COMMISSIONER FOR SUSTAINABILITY
AND THE ENVIRONMENT

IMPLEMENTATION STATUS REPORT ON ACT GOVERNMENT'S CLIMATE CHANGE POLICY

September 2017

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Foreword

PROFESSOR KATE AUTY, COMMISSIONER FOR SUSTAINABILITY AND THE ENVIRONMENT, ACT

Complacency in the face of climate change will lock in dire local and global outcomes. Scientists, social scientists, practitioners, thoughtful and purposeful governments, and the community know this. Every new report released on climate change implications reinforces these concerns.

CSIRO and BOM, our pre-eminent Australian research organisations, tell us that Canberra will have significantly more days over 35 degrees Celsius by 2030 as a function of climate change. Of concern, the hot days in Canberra '*have already exceeded the earlier 2030 projections*'.[1]

By 2050 it is expected that there will be an increase in Forest Fire Danger Index of up to 30 per cent.[2]

The need for ongoing commitment to climate change mitigation and adaptation actions is an imperative for government.

Sub-national governments like the Australian Capital Territory have assumed responsibility and have been rising to the challenges with regulation, policy, community engagement, and the active cultivation of business partnerships. The ACT is regarded as a 'front runner' in the Australian context, committing to 100 per cent renewables by 2020 and net zero emissions by 2050. This has been a bipartisan commitment. The Climate Council has recently observed 'the ACT's leadership ... shows the positive impact one small territory can have in a few short years with political will and smart policy design'.

This audit examines the climate change actions taken by the ACT Government over the last three years. We provide some expert commentary about what is now needed, from people who live and work in the ACT, and we consider some of the potential opportunities.

This is not the time to push the pause button.

I commend the ACT Government for the work which is presently being undertaken to develop the *Climate Challenge* strategy to 2050. Highly focused and auditable actions have never been more urgent.

Recommendations of this review are found at pages 43 and 54-55. Further actions to consider in the development of climate change policy are found at the end of each chapter.

1 CSIRO and BoM, 2016: *State of the Climate 2016.*

2 Lucas C, Hennessy K, Mills G and Bathols J, 2007: *Bushfire weather in southeast Australia: recent trends and projected climate change impacts.*

1. Introduction

"Far from being a dampener on growth, integration of climate change can have a positive economic impact. There is no economic excuse for not acting on climate change, and the risk is high."

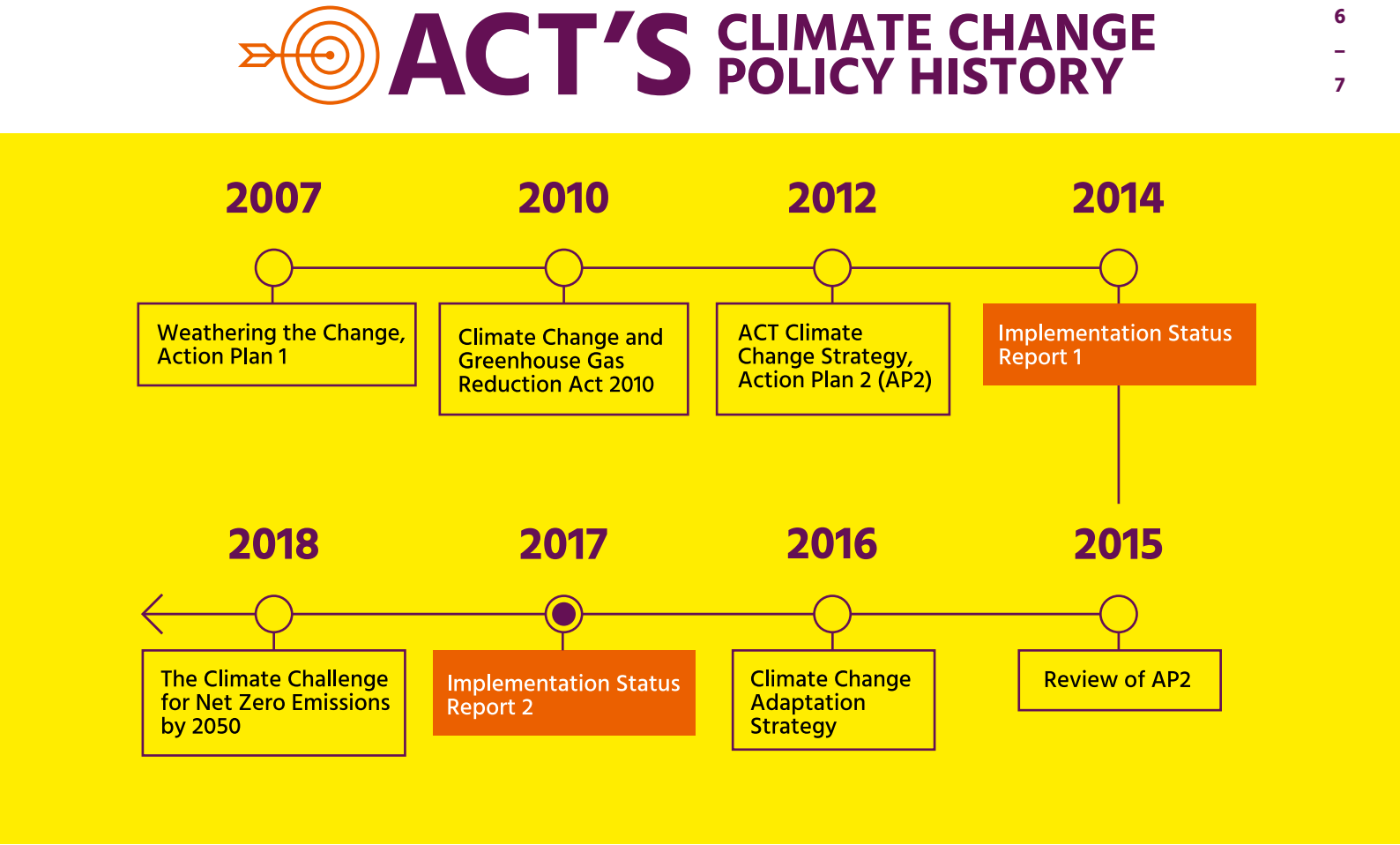
OECD Secretary General Angel Gurria

A Brief History

AP2: a new climate change strategy and action plan for the Australian Capital Territory (AP2) is the second ACT plan to address the urgent challenge of climate change. *AP2* considers social, economic and environmental issues in its implementation actions.

AP2 followed *Weathering the Change* and will be replaced by a *The Climate Challenge for Net Zero Emissions by 2050* in 2018. Consultation about the development and direction of the proposed *Strategy* has begun.

The *ACT Climate Change Adaptation Strategy* was released in 2016 and the *Climate Challenge* will look to incorporate both mitigation and adaptation actions into the holistic climate change strategy to 2050.



ACT's responsive targets – 2016

In 2016 the ACT Government amended legislated greenhouse gas targets to be even more ambitious and align with the intent of the Paris Agreement. The current targets are:

- 40 per cent reduction in greenhouse gas emission on 1990 levels by 2020,
- 100 per cent renewable energy by 2020, and
- zero net emissions by 2050.

Implementation Status Report

AP2 committed to comprehensive, timely and transparent reporting. There were 18 actions in *AP2* and a further 3 actions have been reported in progress reports as supporting actions to *AP2*.[1]

In Action 18, the Territory committed to publishing *Implementation Status Reports* in 2014, 2017 and 2020. The *Office of the Commissioner for Sustainability and the Environment (*OCSE) has received a Ministerial direction to undertake these reports.

This is the second report to be undertaken by OCSE.

Opportunities outlined in the first report have been accepted and addressed by the ACT Government.

These interventions included:

- updating business as usual modelling,
- linking to the *Greenhouse Gas Protocol Mitigation Goals and Accounting Standard*[2] when developing policy,
- alignment of sectors, and
- addressing the time lag in obtaining the greenhouse gas inventory.

Approach to this Report

The objective of this report is to provide an independent audit of the implementation status of *AP2* and ensure that outcomes are effective and evidence based.

TERMS OF REFERENCE

Ministerial Terms of Reference (February 2017):

By 30th September 2017, the Office of the Commissioner for Sustainability and the Environment (OCSE) will audit and report on the status of actions under *AP2*.

The OCSE will define whether actions are completed, ongoing, modified or subsumed through separate policy mechanisms.

The OCSE will report on how the Territory is tracking on greenhouse gas emissions reduction, and towards our greenhouse gas reduction targets.

The OCSE will provide the audit report to the ACT Minister for Climate Change and Sustainability and will make the report accessible on the OCSE website.

The ACT Government will table a response to the audit report within the next scheduled Minister's annual report under the *Climate Change and Greenhouse Gas Reduction Act 2010* in compliance with the Minister's reporting requirements for Special Reports under s21(2) of the *Commissioner for Sustainability and the Environment Act 1993*.

1 ACT Government, 2016:*Climate Change Action Plan 2 August 2016 Implementation Update*
2 http://www.ghgprotocol.org/mitigation-goal-standard accessed 1 June 2017

In this report the OCSE builds on previous reports and assessments and provides relevant, effective and robust input into the review of *AP2*. The focus is on reporting periods 2014–15 and 2015–16.

To address the Minister's Terms of Reference, recognising the magnitude of the climate change challenges which we face, this report includes the following:

- outcomes of a performance audit of the actions in *AP2* actions,
- commentary on actions that are noted as 'of concern',
- outcomes of an audit of the greenhouse gas emissions inventory and associated reporting,
- commentary on supporting actions to *AP2* including Carbon Neutral Government and Social Equity goals, and
- commentary about matters
  - where 'material volume' in terms of emissions is a concern,
  - which are considered complex in nature, and
  - which have been subsumed into broader strategies.

The Outlook – ACT leadership and the climate science

At the time of establishing *AP2* (2012) the Australian Capital Territory was a clear leader in the field of climate change action in Australia and our interventions have received international commendation.

The ACT Government won the *Carbon Disclosure Project (CDP) Australian Climate Leadership Award 2016* for *Best Renewable Target by an Australian City*. CDP highlighted the ACT's "*climate leadership and its dedication to climate change action, renewable energy and the sustainability of Canberra and the ACT.*"[3]

One of ACT's Solar Farms at Royalla. Source – Allan Sharp, Flickr

We are amongst many who are actively and assertively responding to the climate change challenge. This is discussed further in Chapter 2 of this report.

Recent scholarship from Dr Malte Meinshausen[4] and many international scholars and climate change research organisations clearly demonstrate the link between human activity and greenhouse emissions. They recognise the reliance upon government interventions to reduce the risk of catastrophic climate change.

Since the time of establishing *AP2* the urgency around climate change action has risen. The reality of successive years of extreme weather has been recognised globally and locally. So, whilst we can be proud of the ACT's achievements to date, we, as members of the international and ambitious sub-national government community, accept that we can always do more.

Climate Change Activists outside Parliament House Canberra. Source 350 Org, Flickr

3 http://www.psnews.com.au/act/532/news/renewable-energy-targets-score-award

4 University of Melbourne, CSIRO, The Bureau of Meteorology, National Oceanic and Atmospheric Administration, Advanced Global Atmospheric Gases Experiment, Scripts Institution of Oceanography, 2017: *Key greenhouse gases higher than any time over last 800,000 years*

Global change, local impacts

Dr Sophie Lewis, Senior Lecturer, Fenner School of Environment and Society,
ARC DECRA Fellow, Australian National University

CANBERRA'S CHANGING CLIMATE

For over 200 years scientists have known that adding carbon dioxide from human activities to the atmosphere will increase global temperatures. Substantial and rapid increases in the concentrations of carbon dioxide and other greenhouse gases have been measured over the period since. The expected corresponding increases in temperature have been recorded. The 10 hottest years on record have occurred this century. 2016 ranked as the hottest year ever recorded at 0.99 degrees Celsius above average. ***This is climate change***.

While scientific understandings of the role of human activities in climate change is now incontrovertible, the actual impacts of climate change on Canberra might still seem insignificant, or might seem like a concern to be dealt with in the future. However, for temperatures across the whole globe to set new records in 2014, 2015, and 2016, many locations must experience long periods of hot temperatures. ***We are already experiencing climate change.***

Australia is one location contributing to global record-breaking temperatures.

Since the Bureau of Meteorology began keeping high quality weather records in 190, Australia's climate has warmed by 1 degrees Celsius on average. This seemingly small increase in average climate can result in a very large change in the occurrence of extreme weather and climate events. ***This effect has already been observed in Australia.***

Across Australia, we are experiencing rapid climatic change. There has been an increase in the duration, frequency and intensity of extreme heat across Australia. A study of record-breaking temperatures in Australia showed that new hot temperature records are now being set *12 times more frequently* than new cold temperatures. The intense hot weather of the recent decade has already exceeded the temperatures that were projected for 2030. ***Many extremes have already occurred in Canberra.***

CLIMATE CHANGE IMPACTS ON CANBERRA

- In January 2017, only five days in Canberra were cooler than average, and overall Canberra experienced its hottest daytime temperatures on record.
- In 2016, Canberra set a record for the longest March heatwave.
- In 2015, Canberra recorded its hottest October ever.
- In 2014, Canberra set a record of four consecutive days above 39 degrees Celsius.
- In Canberra, night-time temperatures are warming more rapidly than daytime temperatures, leading to a significant decrease in frost days.
- In Canberra, there has been a doubling in the number of heatwave days since 1950, together with an increase in the intensity of heat on those days.

Scientific studies have linked these extremes to climate change. The January 2017 record temperatures in Canberra were three times more likely because of climate change and the October 2015 temperatures were four times more likely for the same reason.

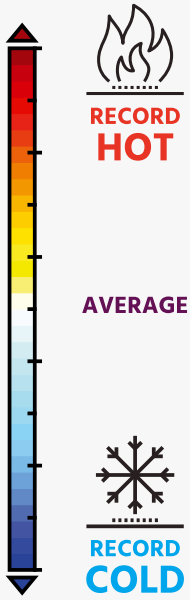
Increases in hot temperatures in Canberra, together with a decrease in cold temperatures, might still seem insignificant, or (for some) even desirable. However, changes in the frequency and intensity of extreme weather and climate events are associated with severe impacts, including on human health, industry and damage to ecosystems. These are occurring now and not just in the future. ***Canberra is already at risk from increases in the severity and frequency of climate extremes.***

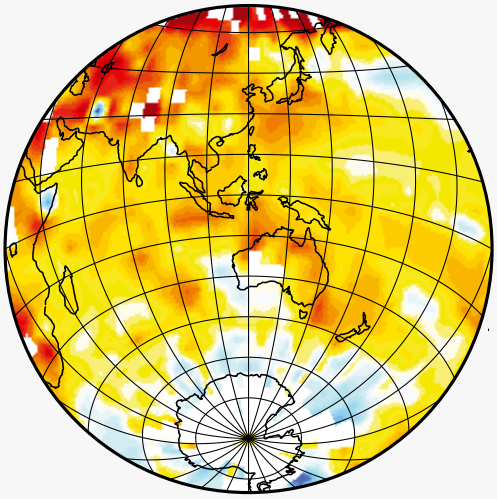
Over the period since 1970, there has been an increase in extreme fire weather, which is occurring during a longer period throughout the year in Australia. During the 2017 heatwaves in Canberra and southeast Australia, a bushfire in Carwoola razed 11 homes and caused tragic loss of life. While the bushfires have not yet been examined scientifically, the heatwaves were more likely because of climate change. An increase in the intensity and severity of heatwaves is also an established risk to human health. The February 2009 heatwaves in Victoria were associated with catastrophic and deadly bushfires, even as the heatwaves themselves were a greater threat to human life than the fires. ***Climate change is not a problem of the future, but a concern for Canberra now.***

While Canberra has already experienced some impacts of climate change, increasing greenhouse gas emissions are projected to cause further global warming and more severe local impacts. Current record-breaking extreme temperatures in Australia are projected to be considered mild or even cool within two decades, due to climate change. Even more severe weather and climate conditions, further excess heat-related deaths and severe bushfires should be expected. ***Further warming will increase the impacts of climate change on extremes.***

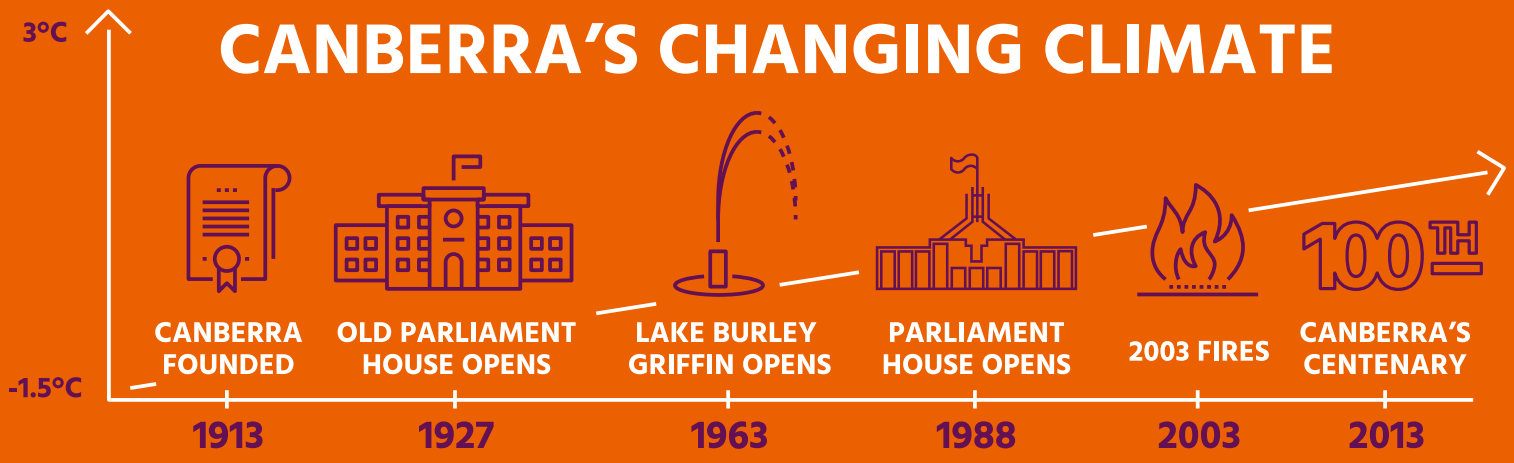
Just as the impact of the global problem of climate change can seem difficult to view at the local scale in Canberra, local solutions can be difficult to appreciate at global scales. The ACT has already started embracing policies for Canberra's future that consider climate change, including for our built environment, energy generation and transport systems. These and further climate-conscious policies that plan for and adapt to future climate change will benefit Canberra, its inhabitants and natural environment. ***Local actions taken here in Canberra also make an important contribution to reducing our global problems.***

GLOBAL CHANGE – LOCAL IMPACT





CANBERRA'S CHANGING CLIMATE



CANBERRA IMPACTS

INCREASE IN EXTREME TEMPERATURES

INCREASE IN SEVERITY, FREQUENCY, INTENSITY OF HEATWAVES

INCREASE IN SEVERE FIRE WEATHER

DECREASE IN WINTER RAINFALL

DECREASE IN COLD WEATHER AND FROST DAYS

INCREASE IN HEAT STRESS AND HOSPITAL ADMISSIONS

Structure of this report

This report includes the following chapters:

- ***The Global Arena*** – this section discusses national and global momentum and action on climate change, reflecting on the important role of sub-national Governments to establish current context.
- ***Action Plan 2 Audit Outcomes*** – this section reports the status of the 18 actions in *AP2* and presents key findings and recommendations.
- ***Monitoring Emissions Towards Carbon Neutrality*** – this section includes outcomes of the audit of the ACT greenhouse gas inventory and analysis on the Carbon Neutral Government Framework.
- ***Community Engagement*** – this section presents leading edge approaches to community engagement to inform future policy.
- ***Social Equity*** – this section discusses a range of factors and the achievement of equitable outcomes.
- ***Transport*** – this section presents a range of opportunities to reduce emissions in the transport sector.
- ***Built Environment*** – this section discusses the opportunity to achieve substantive economic and environmental improvements in the built environment.
- ***Natural Environment*** – this section highlights some of the progress and complexities of supporting appropriate action in protecting our natural environment against climate change impacts.

Generally at the end of each chapter a section titled *Advancing the Plan* has been incorporated. This is where we summarise the key points and suggestions which would facilitate ongoing climate action for the Territory.

2.
The Global Arena

"The 'Davids' are showing the 'Goliaths' how it is done. We cannot, and will not, wait for the Prime Minister of Australia, or the President of the United States to decide that the long term interests of our communities are more important that the interests of the coal lobby. Instead, cities like Canberra are taking action now."

Minister Rattenbury[1]

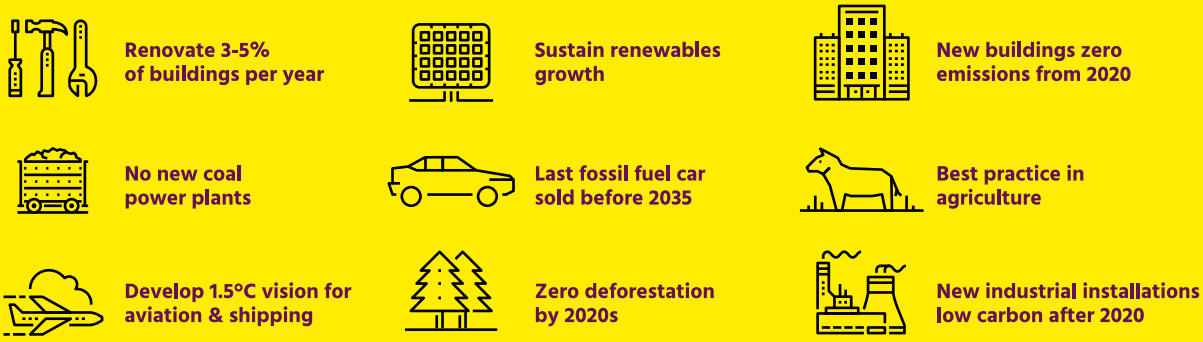
Introduction

Since the first report in 2014, much has changed locally and globally but the ACT's leadership role across a range of sectors stands the Territory in good stead. Whilst Australian federal policy remains uncertain, sub-national governments are taking action as the game changers necessary to address climate change. Like the ACT, city administrations including Adelaide, Brisbane, Sydney and Melbourne, have set themselves goals of reaching carbon neutrality.[2]

Globally, developed and developing countries are taking a united stance against the impacts of global warming. The *Paris Agreement* puts in place pledges by countries to achieve targets that ensure a 1.5 degrees Celsius limit on global warming.[3] Some of the key initiatives recommended by *Climate Action Tracker*[4] to achieve the Paris Agreement are depicted below.

MOST IMPORTANT SHORT TERM

STEPS FOR A 1.5°C WORLD



1 http://www.cmd.act.gov.au/open_government/inform/act_government_media_releases/rattenbury/2016/act-and-cities-lead-global-climate-action accessed 27 April 2017

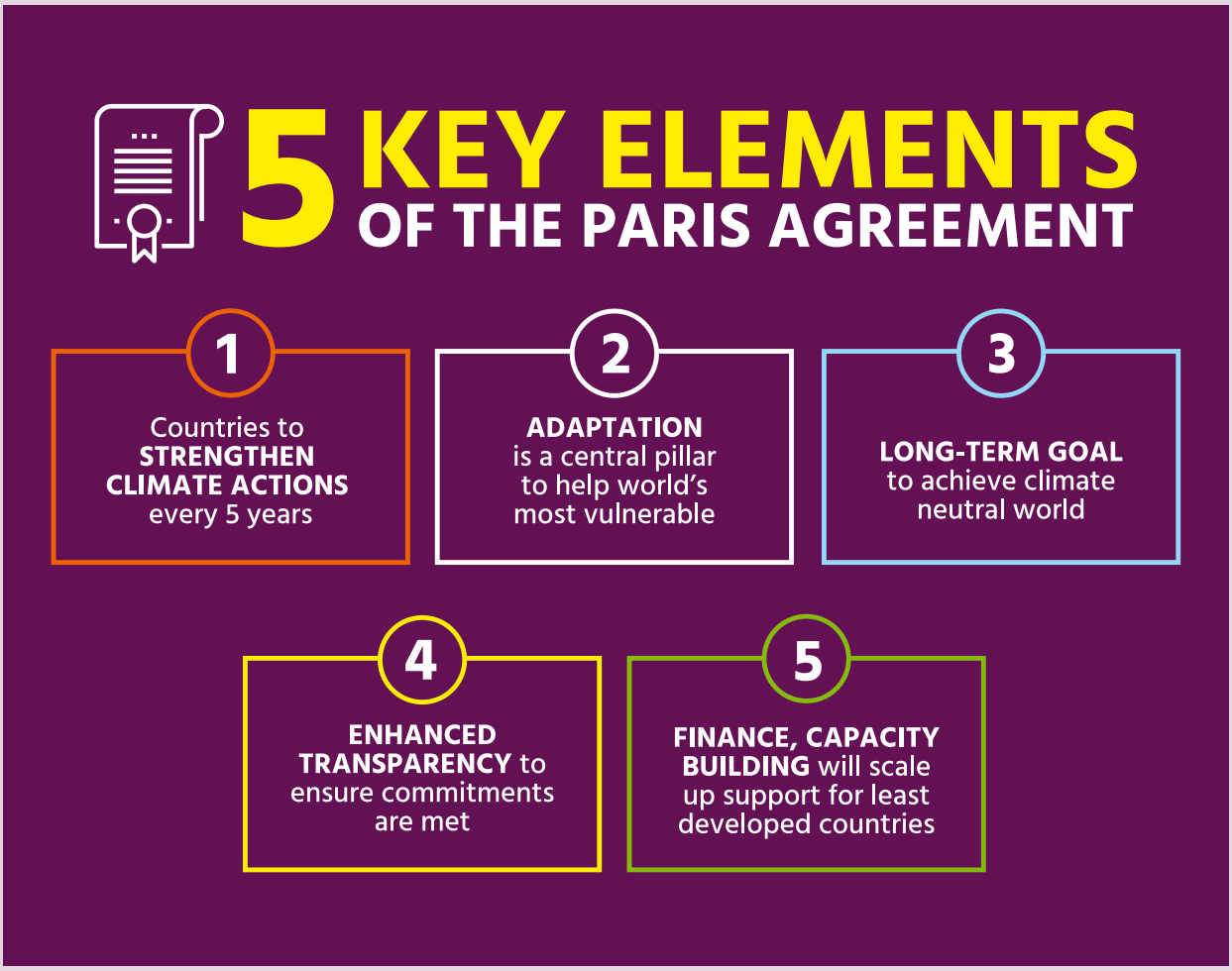
2 Adelaide, https://www.environment.sa.gov.au/Science/Science_research/climate-change/climate-change-initiatives-in-south-australia/sa-climate-change-strategy/carbon-neutral-adelaide; Melbourne, http://www.environment.gov.au/climate-change/carbon-neutral/carbon-neutral-program/accredited-businesses/city-melbourne; Sydney http://www.cityofsydney.nsw.gov.au/vision/towards-2030/sustainability/carbon-reduction/carbon-neutral; Brisbane https://www.brisbane.qld.gov.au/about-council/governance-strategy/vision-strategy/reducing-brisbanes-emissions/carbon-neutral-council accessed on 27 April 2017.

3 Measured against pre-industrial levels

4 www.climateactiontracker.org accessed on 27 April 2017

Fact Box

AUSTRALIA AND THE *PARIS AGREEMENT*



Adapted from: World Resources Institute

Despite the USA departing from the *Paris Agreement*, it remains the first, universal, legally binding climate change agreement. It includes both developed and developing countries. It includes hard carbon reduction targets, with an explicit reference to the ambition to limit global temperature change to 1.5 degrees, and achieving a long term goal of net emissions neutrality.

The five year review process means that countries can only increase their levels of ambition – and accelerate decarbonisation of the global economy. Essentially, the Agreement is more ambitious than anyone thought possible.

In addition to mitigating climate change, the Agreement aims to assist developing countries adapt to the impacts through enhanced financial support.

196 countries signed up to the Agreement in Paris 2015. It came into force on 4 November 2016, thirty days after at least 55 Parties, accounting in total for over 55 per cent of the total global greenhouse gas emissions, ratified the Agreement. The Agreement was ratified by Australia on 9 November 2016.[5]

Australia has set a goal to reduce greenhouse gas emissions by 26 to 28 per cent below 2005 levels by 2030.

5 http://unfccc.int/paris_agreement/items/9444.php

Expert Commentary

The critical role of sub-national and local governments in tackling climate change

Professor David Griggs, Sustainable Development, Monash University (Australia) and Warwick University (UK).

The Intergovernmental Panel on Climate Change (IPCC) has recognised the vital role that sub-national and local governments will need to play in both adapting to and mitigating climate change.[6]

TAKING ACCOUNT OF ADAPTATION

Considering adaptation, the buck stops with local government as they are responsible for taking the decisions that can literally mean life or death for the community that they serve. According to the *United Nations Development Programme* (UNDP) up to 90 per cent of climate change adaptation measures are undertaken by local government. They have the responsibility for including climate change adaptation into development plans, mobilising resources, setting building and land-use regulations and increasing the capacity and willingness of the community to respond.

