

ACT State of the Environment Report 2011

THEME: Climate

Indicator cluster: Adaptation

This cluster has only one indicator:

- *Climate adaptation (R)* - covering infrastructure, buildings, water and energy resources, and transport in terms of climate impacts and responses.

Summary

The ACT Climate Change Strategy to date has focused on strategies to reduce greenhouse gas emissions. However, there has been adaptive action in response to other events, particularly to improve water security. This has been largely in response to the recent drought experienced in the Territory.

The ACT Government has also been looking into possible adaptation in relation to urban form (the physical layout and design of Canberra), and aspects of natural habitats and connectivity between them.

Introduction

Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices and structures to moderate potential damage or to benefit from opportunities associated with climate change (IPCC 2001).

Adaptation and mitigation activities can differ significantly, but they need to be aligned and reinforce each other if the ACT is to achieve an overall effective response to climate change.

This paper focuses on adaptation in relation to the natural and urban environment. Adaptation in other sectors, such as health, emergency management, tourism, primary industry, food and recreation, while important, is beyond the focus of the State of the Environment Report.

Condition indicators (C) present data that tell us the state of the environment at any particular time.

Pressure indicators (P) present data about the main human activities that could potentially adversely affect the condition of the environment.

Impact indicators (I) present data on the effect that environmental changes have on environmental or human health.

Response indicators (R) present data about the main things we are doing to alleviate pressures, or to improve the condition of the environment.

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Condition indicators

There are no condition indicators for this indicator cluster. Weather patterns over recent decades are presented in the *Driving Forces* paper.

Pressure indicators

There are no pressure indicators for this indicator cluster.

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.

Predicted pressures from climate change on the built and natural environments are outlined in the *Climate vulnerability* indicator cluster.

Impact indicators

There are no impact indicators for this indicator cluster. Potential impacts of climate change on human health and native species are outlined in the *Climate vulnerability* indicator cluster.

Response indicators

The primary focus of the Action Plan 1 of the ACT Climate Change Strategy, *Weathering the Change* (ACT Government 2007) has been on strategies to reduce greenhouse gas emissions as a way of working towards a low carbon economy; that is, one that emits minimal carbon dioxide. Of the 43 actions identified in Action Plan 1, only 13 are specifically focused on adapting to current and future climate change. One in particular, Action 28, required all ACT Government agencies to have assessed their vulnerability to climate change by 2010.

Although some work has been completed in this area, vulnerability assessments have not been completed for all ACT Government agencies.

To date, the ACT has made some progress in adapting to future climate change, by trying to understand in more detail the changes that are likely to be faced and how they will impact on society and the region. Key principles related to adaptation in the strategy in *Weathering the Change*, include these:

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- adaptation to future climate change is where the greatest change at the local-government level can be effected; and
- adaptation and abatement efforts are more effective when they are applied together.

The second action plan under *Weathering the Change* is currently being developed and is expected to have a focus on adaptation actions.

Integrating climate change-related activities into existing plans and strategies is an effective means of delivering action by government agencies. In general terms, adaptation strategies that can achieve 'win-win' or 'no-regret' outcomes should be given priority. 'Win-win' refers to strategies that address the climate change risks in addition to having social, economic or environmental benefits. 'No regret' refers to decisions that are positive from a developmental perspective, regardless of whether the climate threat materialises (e.g. restricting development on a floodplain).

This is the first time climate change adaptation has been included in the ACT State of the Environment Report. It is expected that future reporting can focus on the application of these principles in the ACT. For the purposes of the current report, distinction has been made between a planned or anticipatory approach to adaptation (i.e. risk prevention, or research) and an approach that relies on unplanned or reactive adjustments.

Vulnerability assessments

In 2010 the ACT Planning and Land Authority (ACTPLA) commissioned research into climate change risk and vulnerability in the ACT and associated adaptation and mitigation options.

The research (AECOM 2010) modelled a 2°C average temperature rise by approximately the year 2050, which is considered to be a likely future scenario. The project assessed the exposure, sensitivity and adaptive capacity of Canberra to the probable threats of extreme heat, bushfire, flash flooding and water scarcity. This project's analyses of vulnerability were made at a finer scale than previous research about Canberra. It was able to draw conclusions about the risks posed by climate change, although significant data gaps made comprehensive assessment difficult. Climate change is likely to exacerbate existing risks and vulnerabilities in the ACT in relation to water security, bushfire, biodiversity and some aspects of human health.

In 2008, the governments of ACT and NSW agreed to cooperate in analysis of climate change vulnerability and adaptation for the ACT and south-eastern NSW. The agreement resulted in a series of papers intended to act as phase one in assisting the two governments towards the next steps in climate change adaptation (Whan and Webb 2009).

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Water security

The need for a secure supply of water through the drought has driven much of the recent adaptation action in the ACT - rather than climate change itself. Nevertheless, the relationship between the recent droughts and the phenomenon of climate change is an area of intense research activity.

