ACT STATE OF THE ENVIRONMENT REPORT 2011

EXECUTIVE SUMMARY

Introduction

State of the Environment reporting is an internationally recognised approach to assessing change in all aspects of the environment including atmosphere, biodiversity, land, water and human settlements. In the ACT, State of the Environment (SoE) reporting is a requirement of the ACT *Commissioner for the Environment Act 1993.* The Office has undertaken a SoE Report for the ACT, every four years beginning in 1994–95.

This SoE Report covers the period from 1 July 2007 to 30 June 2011.

The objectives of the ACT SoE Report are to:

- provide accurate, timely and accessible information to the community and government, regarding trends and the condition of the environment, underlying pressures and sustainability trends;
- evaluate the effectiveness of community and government actions, policies and initiatives in terms of progress towards sustainability;
- increase community and government understanding of environmental and sustainability trends and interactions;
- satisfy the obligations of the relevant ACT legislation; and
- develop recommendations for the Minister.

Framework

The ACT SoE report has adopted a framework of headline indicators, driving forces, themes, and indicators and indicator clusters to assess and report the environment (see Figure 1).

Headline indicators – These represent a small set of indicators that help provide simple and clear information to decision-makers and the general public about the overall condition of the environment and the changes that have taken place since the last reporting period.

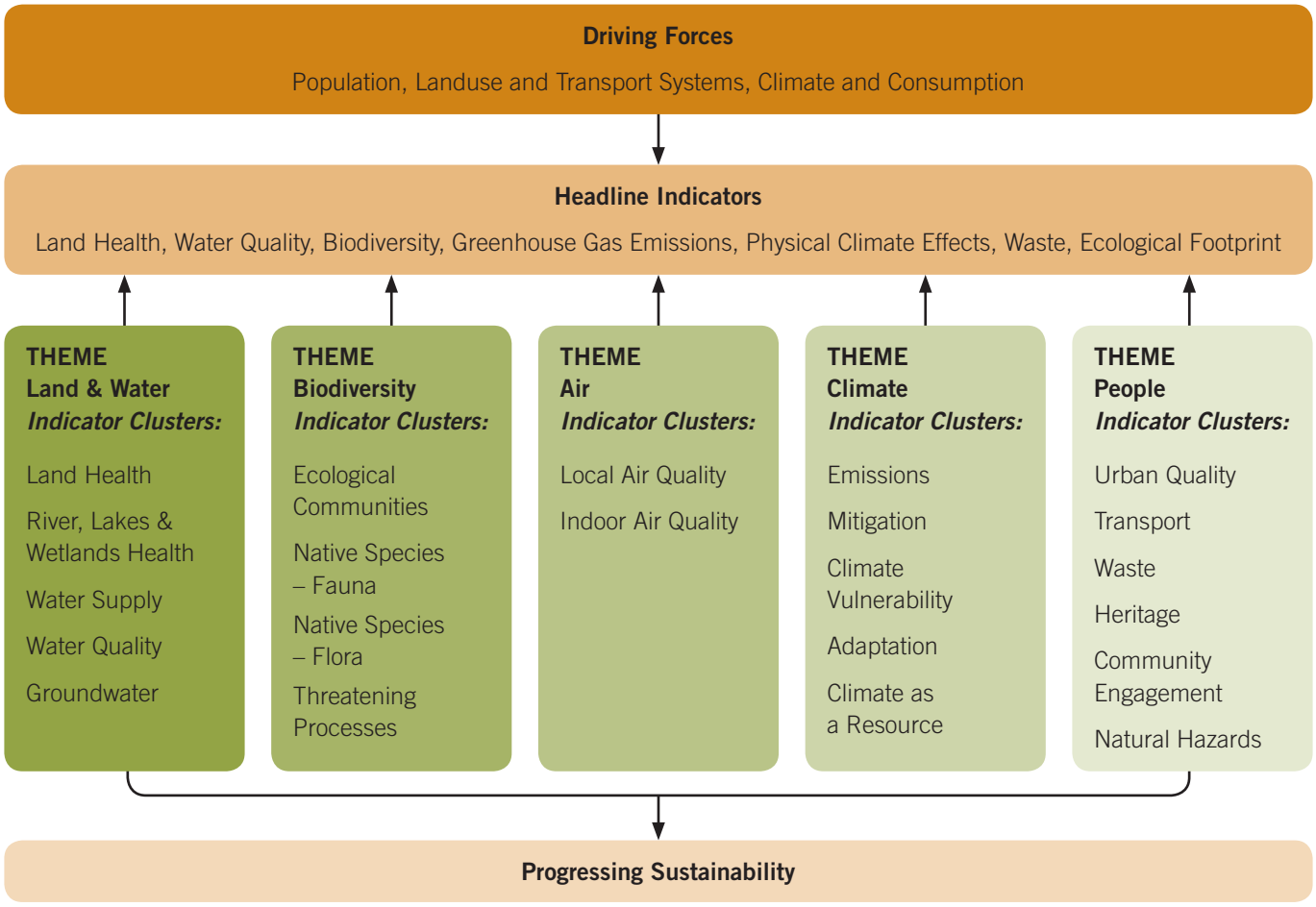
Driving forces – These are indicators that provide data on demographic, social and economic developments, which, in turn, exert pressure on the environment. Four driving forces have been identified, namely, population, consumption, climate and landuse and transport.

Themes – These are the main things one is likely to think of when thinking of the environment, land and water, air, biodiversity, climate and people. These papers provide an overview of the key findings, effectiveness of responses, emerging issues and recommendations in relation to different areas of the environment.

Indicators and Indicator Cluster papers – These are the key measurement areas, which are analysed and interpreted in order to provide an assessment of each theme. Key indicators have been identified, defined and grouped within Indicator Cluster papers. The purpose of the Indicator Cluster papers is to group related condition, pressure, impact and response indicators and highlight interconnections and positive and negative relationships within and across themes.

Progressing Sustainability – This section places the findings of the SoE Report into a wider sustainability framework and provides information on the key challenges and opportunities for progressing sustainability in the ACT into the future.