Both urban and rural areas face particular challenges. With the proportion of people living in urban areas increasing, essentially all future population growth is projected to be in urban areas and Australia is already one of the most urbanised countries in the world with 89 per cent of the population living in urban areas. As the IPCC report *notes* "*a locally-rooted iterative process of learning about changing risks and opportunities, identifying and evaluating options, making decisions, and revising strategies in collaboration with a range of "actors" will be key for climate change adaptation in urban areas*".

However, as a recent Australian Climate Council report "*On the Frontline: Climate Change & Rural Communities*" points out **climate change is likely to worsen the systemic disadvantages suffered by rural and regional communities**, and further widen the gap between rural and urban areas. This is due to the fact that the increase in extreme weather events is disproportionally affecting those in rural areas with serious social, health and economic impacts. However, the report also points out that rural communities are already adapting to the impacts of climate change. Tackling climate change can provide these communities with opportunities, such as investments in renewable technology and the reduced health burden of burning coal.

However, one of the major barriers to adaptation is not physical, financial or a lack of information, but psychological.

The problem is that successful adaptation can be invisible. If the flood levy does its job or people heed the heat alert and stay inside then nobody notices because people's homes were not flooded or people didn't die of heat stress – life goes on. If the adaptation measure is partially successful and fewer homes were flooded or fewer people die the headlines are about the failure, not the success. So even though there are many studies that demonstrate the positive return on investment of adaptation measures, it can be tempting to put off the investment when difficult short term budget decisions have to be made.

ACHIEVING MITIGATION

When most people think of taking action or setting policy to mitigate climate change they think of it as a federal responsibility and this is true in an international and national policy sense. But, as the UNDP points out, more than 70 per cent of climate change mitigation measures are undertaken by local government, and hence, having a co-ordinated approach between federal, state and local governments is critical in meeting greenhouse gas emission reductions targets.

Local governments can drive emissions reductions through the services they deliver, their role as landlords, community leaders and major employers and through their regulatory and strategic functions. Emissions reductions programs can also bring a range of benefits, such as lower energy bills, economic regeneration, job creation, improved health and increased resilience to climate risks.

6 Adaptation and Mitigation are defined in Chapter 3 of this report

Improving energy efficiency is clearly a key area for local government action, but local government planning functions are also a key lever in reducing emissions. It is critical that local governments use their power and influence to:

- enforce energy efficiency standards in new buildings and extensions;
- reduce transport emissions by concentrating new developments in existing cities and large towns and/or ensuring they are well served by public transport;
- work to make renewable energy projects acceptable to local communities;
- plan for infrastructure such as low-carbon district heating networks, green infrastructure and water sensitive urban design; and
- avoid increasing the area's risk to climate change impacts by locating new development in areas of lowest risk.

Local governments can implement sustainable transport programs and promote low carbon vehicles and have an important role in waste prevention and sustainable waste management.

Finally, reducing emissions from local government's own estates is important as it makes a useful contribution to meeting emissions reductions targets and legitimises their wider role in reducing emissions.

TOWARDS A SUSTAINABLE FUTURE

Climate change adaptation and mitigation are critical elements for local governments in ensuring transition to a sustainable future, for their community. But to ensure a sustainable future climate change measures have to be integrated with other social, environmental and economic objectives. These objectives have been enshrined by the United Nations in '*Transforming our World: The 2030 Agenda for Sustainable Development (the 2030 Agenda)*'. It sets out 17 Sustainable Development Goals and 169 associated targets, to be achieved by 2030. The objective is to **end poverty, protect the planet,** and **ensure prosperity for all.**

LOCAL GOVERNMENT RESPONSIBILITY

Local and sub-national governments have the means, the ability, the agility, the resources, the authority and therefore the responsibility to play a leadership role in both adapting to and mitigating climate change. It is vital for the community that they serve and for the global community that they deliver on this grave responsibility.

International context

Changes in the international arena demonstrate the challenges, and determination necessary and further illustrate the role that sub-national and city administrations will play in addressing the issues. The Australian Capital Territory embraced these challenges at an early stage and remained steadfast in its commitment to policy and action.

Brief descriptions of these global developments are provided in the following.

2015 – SUSTAINABLE DEVELOPMENT GOALS – CITY GOALS

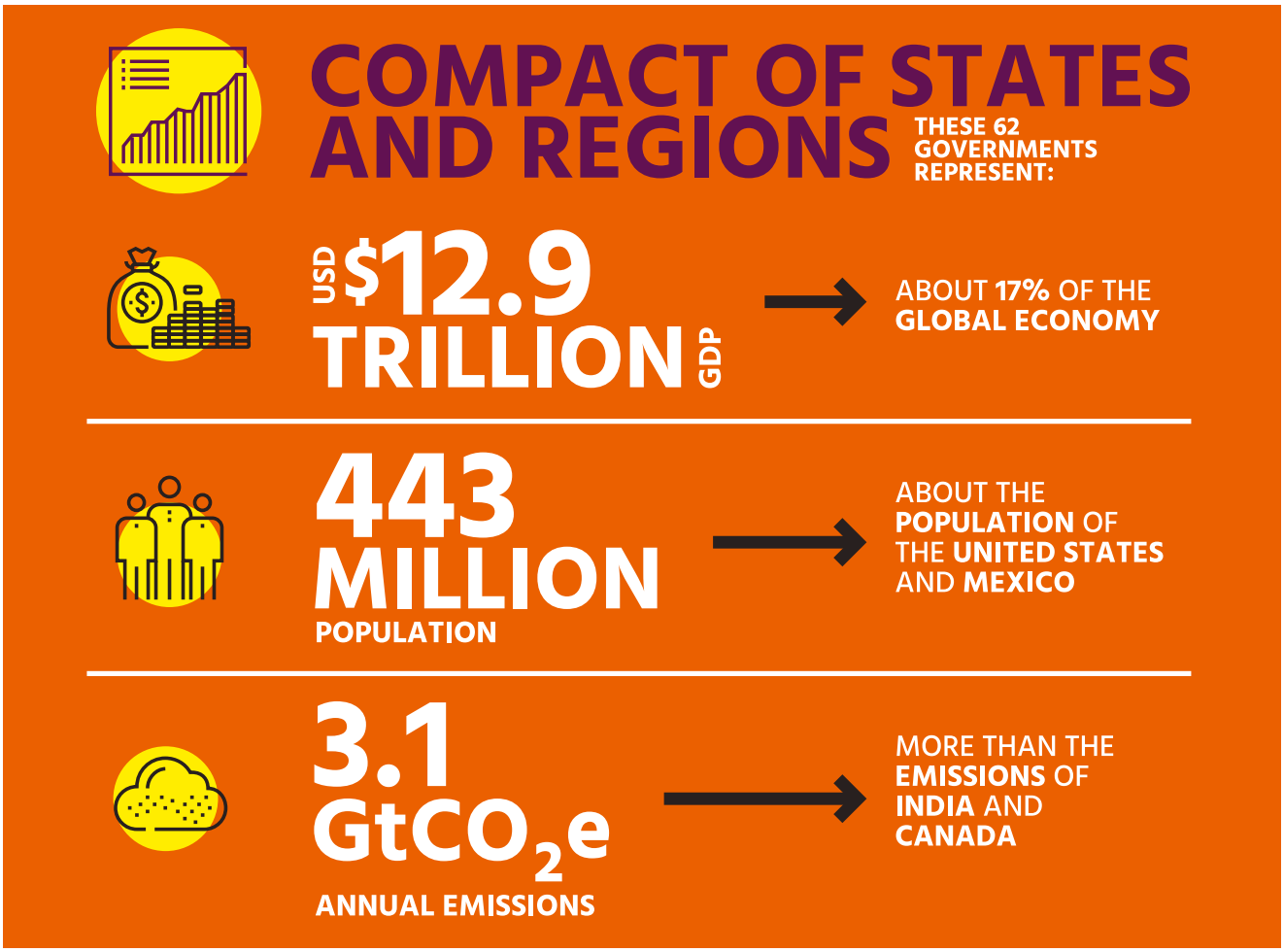
In 2015 the 193-Member United Nations General Assembly formally adopted the *2030 Agenda for Sustainable Development*,[7] along with a set of bold new *Sustainable Development Goals*. Secretary-General Ban Ki-moon hailed them as a universal, integrated and transformative vision for a better world. Of the 17 goals, goal 11 addresses the role that cities can play in responding to climate change by becoming both more resilient and more sustainable.[8]

2015 – WORLD SUMMIT ON CLIMATE AND TERRITORIES – LOCAL GOVERNMENT GOALS

At the World Summit on Climate and Territories, Lyons, July 2015, in the lead up to the COP21 (Conference of Parties), pledges were made by the Compact of States and Regions, sub-national and local governments to respond to climate change challenges. The pledges were to reduce global emissions by 1.5 billion tonnes of carbon by 2020. These commitments were included in the COP21 disclosure report.[9]

This group represents two thirds of the world's population, US $8.3trillion in GDP, and 5 per cent of global emissions.

At this forum UNFCCC[10] Executive Secretary Christiana Figueres described climate action as a '*unifier*'.



Adapted from: The Climate Group

7 https://sustainabledevelopment.un.org/post2015/transformingourworld accessed 2 June 2017

8 http://www.un.org/sustainabledevelopment/sustainable-development-goals/ accessed 2 June 2017; http://www.un.org/sustainabledevelopment/cities/ accessed 2 June 2017

9 http://sdg.iisd.org/news/subnational-governments-to-reduce-emissions-by-1-5-billion-tons-by-2020/

10 United Nations Framework Convention on Climate Change

2015 – COP21: THE PARIS AGREEMENT – NATIONAL GOALS

COP21 was the genesis of the *Paris Agreement* following a four year negotiation period to found a treaty that would commit all countries, developing and developed, to a common framework.

Cities and sub-national governments have embraced the role they play in addressing climate change and building resilience. The extension of these roles was formally endorsed by the Paris COP21 and actively promoted by ICLEI,[11] the international local government organisation which has been working to install sub-national government and cities in formal UN climate change discussions for many years.[12]

Source: COP Paris, Flickr

2016 – NEW URBAN AGENDA

The *United Nations Conference on Housing and Sustainable Urban Development (Habitat III)* in October 2016 in Ecuador saw the adoption of the *New Urban Agenda*. This required cities to, among other things:

- reduce their greenhouse gas emissions, and involve local government business and civil society to support the Paris Agreement, and
- promote safe, accessible and green public spaces, promoting sustainable urban design through urban planning.[13]

2016 – COP22: FURTHERING THE NATIONAL AND SUB-NATIONAL GOALS

COP22 was held in Morocco in 2016 and the agenda focused on how to deliver on commitments made in the *Paris Agreement.* Decarbonised economic goals and transformation were promoted at the sub-national level.

The Resilience Workstream of the *Global Climate Action Cities and the Human Settlements Theme*, both convened by ICLEI, considered financing urban resilience and invoked the role and power of sub-national governments to act.

CITIES TAKING ACTION

There are several movements that are inspiring action and resilience at the city level.

Compact of Mayors: The Compact of Mayors captures the impact of 648 cities' collective actions and provides hard evidence that cities are true climate leaders, and that local action can have a significant global impact.[14] The ACT became a signatory to both the Compact of Mayors and Compact of States and Regions in June 2015.

100 Resilient Cities: 100 Resilient Cities was pioneered by the Rockefeller Foundation and is dedicated to helping cities around the world become more resilient to the physical, social and economic challenges that are a growing part of the 21st century.

Under2MoU: Under2MoU brings together more than 160 states and regions across six continents committed to limiting the increase in global average temperature to below 2 degrees Celsius. It originated from a partnership between California and Baden-Wurttemberg in Germany to mobilise – and galvanise – bold climate action from likeminded city, state and regional governments around the globe. The ACT became a signatory of the Under2MoU in November 2016.

"In recent years climate experts, disaster responders and sustainability proponents have come into rare alignment. They agree we have a once-in-a-lifetime opportunity to develop and invest in a future."

Justin Lester, Mayor of Wellington, New Zealand

11 International Council for Local Environmental Initiatives, ICLEI
12 http://www.iclei.org/tw/details/article/iclei-is-gearing-up-toward-cop22.html accessed 20 April 2017
13 https://habitat3.org/the-new-urban-agenda/ accessed 2 June 2017
14 https://www.compactofmayors.org/history/ accessed 2 June 2017

ADVANCING THE PLAN

- The ACT has established itself as a national and international leader in climate change policy.
- Regardless of the fate of federal policy, the ACT has a significant role to play as a subnational government in advancing climate change action.
- The ACT has a unique role as a Territory Government, focused on the needs of a single city, and should harness this opportunity and continue to lead.

3.
Action Plan 2 Audit Outcomes

'Climate change is one of the most complex issues facing us today. It involves many dimensions – science, economics, society, politics and moral and ethical questions – and is a global problem, felt on local scales, that will be around for decades and centuries to come.'

NASA[1]

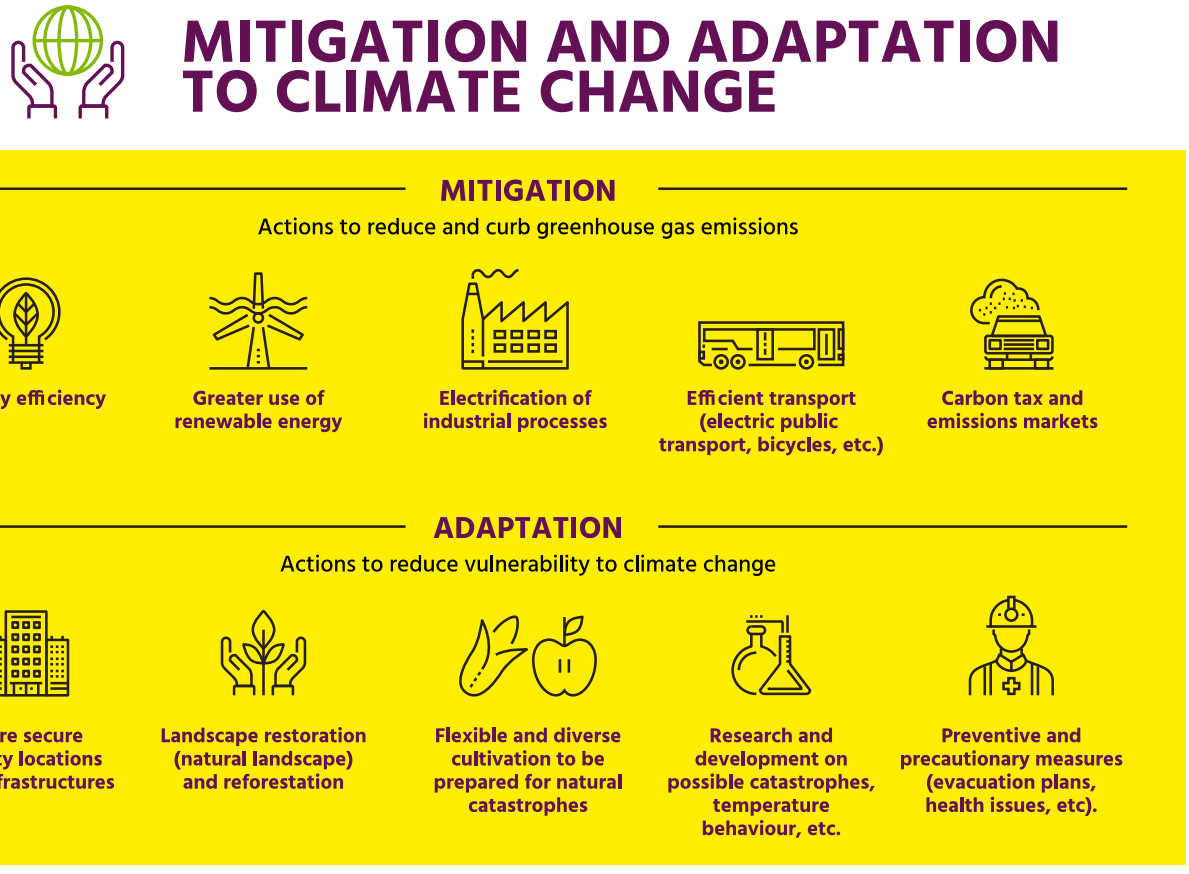
'The window of opportunity to limit damaging climate impacts is rapidly closing and governments are struggling to meet this challenge at the pace required.'[2]

Introduction

The urgency and complexity of addressing climate change is evident. Its multi-sectoral scope, interdisciplinary extent, and 'longevity' demand that governments at all levels move rapidly from policy into action.

There is *no time to pause*. Policy transition – from *AP2* to the *Climate Change Strategy* – must reflect the insistence demonstrated in the climate change science.

Government climate change policy must address both mitigation and adaptation, and immediately work to promote the integration across portfolios necessary to deliver outcomes based on short and long term targets.



MITIGATION ATTENDS TO THE CAUSES OF CLIMATE CHANGE AND **ADAPTATION** ADDRESSES ITS IMPACTS

Source: Sustainability for All

1 https://climate.nasa.gov/solutions/adaptation-mitigation/ accessed 26 May 2017

2 Climate Council, 2017: *Local Leadership: Tracking Local Government Progress on Climate Change*

WHOLE OF GOVERNMENT RESPONSES REQUIRED

Increasingly responses to climate change are addressing complexity and uncertainty, combining environmental, economic and social considerations. Mitigation and adaptation actions will in many instances require significant budget appropriations and investments by governments. The action required extends across the complete array of functions that government delivers.

AN ADDED IMPETUS FOR URGENT ACTION

Policy developed within such a complex matrix requires an assessment system that ensures accountability across government for action.

The adoption of assessment methods based on a matrix approach with firm targets benefits the policy process. It ensures governments know in advance that outcomes will be assessed through an interrelated range of measures. This provides an impetus for policy solutions to address the complexity of climate change, pushing the boundaries of traditional policy development, resulting in innovative solutions.

Fact box

HOW MUCH WORSE WILL EXTREME WEATHER EVENTS BECOME IN THE ACT?

The ACT can expect hotter, drier conditions as a result of climate change. But what are the projections for extreme weather events?[3]

Extreme heat:

- The number of days over 35 degrees Celsius per year is projected to increase from 7 to 12 per year by 2030
- Increasing to 29 per year by 2090

Bushfires:

- Increase in annual Forest Fire Danger Index of up to 30 per cent by 2050.

Drought:

- Increase time spent in drought, with a greater frequency of severe droughts.

The Importance of Sub-national Governments

The need for urgent action on climate change is well established, as is the acknowledgment that sub-national and city governments are key in the delivery of policy and programs. The ACT Minister for the Environment and Climate Change attended the 2015 United Nations Climate Change Conference (COP21) held in Paris. COP21 included associated forums for States and Regions Alliances and other sub-national organisations. Echoing international commentary, the ACT Minister stated the role of sub-national governments was critical in the fight to keep global warming to less than 2 degrees Celsius.[4] The U.N. Environment Programme reported that global commitments still fall short and calls for stronger immediate action.[5]

3 Climate Council, 2017: *Cranking Up the Intensity: Climate Change and Extreme Weather Events*

4 http://www.environment.act.gov.au/__data/assets/pdf_file/0003/1017867/2016-15-Climate-Change-and-Greenhouse-Gas-Reduction-Act-2010-Access.pdf accessed 26 May 2017

5 UNEP, 2016: *The Emissions Gap Report 2016*

'Climate change is a global issue; it is felt on a local scale. Cities and municipalities are therefore at the frontline of adaptation. In the absence of national or international climate policy direction, cities and local communities around the world have been focusing on solving their own climate problems. They are working to build flood defences, plan for heatwaves and higher temperatures, install water-permeable pavements to better deal with floods and stormwater and improve water storage and use.'

NASA.[6]

The ACT Approach

The ACT *Climate Change and Greenhouse Gas Reduction Act* (2010) and the *Climate Change Strategy and Action Plan 2* (*AP2*), released in October 2012, provide a pathway for the ACT to achieve the Territory's legislated 2020 greenhouse gas reduction targets. *AP2* is made up of 18 actions and 3 supporting actions. Actions address energy efficiency, the built environment, new technologies, community engagement, risk assessments and planning. Together the Act and *Plan* address both mitigation and adaptation measures and provide a monitoring framework, including government updates and Implementation Status Reports from the Office of the Commissioner for Sustainability and the Environment.[7]

AN OPPORTUNITY FOR CONTINUED INTERNATIONAL LEADERSHIP

In the lead-up to COP21, more than 1300 non-State stakeholders signed the *Paris Pledge for Action*, supporting the new climate agreement and promising to take personal, concrete action to ensure the level of ambition set in Paris is met or exceeded. Three Australian states and territories—the ACT, South Australia and Victoria—were among the *Paris Pledge* signatories.

The *2015–16 ACT Minister's Annual Report*[8] noted that the ACT was recognised internationally in The Climate Group report: *Unlocking Ambition: Top Corporate and Sub-national Corporate Commitments.*[9] This report recognises that the ACT has amongst the most ambitious emissions reduction targets of all states and regions. Immediate development and swift delivery of the next round of policy currently being considered will be critical to maintain leadership.

6 https://climate.nasa.gov/solutions/adaptation-mitigation/ accessed 26 May 2017

7 http://www.legislation.act.gov.au/a/2010/current/pdf/2010-41.pdf, http://www.environment.act.gov.au/__data/assets/pdf_file/0007/983572/AP2-Implementation-July2016-Factsheet-ACCESS.pdf, http://www.environment.act.gov.au/cc accessed 26 May 2017

8 ACT Government, 2016: *2015–16 Minister's Annual Report on the Climate Change and Greenhouse Gas Reduction Act (2010)*

9 The Climate Group, 2015: *Unlocking Ambition: Top Corporate and Sub-national Corporate Commitments*

Integrated Policy Development and Assessment

Integration of climate change actions across government is essential to maximise outcomes and realise the full investment potential of public funds and resources. Integrated policy development and 'dynamic' assessment and audit models will support action on climate change.

Applying an integrated policy development model to the workings of government is not a simple undertaking. Sub-national or city governments have an advantage in applying such a model as they have a defined scope with closer and more immediate ties to the communities they serve. This elevates the importance of community engagement strategies discussed further on in this report.

The Organisation for Economic Co-operation and Development (OECD)[10] notes that few decision makers in the public or private sectors have the full picture of their exposure to the risks of climate change. While some impacts are routinely captured in government budgets, such as payments from catastrophe funds, other indirect costs (such as impacts on tax revenues) are not. In addition, governments are exposed to contingent liabilities that only become apparent once an event occurs. Improving understanding of these impacts and liabilities can help governments to better manage their exposure to climate risks.

> *'Robust monitoring and evaluation is needed to inform policy development. Given the scale of the challenge, it is essential that effective approaches are being adopted and implemented. Monitoring and evaluation can improve policy learning and strengthen accountability by tracking how resources are spent and whether the policy or project is delivering as expected.'* [11]

Climate change planning should be flexible and integrated. Climate risks are the result of complex, and often unpredictable, interactions between climate and economic, social and environmental systems. Risks are increasingly difficult to predict over long time-horizons. The policy response requires a proportionate, flexible and iterative risk management approach in adaptation planning and mitigation actions.

10 OECD, 2015: *Adapting to the Impacts of Climate Change: Policy Perspectives*
11 OECD, 2015: *Adapting to the Impacts of Climate Change: Policy Perspectives*

HEATWAVES IN THE AUSTRALIAN METROPOLITAN CONTEXT

In *The Angry Summer*[12], the Climate Council reports that the Australian summer of 2016–17 marked the return of the Angry Summer with record breaking heat especially in the east of the nation. The Angry Summer was characterised by intense heatwaves, hot days and bushfires in central and eastern Australia, while heavy rainfall and flooding affected the west of the country.

2016-17 ANGRY SUMMER

IN 90 DAYS OVER 205 RECORDS BROKEN

SNAPSHOT OF THE 205+ RECORDS FROM THE SUMMER OF 2016-17

HIGHEST SUMMER RAINFALL
89
LOCATIONS

HIGHEST SUMMER TEMPERATURE
66
LOCATIONS

NUMBER OF SUMMER DAYS 35°C OR WARMER
50
LOCATIONS

KIMBERLEY
WETTEST DECEMBER ON RECORD

QUEENSLAND
SECOND HOTTEST SUMMER ON RECORD

MOREE
54 CONSECUTIVE DAYS OF 35°C OR ABOVE, A NEW RECORD FOR NEW SOUTH WALES

NEW SOUTH WALES
NEARLY 100 BUSHFIRES RAGING SIMULTANEOUSLY DURING THE FEBRUARY HEATWAVE. AT LEAST 30 HOMES DESTROYED

BRISBANE
30 CONSECUTIVE DAYS ABOVE 30°C

BRISBANE
HOTTEST SUMMER ON RECORD IN TERMS OF MEAN TEMPERATURE

SYDNEY
HOTTEST SUMMER ON RECORD

NEW SOUTH WALES
CLIMATE CHANGE MADE THE EXTREME HEAT OF THE SUMMER AT LEAST 50 TIMES MORE LIKELY TO OCCUR

CANBERRA
HAD ITS HOTTEST SUMMER ON RECORD FOR DAYTIME TEMPERATURE

ADELAIDE
HOTTEST CHRISTMAS DAY IN 70 YEARS AT 41.3°C

PERTH
HAD ITS HIGHEST TOTAL SUMMER RAINFALL ON RECORD

NEW SOUTH WALES
HOTTEST SUMMER TEMPERATURES ON RECORD FOR ALMOST 45% OF NSW

Source: Climate Council

12 Climate Council, 2017: *The Angry Summer 2016–17*

Heatwaves in Australia during 2013–2014 cost approximately $8 billion through absenteeism and a reduction in work productivity, equivalent to about 0.4 per cent of Australia's gross domestic product (GDP).

- A survey of about 1700 respondents found that 70 per cent were less productive because of heat stress.
- Other reported impacts of hot weather include higher work accident frequency because of concentration lapses and poor decision-making ability due to time perception change and higher levels of fatigue.
- During heatwaves critical infrastructure can also be severely affected. For example, during the January 2009 heatwave in Melbourne, financial losses were estimated to be $800 million, mainly caused by power outages and disruptions to the transport network. During this time, Victoria broke previous electricity demand records.
- Heatwaves have caused 2,900 deaths in Australia between 1890–2013 – more deaths than bushfires, tropical cyclones, earthquakes, floods and severe storms combined.
- Children, older people, people with existing health issues, and workers with heat-exposed jobs are the most vulnerable to extreme heat.
- Over the last decade, severe heatwaves around Australia have resulted in deaths and an increased number of hospital admissions for heart attacks, strokes, kidney disease and acute renal failure.[13, 14]

Australian cities, including Canberra, can expect to be impacted by escalating extreme weather.

The impacts of heatwaves in Melbourne and Brisbane[15] included the following:-

Brisbane, February 2004:

- Overall deaths increased by **23 per cent** (excluding injury and suicide) compared with the death rate during the same period in the previous year, and
- More than a **30 per cent** increase in emergency department presentations.

Melbourne, January 2009:

- 980 heat-related deaths during period, 374 more than would have occurred on average for that time of year, and
- **46 per cent** increase in ambulance callouts and **12 per cent** increase in emergency department presentations on the previous year.

With such impacts, governments and communities react to the immediate consequences, and then review actions to establish improved responses and protocols. Community expectations of government policy settings will include plans, frameworks and action to cope with the impacts. The OECD has concluded that the complexity of climate change makes the characteristics of risk increasingly difficult to predict over long time-horizons.

The interrelatedness of heatwave impacts serves to illustrate the need for interrelated policy design and dynamic, iterative assessments.

AMBULANCE SERVICES UNDER CLIMATE CHANGE CONDITIONS

Communities expect that ambulance services will be available when needed. This Government service requires significant resources in a limited budget environment.

In the face of more frequent extreme heat and heatwaves in Australia, added challenges emerge.

- How does a government ensure that in addition to usual demand, its ambulance services can cope with heatwave conditions, where the level of increase in demand is unpredictable, as is the frequency of heatwaves?
- Learning from the Melbourne 2009 heatwave, how would the ambulance services in Canberra cope with a 46 per cent increase in demand?

The provision of adequate ambulance services needs to be considered against all of projected conditions, along with usual policy considerations and government platforms. An integrated policy development approach would provide a framework within which short, medium and long term strategic decisions could be made to provide all relevant services and deal with the impacts of climate change.

13 Climate Council, 2017: *Cranking Up the Intensity: Climate Change and Extreme Weather Events*
14 CAHA and DEA, May 2017: *National Consultation regarding a National Strategy on Climate, Health and Well-being for Australia.*
15 Climate Council, 2017: *Cranking Up the Intensity: Climate Change and Extreme Weather Events*

Expert commentary

Climate Change and Health – A complex relationship

By Dr Liz Hanna (PhD, MPH, BA, RCCN, RN FPHAA, FACN); President: Climate & Health Alliance; Honorary Senior Fellow, Climate Change Institute Australian National University

How will a warming climate impact the lives of those living in the ACT? Providing a definitive answer is difficult. The relatively small population of the ACT diminishes the "statistical significance", which determines our confidence in the accuracy of research findings. When extreme events are uncommon, research requires large population numbers.

