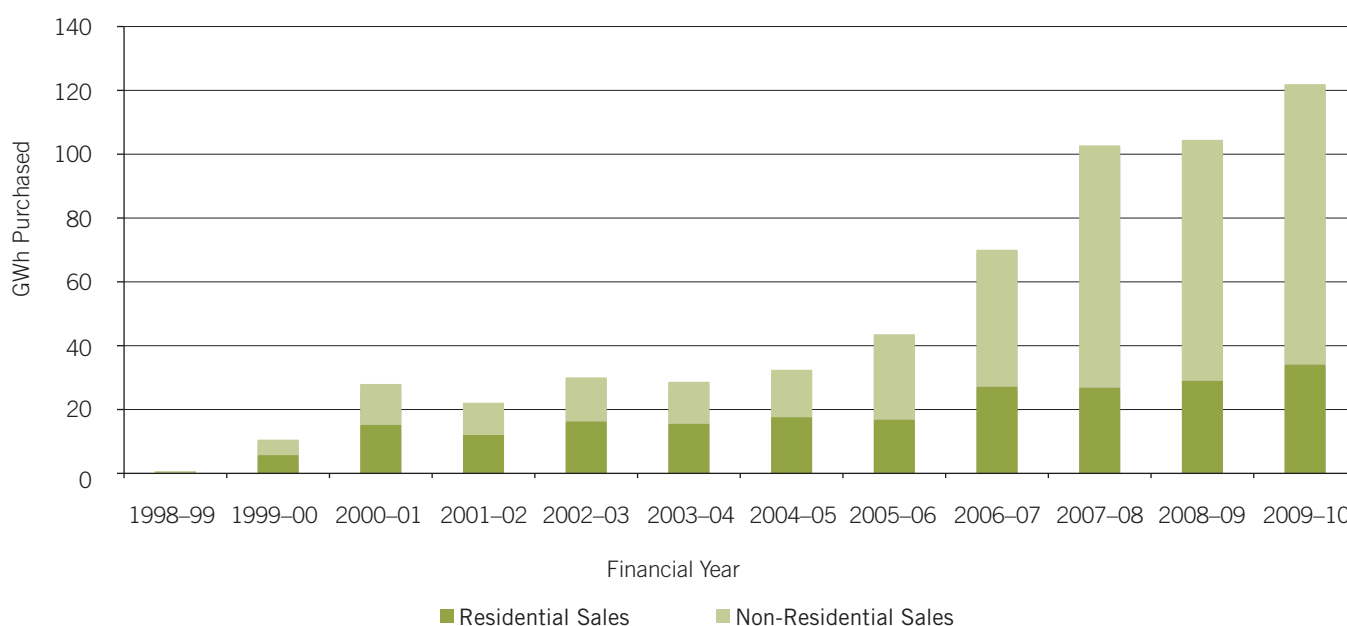
Latest figures indicate that ACT greenhouse gas emissions continue to rise (ICRC 2011). Over 90% of electricity sold in the ACT is still sourced from non-renewable energy sources (ICRC 2011, ORER 2011), from beyond the ACT border. Less than 5% of ACT energy use comes from GreenPower, which is renewable energy purchased voluntarily by households, businesses and other organisations (ICRC 2011). To reduce emissions from use of fuels in transport, the ACT Government has set targets to encourage people to change their mode of travel for work trips. Even if the ACT is on track to achieve the targets, greenhouse gas emissions from the transport sector are still projected to increase to 50–60% above the emissions in 1990 from this sector by 2020 (ICRC 2011, Heuris Partners 2010)². This suggests that transport policy will have to be seriously reassessed if offsetting and disproportionate emissions reductions in other sectors are to be avoided.

In 2007 the ACT Government committed to achieving carbon neutrality in its own buildings and services. It is of concern that the framework for achieving this target is not expected to be released until 2012, four years after the commitment was made. ACT Government agencies have nevertheless taken steps to improve their energy efficiency. Meanwhile, a report on ACT Government Agencies’ Environmental Performance Reporting (OCSE 2010) has indicated that to achieve carbon neutrality, agencies need to significantly strengthen and coordinate their collection of data on energy use, and their management reporting and implementation of resource management plans.