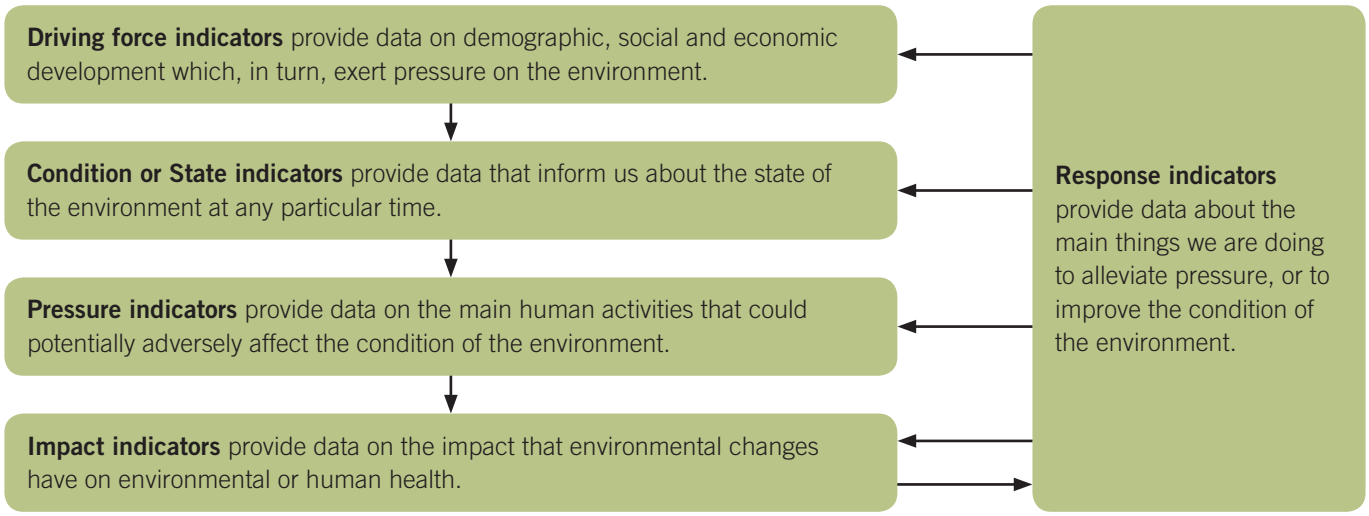
Figure 1. ACT SoE 2011 Framework



DPSIR model

This report uses the Driving Forces-Pressure-State (or condition)-Impacts-Responses (DPSIR) model to explore environmental issues in the ACT.

Figure 2. DPSIR model



Each theme in the report is made up of a number of indicator cluster papers, covering key issues related to each of the themes. The information in these papers is treated in the context of the DPSIR model, where possible. Where appropriate, the report shows the interconnections between the themes and issues.

Report preparation

This report was developed independently by the Office of the Commissioner for Sustainability and the Environment (OCSE). This report uses an evidence-based approach to assess the environment. Data and information were collected, analysed and interpreted by both the OCSE and subject area experts. The report was then developed by the OCSE, and reviewed by both experts and the ACT Government to further ensure accuracy. The OCSE acknowledges and thanks all the consultants and reviewers for their time, effort and expertise.

The information has been drawn from a wide range of sources, in particular the ACT Government, and represents the best information and data available at the time of collection for the report. References to sources are provided throughout the text and refer to a number of Directorates, which were formed in 2011 when the ACT Public Service was restructured into a single department. However, for publications prior to the formation of the current Directorates, previous agency titles have been used in referencing. The OCSE acknowledges the ACT Government for giving authorization to use the data, as well as organisations and individuals for this report.

Drivers of change

Our city, our economy and our society rely on the environment. However, the amount of resources we use is unsustainable and damaging our environment at both local and global levels. At the local level, the quality of our natural environment is comparatively high. In the ACT we have generally good air quality, large areas of green space and lack heavy industries, such as chemical plants or smelters. Further, Canberra has large expanses of open space and nature reserves, which, together with urban trees, form a major part of Canberra's green infrastructure. This provides essential ecosystem services and supports our economic and social systems, as well as the city's biodiversity. As a result, it may be difficult for us to find the link between our lifestyle and its potential to damage the environment.

Nonetheless, results of the extensive community consultation, *Time to Talk: Canberra 2030*, showed that Canberrans are conscious of the challenges they face. Discussions identified a need for change and for Canberra to become a more sustainable, accessible and an affordable city.

In the ACT there are four key forces that drive significant change to our environment. These are further explored in the driving forces paper.

ACT population continues to increase; in 2011 it was 363,834 persons and it is projected to increase to 434,300 by 2030 and to 500,000 by 2050.

The zoned urban area of the ACT has increased by about 9%, during the reporting period.

The trend for higher than average temperatures continued, with 2007 being the hottest year recorded in Canberra and 2009 the second hottest.

The size of the average ACT resident's ecological footprint in 2008–09 was 9.2 global hectares.

Population

The ACT population is growing and ageing and generally continues to have levels of disposable income above the national average (ABS 2011). On 31 March 2011, the estimated resident population of the ACT was 363,834 persons (CMCD 2011) and is projected to increase to 434,300 by 2030 and to 500,000 by 2050 (ACT Government 2011). The ACT's growing population and affluence will have significant impacts on both our urban quality and natural environment including:

- increasing demand for additional and diverse housing and associated infrastructure for transport, placing pressure on our green spaces;
- increasing demand for educational, medical, retail, recreational and other services, placing pressure on government and other resources; and
- increasing demand for water and energy supply and waste services.

However, while population growth and change can have significant negative impacts on the environment, it can also deliver professional and technical skills, knowledge and capacity to a community. As a result, this can bring about attitudinal change and result in practical outcomes in relation to environmental regeneration and protection. Further, communities can play a role as custodians of the natural environment. This is already evident in the ACT, with community groups playing a significant role in areas, such as biodiversity conversation and monitoring.

Landuse and transport systems

The area of land zoned for urban development in the ACT increased by about 9% during the reporting period (ESDD 2011a). Urban development includes area for things such as housing, commercial, recreation and transport-related infrastructure such as roads, parking areas, cycle and footpaths. With around 49,000 additional residential dwellings expected to be needed in the ACT by 2031, the size and form of the urban area is likely to continue to undergo considerable change, with both infill and greenfield development planned. Greenfield development is expected to make up 55% of new residential development from 2011 to 2015 in the ACT (LAPS 2011). Such development can lead to vegetation clearing, reductions in the permeability of land, land degradation, water quality impacts, altered water flows, habitat loss and impediments to the movements of native animals.

Source: ACT Government

Canberra has large expanses of green space, which are not only important for biodiversity, but also contribute to the health, wellbeing, and sense of place of Canberra residents. Further, they increase the potential for human and ecosystem resilience in response to the impacts of climate change by sequestering carbon and ameliorating localised temperature extremes.

In the case of transport systems, motor vehicles are by far the most common mode of travel to work for Canberrans, well above the Australian average despite levels of walking and cycling above the national average (Mees et al. 2007). This creates a substantial problem, as road transport is a significant source of greenhouse gas emissions and air pollutants.

Climate

Having a relatively stable and predictable climate is important for many reasons, including human wellbeing, the health of ecosystems, maintenance of water resources, conservation of biodiversity and food security.

Climate variability during the reporting period reflected the impacts of El Niño Southern Oscillation events with hot summers in 2008/09 (due to El Niño events) and cooler summers in 2010/11 (due to La Niña events). The dry, warm conditions in the early part of the reporting period (due to extended drought conditions) had widespread impacts on native and exotic vegetation, river and catchment health and soil erosion, with two dust storms occurring in 2009 (Davis and Lindesay 2011). The end of this drought was marked by heavy rainfall in 2010 with a significant flooding event in Queanbeyan and ACT in December of that year (Davis and Lindesay 2011). As a result, sediment and contaminants brought by the high levels of runoff into waterways affected water quality and riparian and aquatic habitats (TAMS 2007).