HEALTH RISKS SHIFT FROM COLD TO HEAT

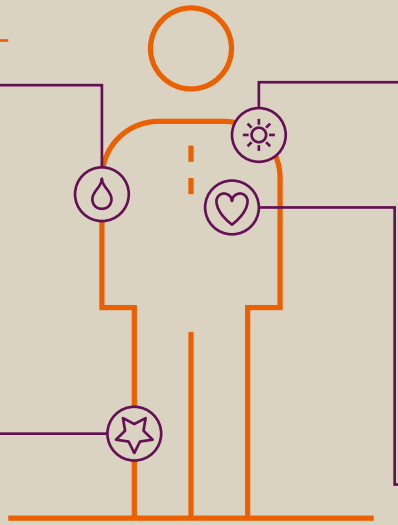
With its hot days being hotter and more frequent, Melbourne has the most similar climate to Canberra, yet with far less severe winter night time temperatures. A recent study suggested that Melbourne will initially 'benefit' from global warming by having fewer temperature related deaths, due to a reduced number of winter respiratory infections.[16] Melbourne's heat deaths are expected to increase. That scenario is likely to also apply to the ACT.

THE SYMPTOMS OF HEAT-RELATED ILLNESS

MUSCLE CRAMPING IS OFTEN THE FIRST SIGN OF HEAT-RELATED ILLNESS AND COULD LEAD TO MORE SEVERE CONDITIONS LIKE HEAT EXHAUSTION AND HEAT STROKE. THE SYMPTOMS FOR EACH ARE LISTED BELOW.

HEAT EXHAUSTION

- HEAVY SWEATING
- WEAKNESS
- COOL, PALE AND CLAMMY SKIN
- FAST,WEAK PULSE NAUSEA/VOMITING
- FAINTING
- MUSCLE CRAMPS
- LOW BLOOD PRESSURE AS VESSELS DIALATE



HEAT STROKE

- BODY TEMPERATURE (ABOVE 39°C)
- HOT, RED, DRY OR MOIST SKIN
- RAPID, STRONG PULSE
- POSSIBLE UNCONSCIOUSNESS
- DISORIENTATION
- LOSS OF THE ABILITY TO SWEAT
- HEART/KIDNEY FAILURE IN EXTREME CASES

16 Guo, Y., et al., 2016: *Projecting future temperature-related mortality in three largest Australian cities.* Environmental Pollution. 208, Part A: p. 66–73

Two issues emerge from this. Firstly, a shift in temperature related health threats requires a reorganisation of the health sector, within the emergency response and treatment arms of the sector, but importantly, also within the health protection realm. Boosting community resilience to heat is necessary to develop a heat wise population, and to avoid life threatening heat exposures.

The second consideration is to examine heat impacts upon lives, livelihoods and wellbeing. We function well in cold weather, as muscles generate additional heat which helps maintains optimal core temperature of about 37 degrees Celsius. Indeed, human physical performance peaks on days of 12 degrees Celsius, but in warm weather, the additional muscle generated heat must be shed to the environment, and on hot days, heat shedding slows.

As the world warms, sustaining prolonged exercise or work will become increasingly difficult, and exercising on extremely hot days elevates the health risk to extreme.[17] Rest periods are necessary to avoid overheating, which reduces productivity, and carries economic ramifications.[18] The Territory's future scenario involves a trade-off between pressures to be productive, versus risking potentially lethal overheating.

HEAT CAN STRIKE ANYONE

Common misconceptions about heat are widely held. During extreme heat, inability to avoid heat exposure is risky for everyone. Vulnerability is heightened amongst people with certain pre-existing health issues, particularly those with impaired cardiac function, the socio-economically disadvantaged, and those who are unaware of extreme heat. However, the young and relatively fit also succumb to heat. Human physiological tolerance to heat exposure has an upper boundary, and acclimatisation only offers limited additional protection.

Technology will not always protect us.

When outside temperatures approach 40 degrees Celsius, air-conditioners struggle to deliver room temperatures of 22 degrees Celsius. Furthermore, power failures render cooling systems inoperative. Understanding heat exposure is a genuine health threat, and reducing exposure therefore becomes critical as the ACT experiences more frequent, and more intense heat waves. Attitudinal change, and social re-engineering are needed to accommodate restrictions of services and human movement.

CLIMATE HEALTH RISKS ARE DIVERSE

Increasingly variable rainfall, more frequent flooding rains, interspersed with longer and deeper droughts are also projected. Accompanying the increased heat and periods of low rainfall, is a steep elevation in bushfire risk.[19]

Direct health effects from an unstable climate are readily identifiable, and community awareness is increasing. However, recovery from extreme climatic events is commonly protracted, frequently poorly understood, poorly planned, and poorly funded. The result is mental stress superimposed on the initial loss, which is reinforced by the large scale, and significant erosion of community cohesion and relationships.[20]

PROTECTION IS EVERYONE'S BUSINESS

The ACT community, industry and health sector all need to be fully conversant with the range of impacts and health risks arising from climate change in order to successfully mitigate those risks. The complexity of this undertaking cannot be over-estimated. Adaptation examples include employers rescheduling activities during heat waves, and ensuring hydration and rest protocols are followed. Meanwhile, the health sector and community need to be fully trained in recognising early symptoms of heat stress, along with lifesaving cooling strategies. Hospitals and ambulance services need to be equipped, staffed and trained to meet the surge demand for acute services that climatic extremes deliver.

Climate change links with health and wellbeing via multiple interlinked pathways. Government has a role to drive the process of mitigation and adaptation, however government services cannot be on hand at all places. Building community resilience is everybody's business. Climate change requires a partnership approach, with industry and commercial sectors, schools, health sector, communities all actively involved. And we mustn't forget the children. Involvement in finding a solution is a defence against despair.[21]

17 Hanna EG and Tait PW, 2015: *Limitations to thermoregulation and acclimatisation challenges human adaptation to global warming* Int. J. Environ. Res. Public Health. 12(7): p. 8034–8074

18 Hanna EG, et al., 2011: *Climate change and rising heat: population health implications for working people in Australia.* Asia-Pacific Journal of Public Health. 23(2 Supp): p. 14S-26S

19 CSIRO and BOM, 2015: *Climate Change in Australia: Projections for Australia's NRM Regions. Technical Report*, Climate Change in Australia Information for Australia's Natural Resource Management Regions: Technical Report, Editor, CSIRO and Bureau of Meteorology, Australia: Canberra. p. pp222

20 Parkinson D and Zara C, 2013: *The hidden disaster: domestic violence in the aftermath of natural disaster* The Australian Journal of Emergency Management. 28(2)

21 Stevenson, K. and N. Peterson, 2015: *Motivating Action through Fostering Climate Change Hope and Concern and Avoiding Despair among Adolescents.* Sustainability. 8(1): p. 6

THE INTEGRATION OPPORTUNITIES FOR AP2

AP2, taken as a whole, along with the *ACT Climate Change Adaptation Strategy*,[22] provides a foundation for integrated policy development. Developing an integrated policy development and assessment process to deal with climate change is not a simple undertaking. The OECD provides some guidance as part of its consideration of adaptation planning and can be modified across climate change actions. The ACT Government has shown itself willing to lead, even on the international level, and that experience supports development of the next policy iteration, *The Climate Challenge Strategy*.

Case Study

THE OECD – SOME DIRECTION

The OECD[23] notes that climate risks, and the measures to address them, are inherently linked with other policy measures and makes the following observations:

- integrating adaptation planning with the relevant policy processes and decision cycles can increase its efficiency and effectiveness,
- recognising that adaptation is one of many policy objectives, not necessarily the dominant one,
- 'mainstreaming' ensures that adaptation priorities are aligned with policy priorities,
- 'mainstreaming' can help to avoid misalignments with climate adaptation e.g.. regulatory regimes for infrastructure that deter investment in resilience, and
- OECD countries' adaptation strategies are all based on impact assessments, often based on historic trends and climate scenarios, and most have identified adaptation options, but few have incorporated adaptation into projects, or established institutional response mechanisms.

MONITORING AND EVALUATION

Monitoring, assessment and evaluation of policy and program interventions are key to good policy. An iterative approach assists in risk management. There are many established monitoring frameworks. The OECD offers an example, based on the following four key tools for monitoring and evaluation of climate change actions summarised below:

1. Climate change risk and vulnerability assessments can provide a baseline of domestic vulnerabilities to climate change against which progress can be reviewed.
2. Indicators facilitate an assessment of progress made in addressing priorities.
3. Project and programme evaluations can help to identify what approaches are effective in achieving agreed objectives, and understand what may be some of their enabling factors for success.
4. Audits and climate expenditure reviews consider whether resources allocated are appropriately targeted and allocated cost-effectively.

The OECD acknowledges the complexity of monitoring and evaluation in regard to climate change planning as an example.

> Monitoring and evaluation is still in its infancy, and quite a few of the national adaptation plans or strategies put in place by OECD or partner countries still have to develop frameworks.[24]

Under the UNFCCC National Adaptation Plan (NAP) process, 52 developing countries, mostly least developed countries, have submitted or are developing strategies on their mid- to long-term adaptation needs.[25] In parallel, regional and city-level plans have steadily grown in importance, spurred by city organisations like ICLEI, C40 and World Mayors Council on Climate Change.

Policy makers at all levels of development should exchange and learn from one another, to make the most of the resources invested in climate change action.

A leadership opportunity in the sphere of integrated policy development and assessment exists. The ACT Government is well placed to contribute to this developing area in providing a framework that addresses climate action – mitigation and adaptation, across sectors and with the involvement of business and community.

22 ACT Government, 2016: *ACT Climate Change Adaptation Strategy*
23 https://www.oecd.org/env/cc/Adapting-to-the-impacts-of-climate-change-2015-Policy-Perspectives-27.10.15%20WEB.pdf accessed 9 June 2017
24 https://www.oecd.org/env/cc/Adapting-to-the-impacts-of-climate-change-2015-Policy-Perspectives-27.10.15%20WEB.pdf accessed 9 June 2017
25 http://unfccc.int/adaptation/workstreams/national_adaptation_plans/items/6057.php accessed 20 July 2017

Audit of AP2 – Observations

Since its release in October 2012, *AP2* has supported the efforts of the ACT to achieve the Territory's legislated greenhouse gas reduction targets. The leadership shown by the ACT Government is commendable. Building on the work undertaken to date, detailed in *AP2* and other initiatives, there is now the opportunity for further national and international leadership in relation to:

- integrated policy development, and
- policy assessment and program auditing.

INTEGRATION OF ACTIONS

The implementation of the 18 Actions of *AP2* by the ACT Government has established sound 'foundational' policy settings for dealing with climate change. The Territory government can now look to build upon these efforts to ensure the longevity of these actions. This will be achieved through continued leadership and integrated policy development.

Complex public policy issues, particularly those that are cross-sectoral and multifaceted, are often referred to as 'wicked problems' – climate change being perhaps one of the ultimate examples. Creating the structures to bring multidisciplinary approaches to handling issues that involve social, economic and environmental perspectives is a difficult undertaking, but necessary to properly address seemingly intractable (wicked) policy issues.

The 18 actions of *AP2* are dependent almost entirely upon ACT Government action. Broadly, 5 are regulatory, 5 relate to research and mapping, 7 are strategy/policy based initiatives and 1 is a monitoring requirement. The actions are all necessary to establish the conditions and circumstances for climate change action. However, arguably, the involvement of the broader community has been limited to the provision of expert advice and consultation on draft government documents. Developing integrated policy is enhanced and actively promoted by involvement of all sectors as co-creators of solutions.

The investments government makes should serve to support changes in business and the community. The policy development process always benefits from including business and community sectors. In completing the measures outlined in *AP2*, and in developing other climate change related policy, the government should increase industry involvement and community participation. Such an approach will ensure that a broader range of issues and solutions are considered as all sectors contribute to development and implementation.

Case Study

INSURANCE AND GOVERNMENT – INTEGRATION OF POLICY THROUGH CO-DESIGN

Establishing an insurance system for natural disasters provides an example of the development of 'integrated policy' across sectors. It also involves social, economic and environmental issues. Without the cooperation of different levels of government, the insurance sector and community members, insurance policies would not be available or affordable in some communities.

Dealing with the threat of natural disasters is a challenging policy area for government as it considers, among other things, ways to increase the resilience of communities. Where people decide to live affects the level of damage they may suffer. For example bushfires are more dangerous to homes on 'bush blocks' as opposed to houses with a buffer of cleared land surrounding them.

Reducing the direct economic costs of catastrophic events can be done with mitigation measures or by reducing the financial impact on those directly affected with the sharing of costs among a wider population through government and/or charitable aid, or insurance. Government aid comes often in the form of post-event appropriations that can create budgetary difficulties and disincentives for mitigation. In countries like Australia insurance policies fund much of the recovery costs.

A recent study considered the role of government in the provision of catastrophe insurance and the potential for the insurance sector to be a positive actor in reducing the economic costs of natural disasters.[26] Both questions had high currency in Australia after the 2011 Queensland and Victorian floods, events that led to widespread public and political criticism of many insurers for their then failure to cover riverine flood damage. Australian insurers have since responded by broadening coverage, so that as of May 2015 over 90 per cent of homeowner's policies cover this peril. This change has been possible largely because of the increased disclosure of flood mapping commissioned by local councils and the processing of this data in ways to allow for better risk identification.

In this example political and public demand saw various levels of government interact to deal with the impacts of natural disasters. The information provided by government to the business/insurance sector allowed for the development of a business model/insurance policy that provided affordable policies for homeowners, reducing the prospective demand on government budgets. Flood mapping would also influence planning laws and the development of communities. This example illustrates that the involvement of various sectors in the co-development of solutions does result in integrated outcomes, rather than outcomes that are imposed.

26 http://www.sciencedirect.com/science/article/pii/S221242091530159X accessed 28 June 2017

AP2 Audit Table

The ACT Government's continued commitment to addressing climate change has ensured the implementation of the 18 actions. The complexity of a number of the actions is acknowledged and in most part the actions have progressed well. However, there is much more to be done and time is of the essence.

The following table presents the assessment of the *AP2* audit. The audit is based on reports and data published by the ACT Government, and on information obtained through this audit. The progress reports reflect the status of actions as reported by the ACT Government in its *August 2016 Implementation Update*.[27]

The actions were assessed against five 'status' categories as specified in the terms of reference. The actions have been grouped in terms of their status assessment, as colour coded in the table below.

Completed	6
Ongoing	8
Modified	1
Subsumed	1
Of concern	2

This report responds to Action 18 of *AP2* and is the second report in a series of three identified. The first *Implementation Status Report (ISR)* was completed by the *Office of the Commissioner for Sustainability and the Environment* in December 2014 and released in March 2015.

The Government released a response to the *ISR* in August 2015, and further addressed comments in the *Review of AP2* published in November 2015.

The third and last report of actions outlined in *AP2* is due in 2020, however this is likely to be superseded with the *Climate Challenge Strategy* currently under development.

In this second report by the *Office of the Commissioner for Sustainability and the Environment* the status of two actions is categorised as being of concern.

However several other actions relate to matters that require urgent attention beyond the explicit action stated. So whilst not noted as a concern in the status, findings reflect the need for further action.

Commentary contained in this chapter is expanded upon in later chapters in this report.

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 2: INEFFICIENT WATER HEATER PHASE OUT		
The ACT Government will introduce legislation to restrict the installation of high-emission inefficient water heaters in houses and townhouses in gas reticulated areas and will investigate the expansion of emissions standards for hot water heaters to all new residential buildings by June 2014, with a view to introduce new standards in the 2015 revisions.	**Progress** The ACT Government has reported that it considered the outcomes of modelling and analysis undertaken in June 2014 on the phase-out of emissions intensive electric hot water heaters and determined that no further action would be taken. The ACT's 100 per cent renewable energy target means that there are limited economic and environmental benefits to phasing out inefficient electric hot water heaters. Other methods of reducing household energy use are being explored in the context of current building regulatory reforms. **Findings** Under the *Energy Efficiency Improvement Scheme* (EEIS) incentives are in place to support Canberra households to use high efficiency water heaters. Currently, the development of future climate action policy has identified the need for enhanced building and operation standards to increase their energy efficiency and reduce emissions.[28] These reforms (and energy efficiency support through Actsmart and EEIS) need to be delivered to ensure that energy efficiency is achieved in existing and new building stock. It is important to note that the current government structure that delivers building energy efficiency outcomes is disparate. It includes functions in planning delivery, climate policy, EEIS, Actsmart and land development. A holistic and integrated approach to the various energy efficiency initiatives should be remapped for the next round of policy. Energy efficiency is discussed further in **Chapter 8 Built Environment**.	Completed

27 http://www.environment.act.gov.au/__data/assets/pdf_file/0007/983572/AP2-Implementation-July2016-Factsheet-ACCESS.pdf accessed 11 July 2017

28 http://www.planning.act.gov.au/topics/current_projects/act_building_regulatory_system_review/improving_the_act_building_regulatory_system_review accessed 17 July 2017

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 9: DISTRIBUTED ENERGY MAPPING PROJECT		
The ACT Government will survey buildings in major commercial districts to develop a map of heating and cooling loads across the Territory to facilitate private investment in low-carbon energy networks. The Government will look for opportunities to streamline regulatory processes through its review of the Utilities Act 2000.	**Progress** The Government, in conjunction with AECOM and ANU engineering students, surveyed major ACT town centres to develop maps of their heating and cooling loads. The project also reviewed technology options for district energy networks to service these loads including tri-generation, solar thermal, and geo-exchange. The maps and the final report are available on the ACT Government website (http://www.environment.act.gov.au/__data/assets/pdf_file/0004/692797/ACT-District-Energy-GIS-Mapping-Technical-Report.pdf). **Finding** Completed.	Completed
ACTION 12: LARGE SCALE RENEWABLE ENERGY		
The ACT Government will, subject to a review of the 40 megawatt solar auction and final policy design, expand the Territory's large-scale renewable energy scheme to deliver up to 690 megawatts of generation capacity, or 2000 gigawatt hours of annual renewable energy generation, by 2020.	**Progress** Large-scale feed-in tariff (FiT) entitlements for 40MW of solar generating capacity were granted in 2012 and 2013 (allocated through a Large-scale Solar reverse auction process). FiT entitlements for an additional 400MW of wind generating capacity were granted in 2015 and 2016, allocated through two 200MW wind auctions held in 2014 and 2015. A further 200MW of wind generation capacity was allocated through the Next Generation Renewables Auction in September 2016. Development of the 1MW Community Solar Scheme is ongoing with the Government expecting to further progress the Scheme in 2017. Government modelling shows that the total 641MW of large-scale FiT supported renewable energy capacity will be sufficient to meet the 100%-by-2020 renewable energy target. **Findings** Completed. It is noted that other contributions to the target are the ACT's share of the national renewable energy target (20 per cent of the total), rooftop solar (3 per cent) and Green Power (1 per cent).[29] This is often not specifically reflected in reports and statements about progress towards the 100 per cent renewable target.[30] This could lead to misunderstandings and should be clarified in future reporting and communications. To achieve the 2020 national renewable energy target additional investment is required over the next 3 years.[31] The Territory should assess the risks in relation to this aspect of the ACT target and have appropriate monitoring and mitigation plans in place.	Completed

29 http://www.canberratimes.com.au/act-news/act-commits-to-100-per-cent-renewable-energy-target-by-2020-simon-corbell-20160428-goh1l9.html accessed 12 July 2017

30 ACT Government, 2016: *2015–16 Minister's Annual Report on the Climate Change and Greenhouse Gas Reduction Act (2010),* page 16

31 http://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/The%20Renewable%20Energy%20Target%202016%20Administrative%20Report.pdf and http://www.smh.com.au/federal-politics/political-news/australia-on-track-to-meet-renewables-target-says-clean-energy-regulator-20170503-gvy6jc.html accessed 12 July 2017

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 13: RENEWABLE ENERGY TARGET		
The ACT Government will determine a new renewable electricity consumption target of 90 per cent renewables by 2020 and publish, in 2013, a methodology for accounting for renewable energy consumption and reporting against this target.	**Progress** The Disallowable Instrument establishing a new 100%-by-2020 renewable energy target (RET) (DI2016-38) was notified on 2 May 2016 which replaced the previous Disallowable Instrument (DI2013-271) that established the 90%-by-2020 RET. The method for accounting the RET has been incorporated into the annual ACT greenhouse gas inventories. **Finding** Completed. It is noted that the next target in *AP2* is 2050. The next round of policy will need to identify targets between 2020 and 2050. These need to reflect the urgency of the climate change situation in which we find ourselves and include energy efficiency and renewable energy targets post 2020.	Completed
ACTION 14: PV NETWORK MAPPING		
The ACT Government will develop detailed mapping of the ACT electricity distribution network providing up-to-date information on the capacity of feeders and substations to absorb additional renewable energy generation.	**Progress** This project has been completed. The information is held by ActewAGL and has not been released for security reasons. **Finding** Completed.	Completed
ACTION 16: PLANNING MINISTERIAL STATEMENT		
The ACT Government will publish a Ministerial Statement on how, from a whole of government perspective, built environment and urban open spaces will be developed to respond to climate change and the ACT's long term mitigation objectives. This will incorporate a review of the Territory Plan development codes and design standards.	**Progress** The Ministerial Statement was delivered on 21 May 2014. A draft *ACT Climate Change Adaptation Strategy* was released for public consultation on 22 February 2016. The final *ACT Climate Change Adaptation Strategy* was released in August 2016. **Findings** This action has been completed. A range of building regulation reforms have been identified and implementation has commenced. It is important that implementation of these reforms continue and it is noted that this has been reflected in the 2017 ACT budget.[32] A recent report by Low Carbon Living CRC provides guidance on how to design best practice policy and regulation for the energy and carbon performance of the built environment and this report should be examined carefully.[33] As with Action 2, it is noted that building reforms to achieve energy efficiency are managed in a variety of areas within government. Structural reform to consolidate energy efficiency functions may lead to faster outcomes being achieved and should be considered. There is tremendous potential to reduce energy costs and emissions in the built environment through these reforms and other government initiatives.[34] To reflect this opportunity, further dialogue is provided in **Chapter 8 Built Environment** supported by expert commentary from the ACT Government Architect and the Australian Green Building Council Chief Executive.	Completed

32 Proof of Transcript Evidence, Select Committee on Estimates 2017–18, 28 July 2017, page 748
33 Low Carbon Living CRC, 2017: Best Practice Policy *and Regulation for Low Carbon Outcomes in the Built Environment*
34 *ASBEC, CIE 2007: Capitalising on the building sector's potential to lessen the costs of a broad based GHG emissions cut*

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 4: ZERO EMISSION BUILDINGS		
The ACT Government will publish by 2015 a *Pathway to Zero Emissions Buildings Policy* informed by a Regulatory Impact Assessment and stakeholder consultation to be undertaken from 2013 covering residential and non-residential building types.	**Progress** The draft *ACT Climate Change Adaptation Strategy* incorporates actions to increase the energy efficiency of residential and commercial buildings through stricter building standards. This will be pursued through the Council of Australian Government's implementation of the *National Energy Productivity Plan* (NEPP). **Findings** These policy developments subsume this action. However it is noted that the initial timeframes were not achieved. This may be an indication that the current structure that delivers energy efficiency reform may not be optimal, as has been observed in comments on Action 2 and 16. Adequate resources need to be applied to achieve the intended outcomes for this action. Moving into a 100 per cent renewable electricity scenario, the policy drivers should transfer to one of (infrastructure) resource efficiency and impacts on cost of living. Building reforms for new buildings[35] need to be integrated with other energy efficiency initiatives such as Actsmart and EEIS. Given the importance of consistent and progressive energy efficiency policy action this is discussed further in **Chapter 8 Built Environment**.	Subsumed
ACTION 6: TRIAL ADVANCED ENERGY TECHNOLOGY SYSTEMS		
The ACT Government will conduct a trial of advanced energy technology systems, in partnership with the Australian National University and the Canberra Institute of Technology aimed at increasing the technical and economic potential for intermittent energy sources on the ACT network.	**Progress** The *Renewable Energy Industry Development Strategy* (REIDS), released on 1 May 2015, brings together industry, government, research and training institutions. Actions 4 to 6 of REIDS are specifically focused on facilitating local research and investment into battery storage as an important 'sunrise' industry. On 18 December 2015, the ACT Government announced the *Next Generation Renewables Strategy* that will support the rollout of distributed solar storage in the ACT. The Strategy commenced with the Next Generation Renewables Pilot that awarded $600,000 through a competitive grants process in February 2016. The scheme was extended in late 2016, with eight successful companies . Under the Pilot three companies will install distributed solar storage in the ACT in around 200 homes in 2016. The latest round of grants closed on 6 July 2016, awarding awarded up to $2 million in funding to support the roll-out of around 600 batteries in homes and businesses over 12 months to the end of 2017. **Findings** This action has been superseded with the *Next Gen Energy Storage* program. This program is the second largest battery roll out program in the world (to Germany) and is funded by the *Renewable Energy Innovation Fund* (REIF).[36] REIF has been expanded with industry support from $1.2 M to $12 M and is led by the Minister, guided by a *Business Advisory Board*.[37] The agile approach that was taken in regards to this action has brought significant benefits to the ACT, beyond original expectations. By analysing and adapting to market responses seeking energy storage solutions, the *Next Gen* battery storage program was conceived.[38] More than 200 systems are to be installed and an advanced data pilot employed to facilitate further development of technology and systems. The program will continue until 2020, installing 36 MW of battery storage into more than 5000 homes and businesses. The *Renewables Innovation Hub* was a result of this action and will serve to continue to advance technology and industry opportunities for the ACT. Although this action has been modified, it has achieved a commendable outcome, consistent with the original intent.	Modified

35 http://www.planning.act.gov.au/topics/current_projects/act_building_regulatory_system_review/improving_the_act_building_regulatory_system_review accessed 17 July 2017

36 http://www.environment.act.gov.au/energy/cleaner-energy/next-generation-renewables accessed 11 July 2017

37 http://www.environment.act.gov.au/__data/assets/pdf_file/0003/1017867/2016-15-Climate-Change-and-Greenhouse-Gas-Reduction-Act-2010-Access.pdf accessed 26 May 2017

38 Personal communications, Megan Ward, 1 February 2017

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 1: ENERGY EFFICIENCY IMPROVEMENT SCHEME		
The ACT Government's *Energy Efficiency Improvement Scheme* (EEIS) commenced on 1 January 2013, requiring retailers to implement energy efficiency improvements to ACT homes with a focus on low-income households. An Amendment Bill to extend the scheme to 2020 was passed on 4 August 2015.	**Progress** Over 70,000 households have participated in the Energy Efficiency Improvement Scheme (EEIS) since January 2013, including over 18,000 low income priority households. By June 2016, electricity retailers had successfully installed over 1,000,000 energy saving items. An independent review of the EEIS was completed in September 2014. Based on the outcomes of the review and further stakeholder engagement and analysis, the government passed legislation to continue the EEIS to 2020. The extension was intended to promote innovation and competition by enhancing business opportunities, introducing new activities and harmonising with other jurisdictions. **Findings** The ACT Government has been delivering the EEIS program since 2013. The EEIS is modelled to deliver a similar level of energy savings for the first three years and lifetime savings of 515 kilotonnes carbon dioxide equivalent from 2016 to 2020. This figure was achieved and exceeded by the end of 2015. The EEIS has a high level business plan to ensure that the program operates effectively, including audits, compliance, target reviews and stakeholder engagement. The extension of the EEIS to 2020 is welcomed as is the emphasis on innovation and business opportunities. This should serve both the customer and the retailers. Ongoing review to assess new activities and harmonise with other jurisdictions is recommended. This will provide an opportunity for refinement of the implementation. EEIS has been successful in its implementation and the legislation will ensure it continues to 2020. Planning for a post 2020 scheme is time critical to ensure its longevity in the commercial market that it currently thrives in. Drivers for the scheme should reflect the avoided cost of future capital (and resources) associated with renewable energy infrastructure. This combined with a revisit of the priority household target to expand its criteria will appropriately incentivise energy efficiency action. The current criteria which requires a householder having an eligible concession card will not reach all vulnerable households which are facing financial hardship. It is understood that the opportunity for savings with lighting upgrades is diminishing.[39] More significant and enduring options such as heating appliance replacements, solar and battery installations will require additional resources to ensure they are accessible to priority households. Energy prices are forecast to rise significantly in coming years.[40] The importance of delivering support to vulnerable houses will remain and extends beyond addressing energy prices in relation to climate action policy. Whilst the EEIS has achieved its targets, the challenges and opportunities in delivering policy that ensures social equity are discussed further in **Chapter 6 Social Equity** and supported with expert commentary.	Ongoing

39 http://thecrowd.me/tags/energy-efficiency-trends accessed 11 July 2017

40 http://www.canberratimes.com.au/act-news/actewagl-announces-sharp-increase-in-gas-and-electricity-prices-20170607-gwmv4r.html accessed 11 July 2017