Management of water resources in Australia has a history of incorporating management techniques for climate variability, and planning for scarcities at certain periods (Whan and Webb 2009). In other words, the Australian water sector has demonstrated it can adapt to climate variability and apply precautionary approaches when necessary.

Water supply in the ACT is highly sensitive to changes in rainfall patterns. An infrastructure network including four reservoirs (Corin, Bendora, Cotter and Googong) and two water treatment plants (Molonglo and Googong) distributes potable water to Canberra (see the *Water supply* indicator cluster). The whole network is supplied by three water supply catchments, all of which are dependent on rainfall. During the severe drought conditions of the last decade, inflows into the ACT reservoirs dwindled: for example, in 2006 inflows were down by almost 90% on historical averages.

The ACT Government established a water security taskforce to consider future water security options for the ACT. Among the resulting water supply improvements have been three major projects initiated during the reporting period: the enlargement of Cotter Dam; the Murrumbidgee River to Googong Reservoir water transfer; and transfer of water from Tantangara Reservoir (see the *Water supply* indicator cluster for more information).

During much of the reporting period 2007-2011, high-level water restrictions were in place in the ACT, and extensive community awareness programs encouraged the community to reduce water use. A number of new initiatives helped the ACT towards achieving a target to reduce overall water consumption by 12% by 2013 (see *Water supply* indicator cluster). The combination of these initiatives and policies is said to have resulted in very strong community awareness of the value of water, and its scarcity as a resource.

Population numbers have a direct impact on water demand and the vulnerability of vital water resources (Engineers Australia 2010). While augmentation projects and diversification of water sources are important, they need to be supported by management tools for increasing a region's overall adaptive capacity to supply its population. *Think water, act water* (ACT Government 2004a) outlines the ACT Government's strategies for sustainable water resource management. Examples implemented throughout the ACT to reduce demand during the reporting period have included:

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- advertising, and education initiatives such as the WaterRight Gardens, a webtool that allows gardeners to develop watering schedules tailored to their garden (ACT Government 2011);
- permanent water conservation measures;
- effluent reuse;
- stormwater harvesting;
- support for rainwater tank installation, via the Rainwater Tank Rebate for connecting rainwater tanks to domestic plumbing for toilets and washing machines;
- greywater reuse; and
- support for installation of water-efficient appliances and fittings, such as the ToiletSmart rebate for replacing single-flush toilet cisterns with water-efficient dual-flush cisterns.

These and other strategies also benefit water quality; for example, stormwater harvesting ‘filters’ stormwater before it reaches lakes and rivers. For further information see the *Water supply* and *Rivers, lakes and wetlands health* indicator clusters.

In combination, these efforts have reduced water consumption per person in the ACT (Engineers Australia 2010), as Table 1 shows for 2007-2009.

Table 1. 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

Substantial efforts are being made to ensure water security within the ACT through the adaptation of water resource management in response to observed climatic conditions. Even so, future climate projections indicate the need for further coordinated actions to be implemented. These management approaches include further consumption reductions, decreases in response-time to reduce consumption levels through water restrictions, further diversification of water sources including non-rainfall dependent infrastructure, improved recycling facilities and usage and catchment-level water management with cross-jurisdiction coordination (AECOM 2010).

The *Think water act water* strategy is currently under review and it is recommended that the implications of climate change should inform the future direction of water policy in the ACT.

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Adaptation of the urban form

Urban form, which is the physical layout and design of an urban area, affects a city's vulnerability to issues such as climate change. Urban form modifies the options available for adaptation and mitigation of climate change effects. Following the vulnerability assessment of the ACT urban area discussed above, ACTPLA commissioned work to recommend and develop adaptation actions. Key recommendations included (SGS 2010):

- *Focusing on stormwater harvesting.* Local stormwater harvesting has the potential not only to reduce, detain and retain stormwater during extreme weather events, it could also provide an additional supply for watering open space areas and street trees, and help in mitigating localised extremes of air temperature. Harvesting and appropriately treating stormwater can have the added benefit of improving water quality before it reaches lakes or rivers.
- *Planning for bushfire risk.* CSIRO climate simulations indicate that ACT fire seasons are likely to start earlier and end slightly later, while generally being more intense throughout their duration (ACT Government 2009). The vulnerability of areas on the urban edge could be reduced by the introduction of edge-roads where they do not exist at present, the reconfiguration of open space, and use of vegetation with lower fire risk. Strategic burning is an important tool for reducing bushfire risk; however, burning plans are often constrained by weather conditions (ACT Government 2009). Other challenges include the need to balance ecosystem benefits and drawbacks and protect vulnerable species; these issues are considered in the *Strategic Bush Fire Management Plan for the ACT 2009* (ACT Government 2009).
- *Improving adaptive capacity.* Intensifying the density of dwellings in urban centres increases the number of households in particular locations, and can be coordinated through an affordable housing policy. Actions that reduce car ownership should help lower emissions of greenhouse gases from transport in the ACT. Freeing up ACT residents' financial resources could mean money might be redirected to adaptive infrastructure such as the retrofitting of houses. The *Canberra Spatial Plan* (ACT Government 2004b) can support the strengthening of adaptive capacity by locating future developments in or near existing town and group centres (thereby possibly reducing household transport costs), and away from vulnerable locations such as those prone to bushfires and flooding.
- *A threefold strategy to reduce the impact of localised extreme temperatures:*
 1. increase the reflective capacity of roofing and roads;
 2. improve self-shading of building facades with awnings and eaves and by street planting; and

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3. make more use of evaporative cooling though increased irrigation of the public domain (although droughts and water restrictions will affect this strategy).