Climate change will have a number of impacts on all of our society and our urban and natural environment. It is likely to lead to changes in the availability of water, an increase in drought severity due to higher temperatures and an increase in the frequency and intensity of weather events such as storms, floods and bushfires (Webb 2011). This in turn is likely to lead to additional pressure on the Territory's water resources and biodiversity, and may significantly change the patterns of bushfire and extreme weather events. This, along with increased population will place greater demand on our natural resources (such as water) and ecosystems. The impacts of climate change will also exert pressure on our infrastructure including health care systems, electricity infrastructure and green infrastructures (nature parks, urban trees and open spaces).

Consumption

The nature of and increase in our consumption per person is driving significant impacts on the environment. In affluent societies, such as the ACT, total environmental pressures tend to continue to grow with income as income drives consumption (Dey 2010). The greater the household income, the more disposable income there is available for activities such as travel, purchasing of retail goods and construction (Murray and Dey 2011) which in turn increases our ecological footprint. An ecological footprint is a calculation of the amount of land and water required to support our use of resources and disposal of our wastes. The size of the average ACT resident's ecological footprint in 2008–09 was 9.2 global hectares (gha) – we used 14 times the land area of the ACT to support our lifestyles. This is an increase of nearly 25% in 10 years and is 13% above the current Australian average (Dey 2010). To live within the current capacity of the world we would have to reduce our footprint to 1.8 gha per person. This figure includes the land needed to support only the human population, and not for other species. Consumption at this level is not sustainable in the long term and in a world with limited resources, as excess consumption by some, results in others living without sufficient resources to sustain life and health.

Overall condition of the environment

The headline indicators for the SoE report indicate that Canberra is a very liveable city. However, as a largely urban population who import most of our consumer goods and services, we are increasing the impact on our local and global natural environment. In particular:

- the size of the average ACT resident's ecological footprint was 9.2 global hectares. This has increased by 8% in 5 years and nearly 25% in 10 years;
- waste generation per person has increased by 28% faster than the population growth of 5.5%, over the reporting period;
- greenhouse gas emissions continue to rise with ACT emissions increasing by 7% between 2005 and 2009;
- generally water quality is similar at Halls Crossing (as it exits the ACT) than that at Angle Crossing (as it enters the ACT). Urbanisation impacts are having an impact on a number of indicators of water quality; and
- during the reporting period, three new nature reserves were added to our conservation reserves, while three additional species were listed as vulnerable.

A summary of changes, challenges and improvements under each theme are presented below. Recommendations, for the ACT Government to consider, are provided in italics and numbered in this Executive Summary.

Land and Water

What has changed?

The effects of drought and fires dominated assessments of water and catchment health in the 2003 and 2007 ACT SoE Reports. Recommendations from previous SoE Reports focused on post-fire rehabilitation to protect catchments and significant steps in post-fire recovery have been made. Conditions have changed in this reporting period, and drought breaking rain and improved condition of riparian vegetation, following the 2003 bushfires, have led to an improvement in the overall river health (DECCEW 2010a). However, the summer incidence of blue green algae in Canberra lakes appears to be increasing.

Urban areas and land health continue to have a large impact on the health of water bodies and catchments in the ACT. Urban run-off, return of treated sewage and changes in geology, among other practices, affect water quality in the ACT. Despite several previous recommendations for improvement, there has been little change in our knowledge of the extent to which land clearing and urbanisation are impacting on our water quality. Waterways, which are less affected by urban pressures, appear to have also shown greater resilience to climatic events, such as drought, than those in peri-urban and urban areas (DECCEW 2009).

The need for long-term research and monitoring and for coordinated catchment management remains as valid today, as it did when recommended in 2003 and 2007.

Specific projects have been developed, which illustrate that cooperative catchment management activities and cross-boundary catchment management is possible. These projects have provided positive outcomes.

Recovery from fire and drought and a number of catchment management projects are likely to have contributed to overall improved land health in the ACT, over the reporting period. However comprehensive data on land health are not available.

Generally water quality is similar at Halls Crossing (as it exits the ACT) to that at Angle Crossing (as it enters the ACT). Urbanisation impacts, including pollutants in stormwater run-off and treated sewerage, are having an impact on a number of indicators of water quality (pH, conductivity, total nitrogen and chlorophyll ‘a’).

Challenges

Vegetation clearing, overgrazing and landuse change can significantly affect land health. This is because land with poor vegetation or ground cover is more at risk of wind and water erosion. However, currently there is limited information available about the extent of impacts of processes, such as erosion and soil acidity on the land in the ACT as well as how other factors, such as vegetation cover and quality, contribute to the ACT’s land heath. The increasing urban footprint results in land degradation, vegetation clearing and habitat loss. This creates a significant challenge since land heath affects the riparian and aquatic ecosystems, biodiversity and green infrastructure of the ACT.

During the reporting period, a landscape function analysis of 34 nature reserves and one potential reserve was undertaken. Even though most of the ACT’s nature reserves are in satisfactory condition, there are localised areas within these nature reserves that were assessed as being in critical condition or approaching critical condition (Sharp 2011).

Water will continue to be a significant issue in the ACT into the future. Land clearing and continuing urbanisation, is likely to have the largest impact on local water quality. Climate change and population growth will continue to place pressure on the ACT’s water resources. Cross-boundary catchment management, including the impact of upstream land uses in NSW on the Murrumbidgee River, continues to be important, and will need to be improved into the future if our water supply is to remain secure.

There are indications of changing expectations for the function and use of water bodies in the ACT, integrating recreational, educational and environmental management objectives with urban infrastructure goals of flood mitigation and water treatment. Managing water bodies for multiple uses while balancing community expectations will be challenging for policy makers and regulators.

How are we responding?

Due to the continuing drought for much of the reporting period, there has been a strong focus on water security and efficiency measures. A number of water supply measures have been implemented. Of these measures, the three major projects initiated during the reporting period included enlarging the Cotter Dam, pumping of water from the Murrumbidgee River to Googong Dam to supplement the ACT's water supply, and purchasing general and high security water entitlements for the Tantangara Transfer project. With water restrictions in place, potable household water use within the ACT decreased by approximately 17% in four years. However, with water restrictions now more relaxed following increased rainfall, it is yet to be determined whether water efficiency has been embedded in the behaviour of Canberrans, or if water use will once again increase.

A number of catchment management projects were implemented to improve the overall health of ACT's land and water resources, particularly in the Lower Cotter Catchment, where a major restoration project has been undertaken to rehabilitate and restore native vegetation. There has also been an increased focus on stormwater harvesting and Water Sensitive Urban Design (WSUD), with the construction of a number of urban wetlands, as well as rain gardens and constructed ponds. These initiatives aim to provide amenity to the urban landscape, whilst at the same time improving and enhancing water quality within the urban environment.