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 7: BUSINESS ENERGY EFFICIENCY IMPROVEMENT SCHEME		
The ACT Government will complete a regulatory impact assessment by the end of 2012 considering the impacts and opportunities for extending the *Energy Efficiency Improvement Scheme* to include fuller business participation.	**Progress** Government considered the Regulatory Impact Statement in May 2013 and agreed to extend the scheme to the non-residential sector from 1 July 2013. The Minister introduced new business activities (commercial lighting and refrigerator display cabinets) into the scheme in July 2016.[41] **Findings** This was not audited as action occurred before the previous report. However business energy efficiency opportunities should be included in the ongoing review of activities considered for the EEIS.	Ongoing
ACTION 8: ACTSMART ENERGY ASSIST		
The ACT Government will establish ACTSmart Energy Advice to provide up-to-date practical advice and support to small and medium sized businesses, community groups and representative organisations.	**Progress** The *Actsmart Business Energy and Water* program commenced on 1 July 2012 to provide advice and assistance to small businesses and community groups in the ACT, including a rebate to assist with upgrade costs. As at 30 June 2016, 480 small businesses, community groups and owners corporations have received a tailored assessment and report, with 227 claiming a rebate and many more currently undertaking efficiency upgrades. To assist medium businesses in the ACT, Actsmart has partnered with the *Canberra Business Chamber* to develop a suite of online resources and tools to help businesses become more sustainable, including ACT specific energy advice and case studies, and a lighting tool to identify upgrade opportunities and savings. These resources will be available through the *Actsmart Sustainability Hub*. **Findings** The Hub provides a range of information for both households and businesses and is a good resource for the ACT community. Although this action focuses on businesses, it is not clear where energy advice and support to households (outside of EEIS) is captured within the current *AP2* actions. Business enterprises are not specifically considered in this audit. It is understood via personal communications that there have been some challenges in recruiting appropriately qualified energy efficiency advisors for both the business and household advice services. Solutions to this should be considered with local institutions to appropriately attract and develop suitable resources. The drive for energy efficiency remains an important ongoing priority to achieve the intentions of *AP2* and businesses are a critical element of that success. Recent research by ARENA demonstrates that there is confusion and misconceptions about the cost and benefits of renewable energy in businesses.[42] The Actsmart business program and EEIS should ensure that it remains relevant and up to date with market opportunities to support businesses in transitioning to renewables and driving energy efficiency.	Ongoing

41 http://www.environment.act.gov.au/energy/smarter-use-of-energy/energy_efficiency_improvement_scheme_eeis/latest-updates accessed 11 July 2017
42 ARENA, 2017: *The Business of Renewables*

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 10: LOW EMISSION VEHICLE STRATEGY		
The ACT Government will implement the *Transport for Canberra* policy, including the *Low Emissions Vehicle Strategy.*	**Progress** The *Transport for Canberra Policy* is currently being reviewed. A discussion paper was released in June 2014 and consultation occurred in August 2014. The final strategy was expected to be released in 2016. **Findings** Although it is outside scope to audit the *Transport for Canberra* policy implementation entirely, progress since 2014 appears to have stalled in relation to the *Low Emission Vehicle Strategy* and the policy evaluation processes. Annual report cards were identified in the Policy, however only one was released in June 2014. The *Transport for Canberra* policy was released in 2012 and identified 138 kilotonnes carbon dioxide equivalent savings by 2020. No information is available to support this figure but OCSE has been advised that it is being reviewed this year, 2017. Some factors are beyond the control of the ACT. Even though take-up of electric vehicle technology is escalating (some suggest exponentially) it is recognised that the industry is still several years away from being able to deliver significant transitional change. Emerging technologies are reducing costs and promoting interest and adoption. Transport will soon be the biggest emissions sector in the ACT. Substantial effort should be directed towards transport opportunities in the next round of climate change policy development. **Chapter 7 Transport** explores a range of opportunities to transition the transport sector and achieve the emissions reduction goals outlined in *AP2.*	Ongoing
ACTION 11: ACT WASTE MANAGEMENT STRATEGY		
The ACT Government will implement the *ACT Waste Management Strategy 2011–2025* and achieve a carbon neutral waste sector by 2020.	**Progress** Implementation of the *ACT Waste Management Strategy 2011–2025* (the *Strategy*) is ongoing, with implementation responsibilities shared across the Government. A five year review of the *Strategy* was undertaken in 2015–16 to assess progress to date and identify opportunities for improvement. A *Strategy Update* will be released when completed as part of the *Waste Feasibility Study*. The *ACT Waste Feasibility Study* is under active consideration and development to assess options to progress the Government's policy outcomes and achieve the targets. From mid 2016 to mid 2017, the second phase of the study aims to: • implement legislative change, • propose improvements to the Territory's waste management system, and • continue industry and community engagement, including closer collaboration with our region. **Findings** Although it is outside the scope to audit the *Waste Management Strategy* implementation entirely, it is noted that the feasibility study is underway. The ACT Government will consider the *ACT Waste Feasibility Study's* recommendations in 2017. It has been reported that the waste sector is not on track to achieve its 2020 emissions reduction target of 16 kilotonnes of carbon dioxide equivalent emissions.[43] The implications of this will need to be considered in the next round of policy development. The waste sector has the lowest proportion of emissions in the ACT emissions inventory and is not discussed further in this report. Pursuing a sustainable waste sector remains an important element of the ACT's ecological footprint. The ACT's footprint is higher than the Australian average, and 3.5 times the global average as discussed in the ACT State of the Environment Report 2015.[44] Community engagement on the issue of waste is critical. It is noted that the ACT Government is currently trialling green waste services and is committed to a Container Deposit Scheme for personal container waste. A forum recently considered the efficacy of this. It is also noted that the ACT Government is considering development proposals involving waste incineration and that this is the subject of ongoing, critical community commentary.	Ongoing

43 ACT Government, 2015: Review *of AP2*

44 http://www.environmentcommissioner.act.gov.au/__data/assets/pdf_file/0003/1063065/eco-footprint.pdf accessed 12 July 2017

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 15: TERRITORY WIDE RISK ASSESSMENT		
The ACT Government will assess the potential risks of climate change to territory life and property, including through acute weather and fire impacts in the ACT and the surrounding region through a new Territory Wide Risk Assessment and will integrate this knowledge into natural disaster and emergency risk management and planning.	**Progress** The Territory Wide Risk Assessment (TWRA) was completed by the Justice and Community Services Directorate in 2012 and made publicly available in 2014. The ACT's risk assessment was reviewed in April 2015 and included in a report on *State Level Natural Disaster Risk Assessments*. The TWRA will be updated as per the national commitment to 'publish a new, revised or updated state-wide risk assessment by the end of June 2017'. A process to incorporate, update and expand the TWRA based on new information from the NSW/ACT Regional Climate Modelling project (NARCLiM) is under development. **Findings** The continued risk assessment process is an invaluable contribution to ensuring the ACT is prepared at both government and community levels to deal with the potential risks of climate change. Integration of this knowledge across all activities of government will support the ACT in the event of acute weather events.	Ongoing
ACTION 17: IMPACT ASSESSMENT ON THE NATURAL ENVIRONMENT		
The ACT Government will continue to assess the potential impacts of climate change on ecological systems in the ACT and the surrounding region, and integrate this knowledge into environmental management and development planning decisions to ensure our natural environment is conserved and enhanced.	**Progress** Under the *Nature Conservation Act 2014*, the implications of climate change must be explicitly considered in the *Nature Conservation Strategy*, and this is to include reviews of Action Plans for threatened species and ecological communities. The ACT NRM Planning for Climate Change Project (finalised 2016) produced a *Regional Investment Plan* which identified investment priorities in biodiversity adaptation. The project developed adaptation pathways to inform updates of Action Plans for broad ecological communities (grasslands, woodlands, and aquatics) by considering: • how biodiversity is currently valued in the ACT and Region, • how climate and/or social expectations may change in the future, and • how management and policy options can help biodiversity adapt to future change. Ecological systems are also recognised as a critical component of the *ACT Climate Change Adaptation Strategy* (August 2016). **Findings** It is noted that the assessment of these matters is intended to be an ongoing process. It is critical that such an approach is maintained as the extent of impacts may change over time. The impacts of climate change on the natural environment will continue to be examined in the Commissioners state of environment reports, the next being released in 2019. The impacts of climate change on the natural environment are wide reaching and complex. Concern about the health, maintenance and resilience of the natural environment in respect of climate action extends beyond maintaining biodiversity. The natural environment provides important mitigation and adaptation functions for climate change impacts. A number of the wide range of issues that need to be considered are reflected in **Chapter 9 Natural Environment.**	Ongoing

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 3: ENERGY EFFICIENCY INFORMATION TO TENANTS		
Subject to regulatory impact assessment, the ACT Government will introduce legislation to require landlords to provide information to tenants on the energy efficiency of homes and fixed appliances and major energy uses. Regulatory impact assessment and stakeholder consultation will be completed in 2013.	**Progress** Following initial regulatory assessment and stakeholder consultation, a pilot project was undertaken through the *Centre for Liveability Real Estate* to find the most effective ways for property managers to provide information to tenants. The project report was completed in December 2015. The resulting guide for tenants developed under this action is available free of charge on the website of the Centre for Liveability Real Estate at https://liveability.com.au/liveabilityguides/download-free-renters-guide/ Options for increasing awareness and information in the residential sector (builders, owners, managers and tenants) are being further considered. **Findings** Since the project report was completed in December 2015 action has appeared to have stalled. The provision of energy efficiency information to tenants and the active promotion of awareness of energy efficiency measures across the residential sector are actions that will address the economic, environmental and social aspects of climate change action within tenancies. The Minister's Annual Report[45] identifies an average increase in electricity bills of $63.40 in 2015–16. Given that many low income householders rent their properties, the impacts on them may be considerable given their reliance upon inefficient housing stock.[46] There is a vast array of research which demonstrates that energy efficiency is a vital component of climate change mitigation and adaptation. While large scale renewable projects are equally important, energy efficiency initiatives should continue to receive the full weight of government support.[47] This action is of particular importance – in fact it could be argued to be central to the ACT Government's programs – given recently announced increasing energy prices and noting that, generally, vulnerable households are not home owners.[48] It is important to note that this is not a simple matter to address. Internationally, split incentives (when two parties engaged in a contract have different goals and levels of information) are recognised as a key barrier to improving energy efficiency in rental properties.[49] Critical to the intent of this action is the need to introduce appropriate regulation and incentives to landlords so that they provide energy efficient housing stock to tenants. The significance of this Action is reflected further in **Chapter 6 Social Equity** and also in **Chapter 8 Built Environment** and is supported with expert commentary.	Of concern

45 ACT Government, 2016: 2015–16 Minister's Annual Report, Climate Change *and Greenhouse Gas Reduction Act 2010.*
46 *Australian Council of Social Service, 2013: Energy Efficiency & People on Low Incomes*
47 http://renew.org.au/pears-report/the-pears-report-energy-inefficiency/ accessed 12 July 2017
48 http://www.acoss.org.au/energy-low-income-households/ accessed 12 July 2017
49 http://www.abc.net.au/news/2016-10-10/renters-are-being-left-out-in-the-cold-on-energy-savings/7914014 accessed 12 July 2017

ACTIONS	PROGRESS & FINDINGS	STATUS
ACTION 5: COMMUNITY ENGAGEMENT STRATEGY		
Develop a comprehensive strategy to engage the community on climate change matters and to provide integrated information, advice and support to Canberra households on reducing energy bills and cutting emissions. This will be guided by a community engagement strategy to be published in early 2013.	**Progress** A community engagement strategy was released in July 2014 and is available on the website.[50] **Findings** The content of the Strategy provides a framework rather than a comprehensive strategy or guide to action. The Strategy identified information sharing and partnerships as the key themes. From the evidence provided it appears that the implementation of the Strategy occurred through a variety of program areas in a relatively compartmentalised manner and absent of an overarching governance structure or adequate resourcing. Elements of engagement that have occurred include: • Actsmart programs, its website and social media, • EEIS programs and its stakeholder consultation, • Consultation on the Low Emissions Vehicle Strategy Discussion Paper, and • Engagement on the Draft Climate Change Adaptation Strategy. The engagement initiatives for the Draft Climate Change Adaptation Strategy demonstrated some success through a pre and post survey of community attitudes in 2013 and 2016. Results from the survey in 2013 indicated that the majority of the community accepted the climate change science, but were not aware of the ACT Government's actions to address climate change. Survey results suggested that awareness of government programs had improved in 2016. Assessment of any community engagement strategy is problematic as measures of success will be both qualitative and quantitative. This presents difficulties in any audit process where it is important to be able to measure outcomes to manage inputs. To achieve reductions in emissions from the transport sector and energy efficiency initiatives, the next round of policy will require behavioural change. This elevates the importance of community engagement. Development and implementation of a sound engagement strategy will be needed to call the community to action and coordinate government responses. **Chapter 5 Community Engagement** explores approaches to inform further initiatives.	Of concern

50 http://www.environment.act.gov.au/__data/assets/pdf_file/0006/620736/Community-Engagement-Strategy-on-climate-change_ACCESS.pdf accessed 12 July 2017

RECOMMENDATIONS

Urgent, purposeful, and targeted climate change action is both a critical function and core business of sub-national governments.

The ACT Government has been a leader and driver of climate change policy and action in the Australian context. There are further opportunities to leverage this position as a small and agile territory, particularly in the absence of national action.

The status of actions in *AP2* has been audited as part of this review. Significant achievements from *AP2* (2014-2017) include:

- Securing large scale renewable electricity contracts,
- Formation of the Renewable Energy Innovation Fund,
- Delivery of the Next Gen Battery Storage programs, and
- Effectiveness to date of the Energy Efficiency Improvement Scheme.

The status of the actions under AP2 have been audited and in general have been found to be progressing satisfactorily. OCSE provide the following recommendations to address audit findings:

1. Budget appropriation for climate change mitigation and adaptation policies will be significant, cannot be postponed and must be consistent.
2. Energy efficiency initiatives are crucial in delivering climate change outcomes and must be prioritised in policy development.
3. Climate change mitigation and adaptation policies must be embedded and integrated across whole of government functions.
4. Transport is the biggest climate change mitigation challenge for the ACT and significant commitment to policy development, action and targets will be central to the ACT continuing its reputation as a climate change policy leader and driver of change.
5. Community engagement in discussions about climate change policy is fundamental to effective interventions in respect of mitigation and adaptation.
6. Commitment to social equity in the face of climate change challenges must be strengthened in all new policy initiatives.
7. To effectively meet immediate and evolving climate change challenges, policy must be timely, focused by means of multi-sectoral short, medium and long term targets.
8. Climate change policy actions and targets must continue to be monitored and evaluated in open, transparent and independent review and audit processes.

4.
Monitoring Emissions Towards Carbon Neutrality

Introduction

ACT has some of the most ambitious emission reduction and renewable energy targets in the world.[1] These targets include:

- emissions reduction of 40 per cent below 1990 levels by 2020,
- 100 per cent renewable electricity by 2020, and
- zero net emissions (carbon neutrality) by 2050.[2]

To demonstrate leadership the ACT Government has committed to working to achieve carbon neutrality in its own operations by 2020.

The task of measuring, monitoring and reporting on these targets is fundamental to *AP2*.

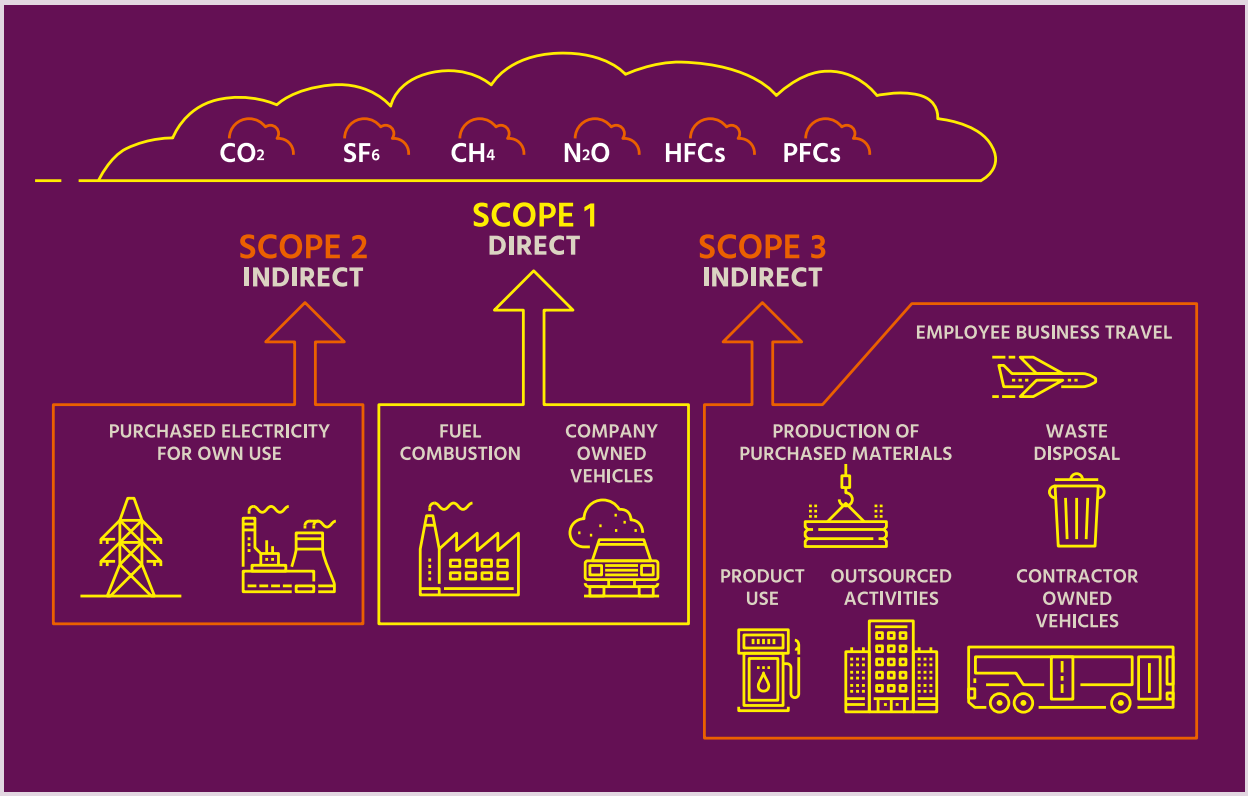
Fact box

EMISSIONS CATEGORIES

Greenhouse gas emissions are mainly caused by using fossil fuels to generate energy. Greenhouse gases are also emitted from the breakdown of organic waste sent to landfill.

There are three categories of emissions:

- Scope 1 and 2 cover direct emissions sources (e.g.: fuel used in company vehicles and purchased electricity), and
- Scope 3 cover all other indirect emissions, such as the production of purchased materials, outsourced activities, contractor vehicles and business travel.[3]



Emissions Categories. Source: World Resources Institute.

1 http://www.environment.act.gov.au/cc/acts-greenhouse-gas-emissions accessed 18 July 2017
2 http://www.environment.act.gov.au/cc/what-government-is-doing/emissions-and-mitigation accessed 18 July 2017
3 https://www.carbontrust.com/resources/faqs/services/scope-3-indirect-carbon-emissions/ accessed on 26 April 2017

ACT EMISSIONS INVENTORY

A report on ACT emissions, including an inventory, has been produced each year since 2010–11. This report tracks progress towards the emissions reduction targets.

Electricity makes up 56 per cent of ACT emissions, followed by transport (26 per cent) and natural gas (10 per cent). Between 2010–11 and 2014–15, ACT greenhouse gas emissions fell by 9.12 per cent to 3,998 kilotonnes carbon dioxide equivalent.[4]

The inventory is compiled in accordance with the *Climate Change and Greenhouse Gas Reduction (Greenhouse Gas Emissions Measurement Method) Determination 2016*.[5] This requires the inventory to be produced by an independent entity. The methodology for measuring emissions was reviewed by independent experts and updated in 2015. These changes brought about alignment with the Greenhouse Gas Protocol, as recommended in the OCSE Implementation Status Report, 2014.

As part of this 2017 report, a limited assurance audit by qualified experts was conducted on the 2015–16 emissions report.[6] This limited assurance audit concluded there were no material misstatements in the ACT emissions inventory.

BASIS FOR PREPARATION

A key recommendation is that the ACT Government develop a Basis of Preparation document:

- to ensure that the compilation of the ACT inventory is repeatable, and
- to enhance transparency.

Essentially such a document will outline the process of sourcing, handling and reporting the data from end to end. This is important given the complexity around the data sources, the changing variables that are included and the long term nature of the policy.

The Basis of Preparation document should outline and include:

- Roles, responsibilities and key contacts,
- Clear, relevant and up-to-date references to source data and the procedures undertaken to gather and store source data,
- A well-structured inventory clearly linking all source data to the summary inventory, and
- Adequate protection of the inventory and 'locked-down' after final reporting.

The Basis of Preparation document would ensure a systematic manner to producing the ACT inventory, promoting ongoing transparency, auditability and consistency for each respective reporting period and across reporting periods.

Best practice would be to audit the inventory at regular intervals. Bi-annually is suggested as appropriate. This will allow for continual improvement and ensure ongoing accuracy.

SETTING ENERGY PRODUCTIVITY TARGETS

It is recommended that as the ACT Government moves to 100 per cent renewable electricity it is timely to consider energy productivity, or primary energy targets in conjunction with emissions targets.

Energy productivity targets serve to drive energy efficiency and avoid future cost of capital associated with sourcing additional renewable energy sources or offsets. Australia's national energy productivity target is to improve energy productivity by 40 per cent from 2015 to 2030.[7]

Clear energy productivity targets would reinforce the government's commitment to address rising energy prices.

A leading example is the 2000 Watt Society for the City of Zurich, Switzerland. This goal engages the community in energy consumption in real, recognisable and relevant ways. It serves as both an energy action and a community engagement tool.

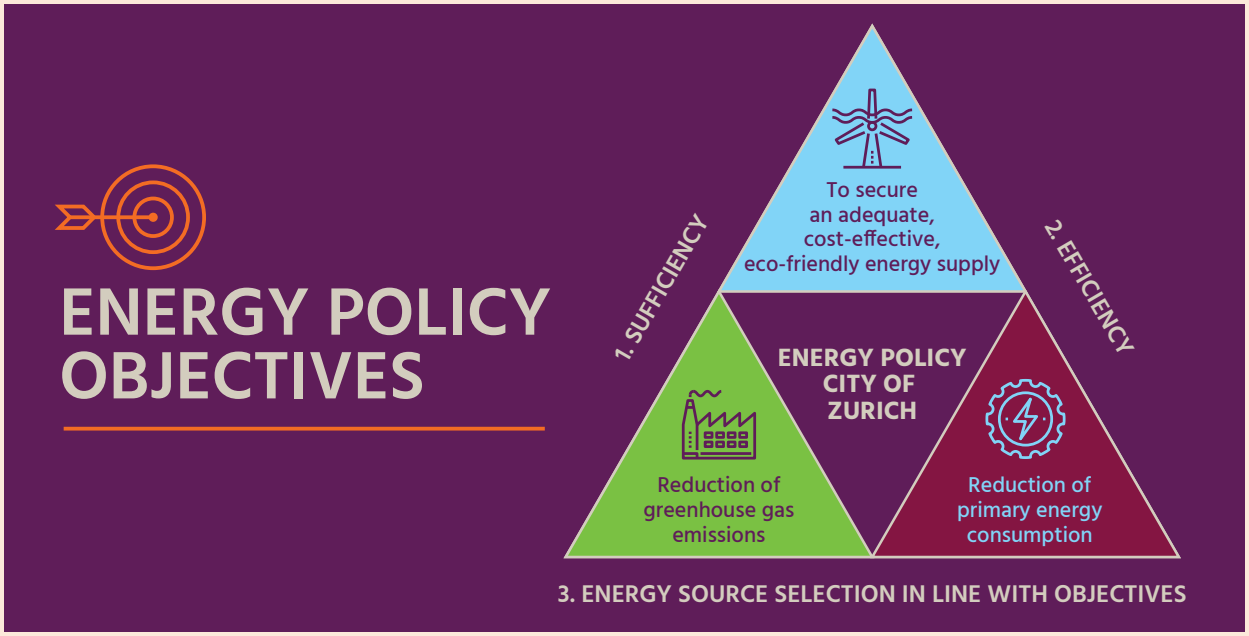
4 http://www.environment.act.gov.au/cc/acts-greenhouse-gas-emissions
5 http://www.legislation.act.gov.au/di/2016-257/current/pdf/2016-257.pdf accessed 21 July 2017
6 Ndevr, 2017: *Voluntary Limited Assurance Audit of the ACT Greenhouse Gas Inventory for the 2015–16 Report*
7 http://www.environment.gov.au/minister/frydenberg/media-releases/mr20160823.html accessed 21 July 2017

Case Study

2000-WATT SOCIETY[8]

The 2000-Watt goal of the City of Zurich, Switzerland, refers to the continuous rate of power consumption and means that each resident has an average two kilowatt hours (kWh) per hour at their disposal to cover their entire energy requirements – such as accommodation, food and mobility. The Energy Master Plan defines quantitative targets for the main parameters of the 2000-Watt Society: primary energy and greenhouse gas emissions.

Source: Wikimedia commons.



Adapted from: Energy Policy Objectives, Zurich.

8 Stadt Zurich, 2016: Energy Master Plan of the City of Zurich

CARBON NEUTRAL GOVERNMENT

The Carbon Neutral Government (CNG) Framework commits the government to working to achieve zero net emissions from its operations by 2020.[9]

The framework follows a three step process:

Step 1: Measure, monitor and report emissions,

Step 2: Implement mitigation measures, and

Step 3: Purchase carbon offsets.

PROGRESS SO FAR

The ACT Government is responsible for approximately 5 per cent of the ACT's GHG emissions. Reducing these emissions to achieve carbon neutrality is the collective responsibility of all agencies. The CNG Implementation Committee (CNGIC) was established in 2013 as the inter-directorate engagement and decision-making body to oversee progress.

The CNG Fund was established in 2012. It has supported projects totalling $12.3 million. Energy efficiency measures have received funding of approximately $10.6 million to date. These will provide around $1.8 million in annual cost savings. The CNG fund is a valuable initiative which should be regularly reviewed to ensure it is fit for purpose and well understood by whole of government.

Currently government is monitoring emissions from electricity, gas and transport fuel usage continues. Since 2012–13, the Government has achieved a 20 per cent reduction in emissions largely through energy efficiency upgrades (lighting, heating and air conditioning systems).[10]

A COMPLEX TASK

Given the nature of ACT Government, the attainment of carbon neutrality is no easy task. Directorates have:

- different governance structures,
- a diverse range of assets and operational needs, and
- are essentially their own business rather than a single organisation.

Case study

EMISSIONS DIVERSITY OF GOVERNMENT

Consider Transport and City Services (TCCS) and Education Directorate (ED).

TCCS delivers a diverse range of services, with a significant fleet and associated transport emissions and a range of depots and other assets. This directorate operates libraries, waste services, linen cleaning, cemeteries, public transport and city presentation functions.

ED is largely school 'assets'. While differences exist across the sector – including building fabric, asset age and community demographics – these assets are generally homogenous in asset type and operation. The very nature of the assets has encouraged ED in seeking and receiving funding from the CNG Fund, applying for projects which cover several schools at a time.[11]

Leveraging economies of scale in funding applications is not as achievable in the assets and operations of TCCS.

A second important challenge to achieving carbon neutrality outcomes is the time frames across which submissions must operate – budget determinations are often short term.

Thirdly, specific expertise is required to develop emissions reports and facilitate mitigation opportunities within agencies. This skills base requires nurturing in terms of human and financial resources.

9 http://www.environment.act.gov.au/__data/assets/pdf_file/0020/630065/Carbon-Neutral-ACT-Government-Framework_ACCESS_aug.pdf accessed 21 July 2017

10 ACT Government, 2016: *Carbon Neutral Government Framework 2016 Implementation Report*

11 http://www.environment.act.gov.au/cc/what-government-is-doing/act-government-operations/examples_of_government_energy_projects_funded_under_loan_funding accessed 21 July 2017

RESOURCES FOR A CARBON NEUTRAL GOVERNMENT

At the time of analysis, directorates differed in the level of human resources assigned to the CNG Program. Resources ranged from several people working on energy related projects and reporting, to the function of a sustainability manager being added to an existing position.

For the program to be delivered effectively directorates need to commit ongoing and secure resources.

It is necessary that directorate personnel are equipped with:

- appropriate technical skills and experience, and
- the ability and authority to influence assets and operations that impact on emissions.

The CNG Program Team are facilitating and coordinating a consistent and high quality approach to CNG across Government. They administer the data management systems and provide training and technical support to the various sustainability managers across the numerous agencies. This is reflective of a matrix organisational structure that can achieve significant efficiencies through agility across functions. This work requires clear roles and responsibilities to operate effectively.[12] This model is being transformed further in the business world to a 'network of teams' model that leads to additional, measurable and multiple benefits.[13]

Integral to an effective network of teams is the need to define the mission of each team clearly, delegate responsibility, assign strong team leadership, and build a shared culture and set of information and communication tools that help teams align with each other. For best outcomes information and communication is shared across functions without having to go up and down the siloed hierarchical channels of conventional business structures. Operating in this way leads to innovation, best practice and – most relevant to CNG – the ability to respond to rapid change. Further, operating in this manner also builds internal expertise and capacity across the whole of government.