The Canberra Spatial Plan is currently under review, a process that should consider the implications of future climate change for the urban form of the ACT.

The ACT Government has already drafted amendments to the Territory Plan that are intended to improve the solar efficiency of houses, and there are a number of voluntary programs in place to encourage energy efficiency in buildings (see the *Mitigation* indicator cluster for more information). These are moves that should help reduce emissions from the urban environment, and help the ACT adapt to potential climate impacts.

Ecosystem adaptation

A recent report (Webb 2011:5-6) on the implications of climate change for nature reserves in the ACT identified the main human challenges for adaptation as:

- better understanding of areas of potential conflict between competing values;
- choosing investment priorities in the context of limited resources;
- doing effective research and monitoring; and
- developing and implementing adaptive management processes that respond to new information as it becomes available.

The report also identified key strategies humans could use to improve adaptation by local ecosystems, including:

- maintaining and enhancing fundamental ecosystem processes and services, including improving landscape function, vegetation and habitat, through facilitating natural regeneration and active restoration;
- enhancing the resilience of ecosystems and species by maintaining diversified habitats and refuges and improving connectivity on a 'whole of landscape' basis;
- facilitating ecosystems and species development;
- land-use planning and fire management that balance protection of humans and natural assets, backed up by progressive monitoring and learning; and
- effective and integrated governance and adaptive management approaches for the reserves; these should be backed up by greater understanding of community values through enhanced communication and engagement with the community; and restatement of the values of, and objectives for, the reserves, to be more appropriate to a changing and, to some extent, an unpredictable environment.

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For further information on ecosystems and climate change see the *Threatening processes* indicator cluster.

Connectivity

The existing separation of habitats across the landscape makes it difficult for many organisms to respond and adapt to a changing climate and environment by moving to somewhere else. Climate change and land use change combined are having a far more detrimental effect on biodiversity than either factor in isolation. As well as maintaining and expanding the reserve system, humans can link habitats to help organisms adapt to climate change. Better connectivity can be achieved by managing off-reserve lands in a manner that recognises the need for wildlife to move across the whole landscape, and the degree of connectivity required for each species to achieve this movement (Manning et al. 2010).

Corridors are increasingly regarded as particularly important for protecting the ecological systems in Canberra's reserves. Corridors are links, in the form of bands or clumps of vegetation, connecting larger patches of habitat. It is important that managers arrange connectivity so it takes into account the specific needs of different species, and is not applied with a 'one-size-fits-all' approach.

In 2007, recognising the importance of connectivity in terms of maintaining biodiversity, especially in the event of climate change, the ACT Government commissioned a report to identify key issues involved in enhancing connectivity through planning and land management in the ACT. Issues identified by the report include, but are not limited to:

- linking existing ACT nature reserves to each other and to those in NSW;
- maintaining and enhancing, especially for aquatic biota, the integrity of the Murrumbidgee River as a key connectivity feature crossing the ACT and linking into NSW;
- maintaining and enhancing connectivity; for example, planning and building urban developments in a way that allows multiple types of organisms to use them; and
- considering species-specific responses of organisms to climate change.

The report also delivers a suite of recommendations designed so that planning in the ACT and surrounding region can maximise the effectiveness of connectivity. The recommendations highlight the need for careful analysis of the aims of enhancing connectivity and the likely responses of species. Modelling identifies high priority areas within and adjacent to the ACT, where re-planning or suitable management could maintain or improve connectivity (Manning et al. 2010).

Further information on connectivity is outlined in the *Threatening processes* and *Ecological communities* indicator clusters.

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Canberra's treed landscape

Green infrastructure is defined as a city's natural features, such as its vegetation, parks, and waterways. Green Infrastructure can improve the quality of the urban environment for present and future human communities. It helps soften the physical and psychological effects of pressures such as increased urbanisation, population growth, pollution and climate change (OCSE 2011). Green infrastructure is an example of a 'win-win' strategy which provides social, economic or environmental benefits as well as assisting in addressing climate change impacts.

Climate change and the prolonged drought have had detrimental effects on the health of Canberra's trees, which have continued in 2011. The Office of the Commissioner for Sustainability and the Environment has reported on the management of Canberra's treed landscape, encouraging a 'care and maintenance' approach. The report also recommends that the treed landscape should be accepted as essential green infrastructure for Canberra, in the ACT Government's strategic planning (OCSE 2011). The ACT Government is yet to respond to the report's recommendations.

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