Catchment management in the ACT is still conducted by a number of different actors, creating challenges for an integrated and cross boundary approach. However some projects such as the restoration of the Lower Cotter and the Upper Murrumbidgee Demonstration Reach initiative have demonstrated the benefits of such an integrated approach.

Urban areas continue to have a large impact on the health of water bodies and catchments in the ACT. Recommendations from the previous SoE report that included monitoring the effects of urbanisation, the effectiveness of the Gross Pollutant Trap network and determining the sources and loads of salts entering the wastewater treatment networks, have not been fully implemented or integrated into water management. A better understanding of the impacts of urbanisation on catchments and the integration of this knowledge into improved management will be an ongoing challenge for the ACT.

Source: ACT Government

How can we improve?

In improving land and water management into the future, it is important that we treat the resources, not as commodities but as part of the total ecosystem. The management of these resources should build resilience to expected climate change impacts. We are part of the wider Murray Darling Basin and catchment management should not stop at jurisdictional boundaries. Projects such as the Murrumbidgee Reach Demonstration Project illustrate the benefits of cross-jurisdictional and multi-partnered community engagement in catchment management.

1. *Establish cross-boundary management of the ACT's water resources including:*

    a. *developing catchment policy and an integrated water supply catchment management strategy, as recommended in previous State of Environment Reports; and*

    b. *strengthening integrated management action by facilitating improved exchange and use of information, such as spatial information, between government agencies, Natural Resource Management groups and Catchment Management Authorities, and by promoting sustainable catchment management with landholders and the community.*

Groundwater is an important localised water resource for the ACT, although it only contributes a small proportion of the overall water supply. Over-extraction affects the health of groundwater dependent ecosystems, and the continuing availability of groundwater for human use. Under legislation, the amount of groundwater taken for use is limited to 10% of the historical groundwater resource. However, improved monitoring of groundwater is needed to provide greater knowledge and understanding of groundwater in the ACT.

2. *Complete assessment of the ACT's at risk groundwater resources.*

The previous two SoE Reports recommended monitoring the effects of urbanisation on ACT region's water catchments and using this information to respond to specific issues. The consequences of urban development, including vegetation clearing and increased run off, have significant impacts on water quality. While investigations have been undertaken on the ACT landscape, particularly around land uses and vegetation in different catchments, the effects of urbanisation remains a critical area for further action. Over recent years, significant effort has been put into Water Sensitive Urban Design. It is important that we monitor and report on the effectiveness of this work including construction and on-going maintenance requirements and changes in water quality, both local and downstream.

3. *Update water management, monitoring and reporting programs to inform:*

    a. *actions to mitigate impacts of urban development on water quality;*

    b. *the efficacy of Water Sensitive Urban Design measures;*

    c. *improvements in sediment and erosion mitigation actions; and*

    d. *management of ACT lakes.*

In contrast to other Australian states and territories, the ACT has a relatively small land area. However, as noted in previous SoE Reports, there is limited information on the extent and changes to land degradation. Given the effect of soil types and condition of land health, improving knowledge of soil conditions and the impact of land uses on soil is important for effective land management.

4. *Improve monitoring to assess the impact of erosion on local land and water resources, and to help to understand the interactions between the ACT's catchment and ecosystem services in particular:*

    a. *undertake baseline soils mapping for the ACT to facilitate monitoring and assessment of soil condition;*

    b. *identify indicators of land health including soil heath, vegetation quality and change, and landuse changes, and monitor and publicly report on these on a regular basis;*

    c. *improve limited land health data by including land health assessments in water catchment data to inform soil condition across the ACT; and*

    d. *improve actions related to sediment and erosion mitigation.*

Co-ordination and ready access to existing and future research, and other data could help improve knowledge in areas with limited data, as noted above and elsewhere in the SoE Report. There is a rich but dispersed environmental research capacity of the ACT which could be capitalised on by facilitating access to and integration of environmental knowledge. This could be undertaken through building on existing government and non-government skills and programs that have the potential to reduce research overlap, identify knowledge gaps and promote a more holistic approach to research across the ACT.

5. *Management of knowledge and the coordination of scientific research, data collection, monitoring and reporting (including public information) is an area of concern across all themes. A specific recommendation to address this is provided under the recommendations section of the Biodiversity Theme paper.*

Biodiversity

What has changed?

The focus on fire management since the 2003 reporting period has seen significant progress in balancing the, at times, competing objectives of protecting life and infrastructure and maintaining biologically appropriate fire regimes.

While over the last two reporting periods, progress has been made in continuing to protect key areas for conservation, pest plants and animals, climate change and urban development continue to put pressure on our biodiversity. Each new reporting period also sees a small increase in plant and animal species that are declared as threatened.

The 2007–08 SoE Report highlighted the impact of the overabundance of kangaroos in the ACT. The recommended Kangaroo Management Plan has been developed to inform management of this important native animal. Its efficacy is yet to be fully determined.

Many of the plans and strategies recommended in the 2003 and 2007–08 SoE reports have been completed and actions implemented to varying degrees. For example, the Jerrabomberra Wetlands Nature Reserve Management Plan, Namadgi National Park Plan of Management and ACT Weeds Strategy have all been finalised and some actions have been implemented. Overall, long-term research, monitoring and evaluation remain limited, with previous SoE recommendations to improve these areas only partially implemented.

Nonetheless, across all reporting periods, community involvement in biodiversity conservation has been valuable and significant.

Three new species the Little Eagle, Glossy Black-Cockatoo and Pink-Tailed Worm Lizard have been listed as threatened during the reporting period.

The riparian shrub, *Bossiaea greyii* is currently being assessed for a nomination as a threatened species.

Three new nature reserves – Callum Brae, Jerrabomberra West and Kama were added in the reporting period. In addition, approximately 80 hectares have been added to existing reserves.

Challenges

Changes at local and global scales are placing the ecosystems and therefore the biodiversity of the ACT under increasing pressures. Threatening processes currently putting pressure on the ACT include climate change impacts, changed fire regimes, pest impacts and development impacts such as urbanisation. Many of the endangered species in the ACT are located in protected areas; however this alone does not ensure their survival.

Despite the continued expansion of conservation land, urban expansion also continues and new suburbs and infrastructure such as major roads and service corridors continue to fragment habitat at many scales (Manning et al. 2010), placing pressure on our flora and fauna. Habitat fragmentation makes it difficult for many organisms to respond and adapt by moving across modified landscapes. The interaction of climate change and landuse change is having a far more detrimental effect on biodiversity than either factor in isolation (Lindenmayer and Hobbs 2007).

There is also the need to capture more relevant and timely data to assist in the better understanding of the condition of ecological communities and native species in the ACT, along with the pressures that are being placed on ecological communities and native fauna and flora species and the changes to their distribution and abundance. This should build on existing government and non-government skills and programs and focus on periodic reporting.