The CNG program team should be reviewed in this context to maximise its potential and ensure its permanency.

The CNG Project Team, if adequately resourced, has potential to augment its role and add further value across directorates, as an internal consultancy team with responsibilities to provide short term intensive assistance during staff or operational changes. This is particularly important given the rate of action needed to address policy objectives in an efficient manner.

STANDARDS FOR CARBON NEUTRALITY AND SCOPE 3

The National Carbon Offset Standard (NCOS) is the national certification scheme which enables entities to be recognised as carbon neutral in their operations, products, services and events in Australia.[14]

Fact box

CARBON OFFSET STANDARDS[15]

Verified Carbon Standard (VCS)

The VCS is an international standard that ensures carbon reductions meet quality standards and are independently verified, numbered and listed in a central database.

The Gold Standard (GS)

Established by the World Wildlife Fund (WWF), the GS certifies offset projects that demonstrate greenhouse gas reductions and positively impact the economy, health, welfare and/or environment of the community where the project is located.

Australian Carbon Credit Unit (ACCU)

The Clean Energy Regulator issues ACCUs for greenhouse gas abatement activities undertaken as part of the Australian Government's Emissions Reduction Fund. Each ACCU issued represents one tonne of carbon dioxide equivalent stored or avoided by a project.

National Carbon Offset Standard (NCOS)

NCOS is an Australian government standard that verifies claims of carbon neutrality in Australia. To verify carbon neutral claims, the NCOS specifies that organisations must buy their offsets from projects verified under eligible schemes.

12 https://pmstudycircle.com/2012/08/what-is-a-matrix-organization-structure/ accessed 26 July 2017
13 https://dupress.deloitte.com/dup-us-en/focus/human-capital-trends/2016/organizational-models-network-of-teams.html accessed 26 July 2017
14 http://www.environment.gov.au/climate-change/publications/national-carbon-offset-standard-version3 accessed 21 July 2017
15 https://www.choice.com.au/home-improvement/energy-saving/reducing-your-carbon-footprint/articles/carbon-offsets accessed 26 July 2017

NCOS requires entities to consider Scope 3 emissions in their operations to achieve carbon neutral certification.[16] This includes materiality thresholds but also acknowledges limitations around the availability and quality of data. At present only some Scope 3 emissions are being identified and reported on in the CNG Program.

In keeping with the important role that local and sub-national government are playing in delivering on the urgent task of addressing climate change challenges several local councils have been certified under NCOS as carbon neutral in their operations.[17] These cities include:

- City of Sydney,
- Brisbane City Council,
- City of Melbourne,
- City of Yarra,
- Leichardt Municipal Council, and
- Moreland City Council.

These city administrations are diverse and all have their own challenges in reaching the targets they have set for themselves. They nevertheless provide examples of how Scope 3 emissions might be introduced into the ACT CNG initiative.

Brisbane City Council applied the *GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard* to develop their Scope 3 emissions.[18] Relevance and materiality were then considered against and the following NCOS criteria:

- the emissions source is likely to be large relative to Council's scope 1 and 2 emissions (1 per cent threshold)
- the emissions source has the potential to contribute to Council's greenhouse gas risk exposure
- the emissions source is deemed to be relevant to key stakeholders
- Council has the potential to influence reductions from the emissions source
- the source relates to emissions from outsourced activities previously performed in-house or activities outsourced by Council that are typically performed in-house by other local government authorities.

Scope 3 emissions accounted for about 33 per cent of Brisbane City Council emissions.

Reporting of Scope 3 emissions is particularly and increasingly important to maintain public confidence and avoid accusations of 'greenwash'.[19]

Reporting on Scope 3 emissions can be subjective, and it is important to know where and how to demarcate the reporting boundary. It is important that a consistent approach is applied across government.

16 http://www.environment.gov.au/climate-change/publications/carbon-neutral-program-guidelines accessed 26 April 2017

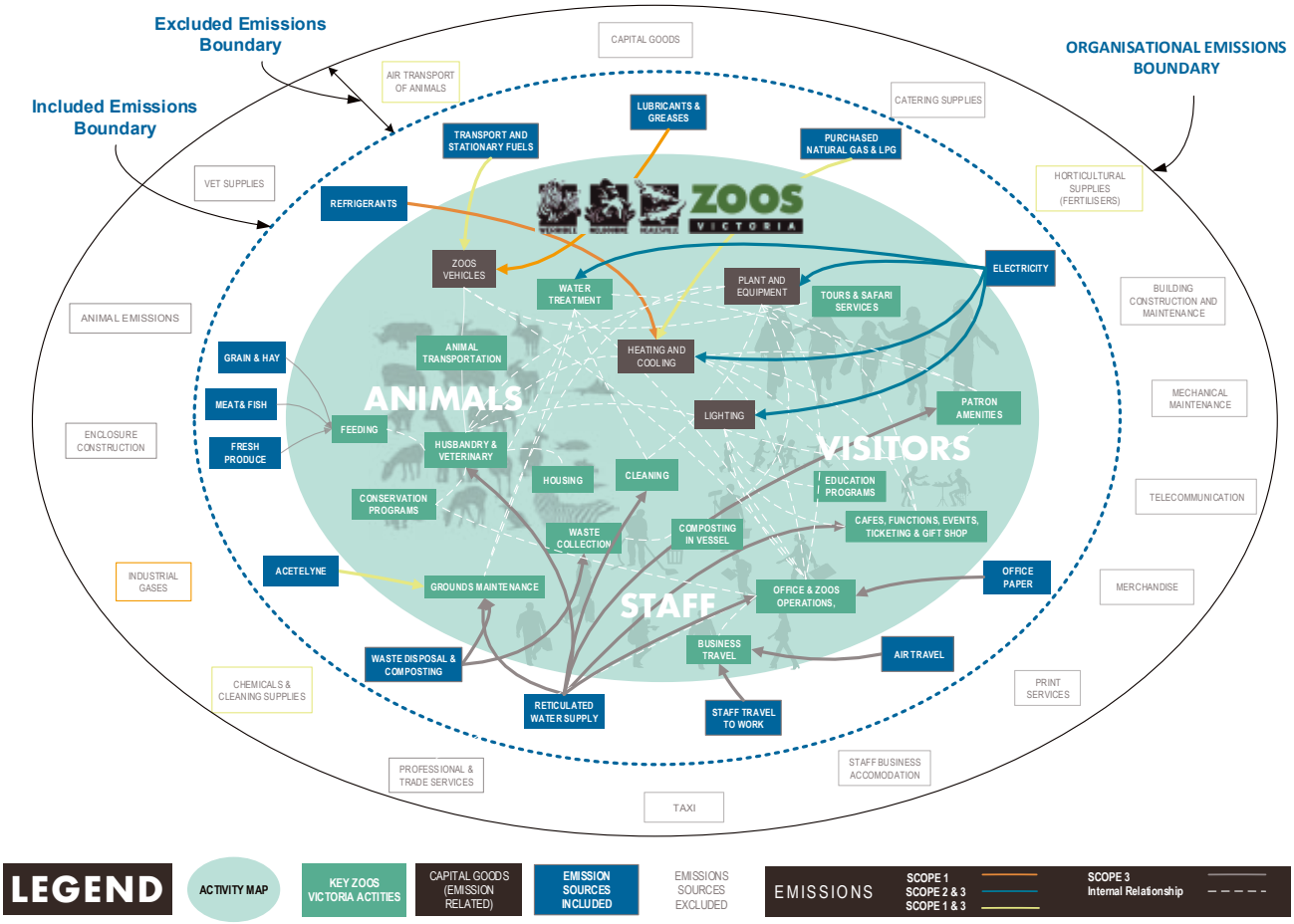
17 http://www.environment.gov.au/climate-change/carbon-neutral/carbon-neutral-program/certified-businesses#Certified_organisations accessed 21 July 2017

18 https://www.brisbane.qld.gov.au/about-council/governance-strategy/vision-strategy/reducing-brisbanes-emissions/carbon-neutral-council accessed 21 July 2017

19 http://www.isa.org.usyd.edu.au/research/InformationSheets/ISATBLInfo17_new.pdf accessed 19 May 2017

CLEAR EMISSIONS BOUNDARIES

The NCOS requires entities to represent their emissions boundaries in a diagram.[20] An example is provided by Zoos Victoria which first asserted its carbon neutrality in 2013.[21]



Example of a Emissions Boundary Diagram. Source: Zoos Victoria[22]

This sort of approach could be used to clearly identify the boundary of the CNG Program and easily communicate which Scope 3 emissions are included and excluded from inventories and mitigation strategies.

The approach facilitates the creation of a boundary which is clear, transparent, reproducible and generally consistent across government. When an agency experiences a restructure or change to its portfolio of assets, the approach could be used to confirm the new boundary.

20 http://www.environment.gov.au/system/files/resources/749d844e-4ee8-440b-bf1d-19365046b2bc/files/national-carbon-offset-standard-v3.pdf accessed 25 July 2017

21 https://www.zoo.org.au/news/your-zoos-are-now-carbon-neutral accessed 26 July 2017

22 http://www.environment.gov.au/system/files/pages/b5882733-7206-40ac-b158-9b0c938ad3fd/files/zoos-vic-pds-2013-14.pdf accessed 25 July 2017

Case study

STRESS FREE SCOPE 3[23]

Reporting Scope 3 emissions would normally require organisations to survey their entire supply chains and the supply chains of their suppliers. This is an administratively complex, expensive and methodologically problematic approach for most organisations.

The Centre for Integrated Sustainability Analysis at the University of Sydney has developed a solution to this problem by modeling supply chain emissions throughout the economy. The ISA methodology based on Input-Output Analysis automatically carries out a complete upstream life-cycle assessment of an organisation's impacts. In order to do this it requires only one set of information – the organisation's financial accounts.

TO OFFSET OR TO NOT OFFSET

There are cogent and differing views as to the role that offsets should play in climate change action. It is argued that offsets do not have the desired effect and any interest in examining their utility is misplaced. [24]

This view reflects concerns about an increased profile of emissions over time, making offsets a questionable remedy.[25] This is particularly important to consider in respect to costs, the impacts on ACT households and social equity.

A carbon offsets policy was established in 2012 as part of the ACT's climate strategy, *AP2*. It is understood that this policy is currently under review. Whilst the policy sets priorities for the purchase of offsets, a purchasing strategy, and the timing of purchases, is now being considered.

With the 2020 ACT target date fast approaching, serious consideration needs to be given to any proposed offsets purchasing strategy. There is a risk that offset prices may increase dramatically approaching 2020 as the Kyoto rules for creating offsets expire.

Further, offsets entail a significant investment and some offsets have varied levels of co-benefits.[26] Some offsets have been proven to have detrimental impacts or unintended consequences.

Should the ACT Government consider pursuing an offset strategy, matters which require assessment would include consideration of the volume and timing of purchases, and the triple bottom line value of the offsets.

There are also serious reputational considerations. A preference for using carbon offsets generated in the ACT, and secondly Australia, has been identified as a preferred measure in consultation for this report. Offsets range in quality and have varying levels of co-benefits and additionality that need to be carefully considered. Using Gold Standard Credits to manage the social impact risks is preferred, however these generally come at a higher price than lower quality offsets.

In the event an offsets purchasing strategy is implemented it must be supported by clear justification of the use of government funds and that it is pursued only as a last resort to firstly avoiding and reducing emissions.

It is unlikely that offsets required for both Government and ACT carbon neutral targets would be able to be secured from within the ACT.

Given the significant investment that may be needed for offsets and some of the risks outlined here, it is necessary to assess such a policy against investment in, for example, energy efficiency initiatives within the ACT. A community discussion on this important decision should commence immediately. The decision is one which will impact energy prices and, if not supported by an engaged community, it will be fraught with risks.

An ACT case study that demonstrates recent offset practice is the construction of the New Cotter Dam.

23 http://www.isa.org.usyd.edu.au/research/InformationSheets/ISATBLInfo17_new.pdf accessed 19 May 2017
24 http://carbonmarketwatch.org/wp-content/uploads/2017/04/Good-bye-Kyoto_Transitioning-away-from-offsetting-after-2020_WEB_1final.pdf accessed 25 July 2017
25 http://www.abc.net.au/triplej/programs/hack/how-australia-can-emit-more-while-kyoto-protocol-emissions-fall/7007346 accessed 25 July 2017
26 https://www.choice.com.au/home-improvement/energy-saving/reducing-your-carbon-footprint/articles/carbon-offsets accessed 26 July 2017

Case Study

OFFSETTING CONSTRUCTION EMISSIONS WITH THE NEW COTTER DAM

In 2008, when the ACT Government and Icon Water (formerly ACTEW Corporation) had to deal with the imminent consequences of climate change and improve water security, it ensured that mitigating carbon emissions was at the forefront of its decision making process.

As part of a holistic solution, the ACT Government and Icon committed to minimising and then offsetting greenhouse gas emissions (GHG) associated with the project. This commitment included offsetting all greenhouse gas emissions associated with the construction and operation of the new Enlarged Cotter Dam (ECD).[27]

Spilling on 10 July 2016. Source: Wikimedia commons.

In the early phases of design, Icon developed greenhouse gas assessments including the emissions associated with:

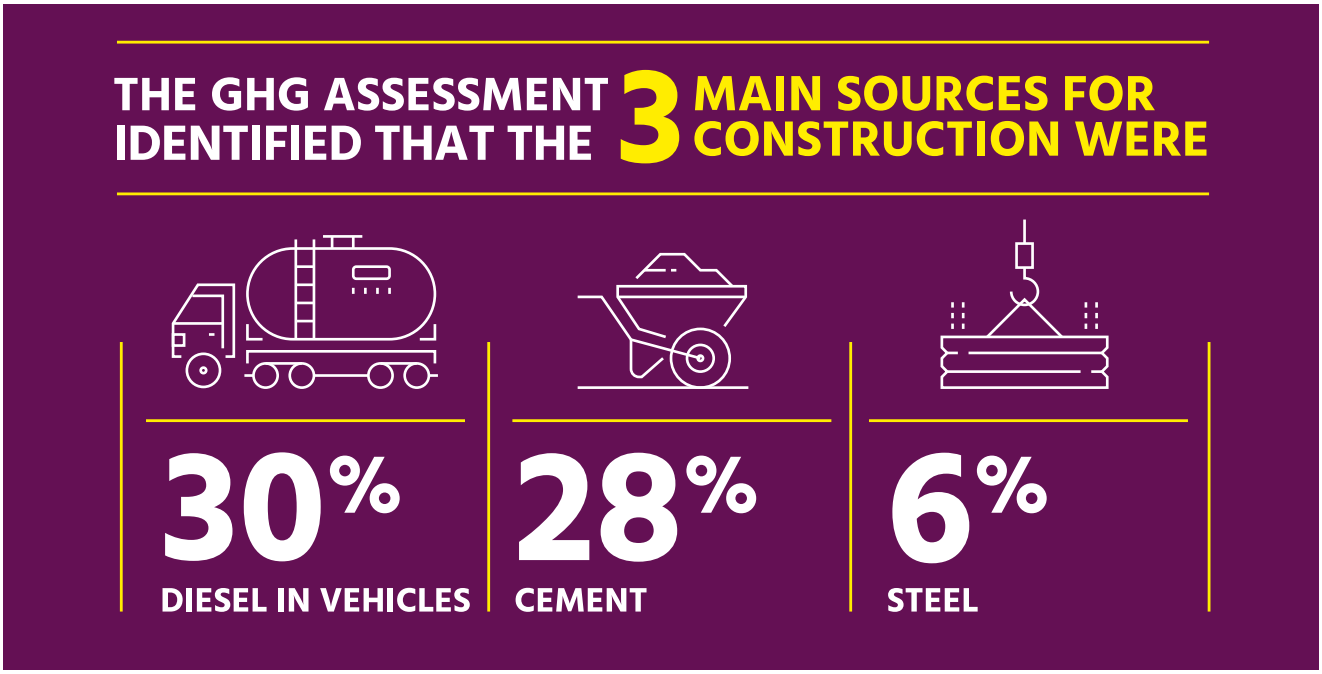
- the production of raw materials,
- transportation of materials to site,
- fuel and electricity consumption during construction,
- the disposal of waste generated during construction,
- bioemissions associated with the inundation of the reservoir,
- the removal of forested areas, and
- the electricity consumption during operations.[28]

The GHG assessment identified that the three main sources for construction were diesel in vehicles (30 per cent), cement (28 per cent) and steel (6 per cent).

A total of 106,000 tonnes of carbon dioxide equivalent – were identified for the construction of ECD and 241,000 tonnes of carbon dioxide equivalent were projected for a 30 year operation horizon. Icon pursued a diversified portfolio of offsets[29] to secure contracts to deliver the required offsets over a 30 year period.[30]

About 2,600 ha of former marginal wheat farms near Morawa, Western Australia were planted using a biodiversity model that germinates over 30 native, endemic species which are sourced locally.[31] This model is designed to maximise carbon sequestration from self-sustaining, biodiverse forests and to provide a conservation habitat for endangered flora and fauna.

A second forest was planted on poor agricultural land near Tullamore, NSW, with blue leaf mallee eucalypt, a species endemic to that region.[32]



27 Enlarged Cotter Dam, Environmental Impact Statement 2009, page 160;and https://www.iconwater.com.au/Sustainability-and-Environment/Sustainability-and-environment-programs/Sustainable-infrastructure.aspx accessed 4 April 2017
28 Enlarged Cotter Dam, *Environmental Impact Statement* 2009, Appendix P
29 Enlarged Cotter Dam, *Environmental Impact Statement* 2009, page 161
30 Canberra Times, 11/9/11 – *Emissions target slugs water users*;
31 http://www.auscarbongroup.com.au/pages/bio.php accessed 10 April 2017
32 http://www.moreechampion.com.au/story/931782/grazing-and-farming-land-taken-over-to-offset-carbon/ accessed 10 April 2017

ADDITIONAL RECOMMENDATIONS

The ACT has shown leadership in its emissions reduction and renewable electricity targets.

The establishment of the Carbon Neutral Government Framework is commendable and reflects government's commitment to climate action.

To effectively support these policy initiatives the following additional recommendations are provided, continuing on from recommendations made on page 43.

For both initiatives, the notion of purchasing offsets to achieve targets is relevant. For this matter, it is recommended that Government:

9. Engage the community in a meaningful conversation about the credibility and validity of investing in offsets to support carbon neutrality against other investment options.

ACT Emissions Inventory

10. Develop a Basis of Preparation end to end process manual for the ACT emissions inventory to ensure ongoing accuracy and repeatability of ACT emissions monitoring and reporting.
11. Conduct an audit of the ACT emissions inventory to ensure accuracy and facilitate continuous improvement, initially in 2 years time and at regular intervals thereafter.
12. Identify energy productivity and/or efficiency targets in conjunction with emissions reduction targets at 5 to 10 year intervals out to 2050 to optimise sustainability outcomes.

Carbon Neutral Government

13. Ensure that adequate and permanent resources are committed to the CNG Program, both in the central facilitation team and within agencies.

14. In line with national best practice, consider reporting significant Scope 3 emissions associated with ACT Government operations and clearly document their inclusion or exclusion in carbon neutral aspirations.

15. Produce an emissions boundary diagram for each agency to improve transparency and rigour in reporting emissions and developing mitigation strategies.

16. Ensure ongoing improvement to document processes for government agency greenhouse gas inventories to ensure integrity and efficiency of initiatives.

17. Improve awareness and ease for applications to the CNG Loan Fund.

5. Engaging the Community in Climate Change Action

There are social dimensions that inhibit the broader community accessing energy efficiency and being engaged in the energy conversion to renewables. There is an apparent disconnect between how electricity is made and how it is socially perceived. This perpetuates public apathy and misinformation.[1]

Introduction

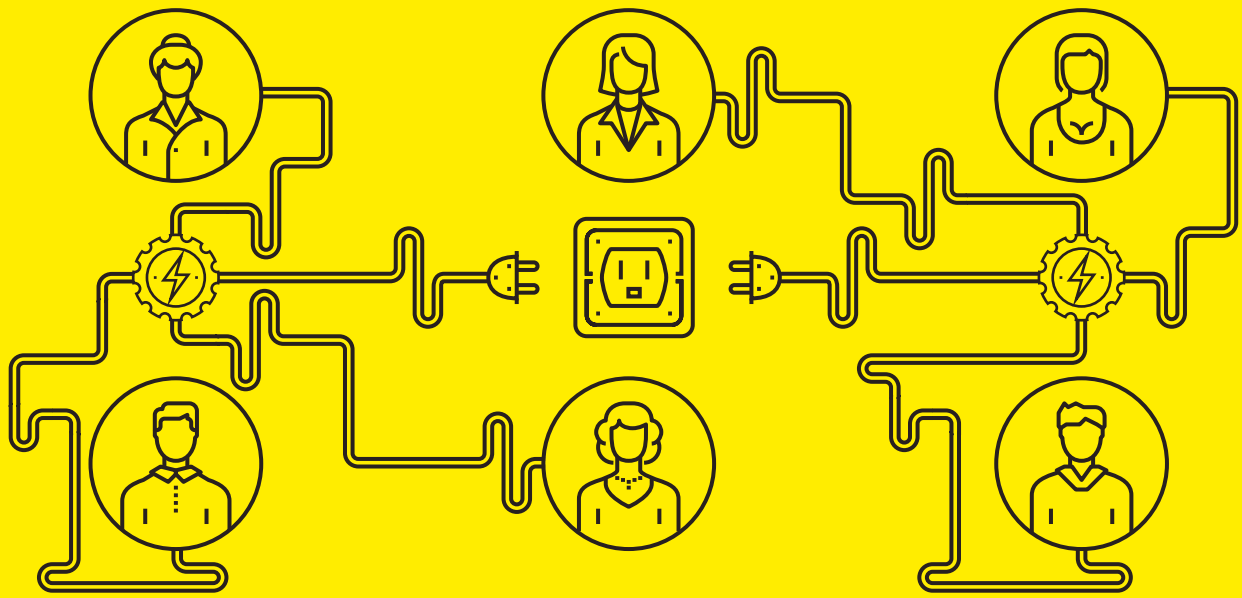
The challenge of 'community engagement' about climate change action (*Action 5 AP2*) is recognised as an area of concern in this audit.

The ACT Government surveyed the community about climate change in 2013 and 2016. In 2016 *90 per cent of ACT respondents agreed that climate change is a genuine problem for the future*. This suggests that raising awareness of the problem of climate change is less important than promoting action and effecting implementation of climate change programs.

Action 23 of the ACT *Climate Change Adaptation Strategy* (2016):

- calls for awareness raising,
- promotes more effective information sharing across all stakeholders,
- requires a review of the achievements of the 2014 ACT *Engagement Strategy*, and
- establishes the need for an assessment of priorities for new climate change activities from 2017 to 2020.

The comments made in this chapter are intended to assist in the development of *Action 23*.



1 Benjamin K. Sovacool, 2009: *The cultural barriers to renewable energy and energy efficiency in the United States*, Technology in Society, Volume 31, Issue 4, Pages 365–373

A Universal Challenge

Jurisdictions everywhere accept the imperative nature and complexity of community engagement in effecting implementation of climate change programs. Local governments have committed to working with the community on climate change adaptation.[2] Toolkits[3] and city climate change plans[4] have been developed all over the world. Community mapping[5] and action planning has been used to bring out local voices[6] and protocols have been developed in many jurisdictions.[7] In the international context, universities, sub national governments and cities (UCCRN) have all proposed schemes to better engage the public in the challenges and solutions which impact them. In the Australian climate change context NCCARF[8] and VCCCAR[9] have worked to provide templates, tools and theoretical demonstrations of best practice.

In 2015 the Victorian government's Auditor General reported that '*public participation is a critical government activity*'. Alienation, '*negative impacts*' and '*poorly informed and implemented decisions*' would flow from failure to recognise and embrace it.[10]

The *Community Engagement Handbook South Australia*, and its subsequent iterations under the banner *Better Together*, speak of the *need to plan* for community engagement, not just launch into it,[11] and to operate on the basis of '*principles*' which include timeliness, authenticity and acceptance of critical feedback.[12] The need for a whole of government framework is both necessary and challenging.

The previous ACT *Community Engagement Strategy on Climate Change*[13] was launched in July 2014. It follows a range of earlier statements, strategies and directions.[14] The 2014 *Strategy* was developed by a whole-of-government communications network, driven by a commitment to shared responsibility and a partnership approach, with the intention to promote resilience. Much activity has followed the launch of the *Strategy*.

In furthering the *Strategy*, the ACT Government has:

- disseminated information to the public, in hard copy, social media, a web hub, opinion pieces, competitions, stalls and installations, public reports, launches and events (using the sort of '*multiple modern media*' which is necessary to engage a diverse community),[15]
- conducted stakeholder forums with feedback loops, on the *Energy Efficiency Improvement Scheme*,
- undertaken '*mandatory*' community consultation on the draft 2016 *ACT Climate Change Adaptation Strategy: Living with a Warming Climate*, seeking written submissions and responses to an online questionnaire, conducted stakeholder workshops, and provided presentations at Community Councils and to other organisations,
- taken submissions on the *Low Emissions Vehicle Discussion Paper*, and
- conducted community surveys to gauge community views on climate change and other issues.[16]

Actsmart also reported establishing and encouraging partnerships with households, schools and community groups; business, industry and knowledge brokers; and regional local government and other sub-national governments.

Activity has not been lacking, but as *Action 23* provides for the reconsideration and re-evaluation of community engagement strategies, it is timely for this audit to provide input.

2 http://www.acelg.org.au/system/files/publicationdocuments/1353548699_Connecting_Communities_NZSIG-ACELG_August_2012.Pdf; https://www.hume.vic.gov.au/files/51cbbebe-df6c-453c-ae26-9f2800edb59f/Community_Engagement_Framework.pdf accessed 9 June 2017

3 http://www.communityplanningtoolkit.org/sites/default/files/Engagement.pdf accessed 9 June 2017

4 http://onenyc.cityofnewyork.us/wp-content/uploads/2017/05/OneNYC_Progress_Report_2017.pdf; http://www.100resilientcities.org/blog/entry/building-resilience-through-community-engagement-the-fargo-project#/-_/ accessed 9 June 2017

5 http://www.germapcenter.org/?lang=en accessed 9 June 2017

6 http://www.participatorymethods.org/authors/scottish-participatory-initiatives accessed 9 June 2017

7 http://www.participatorymethods.org/method/facilitating-workshops-co-generation-knowledge-21-tips accessed 10 July 2017

8 https://www.nccarf.edu.au/synthesis/information-manual-9-community-engagement accessed 10 July 2017

9 http://www.vcccar.org.au/sites/default/files/publications/VCCCAR%20IA%20Community%20Sector%20Report%20FINAL%20250713.pdf accessed 9 June 2017

10 http://www.audit.vic.gov.au/publications/20150130-Public-Participation-BPG/20150130-Public-Participation-BPG.pdf accessed 8 June 2017

11 http://www.lga.sa.gov.au/webdata/resources/files/Community_Engagement_Handbook_March_2008_ accessed 10 July 2017

12 http://bettertogether.sa.gov.au/principles-of-engagement accessed 10 July 2017

13 ACT Government, 2014: *Community Engagement Strategy on Climate Change*

14 ACT Government, 2011: *Engaging Canberrans: A guide to community engagement 2011*. Demonstrating the shift in emphasis across time the 2011 'guide' addresses (amongst other things) the need to '*manage* extreme views', '*manage* expectations', and is concerned about the 'benefits and *risks* of community engagement' (OCSE emphasis).

15 Marshall, N. et al, 2017: *Empirically derived guidance for social scientists to influence environmental policy*, PLosOne

16 www.environment.act.gov.au/cc/community-engagement accessed 9 June 2017

Partnerships, Timeliness, Authenticity and Critical Feedback

Community engagement is complicated and increasingly it is multifaceted.[17]

A community is never a monolithic demographic. The community in the ACT which needs access to the programs offered by the government through *AP2*, and whose voices are important to good policy outcomes, is complex. The Australian Bureau of Statistics 2017 data analysts recognise this –

> *'[the 2016] Census provides plenty of info on the 'typical' Australian, [and] it also shows we're a big, diverse community. There's nothing typical about Australians'*.[18]

The challenge is to engage those members of the public who are 'hard to reach'. It is important to not just revitalise links with interested and already active members of the community. Reflecting the breadth of the undertaking, when launching *AP2,* Minister Corbell[19] observed that *'everybody'* has a responsibility to act on climate change.[20] This includes government, business, the public, and the academic community and non-government organisations.

Business enterprises are not specifically considered here, but it is abundantly clear that ACT businesses have a role in climate change mitigation and adaptation processes as

- retailers of adaptation products,
- office-based organisations, and
- community members with leadership skills and positions of authority.