Over the reporting period, the ACT Government has introduced initiatives to both reduce electricity consumption and increase renewable energy uptake. Although it is taking action to improve public transport; the initiatives are not fully implemented, and are yet to demonstrate significant results in terms of a reduction in cars commuting each day. For energy efficiency in office buildings, the Government has introduced mandated building energy efficiencies. However, even with these changes it will take decades to achieve significant improvements in the energy efficiency of housing, infrastructure and buildings in the Territory. Numerous older buildings are still operating at efficiency levels well below the standards set for new projects.

There has been an increase in total sales of GreenPower over the reporting period for both residential and non-residential consumers, despite it being sold at a premium (Figure 2). During 2009 the total amount of Greenpower sold was 118.99 GWh, or just over 4% of the total energy consumption (2914.78 GWh) for the ACT. This may be attributed in part to efforts to make GreenPower relatively more affordable through a number of government initiatives and rebates. ACT electricity retailers offer a range of accredited green energy products (ICRC 2009).

Figure 2. GreenPower energy sales in the ACT



Source: TAMS 2010a

2 Calculations based on ICRC transport emissions data from the 2009 Greenhouse Gas Emissions Inventory (ICRC 2011) and ACT Government-commissioned research into existing policy baseline projections to 2050 (Heuris Partners 2010), as well as estimates of a 3% reduction based on changes in mode of work transport detailed in the *Draft Sustainable Energy Policy 2010–2020* (DECCEW 2011).



The feed-in tariff scheme associated with solar photovoltaic (PV) installation generated an extremely high level of interest and uptake of small- and medium-scale PV installations by residents in the ACT. Despite its popularity, the total installed capacity of renewable generators at 30 June 2011 was only about 14 MW – a third of the capacity of the planned large-scale solar plant (ICRC 2011).

It was announced in November 2010 that the Government would be proceeding with a large-scale solar plant with a capacity of up to 40 MW. There is some evidence that the high demand from the community to generate their own solar power has overwhelmed the solar PV supply market and governance structures for its installation in recent years, and may require further attention if the initiative is reinstated in the future.

Adaptation

The *ACT Climate Change Strategy – Action Plan 1, 2007–2011* (ACT Government 2007) lists 43 actions relating to climate change, of which 13 specifically focus on adapting to current and future climate change. Adaptation efforts have mostly been focused on understanding and building knowledge. For example, ACTPLA has commissioned a number of vulnerability assessments for the urban area, which are aimed at recommending and developing important types of adaptation. Examples include: stormwater harvesting, planning for bushfire risk, improving adaptive capacity and reducing the impact of localised extreme air temperatures through building design and planning (ACTPLA 2010). The ACT Spatial Plan (ACT Government 2004) is currently under review, a process that should consider the implications of future climate change for the urban form of the ACT.

Adaptation actions have been undertaken in response to other situations, such as water security. With a target of reducing overall water consumption within the ACT by 12% by 2013 (Engineers Australia 2010), water management strategies have been implemented throughout the ACT to reduce demand. During the reporting period, these have included education and advertising, permanent water conservation measures, effluent reuse, stormwater harvesting, greywater reuse and water-efficiency programs. A combination of these efforts has been successful in reducing water consumption per person in the ACT (Engineers Australia 2010). Table 2 shows consumption levels in the ACT per person between 2007 and 2009.

Table 2. ACT water consumption, 2007–2009

	2007	2008	2009
Total consumption (kL)	51,060	43,556	44,955
Consumption per person per year (kL)	136	115	116
Consumption per person per day (L)	373	315	318

Source: *Engineers Australia 2010*

A number of commissioned reports have expanded understanding of the implications of predicted climate change effects for ecosystems in the ACT. The reports have addressed issues such as nature park vulnerability (Webb 2010), ecological connectivity (Manning et al. 2010) and the need for effective management of green infrastructure to build the resilience of the ACT's natural environment (OCSE 2011). For more information see the *Adaptation* indicator cluster paper.

Adaptive action in relation to urban form – that is, the physical layout of Canberra – can often achieve benefits in both mitigation and adaptation. For example, passive solar design and energy efficiency can reduce energy use and its associated emissions because the resulting buildings are more likely to provide comfortable temperatures for the occupants in hot or cold weather.