Despite the pressures noted above, the recent report *Building Nature's Safety Net 2011 – The State of Protected Areas for Australia's Ecosystems and Wildlife* (WWF 2011) identified the ACT's reserve system being very close to adequate, with the key remaining priority being the protection of Yellow Box-Red Gum grassy woodlands.

Source: ACT Government

How are we responding?

A number of innovative biodiversity conservation projects have been undertaken during the reporting period and include:

- a report, *Ecological Connectivity for Climate Change in the ACT and Surrounding Region* (Manning et al. 2010), which aims to better inform the ACT's planning process and future policy and strategies for connectivity. Building on this, the ACT Government has commissioned a connectivity analysis, including producing a biodiversity connectivity map for the ACT. It is important that the outcomes of the connectivity work are integrated into urban planning processes;
- the *Strategic Bushfire Management Plan*, developed over the reporting period, has established a framework aimed at balancing safety and ecological needs (through the ecological guidelines for burning); and
- a research and restoration experiment is underway in the Mulligans Flat – Goorooyarroo Woodland. The experiment is a partnership between the Australian National University, the ACT Government and CSIRO and aims to identify methods to restore the structure and function of temperate woodlands and increase biodiversity, with the intention to support park managers in their work to conserve woodlands (Manning et al. 2011).

In addition, changes to funding and management arrangements are being implemented. The Capital Woodland and Wetlands Conservation Trust is a partnership between Government and the community, which aims to access additional private sector and community funding for projects located on public land. The Trust is being established to support projects in Jerrabomberra Wetlands Nature Reserve and Mulligans Flat Woodland Sanctuary and is intended to supplement, rather than replace annual government support for normal, ongoing management of these areas (OCSE 2011).

How can we improve?

Accurate, current and detailed biodiversity data in the ACT is increasingly important, since governments, the community and industry need to access this data in order to better guide planning and development decisions. There are several areas of data management that need strengthening. Much biodiversity data and monitoring undertaken in the ACT is often focused on a specific location (through planning processes) or on threatened species. Strategic monitoring and data consolidation across the ACT is limited, yet is important for determining key changes including habitat loss across the ACT as well as identifying species that may be at risk of becoming threatened or endangered.

Monitoring and tracking changes to ACT's biodiversity assets would involve the assessment of those assets that remain following planning and development decisions that affect individual species, populations and ecological communities. Public reporting about biodiversity matters is also needed in a way that clearly identifies and assesses the outcomes of decisions and activities that are related to individual species, populations and ecological communities in the ACT. Finally ensuring collaboration with the NSW Government and Regional Councils needs to continue to be effective to progress data and information gathering.

6. *Strengthen research, planning and practical projects to enhance biodiversity conservation in the ACT through:*

    a. *developing a biodiversity monitoring strategy, building on existing government and non-government skills, capacity and programs, and focused on periodic reporting. This should include, where appropriate, systematic statistical methodologies which support monitoring of trends and changes to biodiversity assets in the ACT;*

    b. *funding a dedicated senior officer position to facilitate knowledge development and consolidation, across disparate sources, including more strategic integration within and between government, research/academic institutions and community groups and members. To support this role, systems should be developed to provide wide public access to information to guide research, teaching, planning and practical projects to enhance the sustainability of the ACT and Region;*

    c. *identifying opportunities to integrate multiple environmental assessments. For example, when monitoring nature reserves for vegetation qualities, land-health indicators and grazing impacts should also be monitored at the same sites. Assessing sites in Canberra Nature Park on a rolling 3-year basis over a 10-year period would provide the basic information for monitoring trends in environmental condition;*

    d. *publicly reporting decisions and activities relating to individual species, populations and ecological communities in the ACT. This should include both qualitative and quantitative information;*

    e. *reviewing and updating Action Plans where appropriate, and publicly reporting on progress against Action Plan objectives and proposed actions; and*

    f. *collaborating with NSW Government and regional organisations to contribute to regional and national biodiversity data sets.*

Fragmentation of habitat and the removal of native vegetation through ongoing landuse changes exert key pressures on our biodiversity. While progress has been made over the last two reporting periods to increase conservation areas, threatened species and communities remain under pressure due to further clearing of the native vegetation primarily for urban development. Each new reporting period has also seen a small increase in the number of new plant and animal species that are declared as threatened. Finally, the existing high level of habitat fragmentation makes it difficult for many organisms to move between modified landscapes.

7. *Better integrating biodiversity values within urban planning through:*

    a. *Integrating biodiversity corridors and habitat connectivity in the Territory Plan process;*

    b. *identifying, where possible, appropriate clearance thresholds for ecological communities across the ACT to maintain and improve biodiversity values and guide development decisions. To complement this the draft biodiversity offset policy should be finalised to ensure no net loss in ecosystems; and*

    c. *developing and implementing an ACT fauna sensitive road design manual.*

Making biodiversity conservation an element of the landuse planning process in the ACT by integrating connectivity opportunities in all planning decisions and strengthening legislation would also assist in enhancing clarity and integration of biodiversity needs into the ACT planning framework.

8. *Improve transparency of biodiversity integration into legislative and planning frameworks through:*

    a. *including objectives for the protection of biodiversity and a definition for 'biodiversity' as part of the Nature Conservation (NC) Act 1980 review;*

    b. *aligning provisions in the Environment Protection Act 1997 and Planning and Development Act with any relevant changes to the NC Act including biodiversity definitions and reviewing the definition of environmental harm to determine whether unauthorised loss of biodiversity should be included as an offence; and*

    c. *assessing the effectiveness of managing threatening processes through Action Plans and determining if management of key threatening processes needs strengthening through listing under the NC Act.*

Air

What has changed?

Canberra's good outdoor air quality has not changed significantly during the last two SoE reporting periods. The ACT continues to enjoy good air quality in large part due to the lack of heavy industry, such as chemical plants or smelters, the absence of concentrated high-density urban development and the relatively small population. Recommendations to encourage low emission vehicles and publicly reported air quality data have been implemented and we have continued to see reductions in carbon monoxide emissions and particulate matter.

Previous recommendations to improve indoor air quality information have not been implemented and knowledge of indoor air quality in the ACT remains limited.

The ACT continues to enjoy good outdoor air quality, with National Environment Protection Measures (NEPM) standards for carbon monoxide, nitrogen dioxide and ozone met during the reporting period.

The NEPM goal for particulate matter to remain less than 10 micrometres was not met in 2009.

Challenges

We need to be proactive to ensure we maintain good air quality. The ACT continues to see increases in motor vehicles, population and urban development. Despite actions to reduce pollution from motor vehicles and reduced sources of particulate matter, such as woodheaters, these trends are likely to place pressure on air quality in the ACT. Recommendations in the 2003 and 2007–08 SoE Reports for using extra nephelometers for campaign or mobile monitoring of smoke pollution, related to ambient air quality, have not been implemented due to calibration, set up and data gathering requirements. Their use for this purpose needs to be clarified.