To this end, the commentary contained in this chapter has relevance to business but is not intended as a guide to best business practice, except to the extent that these comments might broadly assist businesses in building climate change adaptation and mitigation engagement processes.

Notoriously, climate change exacerbates the already obvious challenges to government in its attempts to engage with the public as it is a multi-disciplinary problem with temporal and spatial elements.[21] There are cultural,[22] as well as social and economic challenges to be overcome, barriers are not simple, and inertia and resistance to change has many sources.

In a 'top down' manner, government cannot simply address this challenge. Communities and individuals present an array of drivers, responses, interests, issues and levels of receptiveness and enthusiasm for assuming responsibility for change. Solutions will be both imposed and organic, and leadership will emerge across the spectrum. Big technological interventions (such as solar and wind farms) can be installed from the top down, but the energy efficiency efforts we need to make will require action with a number of entry points.

Partnerships for change have never been more necessary.

In the infographic overpage we illustrate the array of principles, sectors and practical applications, to show a range of the potential interactions.

17 For example, consultation processes unrelated to the *AP2*, such as *Mingle* and *Your Say*, are exploring ways to engage the community in education, precincts, development applications, transport options: http://suburbanland.act.gov.au/en/community-consultation accessed 10 July 2017.

18 http://www.abs.gov.au/websitedbs/D3310114.nsf/home/2016+Census+National accessed 10 July 2017

19 Minister Simon Corbell, Community Engagement Strategy on Climate Change, July 2014.

20 https://www.carbontrust.com/news/2015/12/cop21-paris-agreement-for-business/; http://citiscope.org/habitatIII/news/2015/12/paris-city-hall-declaration-world-mayors-throw-down-gauntlet-climate accessed 9 June 2017

21 Moser, S. (ed), 2012, *Creating a climate for change* University of Colorado, Boulder, *https://www.cambridge.org/core/books/creating-a-climate-for-change/B9FA846F3E45EB7C2DAE45ABF0900BB8*

22 Benjamin K. Sovacool, 2009: *The cultural barriers to renewable energy and energy efficiency in the United States*, Technology in Society, Volume 31, Issue 4, Pages 365–373

ELEMENTS OF COMMUNITY ENGAGEMENT

HOW TO PRACTICE PUBLIC PARTICIPATION

1. **REFLECT** the **why** and the **what**
2. **WRITE** a brief concept
3. **PERSONALISE** the approach with your audience
4. **CO-CONVENE** your approach with a key stakeholder
5. **PLACE-BASED** settings
6. **PLAN** but do not overplan – be flexible and adaptable
7. **TAKE CARE** with your initial approaches and invitations
8. **KNOW** government protocols
9. **SHARE** key documents early
10. **ENCOURAGE** multiple ownership and credit
11. **SET** an informal and open atmosphere
12. **ENSURE** the approach is accessible to many
13. **BRAINSTORM** to create agendas
14. **SUPPORT** self-organising systems on the edge of chaos
15. **USE** participatory, not preaching, presentations
16. **BE PREPARED** for follow up and seek agreement on actions
17. **FOLLOW UP PROMPTLY** with outcomes and further information
18. **SHARE** what is learnt

HOW TO FACILITATE PUBLIC PARTICIPATION IN DECISION MAKING

1. **DEFINE** the decision required, and the scope of the public participation exercise
2. **IDENTIFY** who is affected and how they should be included
3. **UNDERSTAND** what you need and when
4. **DOCUMENT** the public participation and management approach into a plan
5. **IMPLEMENT** the plan and monitor its progress
6. **EVALUATE** the exercise and apply continuous improvement

HOW TO ENGAGE ESTABLISHED NETWORKS ON CLIMATE CHANGE

1. **MAP** existing networks
2. **IDENTIFY** key champions
3. **SUPPORT** engagement of key champions
4. **SUPPORT** climate change initiatives
5. **MONITOR** and EVALUATE
6. **SHARE** innovations and lessons

Case Study

SOUTH AUSTRALIA

The South Australian experience of community engagement suggests that in practical terms it is necessary to:

- know who we are engaging,
- know who to engage,
- know the histories of processes and projects and communities,
- start *together*,
- be *genuine*, and
- make what we do both relevant and engaging.[23]

Fundamentally, the community has valuable contributions to make. Partnerships are pivotal to better outcomes in both developing policy and implementing it. Government needs to begin with the recognition that it will benefit from openness and candour in developing policy which impacts the community.[24]

Timeliness and persistent *feedback loops* are highly significant starting points for improving interactions and outcomes.

Case Study

AN ACT COMMUNITY PERSPECTIVE – MIRRORING THE SOUTH AUSTRALIAN OBSERVATIONS

We asked Lauren Bradley, a Woden community development officer, for her insights about community engagement and her experience echoed the work coming out of South Australia.

The following thoughtful and purposeful roadmap on intent, parties, processes, expertise, messaging and co-benefits, was provided.

- *Genuine* and effective community engagement will leverage the *existing networks* and resources in our communities.
- In sustainability contexts, government and organisations need to *look beyond* engagement with *organisations that are specifically concerned with sustainability* and environmental matters.
- Messaging needs to be shaped to *appeal to people's different lives and priorities*. Some people will be motivated to change behaviour for the sake of the environment whereas, for others, understanding the financial benefit of greener activities will be more appealing.
- *Visual demonstrations and interactive pop-ups are a valuable tool to engage with a range of people face-to-face*. Such installations provide demonstration sites and *show* the community directly *how* to make changes.
- Projects and programs which facilitate this sort of exchange also *provide for interaction with the experts* and present an authenticating environment for change.
- *Authoritative responses to questions* and providing immediate linkages to opportunities are an important way to deliver information so that it is conducive to action being taken.
- Providing an interactive forum (not just 'talking heads') for questions and answers also *responds directly* to the concerns people may have.
- People make decisions based on their lifestyles and they often express concerns about the impacts on their current standard of living if they are to adopt greener methods/options. The *co-benefits of action* need to be described in a realistic manner.

23 http://bettertogether.sa.gov.au/principles-of-engagement accessed 10 July 2017
24 http://saplan.org.au/assets/better-together.pdf accessed 8 June 2017

Take Home Messages

INFORMATION AND CO-BENEFITS

'Facts' and 'information' are not enough to drive change, particularly when the issues are complex and problems 'wicked'. Communities are diverse and divergent, and the messages have to address this level of complexity.[25] Co-benefits may be a persuasive lever in some cases. This will involve a conversation about other issues than climate change and has the potential to make the discussion both more and less complicated.

CLEAR NEEDS, REAL AND RELEVANT PROJECTS

Programs need to be real and relevant, address clear needs, and be easy and accessible. The public will be a helpful partner and guide to this. Public participation will be instrumental in driving take up and change.

PARTNERSHIPS AND CO-CREATION

Recognition of the importance of iteration and co-creation[26] can be challenging when results are required (immediately) and decisions about policy matters have already been determined.[27] In spite of these pressures, co-creation of policies and solutions is clearly more effective in advancing implementation than the simple imposition of programs (which is effective in the short term). It is through the enthusiasm which is generated by co-creation, and the routinisation of possibilities through replication, that opportunities are exported beyond the immediate circle of beneficiaries.

ACCESSIBILITY

People need to not only *know* about initiatives but also how to access them – this is a clear role for government and its agencies. The previous commentary from the Woden community perspective supports this observation, as does the ever-increasing community engagement scholarship in respect of climate change.

TIMELINESS AND FEEDBACK – COMPLEXITY SIMPLIFIED

To get to, engage, and hold the interest of the public, and to drive climate change adaptation and mitigation action in the community, there will need to be:

- timely or pre-emptive engagement with the 'user' community (however broad it might be) to listen to their perspectives and ideas, as much as to share insights,
- a recognition that there will be a range of entry points for action, and that those organisations or communities which need to be engaged will not necessarily be 'sustainability' focused (health, housing, youth, and other groups must be involved early and often),
- a recognition that there will be a number of perspectives and responses and that the demographic is highly variable as to finance and other factors,
- a genuine commitment to installing feedback loops and learning from feedback across the whole timeframe of projects,
- persistent iteration of projects and processes, in familiar places,
- an ongoing commitment to partnerships across sectors and demographics,
- regular interactions across government and non-government organisations specific to programs, roll outs, and feedback loops, and
- a multi-media response – the 'communication strategy'.

A high level framework alone, will not deliver these attributes. Neither will a sectoral approach if linkages are not forged and cultivated.

25 Moser, S: *Creating a Climate for Change*

26 Marshall, N. et al, 2017: *Empirically derived guidance for social scientists to influence environmental policy*, PLosOne

27 Alvial-Palavicino, C et al 2011: *A methodology for community engagement in the introduction of renewable based smart microgrid*, Center of Energy, Faculty of Mathematical and Physical Sciences, School of Engineering, University of Chile (CMM, ISCI, DIE)

ADVANCING THE PLAN

- Community engagement should be driven by principles (see the South Australian example) and reflect the commentary provided by community user groups (see the Woden commentary and the chapter on social equity).
- Government's role will continue to be that of facilitator of the conversation and funder of programs for those less able to fund themselves. Policies in respect of transport and the built environment will require government interventions.
- To achieve the ambitious goal of 100 per cent renewable energy in 2020, government will need, after proper community consultation, to drive policies which embed energy and other efficiencies.
- Government's role is to embed efficiency in the conversation, but to do so in partnership with the public.

6.
Social Equity

"We don't run our heaters in winter for obvious reasons. It costs too much. It would be nice to be able to run the heaters a little bit. Same with cooling in summer, it's just not done."[1]

Introduction

In *AP2* a key outcome is to *ensure a fair society in a low-carbon economy*. Social equity and cost of living impacts of *AP2* have been reported each year to the Assembly.[2] A *Cost of Living Impact Assessment* is included in the report and it also reports on low income programs, including the *Low Income Household Program* and *Energy Efficiency Improvement Scheme (EEIS)*.

The 2015–2016 Ministerial Annual Report on the *Climate Change and Greenhouse Gas Reduction Act 2010* recognises and seeks to respond to the fact that people who are on low income and/or suffering from hardship, are highly likely to be significantly adversely affected by both climate change, directly, and also, potentially, by mitigation policies.[3] This Report builds on the *AP2* recognition of these complex issues and outcomes.

Many low income households spend a high proportion of their income on rent, in energy inefficient houses, and are forced to cut back their food and health spending. Many struggle to pay utility bills and they ration their utilities to sustain their essential needs,[4] leading to health and mortality risks.[5]

Electricity costs are but one challenge that vulnerable households juggle, and it is apparent the impacts of climate change are broader than just energy costs.[6] A key challenge is to provide appropriate interventions and support to prevent people from adverse impacts.

Case Study

THE INCREASING HEALTH RISKS FOR VULNERABLE HOUSEHOLDS

As heatwaves become more frequent, longer and hotter, how do we help households who are most vulnerable to health and financial impacts? A new study led by RMIT's Centre for Urban Research is investigating the financial and health risks of heatwaves in vulnerable households.[7]

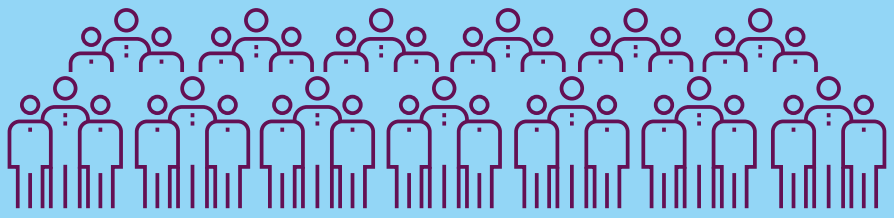
With research taking place in Melbourne, Dubbo, and Cairns to represent different climates and communities, the major aim of the Heatwaves, Homes and Health project is to find ways to reduce health and wellbeing risks for households, and raise awareness of health implications in electricity policy-making. Elderly people, infants, and people with chronic health conditions are most likely to be at risk during extremely hot weather – particularly if they live in poor quality housing.

The study is funded through an Energy Consumers Australia grant and will also look at the possible impacts of electricity price signals or cost-reflective tariffs as electricity sector responses to high electricity demand during heatwaves.

1 Housing and Homelessness Policy Consortium, ACT, 2016: *Housing affordability and the labour market in the ACT*
2 ACT Government, 2016: *2015–16 Minister's Annual Report – Climate Change and Greenhouse Gas Reduction Act 2010*.
3 Borrell, J., Lane, S. & Fraser, S. (2008) *Likely Effects of Global Warming and Mitigating Policies on Rural Households*. New Community Quarterly *(6)*, 4, pp. 4–10.
4 W Smith and D Hetherington, *The adequacy of the age pension in Australia: An assessment of pensioner living standards*, Per Capita, September 2016, pp. 18–28
5 Australian Council of Social Service, 2013: *Energy Efficiency & People on Low Incomes*
6 https://www.nccarf.edu.au/content/pathways-climate-adapted-and-healthy-low-income-housing accessed 26 June 2017
7 https://gallery.mailchimp.com/b38874b25e686137780eb836e/files/c5798a13-d43e-4e98-8d06-0ed27997b3eb/Urban_Observer_May_2017.pdf accessed 22 May 2017

INCOME DISTRIBUTION AND HOUSEHOLD COSTS

AUSTRALIAN NATIONAL STATISTICS



13.3%
OF THE POPULATION LIVE IN POVERTY

57%
OF PEOPLE IN POVERTY RELY ON SOCIAL SECURITY AS THEIR MAIN INCOME

32.1%
OF PEOPLE IN POVERTY RELY ON WAGES

THOSE ON PAYMENTS WHO LIVE IN POVERTY:

55%
OF PEOPLE ON NEWSTART

36.2%
RECEIVING DISABILITY SUPPORT

51.5%
RECEIVING PARENTING PAYMENT

24.3%
RECEIVING CARERS PAYMENT

13.9%
ON AGED PENSION

Adapted from: ACOSS, 2014[8]

8 http://www.acoss.org.au/poverty/

Expert Commentary

Climate change in the ACT social services sector

In April 2017, the Commissioner sat down with ACTCOSS[9] Director, Susan Helyar to discuss climate change in the ACT social services sector. This is one of the ACT organisations which advocates for climate change interventions which are both beneficial and do-able for disadvantaged people.

Kate: *What do Canberra's most vulnerable households think about climate change and the Government's action?*

Susan: People on low incomes want to see climate change action and are just as concerned as others about environmental sustainability, but for many, the debates just don't feel relevant to their lives. People say that priority one is paying their rent, after which they are concerned to keep their car on the road. Food, health care and remaining connected socially or with family comes a distant third. This section of our community seek emergency assistance for food and utilities, and when things get too much, some take the step to 'self black out' their homes. One woman, whose story was shared recently, told us that she was heating her baby's bathwater on a camp stove for a month to save on electricity costs. People make do with no heating, or they use it very minimal times of the day in a very small contained part of their house.

This is the reality for many households in the ACT.

What is of real concern is what we call the *M curve* of income distribution in the ACT.

Kate: *What's the M curve, is that like the bell curve?*

Susan: Yes, it's like the bell curve but it describes the distribution of income in the ACT in which a relatively small number of people are "average". It often appears we are designing policy for the top 60 per cent of income distribution, but there is a big gap between the top 60 per cent and the bottom 40 per cent.

The solar panel feed in tariff – whilst an important policy response to climate change – was definitely advantageous to the privileged and inaccessible to the vulnerable, widening the gap on the M curve.

We expect to see the same imbalance in the pattern of uptake of battery storage options. Self generating power to feed back into the grid, or to store for use when power can't be generated, are excellent investments to reduce household energy bills. But low income households can't afford these investments. Neither can those who live in rental housing adopt such innovations as tenants can't control spending on infrastructure.

The investments that can make long term enduring benefits to our most hard up households can't be made by the households who need it most.

Kate: *We are looking at the Government's climate change plan. It covers renewables, energy efficiency, transport, and waste. What are the big issues for the social services sector?*

Susan: Cost of energy is always critical but one of the less recognised aspects is transport.

Some people just cannot afford bus fares. Routes aren't designed around their needs. Our public transport is designed towards getting people out of their own private vehicles on to a bus or tram to and from their 9 to 5 jobs.

We are concerned that outreach services are being reduced in favour of frequent Town Centre focused and "Park and Ride" schemes on major artilleries. This sort of service does not meet the needs for many of our community who are living on or below the poverty line. For these households keeping a car on the road is actually essential, even if this means compromising on food or healthcare.

Kate: *Can you tell us a bit about the key gaps that need to be considered in relation to public transport? We are interested in this from the point of view of the reduction of greenhouse gas emissions and it is clear your community have other concerns.*

Susan: *Public* transport design needs to incorporate the needs of people who are transport disadvantaged. This is a diverse group and includes

- those who don't own a private vehicle,
- those with restrictions on their mobility,
- people who have shift work jobs, who often work out of corporate business hours,
- people who have multiple medical or family destinations which they need to get to during the day or on the weekend, and
- single parents recovering from leaving a violent relationship who have multiple appointments to address legal, financial, health and children's support needs.

Public transport doesn't currently work well for these people. These community members struggle to get around to all of these appointments using public transport, they may not own a car, and they may not have a driver's license.

9 ACT Council of Social Services, ACTCOSS

We are asking ourselves – how do we consider those issues when we plan public transport services? I think we need to be looking more at smaller scale public transport models that don't rely on a large bus or tram moving large numbers of people between major centres. The co-benefits will be economy, efficiency and reductions in emissions.

Kate: *How about concession schemes to promote public transport, do these help to build a culture of accessing public transport?*

Susan: It helps some people in some ways.

Anecdotally I have heard that there are less 'no shows' for medical appointments, as people now have free travel if they have a pension or health care card – so that's great.

However, eligibility is definitely not optimal. ACTION relies on pensioner and health care cards, and the service has been provided during off peak hours. This means that people who are keeping jobs but *also* struggling in terms of income are not eligible. We ask ourselves – what about people trying to balance study and work, get to job interviews or attend multiple appointments around work, study or caring responsibilities? Children above 5 years old are not eligible.

Free bus rides may mean the difference between attending a medical appointment, getting to school, or being able to go to a social or sports event. Without this service, people can become isolated and lose the opportunities to build and sustain social networks that can offer support. Such isolation adds to health and wellbeing risks.

Strategies to assist these people with their transport needs would not be covering a large number of people but it would be very beneficial to these people in terms of improving their lives and to the community as a whole by reducing vulnerability.

Kate: *What do you think we need to do to address the challenges you have shared with me?*

Susan: We need to make the life experiences, needs and interests of people who are disadvantaged and living on low incomes central to designing a climate change mitigation strategy for the ACT.

We should enable people living on low incomes to access the resources and opportunities to meet the costs of living a decent and sustainable life. If we were to do this these Canberrans will be able to make choices that contribute to community wide climate change mitigation goals.

CANBERRA HAS THE

SECOND HIGHEST

EXPENDITURE ON TRANSPORT AMONGST CAPITAL CITIES IN THE COUNTRY AT

$232.23

THIS IS CONSIDERABLY

HIGHER THAN

THE AVERAGE WEEKLY FIGURE OF ALL CAPITAL CITIES BEING

$194.44[10]

FUEL COSTS IN THE ACT ARE

INCREASING BY $270

PER YEAR ON AVERAGE[11]

CANBERRA HOUSEHOLDS SPEND ALMOST AS MUCH ON

TRANSPORT $232

AS THEY DO ON

FOOD $235

10 ACTCOSS 2016 – ACT Cost of Living Report: Transport, 2016 (https://actcoss.org.au/publications/advocacy-publications/act-cost-living-report-transport-2016)

11 Australian Automobile Association, 2017: *Transport Affordability Index*

Initiatives in the ACT

In keeping with its commitments in the *AP2* the ACT has implemented several initiatives to support vulnerable households in the ACT with climate change impacts. These include:

- The *Energy Efficiency Improvement Scheme* (EEIS) which includes a legislated Priority Household Target (PHT) to ensure that a set proportion of EEIS savings be delivered to these priority households every year. A PHT household is one where a resident holds an eligible concession card. This program has reached around 20,000 households since 2013.
- The *Low Income Household Program* provides energy efficiency advice and support through St Vincent De Paul (SVDP). Some households receive efficient refrigerators, a limited amount receive curtains. This program reached around 300 households in 2015–16.
- *A No Interest Loan Scheme* (NILS) is supported by ACT Government and delivered by a partnership between the Salvation Army and Care Financial Services. Subsidies are provided for efficient appliances up to $1500.
- *Efficient heating system replacements* for low income households started in April 2016.[12]
- *A Solar for Low Income Pilot Program* was announced as part of the budget for 2016–17 and is under development with funding of $2 million dollars over 4 years. It will provide grants to low income households to assist with the uptake of solar energy by overcoming up-front cost barriers.[13]
- An *Energy Advocate* was appointed in January 2017 to ensure the energy interests of households, non-government organisations and small businesses are taken into account in regulatory decisions.[14] The position operates under a consortium arrangement led by ACTCOSS and including Care Financial Counselling Inc, the Canberra Business Chamber Small Business Taskforce, the Conservation Council of the ACT and SEE-Change. The advocate provided submissions to various processes including the EEIS Priority household target review, Finkel review and ICRC energy pricing reviews.
- *Energy and Utility concessions* are provided to concession card holders through energy retailers for both electricity and gas to a maximum amount each year.[15]

These initiatives are generally funded by the EEIS contributions from energy retailers.[16] The EEIS is legislated till 2020[17] but these initiatives will continue to be critical after that. In fact the magnitude of need is even greater than the current resources can meet. Approaches need to continually evolve and expand.

Mural of children near Woden Community Services Centre, Source Kate Auty

Case Study

RECORD ENERGY PRICE RISES AND THE ENERGY SUPPORT FUND IN THE ACT

The Independent Competition and Regulatory Commission (ICRC) announced unprecedented price rises in gas and energy bills from July 2017.[18] Gas increased by about 17 per cent, while electricity soared by about 19 per cent. The price rise was largely attributed to the ongoing uncertainty in national energy policy. Price increases will continue in 2018.

ActewAGL established an energy support fund to support families who will struggle with the increase in living costs. The ACT Government provided a matched contribution; bring the fund to $500,000. The fund will be used for energy vouchers and a solar grants program for eligible community organisations.

12 ACT Government, 2016: *2015–16 Minister's Annual Report – Climate Change and Greenhouse Gas Reduction Act 2010.*
13 ACT Government, 2016: *Budget Paper No.3*
14 http://www.cmd.act.gov.au/open_government/inform/act_government_media_releases/rattenbury/2017/new-advocate-appointed-to-promote accessed 20 June 2017
15 http://www.assistance.act.gov.au/adult/utilities/energy_concession accessed 20 June 2017
16 http://www.environment.act.gov.au/__data/assets/pdf_file/0003/642315/ACT-EEIS-Review-Final-Report.pdf
17 *Energy Efficiency (Cost of Living) Improvement Act 2012*
18 http://www.cmd.act.gov.au/open_government/inform/act_government_media_releases/barr/2017/icrc-releases-final-electricity-prices accessed 21 June 2017

Case Study

SENIORS FEEL THE COLD AND TAKE ACTION

Seniors feel the impacts of increasing energy prices and often have difficulty paying energy bills. But they are more inclined to reduce their energy use, to the detriment of their health and wellbeing, than fail to pay their bills.[19]

Council of the Ageing ACT, with ActewAGL, provide free energy savings workshops to seniors. Workshops involve simple and easy tips to help prepare homes for winter and save on energy bills.

Case Study

INDIGENOUS ENERGY PROGRAMS

In Victoria, Kildonan introduced the *Koorie Energy Efficiency Program* (KEEP)[20] to help the Indigenous community better manage their energy usage and bills. KEEP was run in partnership with Aboriginal organisations: Aborigines Advancement League, Ngwala Willumbong Limited and Victorian Aboriginal Childcare Agency.

Almost 3000 Aboriginal households were reached through community education sessions. More than 1000 individualised home energy visits enabled a large proportion of the Victorian Aboriginal community to learn more about energy, receive support in managing their bills, and improve their home and personal situation. KEEP used home energy visits as a means to identify and holistically address other issues that may be impacting on a family's wellbeing.

The Challenges

The general criterion to receive low income support initiatives is that recipients have an eligible concession card. It is clear from the reports by ACOSS *Poverty in Australia*[21] that this does not always confirm financial need, nor does it cover all households living in poverty.

There are around 30,000 households in the ACT that have utility concessions. This figure under-represents those in need as not all of Canberra's vulnerable have concession cards. Many who have minimum wage jobs or single parent families with children do not qualify for the concession cards but survive on a similar income and struggle to pay their utility bills. The cost of essential services is often cited as a cause of financial stress for single parents.[22] Steep increases in essential service costs have not been met with comparable increases in income support payments and concessions.[23]

ACTCOSS suggests that a single person household with less than $40,000 annual income and families with less than $80,000 annual income are as vulnerable as many which are receiving concession support.[24]

> One third of Australians living in poverty have a job.[25] Underemployed households are increasingly seeking the help of community organisations to buy food, pay utility bills, cover children's education costs, and negotiate mortgage and credit card debt.[26]

19 COTA ACT & Beck, 2014: *Managing Rising Energy Costs for Seniors in the ACT*
20 https://www.kildonan.org.au/assets/Uploads/Kildonan-Annual-Report-1516.pdf accessed 26 June 2017
21 http://www.acoss.org.au/poverty/ accessed 26 June 2017
22 http://www.aph.gov.au/DocumentStore.ashx?id=bac1ff7f-2129-428f-ba86-a72fdb10b05b&subId=413687 accessed 26 June 2017
23 Corrie, T (2011) *Microfinance and the Household Economy*, Good Shepherd Youth & Family Service
24 https://www.actcoss.org.au/publications/advocacy-publications/submission-discussion-paper-options-improve-fairness-and accessed 10 April 2017.
25 Australian Council of Social Service, *Poverty in Australia 2014*, 2014, p. 32
26 J Hancock and S Oakley, *The rising cost of under-employment: Building a policy and program response to improving social inclusion and community for under-employed households*, 10 November 2014.

EEIS activities have shifted over time and co-contribution requirements are likely to be required for significant energy-saving appliances like insulation, solar and battery storage and non-ducted heat pump systems.[27] This arguably makes the program components increasingly inaccessible to low income households. Initially free activities were delivered such as lighting replacements, draught sealing and refrigerator removals.[28] The Commissioner for Sustainability and the Environment identified many of these challenges in its submission to the 2017 annual review of the Priority Household Target outlined in the *Draft Regulatory Impact Statement*.

Any *initial* monetary investment represents a significant barrier to the most vulnerable members of our society.

Social housing providers have a significant role to play in providing energy efficient housing and this is being tackled both nationally and internationally.[29] Housing ACT provides housing to those in need in the ACT and is the key stakeholder in this regard.[30]

Three key challenges arise:

1. Eligibility criteria for assistance needs to be broader
2. Capital is required for significant energy savings activities
3. The rental demographic and the role of property owners need to be reconsidered.[31]

Several case studies are provided to illustrate the challenges and the opportunities in bridging this divide.

Case Study

HOUSING ACT

The public housing system provides housing and community services to the most vulnerable members of the Canberra community.[32] More than 20,000 people are provided with affordable and secure accommodation in public housing through about 11,000 dwellings. More than 95 per cent of tenants receive rental rebates. As at 30 June 2016, there were still over 1900 households needing accommodation on the waiting list.

In 2015–16, 2,119 homes had improvements made under the Energy Efficiency Program, bringing the total number of homes that have received improvements since the commencement of the ten-year program to 8,956. Energy efficiency measures include ceiling and wall insulation, draught sealing, and installation of gas and electric boosted solar hot water systems. Pelmets and curtain rods were also installed in all freestanding homes on vacancy. In 2015–16, ACT Government spent approximately $3.6 million on energy efficiency improvements.

ACT Government began to transform public housing in 2015 with its *Public Housing Renewal Program*.[33] This represents the biggest upgrade to public housing since self-government. The program delivered 106 replacement dwellings in 2015–16.

All new public housing dwellings are built to the Gold level of the Liveable Housing Australia Design Standard. The dwellings are also constructed to achieve 6-star energy ratings under the Nationwide House Energy Rating Scheme (NatHERS). To achieve this rating, dwellings are appropriately oriented for solar gain and include wall and ceiling insulation, energy efficient glazing and shading and draught proofing to windows and doors. Energy efficient appliances such as high efficiency gas or electric boosted solar hot water systems are installed with the aim of reducing energy costs for public housing tenants.

Case Study

STUCCO SPEARHEADS A SOLAR REVOLUTION IN SOCIAL HOUSING COMPLEXES

A social housing apartment block in Newtown Sydney has become one of the first multi-dwelling buildings in Australia to install a shared solar and battery storage system. *Stucco* is a cooperative, not-for-profit housing complex for low-income students from Sydney University.[34]

There are 40 residents in the eight units. Each pays about $90 in weekly rent. As a cooperative, the students self-manage the property, which is part-owned by the university and the Department of Housing.