Emerging issues

The future population of the ACT is projected to be older, on average, than it is currently (ACT CMD 2010). This ageing is an emerging issue in terms of vulnerability to extreme events. The proportion of inhabitants older than 65 years of age was one of the factors considered in the vulnerability assessment; it is particularly relevant in extreme heat and during bushfire. Elderly people are a vulnerable group because they tend to have limited mobility and chronic health conditions.



A key emerging issue is the need to plan and manage transport and urban structure for the ACT in an integrated way, particularly when there are additional pressures from increased population and the predicted variability of future climate. The interconnectedness of the ACT with the surrounding region and other major cities, as well as the uncertainty surrounding the role of new technologies and modes of transport in addressing both emission reduction and Canberra's future form are complex and challenging emerging issues that will need to be addressed.

The technology of renewable energy is advancing and becoming more efficient. As a result, households and businesses are finding that energy from renewable resources is an increasingly effective option.

The renewable energy industries, along with industries such as tourism and agriculture, are making the most of opportunities presented by the need to reduce our greenhouse gas emissions in order to reduce the dangerous effects of climate change. However, the effectiveness of renewable energy technologies is still maturing and yet to reach its potential. Many of the governance structures are not able to respond quickly; for example, inspections to ensure timely and safe connection and installation of private solar panels could not keep pace with demand during the reporting period. The development of effective regulatory and governance systems will have implications for future take-up of renewable energy and energy efficiency technologies.

Planning of adaptation and government coordination, remain the two largest challenges in implementing a response to the predicted impacts of climate change on the ACT. Particular issues surround the capacity of vulnerable communities to proactively adapt. Cooperation and collaboration between research, policy and the application of adaptive action is important and not always integrated effectively (Nelson et al. 2010).

Emerging issues exist for different economic sectors around the reliance on the stability of current climate conditions. For example, tourism and agriculture rely on particular current climate characteristics, such as snow conditions, or temperatures for viticulture. Under climate scenarios, these and other sectors represent potential vulnerability that will vary depending on the extent and nature of climate change.

The ACT water supply is heavily dependent on rainfall, and is therefore vulnerable to the combined pressures of an increasingly dry climate and a growing population. Water security in the ACT has been the subject of much attention, and the community responded by using less water. However, for as long as the population continues to grow, there will need to be ongoing efforts to secure alternative sources and enhance reuse, so the ACT can have secure future water supplies.



Source: ACT Government



Recommendations

1. As a priority the ACT Government develop and implement a pathway to achieve carbon neutrality in ACT Government buildings and services. This should be implemented through the second Action Plan of *Weathering the Change* and include monitoring, evaluation of actions and annual public reporting on progress.
2. The ACT Government develop and implement a pathway to achieve the legislated climate change emission reduction and renewable energy targets. This should be implemented through the second Action Plan of *Weathering the Change* and include:
 - a. a focus on reducing emissions from transport and buildings (especially improving energy efficiency of old building stock);
 - b. responsive regulatory, governance and investment arrangements for renewable energy;
 - c. continued engagement with the ACT community; and
 - d. regular monitoring, evaluation of actions and public reporting on progress against the targets.
3. Develop an climate change adaptation planning and implementation response through:
 - a. building on existing, and undertaking additional, sector vulnerability risk assessments;
 - b. establishing a monitoring, evaluation, reporting and improvement methodology and framework as a consistent guide for Government, to develop, progress and report against adaptation planning; and
 - c. integrating adaptation planning outcomes into existing ACT planning and management frameworks.
4. Develop a regional approach to planning for climate change. This needs to be done in partnership with NSW Government, local councils and regional organisations. Key areas of focus should include opportunities for renewable energy development, water security, urban and regional planning, transport management and adaptation of ecosystem services to climate change.

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Other data sources

In addition to these published reports, data for this paper were also sourced from:

ACT Department of Territory and Municipal Services (TAMS) – now Territory and Municipal Services Directorate (TAMSD)

Environment and Sustainable Development Directorate (ESDD)

Independent Competition and Regulatory Commission (ICRC).