The recent review of Ambient Air Quality standards identified a number of studies that indicate negative health effects that occur below the current national Ambient Air Quality standards for carbon monoxide, oxides of nitrogen, ozone and particulate matter. This Report is soon to be reviewed by the Environment Protection and Heritage Council, and the review's recommendations will be prioritised and responded to, through the development of the *National Plan for Clean Air*.

How are we responding?

The ACT Government continues to be involved in a number of national and local programs aimed at improving air quality. The ACT Government has continued to implement education and enforcement programs to address wood smoke in order to reduce particulate matter in the air. Programs such as wood heater replacement, The *Don't Burn Tonight* campaign and changes to legislation and crown leases conditions in East O'Malley and Dunlop limiting solid fuel fires, have helped reduce particulate matter in the air. Further, despite an increase in vehicle numbers, national pollution control legislation for car exhaust emissions is perhaps contributing to the reduction in carbon monoxide in the ACT air shed.

As identified in the previous SoE Report, limited action has been taken with regard to indoor air quality. For example, legislation has been put in place, banning smoking in public buildings and licensed premises. It is reasonable to assume that this has greatly improved indoor air quality for many people by reducing a source of pollution. Little else has been progressed to improve knowledge or management of indoor air quality.

How can we improve?

Given that we spend a significant amount of time indoors, better knowledge of our indoor air quality is needed.

9. *To improve knowledge of our indoor air quality, the Chief Health Officer should consider the health impact of indoor air quality in the ACT in the 2014 Chief Health Officer Report.*

As our urban footprint increases, undertaking air assessments for all new greenfield developments and aligning planning, development and air quality measures would ensure the identification and management of potential future air pollutant issues. Mobile monitoring and measuring ambient air quality at hotspots such as intersections should be investigated. This has also been recommended in the previous SoE Reports.

During the reporting period, the ACT population increased, thus triggering the requirement for a second outdoor air performance monitoring station for reporting, under the NEPM (EPA 2010). Until a second ambient air quality NEPM performance monitoring station can be established, data from the Civic performance monitoring station, though not ideally located, will be used for annual report purposes.

10. *Improve local air quality outdoors through:*

    a. *requiring air quality assessments in all new greenfield developments, to identify and manage air emissions, potentially detrimental to human health and the environment;*

    b. *installing and operating a second performance air monitoring station to ensure that the ACT is compliant with NEPM standards; and*

    c. *determining the feasibility, including costs, of mobile monitoring of appropriate ambient air quality NEPM standards at locations in and around Canberra.*

Source: ACT Government

Climate

What has changed?

Only greenhouse gas emission levels and energy use have been reported in the previous SoE Reports. Although previous recommendations regarding the completion of climate change strategies have been largely implemented, atmospheric levels of global greenhouse gases are continuing to increase, both globally and locally. This will directly impact our environment significantly and indirectly impact our economy and society.

Electricity produced by burning fossil fuels remains the largest contributor to greenhouse gas emissions in the ACT, followed by natural gas and transport fuels. It is clear that significant emission reduction efforts need to focus on these sectors. The total share of our electricity sourced from renewables has increased from 4.6% at the end of the last reporting period to 8.94% in 2009–10 (ORER 2011, ICRC 2011b). This includes renewable energy sourced as part of the Australian Government renewable energy targets requirements as well as GreenPower, which is purchased voluntarily by households, businesses and other organisations. Nonetheless, GreenPower continues to contribute less that 5% of ACT's energy use (ICRC 2011a).

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.

Long term trends indicate an increase in our greenhouse gas emissions of over 30% since 1990 and more than 5% since 2005.

Challenges

ACT greenhouse gas emissions continue to rise and as of 2009–10, 91% of electricity sold in the ACT is still sourced from non-renewable energy sources (ORER 2011, ICRC 2011a). Without significant change in the way we use our resources, future predictions of a growing and ageing population in the ACT is likely to increase demand for the goods and services that produce greenhouse gases. Further, these population predictions will also place additional strain on our resources such as water, medical and other services, under the constraints brought about by climate change. There is therefore an urgent need for action at all levels – locally, nationally and globally – to manage greenhouse gas concentrations and their potential impacts.

Small changes in average values of climatic parameters, such as temperature and rainfall, can lead to large changes in the frequency and intensity of extreme events such as heatwaves, storms and fires. Further, climate change is likely to bring additional pressure to the Territory's water resources and biodiversity, and may significantly change the patterns of bushfire and extreme weather events. These in turn will have direct negative impacts on our health, biodiversity, food availability and other indirect impacts on our society such as higher prices for food, building damage, flood and fire.

How are we responding?

The ACT Government has legislated ambitious targets to reduce greenhouse gas emissions in the ACT and increase the use of renewable energy (ACT Government 2010). However, 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 the path to meet these targets.

In addition, in 2007 the ACT Government committed to achieving carbon neutrality in its own buildings and services. It is of concern that the framework to achieve this target is not expected to be released until 2012, four years after the commitment was made.

The first action plan under *Weathering the Change* (the ACT Climate Change Strategy), focused primarily on actions to reduce emissions. However, reducing emissions cannot be done quickly; for example, it will take decades to achieve significant change in the energy efficiency of housing, infrastructure and building in the Territory.

While efforts to adapt to these potential changes are occurring in the ACT, these endeavours have mostly been focused on building knowledge and understanding the potential impacts. However, adaptation actions have been undertaken in response to other events, in particular in relation to water security and the natural environment.

Source: ACT Government

How can we improve?

It is acknowledged that work is being done to encourage emission reduction by government and the wider community and that business and community must play a role in reaching the ACT wide targets. However, there needs to be a framework to effectively measure and evaluate progress. This may include targets for key sectors contributing to emissions – transport, electricity, waste, with transport and older housing stock being a particular focus. Such targets, measures or actions will need to be integrated into relevant policies and plans.

11. *As a priority the ACT Government develop and implement pathways to achieve carbon neutrality in ACT Government buildings and services. These should be implemented through the second Action Plan of Weathering the Change and include monitoring, evaluation of actions and annual public reporting on progress.*

12. *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 our buildings (especially improving energy efficiency of old building stock);*

    b. *responsive regulatory, governance and investment arrangements for renewable energy;*

    c. *continued engagement with ACT community; and*

    d. *regular monitoring, evaluation of actions and public reporting on progress against the targets.*

Futures impacts from climate change and climate variability are likely to be more prevalent in the ACT. Much of the vulnerability work has been done in the water and emergency services sector and, more recently, in development planning and health areas. These areas remain important for further focus and additional areas may include disaster and emergency management; natural resources; human settlements; infrastructure vulnerability and protection and tourism and recreation. Many climate change issues and responses have elements in common with the broader sustainability agenda and there is potential for climate change responses to align with, or leverage off, existing approaches (Rotstein and Webb 2009). Planned adaptation and government coordination are a significant challenge in implementing a response to climate change in the ACT.