In December 2016, 30 kilowatts of solar panels were placed on the roofs and 36 batteries set up in the building totalling 42.3kW storage capacity. The solar system will now provide 80 per cent of the residents' energy needs and save each student about $30 per month.

The solar and battery system is expected to take about six to seven years to pay for itself, supported by a grant from the City of Sydney. The students have started a crowdfunding campaign to help rebuild the administration and sinking funds.

This project has pioneered an approach to installing solar in multi-apartment, tenanted apartments.

27 http://www.actewagl.com.au/Product-and-services/Ducted-gas-replacement-promotion.aspx accessed 26 June 2017
28 http://www.actewagl.com.au/Save-energy/Free-energy-services/Fridge-buyback.aspx accessed 26 June 2017
29 http://climatelondon.org.uk/wp-content/uploads/2013/02/Your-social-housing-in-a-changing-climate.pdf accessed 26 June 2017
30 ACT Government, 2016: *Community Services Directorate Annual Report*
31 This is discussed further in *Chapter 8 Built Environment*
32 http://www.communityservices.act.gov.au/__data/assets/pdf_file/0005/273551/Public_Housing_Asset_Management_Strategy.pdf accessed 20 June 2017
33 ACT Government, 2016: *Community Services Directorate Annual Report*
34 http://www.abc.net.au/news/2016-12-08/stucco-student-housing-installs-shared-solar-battery-system/8103298 accessed 26 January 2017

Case study

SOLAR FOR COMMUNITY HOUSING IN SYDNEY

In November 2016, AGL and the New South Wales Government announced a $1 million program to deliver solar energy for community housing tenants in Sydney.[35] The pilot program will include 250 households, which will have solar panels, digital meter and energy monitoring systems installed at no cost.

The initiative is co-funded by AGL and NSW Government. AGL established the *Affordability Initiative* in 2014 which is funding their contribution to support vulnerable households.

The program is expected to reduce costs to these households by around $420 a year or collectively by around $105,000 each year.

Measuring co-benefits

The decisions surrounding climate policy rarely enter co-benefits into assessments,[36] often because the methods for integration are lacking or not known. Research has shown that the incorporation of co-impacts can significantly change the outcome of economic assessments. Quantifying and incorporating these co-benefits into the development of climate change mitigation policies may facilitate the adoption of stronger policies.[37]

In terms of housing, for instance, health benefits may be derived when mitigation policies reduce exposure to heat waves and extreme cold, reduce exposure to mould and dampness, and support better environmental design of transport.[38] For some key measures, there is quantifiable evidence of economic savings in health care costs. For instance, investments in home insulation have reduced health care costs of chronic respiratory disease in some settings, justifying investments made in large-scale housing improvement programmes.

Housing improvements can impact both mental health and sense of well-being. Health can be an economic driver of housing investments. While climate gains may be mostly reaped in the future, many of the health gains are immediate and quantifiable. These include savings to households, health systems and economies in terms of reduced illness, fewer medical visits, and sick days off work and school.

The International Energy Agency reports[39] that there are co-benefits beyond health in relation to energy efficiency for low income households.

> 'Non-energy benefits can accrue to different stakeholders or to society as a whole. Examples include higher property values, improved appearance of the community, local job creation, lower school and work absenteeism, and potentially lower outlays on government or utility energy subsidies. Some of these benefits, notably job creation, are often cited by policy makers as a rationale for government spending on low-income energy efficiency. However, program evaluation frameworks generally do not take into account these co-benefits.'

35 http://www.esdnews.com.au/agl-nsw-govt-installing-solar-low-income-homes/ accessed 20 June 2017
36 http://www.annualreviews.org/doi/pdf/10.1146/annurev-environ-031312-125456 accessed 20 June 2017
37 Workman, Blashki, Karoly and Wiseman, 2016: *The Role of Health Co-Benefits in the Development of Australian Climate Change Mitigation Policies*. International Journal of Environmental Research and Public Health, 13, 927
38 World Health Organisation, 2011: *Health co-benefits of climate change mitigation – Housing sector*
39 https://www.iea.org/publications/freepublications/publication/low_income_energy_efficiency.pdf accessed 20 June 2017

NON-ENERGY CO-BENEFITS OF LOW-INCOME ENERGY-EFFICIENCY PROGRAMMES

REDUCED ENERGY INFRASTRUCTURE COSTS

REDUCED EMISSIONS

IMPROVED HUMAN HEALTH

FEWER ENERGY SUBSIDIES

LOCAL SPENDING

LOCAL EMPLOYMENT

HIGHER PROPERTY VALUES

IMPROVED COMMUNITY APPEARANCE

Adapted from: IEA

ADVANCING THE PLAN

- Eligibility criteria for support for low income programs need to be carefully considered to ensure support is provided to those in need.
- Housing ACT has a significant role for leadership in providing energy efficient housing and improving the health and wellbeing of Canberra's vulnerable households.
- Barriers need to be overcome in the context of private landlords to ensure that rental houses provide an acceptable living standard for energy efficiency.
- The ACT Government needs to leverage government and private equity to shift from co-contributions for energy efficient infrastructure upgrades for low income households.
- A whole-of-government approach to identifying and mitigating climate change impacts for low income households should be considered, stretching beyond household energy costs to reflect other matters such as health, wellbeing and transport.
- Agency business cases need to consider and reflect the co-benefits of various low-income initiatives.

7. Transport

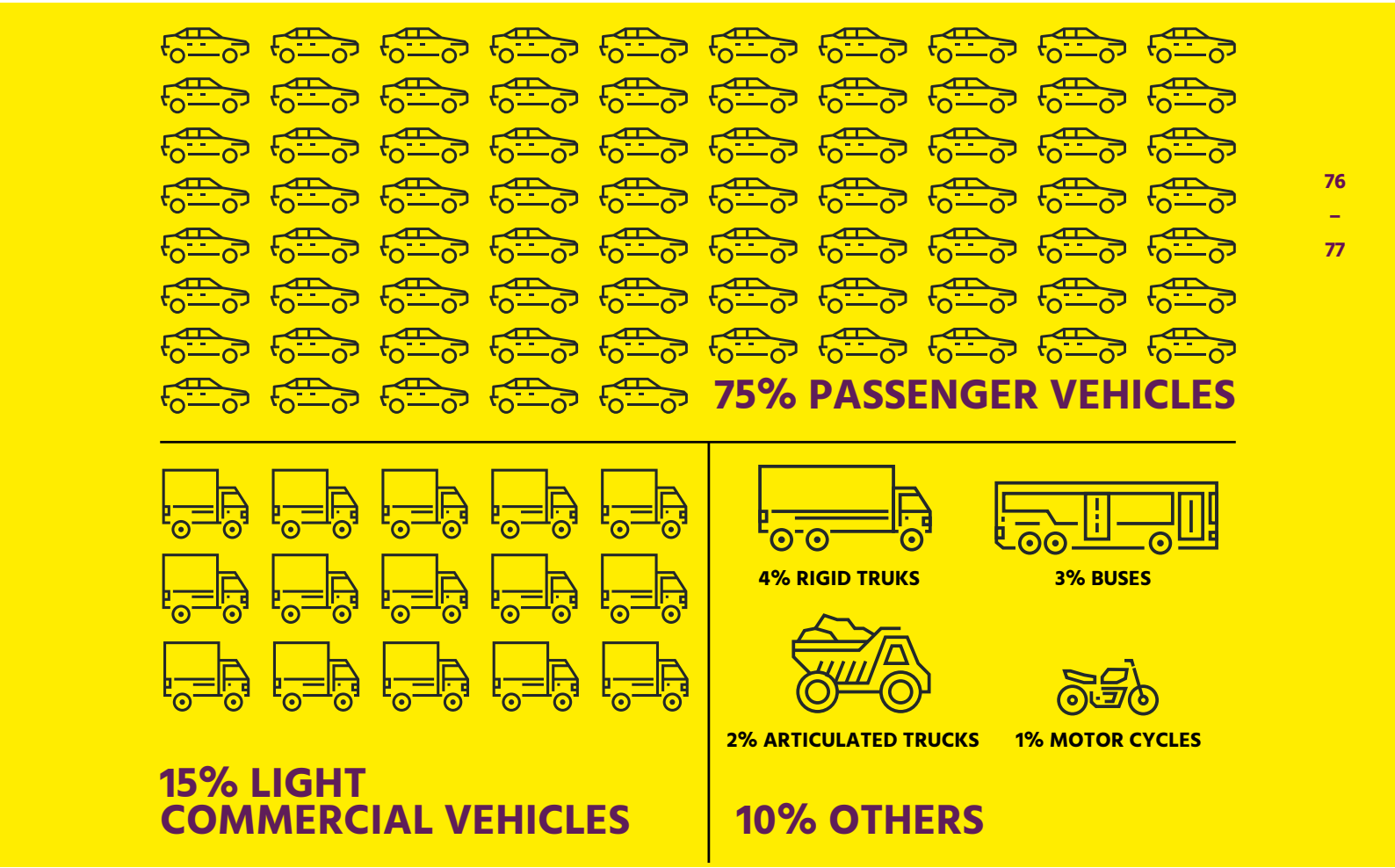
"The future for transport is clear – it is renewable and it is electric. Both batteries and hydrogen energy storage technologies may have important roles to play as we electrify our vehicle fleets, and have an electricity grid based on 100 per cent renewable energy."

Former ACT Deputy Chief Minister Simon Corbell.[1]

Introduction

With the ACT set to achieve its 100 per cent renewable electricity supply by 2020, the next big challenge is in the transport sector. By 2020 this sector will contribute about 60 percent of the total emissions in the ACT. Passenger vehicles are the biggest proportion of transport sector emissions constituting about 75 per cent.

The *Transport for Canberra Policy 2012* is the key enabler identified in *AP2* (Action 10). It includes development of a low emissions vehicle strategy. This policy is currently under review.



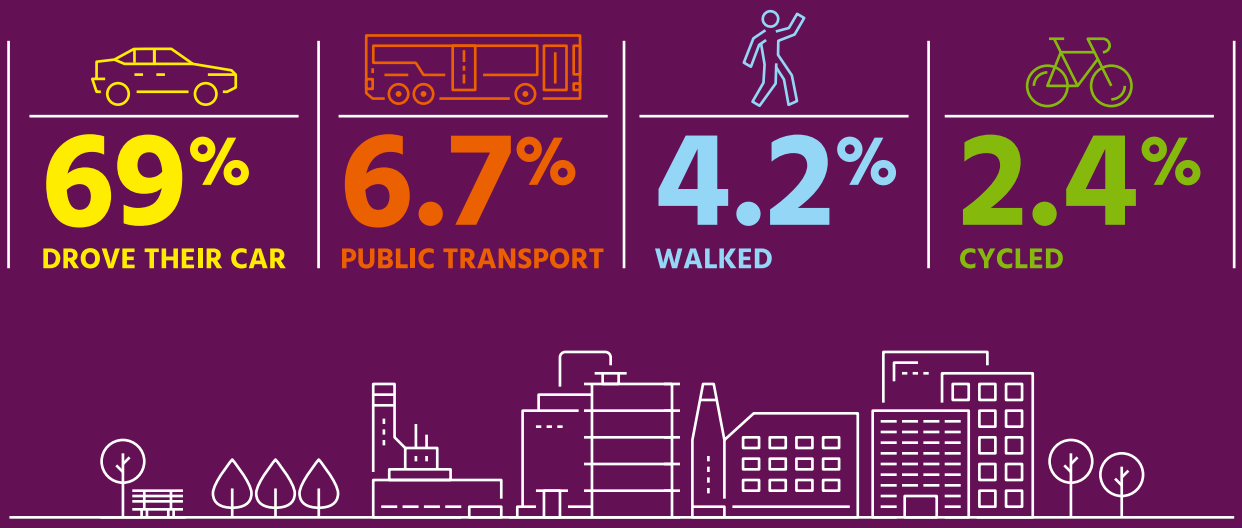
Proportion of emissions to vehicle type in the ACT2

1 http://www.cmd.act.gov.au/open_government/inform/act_government_media_releases/corbell/2016/act-government-brings-hydrogen-energy-storage-to-canberra accessed 4 May 2017

2 Blakers et al, 2016: *Project 2–106 Sustainable Mobility Solution for Canberra City*

ACT TRANSPORT MODES

HOW DO CANBERRANS TRAVEL TO WORK?

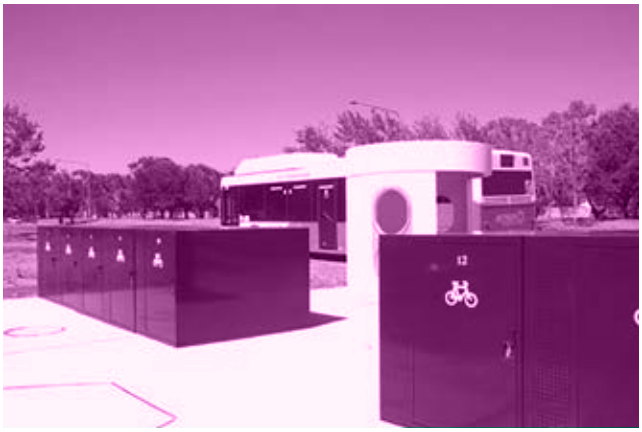


WE OWN ON AVERAGE 1.7 MOTOR VEHICLES PER HOUSEHOLD AND ONLY 6% DO NOT HAVE A VEHICLE.[3]

ACT Transport Policy

The *Transport for Canberra Policy* sets a range of initiatives to reduce vehicle use and their emissions. These include:

- Providing a variety of transport options including frequent and reliable public transport connecting with walking and cycling networks,
- Encouraging mixed land uses to reduce vehicle travel, and
- Fostering walkable neighbourhoods and active travel options.



Park and Pedal Stop. Source: ACT Government

3 Australian Bureau of Statistics, 2011: *Census*

ACT Achievements

There have been several achievements in the ACT to reduce transport emissions including:

- Introducing Park & Pedal in February 2017; with expansion to Stage 2 in April 2017.
- Holding the inaugural Canberra Walk & Ride Week in March 2017; with a program of events and activities, and the development of the ACTiveLog smartphone app to track walking and bike riding patterns.
- Upgrading cycleways on Sullivan Creek and connections to the Canberra Hospital.
- Introducing 8 e-bikes into the ACT Government fleet.
- Releasing a Low Emissions Vehicles Strategy Discussion Paper in July 2014. This identified a range of measures including car sharing and parking changes to support car sharing.[4]
- Commencing an electric bus trial involving three buses over a 12 month period.

Electric Bus Trial. Source: ACT Government

- Supporting the development of hydrogen cars through the ACT Government's renewable energy innovation fund with an investment of $180 Million into hydrogen technology development. The initiative will include 20 fleet vehicles and reflects real leadership as it represents the first hydrogen-fuelled fleet in Australia.[5]
- Starting construction of Stage 1 of the Light Rail. It will run from the City to Gungahlin, along Northbourne Avenue and Flemington Road and deliver high quality, reliable and frequent public transport along one of Canberra's busiest corridors. Stage 2 is currently being developed and will extend the rail through to Woden.

A continued approach to reduce emissions from transport through a range of initiatives is judicious and reflects leading practice internationally.

Low Emission Vehicles, Electric Vehicles and the ACT

The most significant change in transport is anticipated to come from electric vehicle penetration, primarily in the passenger vehicle mode.

A solid Government and market based strategy to increase electric vehicles is required to achieve robust outcomes. This has been recognised nationally with the recent launch of the Australian Electric Vehicle Council.[6]

Currently the ACT offers two incentives for low emissions vehicle purchase:

- Reduced stamp duty for purchase of low emissions vehicles, and
- Reduced registration costs.

In the 2016 survey[7] undertaken by ACT Government, Canberrans indicated that the three factors most likely to influence their decision to buy an electric vehicle were:

- Cost of electric vehicles (58 per cent),
- Fast charging locations in the city (52 per cent), and
- Increased driving range (32 per cent).

There are currently about 15 electric vehicle charging stations across the ACT region.[8]

Electric Vehicle Charging Station at the Canberra Airport. Source: Edwina Robinson

4 https://www.transport.act.gov.au/__data/assets/pdf_file/0007/887362/Transport-for-Canberra-Report-Card.pdf accessed 3 May 2017
5 http://reneweconomy.com.au/act-leads-180m-investment-hydrogen-storage-car-fleet-33870/ accessed 23 May 2017
6 http://www.energymatters.com.au/renewable-news/australian-electric-vehicle-renewable-electricity-em6053/ accessed 25 May 2017
7 Piazza Research, 2016: *Community Engagement Survey Report for ACT Government*
8 http://electricvehiclecouncil.com.au/charger-guide/ accessed 25 May 2017

Case Study

TRANSFORMING THE TAXI INDUSTRY

Taxi fleets all over the world continue to reinvent their fleets to low emissions vehicles. Hybrids have proven to be more reliable and economical than standard fuel vehicles, particularly in relation to maintenance costs.[9]

The ACT taxi fleet has moved with the times and recently seen a dramatic shift in fleet to hybrids. In 2011, hybrids were 5 per cent of fleet, climbing to over 75 per cent in 2015.[10]

Illustrating the escalation of take up of electric vehicle technology in fleets, Nissan is currently partnering with New York Taxi Cabs to run a one year pilot trial of electric taxis.[11] The trial will also deploy quick charging stations at home and fleet garages that can recharge in less than 30 minutes.

New York Electric Taxi. Source: NY Taxi and Limousine Commission

NRMA

NRMA has adapted to support the transition to an electric transport sector. It has launched its first mobile electric vehicle charger to rescue members if their electric vehicle battery goes flat. This mobile charging station recharges an electric vehicle battery to a point where members can drive their car to a dedicated charging station for full charge.[12]

ELECTRIC BUSES

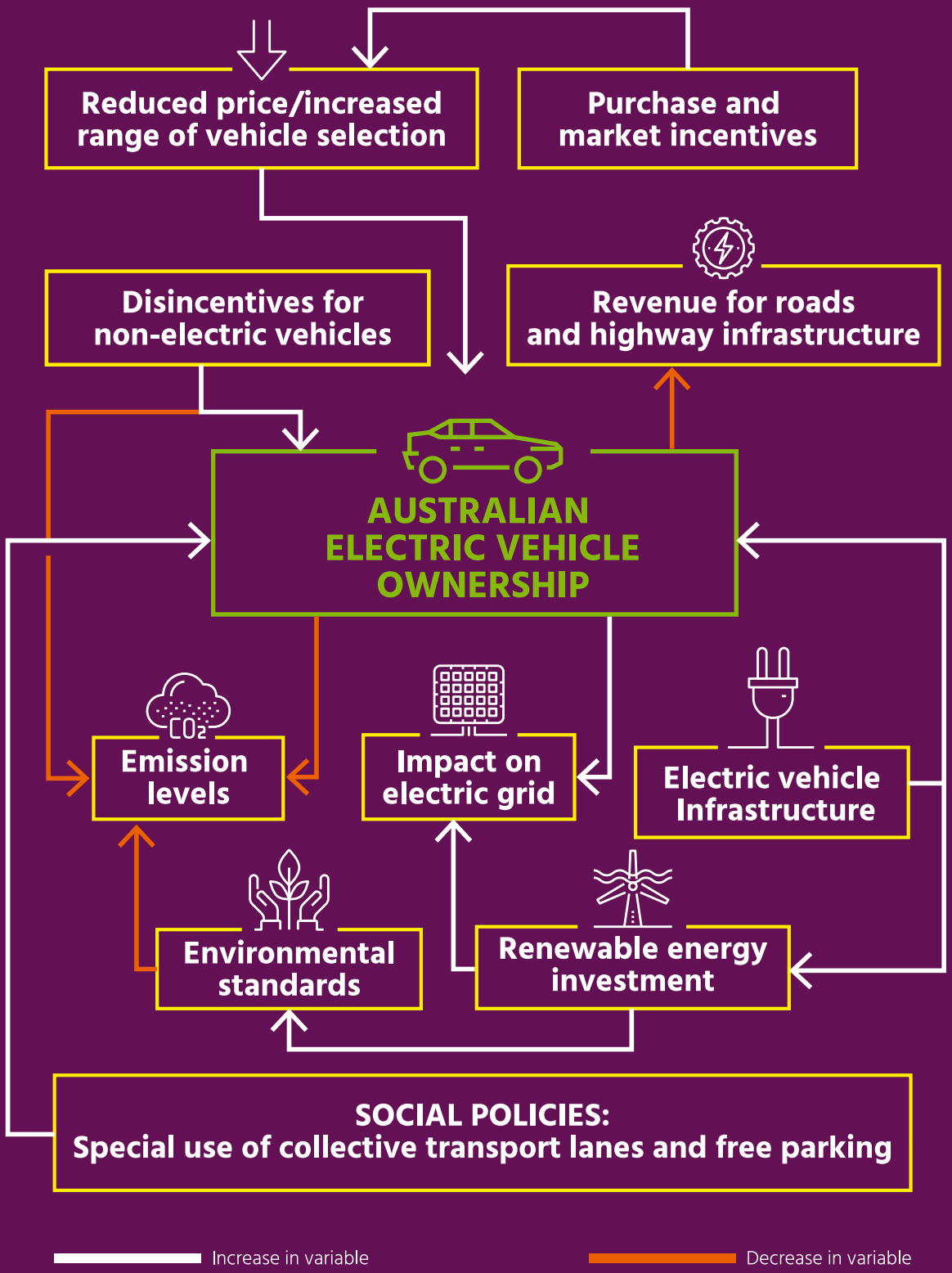
In 2016, Beyond Zero Emissions found 'A shift to 100 per cent electric buses for all urban public bus transport in Australia is found to cost only 10 per cent more than business as usual.'[13]

9 http://www.standard.net.au/story/1934560/hybrid-taxis-now-the-transport-of-choice/ accessed 3 May 2017
10 Australian Taxi Industry Association, 2016: *ATIA State Reports*
11 http://www.nyc.gov/html/tlc/html/news/initiative_ev_pilot_program.shtml accessed 3 May 2017
12 http://www.mynrma.com.au/motoring-services/petrol-watch/charge-your-vehicle.htm accessed 27 April 2017
13 Beyond Zero Emissions, 2016: *Zero Carbon Australia Electric Vehicles*

Fact box

THE ELECTRIC VEHICLE RELATIONSHIP CONUNDRUM

The conundrum with electric vehicles is that without the supporting infrastructure, manufacturers will not import and consumers will not buy. There are many interrelated and complex factors that can influence or are influenced by a transition to electric vehicles. Most importantly, the impacts on existing infrastructure and the need for new infrastructure should be carefully considered to optimise outcomes. There is a clear role for government in this transition.



Adapted from: Blakers et al

Case Study

DUTCH LEADING THE CHARGE

The Dutch infrastructure for charging electric vehicles is well organised and of high quality and superior performance.[14] Private and public parties have created an open and competitive market model for the development of the EV charging infrastructure. The Netherlands has made national agreements on interoperability, corresponding to European standards. Many charging systems in use in the Netherlands have been interoperable since the beginning of 2011.

Lower cost
At the end of 2014 the National Charging Infrastructure Knowledge Platform Foundation (NKL) was founded. The NKL's goal is to lower the cost of public infrastructure for all stakeholders through shared projects. To that end, the foundation is working to optimise the installation process, which involves the distribution system operator, charging point operator, and municipality.

Fast charging
A network of fast-charging stations is being rolled out along Dutch highways. Many regional governments, cities, and companies now provide electric vehicle fast chargers in parking lots. The Netherlands has selected fast charging as a necessary option to complete the country's charging infrastructure. Over 600 fast charging points were available by the beginning of 2017 throughout the Netherlands.

Case study

ELECTRIC VEHICLE WORLD LEADER – NORWAY

Norway leads the way with shifting to electric vehicles, selling 100,000 electric vehicles in December 2016.[15] This is more than 10 times what most countries are achieving, thanks to its progressive introduction of incentives including:

- No purchase/import taxes (1990),
- Exemption from 25 per cent VAT on purchase (2001),
- Low annual road tax (1996),
- No charges on toll roads or ferries (1997 and 2009),
- Free municipal parking (1999),
- Access to bus lanes (2005),
- 50 per cent reduced company car tax (2000), and
- Exemption from 25 per cent VAT on leasing (2015)[16].

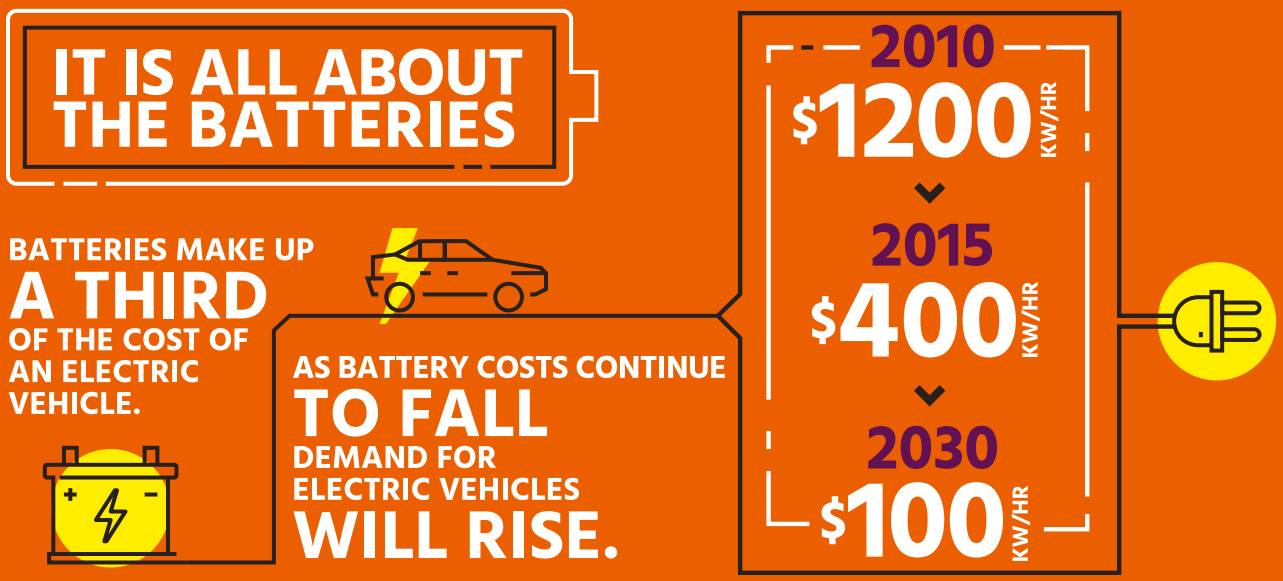
The Norwegian Parliament has set a goal that all new cars sold by 2025 should be zero (electric or hydrogen) or low (plug-in hybrids) emission. The Parliament will reach this goal with a strengthened green tax system based on the polluter pays principle, not a ban.

14 http://nederlandelektrisch.nl/charging-infrastructure accessed 24 May 2017
15 Blakers et al, 2016: *Practical Policy Options*
16 http://elbil.no/english/norwegian-ev-policy/ accessed 26 April 2017

The Battery Technology Sprint

Over the past 12 months, one of the most noteworthy signals is the rise of mass market electric vehicles. Technological improvements have led to significant cost reductions in electric vehicles and rapidly rising sales figures. This will continue through further enhancements in battery storage and recyclability which will lead to longer driving ranges.[17]

Research by Bloomberg suggests that electric vehicles will become more economic during the 2020s than a conventional car.[18] This is largely due to the continued decreasing costs associated with batteries.



17 Blakers et al, 2016: *Project 2–106 Sustainable Mobility Solution for Canberra City*

18 Bloomberg New Energy Finance, 2016: *Electric vehicles to be 35% of global new car sales by 2040*

Expert Commentary

Transport Modernisation in the ACT

Dr Evan Franklin, Senior Research Fellow; Australian National University
Research School of Engineering

Transport modernisation presents the ACT with an outstanding opportunity to build on its well-earned position as national and international leader and innovator in response to climate change. On the back of hugely successful policies and programs designed to yield a 100 per cent renewable electricity territory, the ACT as a jurisdiction should and must continue to punch above its weight. A renewed policy focus on transport modernisation will see the territory continue to lead; but, far more importantly, for a modern and progressive Canberra this simply makes good sense.

THE ELECTRIC TRANSPORT TRANSITION

By 2020 the ACT will be sourcing, on an annual net basis, all of its electricity from renewable generation sources, chiefly solar and wind. Carbon emissions attributable to transport will dominate, representing close to two-thirds of all emissions for the territory, and will thus be in the spotlight. Meanwhile, the future transition globally to an electrified vehicle fleet appears almost a *fait accompli*, the question now being "when" rather than "if". This transition will require considerable changes to policy settings, to transport infrastructure, to society and culture, and to personal habits. The first-mover advantage afforded the ACT via its soon to be 100 per cent renewables-based electricity system hands the territory government the chance to focus on this transition far more effectively and with a far greater impact than almost any other jurisdiction around the world.