13. *Develop a 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;*

    c. *integrating adaptation planning outcomes into existing ACT planning and management frameworks.*

Climate change impacts are not limited by jurisdictional boundaries. Much will need to be done across the region to adapt to climate change. Climatic and environmental conditions of the Australian Capital Region are highly suited to a number of renewable energy industries. The ACT Government, working with the NSW Government, regional development authorities and local councils, could develop this region into a leader in renewable energy.

14. *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.*

People

What has changed?

Our urban area continues to increase with both greenfield and infill development continuing to grow, although this increasing densification is not embraced by all Canberrans. While the implementation of the Housing Affordability Strategy continues as recommended in the 2003 SoE, housing affordability remains a challenge.

The modest shift away from private car use seen in the last reporting period has not continued. Despite high cycling and walking rates compared with that of the other Australian cities, the ACT continues to rely heavily on motor vehicles for transport with the public transport being under-utilised despite fleet, timetabling and route improvements. Recommendations from the 2007 SoE have only been partially implemented with, targets and plans relating to greenhouse gas emission from transport and delays in the development of the *Sustainable Transport Action Plan (2010–2016)* (recently re-titled *Transport for Canberra 2011–31*) being of particular concern.

We continue to generate waste at a faster rate than population growth. The decrease in waste to landfill seen in the 2003 and 2007 SoE Report has been reversed in this reporting period with the increase driven mainly by construction and demolition and commercial and industrial waste. As recommended in the 2007 SoE, public place recycling, business waste reduction programs and e-waste actions have been progressed. However, recommendations regarding organic waste collection, promoting waste minimisation and waste minimisation/avoidance action plan have not been implemented.

Progress has been made in heritage legislation noted in 2007, though it is yet to be finalised. Identification and management of Aboriginal heritage places and objects has improved since the 2003 SoE.

Government and community response to dealing with natural hazards in the wake of the 2003 bush fires has been significant.

Across all reporting periods, ACT residents continue to be concerned about the environment. However, this does not always translate into action, particularly around consumption and transport use.

Waste generation per person has increased by 28% over the reporting period and population by 5.5%.

Since 2007–08, the number of registered heritage places or objects has increased by nearly 27%.

Passenger vehicles accounted for 84% of all motor vehicle registrations in the ACT, which was the highest of any state or territory in Australia; although cycle rates continue to increase.

Canberra has been ranked as the 26th most liveable city by the 2010 Mercer Worldwide Quality of Living Survey.

Over the reporting period 72% of new development was in Greenfield sites.

While awareness of GreenPower in the ACT is 66%, the percentage of people who actually purchase GreenPower in the ACT is 4.9% indicating that awareness and action do not always correlate.

Between 1974 and 2003 Canberra experienced an average of 23 days of very high' or 'extreme' fire danger. This is predicted to increase to 36 by 2050.

Source: ACT Government

Challenges

One of the key management challenges for the ACT is improving the sustainability of the city of Canberra in the face of a growing population. A sustainable city is arguably one where residents have access to appropriate and affordable housing, proximity to work and recreational opportunities along with community facilities such as schools, shops, medical and other services. Integration of, and accessibility to, the natural environment is fundamental to improvement of the sustainability of the city's urban form, while also increasing environmental awareness and stewardship. Furthermore, a sustainable city offers an integrated transport network, allowing people to move between energy efficient residential and commercial buildings. Benefits of sustainability should be shared by all members of society, in particular those more vulnerable to the potential impacts of infrastructure costs and changes. Currently, Canberra's public transport remains under-utilised, with per capita usage rates barely half those of two decades ago, despite significant action and investment in public transport during the reporting period. Of particular concern is the recent work indicating that greenhouse gas emissions from the transport sector are still projected to increase to 50–60% above 1990 levels by 2020 (ICRC 2011a, Heuris Partners 2010)[1], even if the *Sustainable Transport Plan* targets are achieved.

The Government is struggling to meet the demand for affordable land and housing. In addition, increased land release and development has significant impacts on ecosystems and natural resource in the ACT and currently this is not effectively measured and monitored. A growing city and population requires the provision and maintenance of community services and facilities, public amenity, open space and recreation areas. This will be a challenge for government and community. Currently, our relative wealth and consumption continues to drive an increase in the ACT's urban growth and ecological footprints and waste generation. The co-location of employment, essential recreational and ancillary services, along with residential developments in town centres will need to be core components in efforts to increase the sustainability of the city while reducing carbon emissions and overall environmental impact. However, the share of development occurring within 7.5 km of the city decreased steadily over the reporting period, to 28.5% in 2009–10; well below the 50% target set out in the *Canberra Spatial Plan* (ACT Government 2004).

1 Calculations based on ICRC transport emissions data from the 2009 Greenhouse Gas Emissions Inventory (ICRC 2011a) 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 2009).

The close proximity of bushland reserves to urban areas of ACT brings challenges, along with benefits. The health benefits provided by green spaces include positive physical, social, mental and spiritual health outcomes. However, managing this large area of open space with limited resources is challenging. Further, the close proximity of urban areas to bushland reserves and hilly terrain increases the risk of bushfire impacts on our urban area. Finally, extreme events such as storms and fires are also likely to increase in frequency and intensity in the future as a result of climate change impacts.

How are we responding?

The design and use of our urban areas and infrastructure, and our parks and open space, can significantly affect the quality of the environment. Community engagement and awareness in environmental issues can also have significant impacts on our overall level of resource use and waste generation. During the reporting period, the ACT Government has introduced or continued a number of frameworks, policies and initiatives including:

- release of the *Strategic Public Transport Network Plan*;
- five-year infrastructure program *Building the Future* which provides guidance and direction for the development of the first ACT *Infrastructure Plan*;
- water, waste and energy efficiencies programs for business and industry, schools and community as well as temporary initiatives at public events;
- free heritage and architectural guidance provided by the Heritage Advisory Service to owners and potential buyers of heritage buildings on renovating or extending a heritage home; and
- The *Strategic Bushfire Management Plan for the ACT.*

While the interaction of resource use, urban design, and green infrastructure is complex, this complexity can be managed through a strategic, ongoing approach to sustainability that integrates the protection of our natural environment, the development of our city and the enhancement of our wellbeing. The *Spatial Plan* of the city is currently under review and will need to reflect the growing demands of ACT residents with the need for such sustainable development.

ACT residents also play a significant role in managing and protecting our environment with a high number of community groups involved in environmental programs in areas ranging from biodiversity conservation and water quality to renewable energy, climate change and sustainable food and gardening.

How can we improve?

A consolidated mix of greenfield and infill development is an important part of providing affordable and diverse housing options, and for increasing population densities in the ACT. As noted there is some concern voiced about altering the landscape character of the city through increasing height and plot ratios associated with densification. If we are to progress sustainability those concerns need be acknowledged and included in future decisions for the form of our city. There is an opportunity for the government to engage with the public through fora such as "Time to Talk" with the objective of improving sustainability through population densification

The city's environment, liveability and amenity depend in considerable measure on accessible open space and green infrastructure that provides passive ecosystem benefits. While Canberra's urban trees, parks, waterways and public open spaces are a major asset, they are also a management challenge.

15. *Finalise and implement the draft ACT Planning Strategy to provide an integrated approach to future landscape planning. Particular attention should be paid to:*

    a. *determining indicators and measures for urban quality in the ACT that includes the benefits provided by green infrastructure and access to open space; and*

    b. *developing greenfield and infill targets, which take into account both the need for public open space and the passive benefits of green infrastructure, as well as strengthening a sense of community and self containment.*

Future population growth and demographic changes will lead to an increased demand for housing, government and other services. More flexible options in various forms of housing will be needed to suit the diverse needs of young families, Canberra's large student population, older people and one-person households.

16. *Develop adaptable housing strategies to address the needs of changing population demographics into the future.*

Despite actions that have been undertaken by ACT Government and the large increases in operating costs, Canberra's public transport system has seen little improvement in patronage in the short-term, while comparisons with long-term trends indicate that usage per person remain barely half that observed two decades ago. The transport sector is the second largest contributor to the ACT's greenhouse gas emissions; a share that is expected to increase. A lack of current data, particularly regarding non-work travel, further restricts our capacity to understand travel behaviour in the ACT. Urgent, evidence-based actions and policies are therefore needed in order to encourage a shift to more sustainable transport options.

17. *Finalise and implement the draft Sustainable Transport Action Plan to provide an integrated approach to transport and urban planning. In doing so:*

    a. *obtain additional non-work related travel data, similar to the annual Sydney Household Travel Survey, to ensure a more complete understanding of Canberra's transport habits;*

    b. *focus on strategies and targets to improve access to sustainable forms of transport outside of transport corridors;*

    c. *develop targets for;*

        i. *reducing greenhouse gas emissions from transport;*

        ii. *increasing sustainable transport usage for non-work travel to complement the existing targets for work travel; and*

    d. *track progress towards Sustainable Transport targets on an annual basis.*

Waste generation and waste to landfill continue to increase. Construction and demolition as well as commercial and industrial wastes have been largely driving this increase and along with organic waste should be diverted from landfills. The link between our ecological footprint, consumption and waste generation is not well understood and further work and broader understanding of the issue is needed to help the Canberra community make more informed consumption choices.

18. *Finalise and implement a new ACT Waste Management Strategy with a focus on reducing waste generation; in particular:*

    a. *examine and implement options for diverting wastes from landfill to higher order beneficial reuse opportunities. These actions should be measured, recorded and reported publicly.*

    b. *focusing community education on the link between consumption and waste; and*

    c. *targeting specific programs to reduce waste from the construction and demolition sector, and commercial and industrial sectors.*

There is a large backlog in processing relating to the ACT Heritage Register. Heritage places and objects in the ACT are at risk because of limited funding for registration and for management of the pressures of development. The Marshall Report (Marshall 2010) found that audit, compliance and enforcement are weak elements of the Heritage Act. In February 2012 the *Register of the National Estate* becomes obsolete potentially placing the protection of some ACT heritage sites at risk. Housing from the post-war boom period of Canberra's growth are common subjects of renovation and replacement. Some of these buildings, although worthy of nomination, are under threat.

19. *Strengthen heritage protection in the ACT by:*

    a. *developing an action plan for heritage which addresses the backlog of heritage nominations and recognises key future places for protection;*

    b. *strengthening audit, compliance and enforcement processes in line with recommendations of the Marshall report;*

    c. *developing a memorandum of understanding with the Australian Government to protect assets, subject to Australian Government planning approvals, on the ACT Heritage Register;*

    d. *promote ACT heritage values as a part of the Canberra 2013 Centenary celebrations.*

Many of Canberra's urban elements are close to, and inclusive of many of the natural features of our landscape such as bushlands, reserves and waterways that provide risks from fires, floods and storms.

20. *Align and integrate climate adaptation planning and disaster risk management where appropriate. This should include lessons learned from changes to fire management.*

21. *In collaboration with NSW Government and local councils, develop a regional approach to planning and risk management to address future challenges of population and climate change.*

ACT residents have a relatively high level of concern for and involvement in protecting the environment. They engage in regeneration, protection and research activities, demonstrating their commitment over long periods of time and across multiple projects. However awareness in regards to sustainable transport, renewable energy and the impacts of consumption are not necessarily reflected in actions.

22. *Strengthen community engagement in sustainability by:*

    a. *undertaking research on attitudes to sustainability and consumption patterns and behaviours. This could be done through regular, comparable, community surveys similar to the annual NSW Who cares about the environment? with the outcomes informing focus areas for community engagement.*

    b. *foster behavioural change through community engagement to reduce our ecological footprint with a particular focus on:*

        i. *sustainable transport; and*

        ii. *impacts of consumption.*

Data

As has been identified in previous SoE reports, the lack and sometimes inadequacy of relevant data is an ongoing challenge for not only reporting but also for the effective monitoring and management of the ACT environment. Good environmental management requires good data in order to produce, and improve on, evidence-based strategies.

Currently key datasets are missing or incomplete, including indoor air quality sampling, assessments of the effectiveness of emissions reduction measures, data on land use changes including erosion, soil salinity and acidity, vegetation quality and cover changes, non-work related travel data, and consolidated habitat loss across ACT and thresholds for habitat loss.

Further, there is a lack of alignment between Australian Bureau of Statistics' *Census of Population and Housing* and ACT SoE Reporting cycles. For example, the Census provides valuable information on changes to the ACT community. The 2011 census data will not be available until mid 2012, resulting in this report relying on 2006 census data, pre-dating both the reporting period itself, and many of the current ACT government policies and management objectives. This problem is likely to be faced again in the next reporting cycle.

For its size, the ACT has an exceptionally high capacity to collect data and conduct research, with world-class research institutions, globally-recognised experts across national and local government institutions, numerous non-government organisations and a community highly-engaged in monitoring and environmental advocacy. Thus, in order to ensure efficient research and enhance planning and policy processes, there should be continued efforts to provide access to information, co-ordinate research and facilitate collaboration both between these institutions, and with members of the wider community in order to raise public awareness of environmental issues.

A strategic monitoring, evaluation, reporting and improvement framework is needed to ensure that data from all parts of government are brought together to create a more holistic picture of environmental changes in the ACT. Such a strategy should co-ordinate and integrate the current knowledge and research, existing government and non-government skills and programs and focus on periodic reporting. Information-sharing mechanisms would also benefit from a centralised data repository, reducing repetition of monitoring, fragmented understandings of interconnected environmental issues and streamlining resourcing. This would require a dedicated position to consolidate and provide access to information and facilitate collaboration and integration between government and research/academic institutions across disparate fields to undertake research, teaching, planning and practical projects to enhance sustainability relevant to the ACT and Region.

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