Electric vehicles are on their way, and they are approaching fast! The key driver is rapidly declining prices, as the advantage of volume manufacturing of batteries starts to kick in. The International Energy Agency, for example, recently reported battery prices dropping at a rate of about 22 per cent (a 22 per cent reduction in price for every doubling in cumulative manufactured volume). If recent history with rooftop solar is anything to go by, once Australians realise that it is cheaper to switch to a new technology which also makes environmental sense, then they will do so in droves. As someone who has bought and owned a couple of rooftop solar systems and has driven a few electric vehicles, I'm here to tell you that there is *a whole lot more* to get excited about when it comes to electric vehicles!

Of course it won't stop at just personal transport. Canberra light rail is already embracing clean, electrified public transport, and with various electric bus trials being conducted around the world now, there is no reason why the fleet of ACTion buses shouldn't quickly follow suit.

CANBERRA TO LEAD THE CHARGE

So, why should Canberra lead the charge in Australia?

Put simply, Canberra is blessed with all the right ingredients.

It has a strong and efficient electrical distribution network which will be able to accommodate a well-planned transition to electrified transport. The same network is, at least in part, responsible for the lowest retail electricity prices in Australia, which makes 'filling up the tank' of an electric vehicle markedly cheaper than anywhere else. Canberra is characterised by a compact urban population where short stop/start car trips are the norm and the type of operation where electric vehicles perform at their best. Finally, as a society, Canberra is well-educated and progressive, with an above-average means to be early adopters, and hence become early beneficiaries of this technology.

The benefits to the ACT of an early transition to electrified transport will be significant. In terms of climate policy outcomes the case certainly should not be understated. Very few jurisdictions in the world could genuinely claim the immediate environmental outcomes that Canberra could: a switch to electrified transport being only as beneficial in emissions metrics as the local electricity generation mix dictates.

THE CO-BENEFITS OF AN ELECTRIC TRANSPORT SECTOR

The ACT being on track to reach its 100 per cent renewable energy target ahead of time, and with ease, begs the question of 'where to next?'The electrification of Canberra's transport fleet in part answers that question, paving the way for the territory to secure more reliable and cheap renewable energy via its highly successful approach to date. But, the benefits certainly don't stop at local emissions reductions.

A city full of electric vehicles, operated as a fleet of coordinated, flexible energy resources, represents a fantastic opportunity to better manage the electricity grid and to help ensure energy security well into the future. It will foster and demonstrate home-grown innovation borne out of, research institutes and businesses around Canberra. Meanwhile, being at the forefront of such a transition will undoubtedly create other economic and social benefits, creating new business opportunities in the Territory while encouraging the rest of Australia to look towards Canberra for leadership.

Finally, as an engineer with a career built on technological innovation, it has always intrigued me to see how the somewhat dated and relatively unchanged internal combustion engine technology has continued to dominate ground transport for so long. However, I don't see this dominance lasting much longer.

Now is the right time for change, and *this very timely review of transport and climate policies is the perfect opportunity for the ACT to lead that change.*

End of Life Considerations for Batteries

A move to electric vehicles and higher battery production has implications for natural resource exploitation. Whilst we move away from the use of fossil fuels, there will be a higher demand for metals and minerals like lithium, nickel, cobalt, and steel.

Several companies, including Daimler, Nissan, and BMW, have announced end-of-life applications for their battery packs.[19] Large auto manufacturers such as Toyota and Honda are establishing reverse-supply-chains to ensure that end of life electric batteries are recovered and properly recycled.[20]

Appropriate legislation needs to be in place to support and promote the environmentally sound recycling of these batteries. Again, this is a role for a forward-thinking government.

Case Study

INDUSTRY ON BOARD

In January 2017, 100RC (100 Resilient Cities) announced its first partnership with an automotive company, Nissan, to help cities plan and prepare for autonomous vehicles, electric cars, and new mobility services.[21]

Nissan will work with selected cities to test and pilot emerging mobility technologies, such as autonomous drive, driverless cars, and electric vehicles, as well as charging and vehicle-to-grid infrastructure, to enable cities to better plan for their adoption on a large scale.

Transforming Transport in a Modern Age

There is no doubt that the biggest game changers will involve harnessing modern technology advances. Apps are now used to book and track all types of transport options. Companies like Uber have disrupted conventional taxi services using an app-based approach, and the use of private vehicles that allow you to check the fare, car type and driver's location before booking.[22]

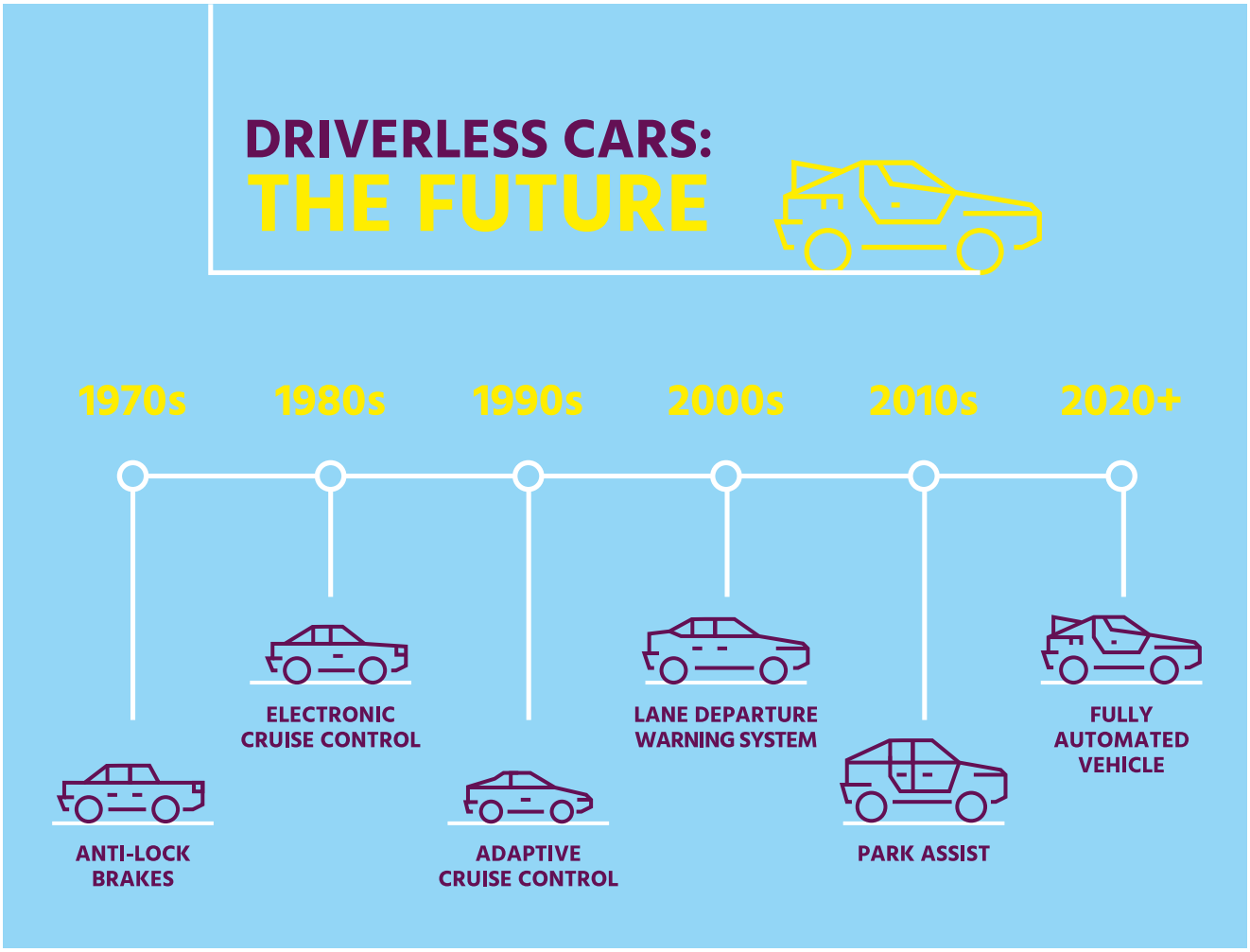
Transport Game Changer Uber. Source: Pexels

This concept is being taken one step further to encourage ridesharing using social media networks. Social network-based ridesharing applies preferential matching of 'friends' within your social media network. This modern method of managing processes overcomes barriers that have existed to ridesharing: our reluctance to detour for others, our distrust of strangers, and our disinclination to share our personal space.

Car sharing in the ACT with Goget. Source: Wikimedia

Disruptive technologies such as driverless cars will take these methods and concepts to a new level and challenge our perceived need for a private car. Mobility will be reconceived and seen as a service rather than a dependency for a driver. Modern vehicles already come with sensors that can detect distances between objects and other vehicles, lane deviations and 'drifting'.[23] Automated vehicles, inconceivable five years ago, are now imminent.

19 https://www.greentechmedia.com/articles/read/nissan-green-charge-networks-turn-second-life-ev-batteries-into-grid-storag accessed 15 April 2017
20 https://waste-management-world.com/a/cec-report-electric-vehicle-battery-recycling-to-surge accessed 15 April 2017
21 http://www.100resilientcities.org/blog/entry/nissan-partners-with-100-resilient-cities-to-promote-urban-resilience-prepa#/-_/ accessed 4 May 2017
22 https://pursuit.unimelb.edu.au/articles/ridesharing-goes-social accessed 10 May 2017
23 http://www.nbnco.com.au/blog/entertainment/future-transport-tech-around-the-corner.html accessed 10 May 2017



The Evolution of Driverless Technology. Adapted from Department of Transport

Apps are being introduced rapidly into public transport systems to provide real time information and increase accessibility. Queensland[24] recently introduced an app that provides commuters with personal audio announcements to track trips on a stop-by-stop basis and across several modes: bus, train, tram, ferry. This significantly eases the ability for people with a disability or vision impairment to use public transport.

As entire public transport networks become connected by technological innovations like apps, the travelling public will have more accurate real-time feedback on travel times and available seating.

Perhaps the most exciting prospect for future, connected public transport is the fact that it will be possible to ensure that supply meets demand.

24 http://statements.qld.gov.au/Statement/2016/2/3/trip-announcer-app-leads-the-way-for-public-transport-passengers accessed 10 May 2017

The e-bike Potential

The potential of e-bikes to reduce emissions, ease traffic congestion and stimulate healthier living is yet to be realised. The technology has evolved whereby e-bikes are affordable, user friendly and have reasonable travel ranges.[25]

Trials of e-bikes have showed that once on the e-bike, most people like it. When 40 employees were given an e-bike to use for 10 weeks in a 2015 Perth trial run by RAC,[26] the trial found that:

- 80 per cent of e-bike trips were made to commute to and from work,
- Nearly half chose to purchase the bike and continue using it post-trial,
- 100 per cent of participants said they were satisfied, with more than half saying they were extremely satisfied with the e-bike, and
- Freedom, enjoyment and having a quicker way to get to work were frequently cited benefits.

E-bike as a mainstream transport option. Source: Katie Bordner, Flickr

25 https://rac.com.au/car-motoring/info/future_the-rise-of-electric-bikes accessed 24 May 2017
26 https://rac.com.au/car-motoring/info/e-bike-trial accessed 24 May 2017

ADVANCING THE PLAN

- Continue to expand and improve Canberra's integrated transport network with a view to achieving higher public and active travel outcomes.
- Develop a clear plan to transition the Government fleet to electric vehicles and invest in infrastructure to support this and facilitate private use.
- Progress bulk buy options for electric vehicles and possibly e-bikes and allow private access.
- Partner with others to develop fully customised, smart digital mobility platforms that use leading edge technology to personalise communications and incorporate real time situation specific information.
- Introduce or enhance financial incentives for electric vehicles.
- Introduce or enhance incentives such as free parking and use of transit lanes for electric vehicles.
- Consider methods of encouraging take up of electric vehicles and e-bikes by tax incentives For example salary sacrifice or FBT concessions.
- Review the outcomes of the electric bus trial to inform potential transition of the bus fleet to electric.
- Explore with industry integration of a high proportion electric vehicle fleet and their ability to support grid stability.
- Establish a target for electric vehicles in the ACT to clearly guide the market. For example 500 electric vehicles in the ACT by 2020.
- Develop procurement with industry to ensure that end of life battery issues are addressed.
- Support initiatives with meaningful and effective communication.

8. The Built Environment

‘Building efficiency can improve people’s quality of life, especially for low-income residents, and it creates opportunities for better health and productivity’.

World Resources Institute[1]

‘Buildings could… meet over half of the national energy productivity target….’

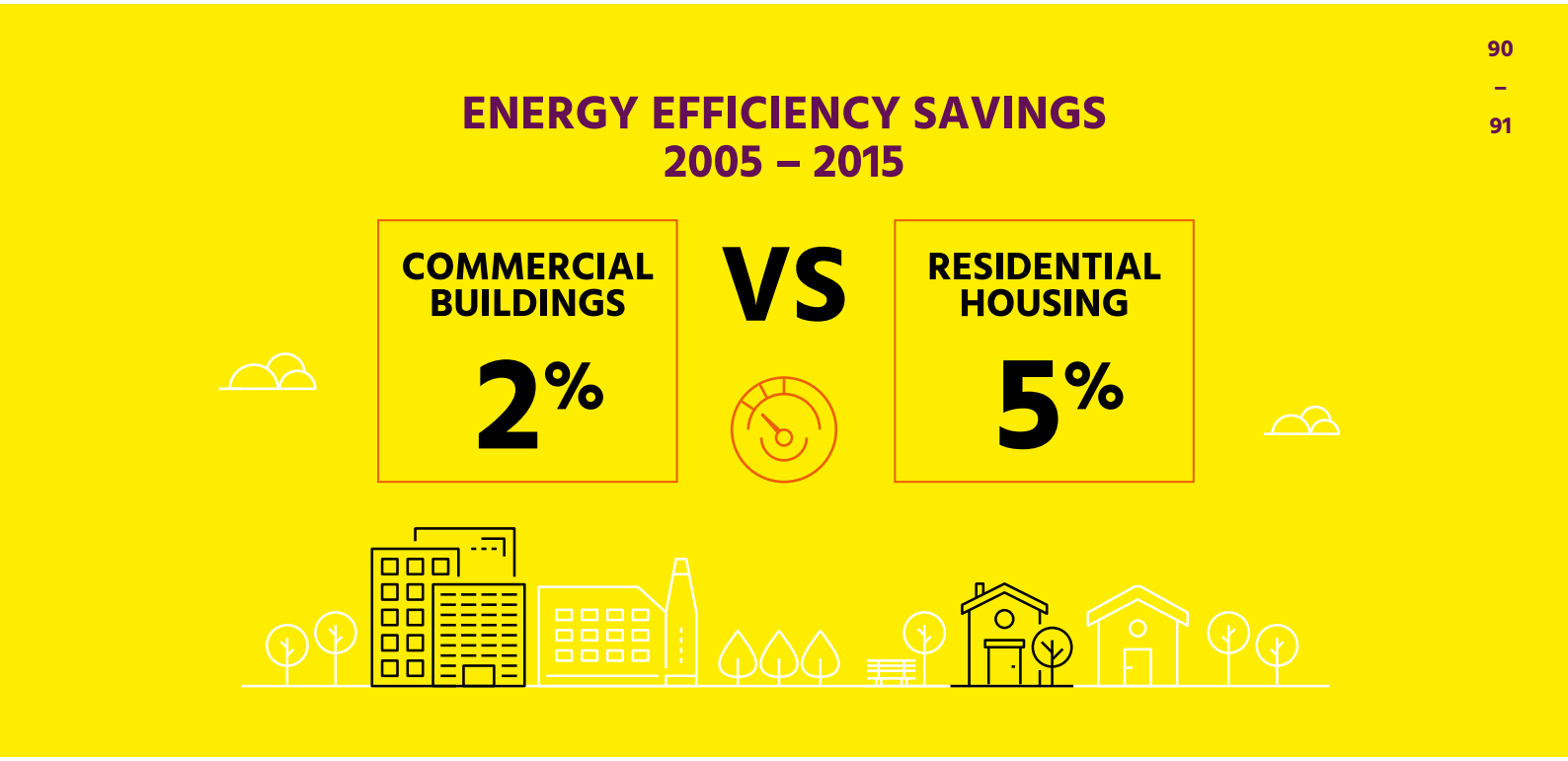
Australian Sustainable Built Environment[2]

Introduction

The built environment accounts for about a quarter of energy consumption[3] nationally in Australia. *AP2* recognised the importance of this sector with Action 4 seeking to introduce a zero emissions building policy by 2015.

Whilst there has been significant progress in the ACT securing renewable energy supplies, there has only been a modest advance in energy efficiency for both residential and commercial buildings. There is enormous potential to improve energy efficiency in the built environment.

The ACT recently reviewed its building regulatory system and recommended a range of improvements that should be made.[4] A key tension in building regulation is the gap between design intent and built performance.



Adapted from Asbec[5]

1 World Resources Institute, 2017: *Accelerating Building Efficiency*
2 Australian Sustainable Built Environment Council, 2016: *Low Carbon, High Performance*
3 https://soe.environment.gov.au/theme/built-environment/topic/2016/ accessed 11 April 2017
4 http://www.planning.act.gov.au/topics/current_projects/act_building_regulatory_system_review/improving_the_act_building_regulatory_system_review accessed 10 May 2017
5 http://climateworks.com.au/sites/default/files/documents/publications/summary_report_-_low_carbon_high_performance_20160511_1.pdf sourced 11 April 2017

Expert Commentary

The possibilities for carbon positive cities

Romilly Madew, Chief Executive Officer Green Building Council of Australia

When Australia signed the Paris Agreement, we made a binding commitment to limit global temperature rises to less than 2˚C, and to strive towards global temperature rises of no more than 1.5˚C.

Each country now has a finite carbon budget, and a clear deadline for carbon neutral assets to be delivered as a matter of course.

As the home of our national government, and as the host city for dignitaries from across the world, it is appropriate that Canberra seeks world-leading sustainability.

The ACT has positioned itself as a leader on climate action for many years, with ambitious greenhouse gas reduction targets and a comprehensive plan to achieve net zero emissions by 2060.

HOW DOES ACT PERFORM WITH GREEN STAR RATINGS?

The first Green Star-rated building in Australia was 8 Brindabella Circuit at the Canberra Airport, and today a massive 25 per cent of the ACT's office space is Green Star certified.

Photo of 8 Brindabella Circuit. Source: Green Building Council of Australia

The ACT has 72 Green Star-rated buildings – including offices, schools, university buildings, apartments and the first Green Star hotel in the country. The ACT Government has constructed four Green Star schools, and two more are in the pipeline. It has also committed to achieving Green Star certification for the new ACT Law Courts.

Photo: Global Change Institute Interior. Source: Green Building Council of Australia

INNOVATION – GREEN STAR – COMMUNITIES RATING SYSTEM

The ACT Government also partnered with the Green Building Council of Australia to develop the Green Star – Communities rating system. Developed in collaboration with state governments, industry and academia, the Green Star – Communities rating tool has set evidence-based best practice benchmarks across a range of criteria, from design and governance through to environmental sustainability and economic prosperity.

More than 50 large-scale community projects – some of which will one day be home to hundreds of thousands of people – are working towards ratings.

Among them is Ginninderry, a joint venture project between the Land Development Agency and Riverview Developments, which was the first community in the region to achieve a 6 Green Star rating, representing world leadership in sustainable precinct design.

CARBON NEUTRALITY IN BUILDINGS – HOW DO WE PERFORM?

While these achievements all deserve applause, just a handful of the 1,460-plus Green Star projects around Australia are what we would call 'carbon neutral' – and none of them are in the ACT.

These include the University of Queensland's Global Change Institute in Brisbane which captures and stores its own power through one of the largest solar arrays in Queensland; and the Australian Institute of Management's Katitjin Centre in Western Australia, which is emissions neutral through a combination of smart orientation and highly efficient systems.

NUMBER ONE ECONOMIC RISK

Megatrends are all pointing in one direction.

The *World Economic Forum (WEF)* continues to rate failure of climate change mitigation and adaptation to be number one of 29 global economic risks. WEF considers climate change a greater risk than weapons of mass destruction, water crises or large-scale involuntary migration.

This resonates with shareholders and investors who are concerned about the resilience of their assets in the face of extreme weather, their desire to 'keep the lights on' and manage their risk of being left with stranded assets as a result of climate change.

We are already seeing rating agencies, banks, institutional investors and sovereign wealth funds looking for assets that meet a carbon zero trajectory.

In May 2017, long-term institutional investors with more than US$15 trillion of assets under management urged global governments to stay the course with the Paris accord. The 214 institutional investors argued that 'mitigation of climate change is essential for the safeguarding of our investments'.

THE CARBON POSITIVE ROADMAP

This is why the Green Building Council of Australia is developing a 'Carbon Positive Roadmap' to help the property and construction industry achieve net zero emissions. We have identified four key priorities:

18. Promoting energy efficiency through passive design and efficient systems
19. Driving investment in resilient, renewable energy infrastructure
20. Increasing markets for net zero carbon products, materials and services
21. Promoting offsets for remaining emissions.

We aim to create an approach that is a cost-effective pathway for buildings and portfolios which will also achieve other positive outcomes for Australia – such as efficient, comfortable and healthy buildings, energy security and a thriving renewable energy industry, job growth in emerging sectors, and enhanced biodiversity.

The question that we're facing is how to move beyond 'random acts of carbon neutrality' – because we don't have time for that.

We need scale and we need it now. In the future, anyone operating an asset in the built environment will be obliged to ensure that asset is carbon neutral.

To that end, we've been working with the Australian Government Department of Environment and Energy's Carbon Neutral Program to help establish a new draft voluntary standard for carbon neutral buildings and precincts with certification that can be achieved through Green Star.

SO, WHERE DOES THAT LEAVE CANBERRA?

The ACT Government has developed policies and programs to support Canberrans' transition to a carbon zero future – whether that's through its climate change adaptation strategy or the carbon neutral framework.

The Canberra community is also brimming with some of the nation's great innovators, academics and entrepreneurs who together can transform Canberra into a truly sustainable city.

All the fundamentals are in place for the ACT to accelerate its sustainability agenda. Canberra is in a unique position globally – large enough to be taken seriously on a world stage, but small and agile enough to adapt and change direction quickly.

Canberra's challenge is to escalate its efforts rapidly, and to strive towards carbon neutrality across every sector and in every facet of life.

With steadfast commitment, Canberra can show the world what it takes to become the world's first carbon neutral capital.

The Built Environment in the ACT

The built environment transformative agenda needs to consider opportunities across a variety of sectors including:

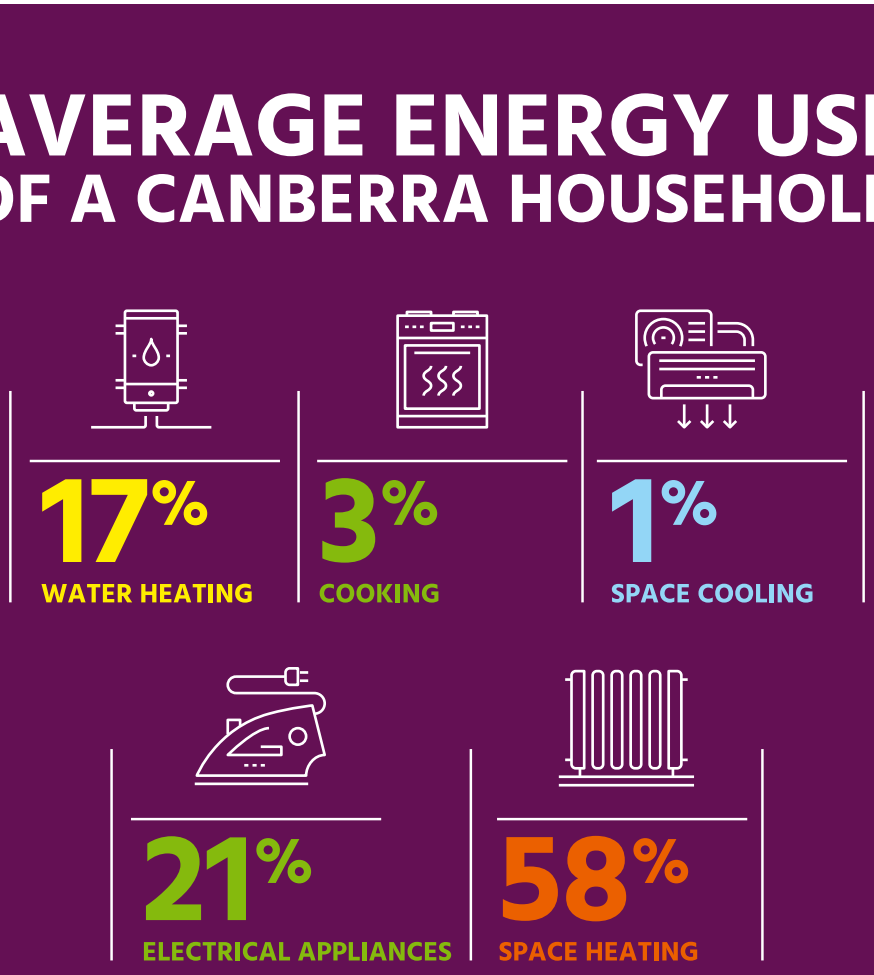
- new and existing buildings,
- commercial and residential premises, and
- owner occupiers and rental tenants.

RESIDENTIAL

Households were the largest domestic consumer of energy (1054 petajoules, or 26 per cent) in Australia in 2013–14.[6] Cold climate locations like the ACT consume a lot of energy per person, approximately 58 per cent of energy use is for heating.[7]

All homes in the ACT are required to carry an energy rating when being sold. Newly built or substantially altered homes must meet a minimum of six stars. In 2015–16, 4076 apartments and 1,055 detached houses commenced construction in the ACT[8] representing about 1.3 per cent of total housing stock.

The Land Development Agency recently engaged Actsmart Household Home Energy Advice to deliver pre build workshops. These workshops gave homeowners the opportunity to seek a range of advice from Actsmart's energy efficiency officer. Five workshops were run between February and May 2017.



Adapted from: Actsmart Energy Savings Guide[9]

6 https://soe.environment.gov.au/theme/built-environment/topic/2016/increased-consumption accessed 11 April 2017

7 http://www.environment.act.gov.au/__data/assets/pdf_file/0005/701186/Attachment-A-Energy-Efficiency-Information-for-Tenants-Final-Consultation-Report.pdf accessed 10 April 2017

8 http://www.allhomes.com.au/news/house-construction-on-the-rise-as-units-decline-in-canberra-report-20170309-guuzx5/ accessed 10 April 2017

9 http://www.actsmart.act.gov.au/__data/assets/pdf_file/0006/596049/130451-Energy-Smart-Booklet-Accessible.pdf accessed 11 April 2017

COMMERCIAL

Commercial buildings account for about 3.5 per cent of national energy consumption.[10] In the ACT these premises would mostly consist of office and retail buildings.

TOTAL ENERGY CONSUMPTION BY BUILDING TYPE

2%
PUBLIC BUILDINGS

11%
HOTELS

13%
EDUCATION

14%
HOSPITALS

25%
STAND ALONE OFFICE

35%
RETAIL

10 https://industry.gov.au/Energy/EnergyEfficiency/Non-residentialBuildings/Documents/CBBS-Part-1.pdf accessed 10 May 2017

The Rental Market

There is a very real barrier to take up of energy efficiencies in rental properties. This is referred to as a 'split incentives' issue between landlords and tenants. Landlords have little incentive to invest in efficiency improvements like insulation and draught-sealing because the tenants obtain the benefits of lower bills and more comfortable homes. This predicament was intended to be partly mitigated through Action 3 of *AP2*.

At the time of the 2011 Census, there were 129,000 households in the ACT and almost a third of these were rental properties. A typical household energy bill is likely to be well over $3,000 per year. Energy bills are typically higher in rental properties and this leads to higher than necessary costs for tenants.[11] These issues extend across both the residential and commercial sectors.

A report by Pitt and Sherry in 2014[12] recommended 6 actions over the short to medium term to address these challenges. Most of these centred on providing self assessment tools for real estate agents and tenants.

Building Energy Regulations

The first round of national residential building efficiency regulations was introduced in Australia in 2003. The Code, now called the *National Construction Code,* is a model code that is administered by each state jurisdiction, leading to variations in implementation.

The Code is currently being reviewed and revised against the *National Energy Productivity Plan* with an update to be released in 2019. There may be the need for the ACT to go beyond national standards to ensure optimal outcomes for a colder climate.

The ACT Government developed a series of regulatory reforms in 2016 to strengthen the regulation and integrity of the ACT building industry. The reforms were developed in consultation with the community and industry and aimed to achieve high quality design, building and training practices.

Adapting Our Built Environment to a Changing Climate

With a changed climate causing increases in extreme events, the need to adapt our built environment to reduce the potential impacts on infrastructure becomes even more critical. Even under a stable climate, extreme weather events are under-considered in planning, building and insurance.[13] Each of these can provide leadership and effective responses to changing climate-related hazards for the built environment. But each has its own independent professional knowledge and governance, making a consistent approach challenging.

ACT Government Architect, Catherine Townsend, discusses the potential of regulatory reform further.

11 http://www.environment.act.gov.au/__data/assets/pdf_file/0005/701186/Attachment-A-Energy-Efficiency-Information-for-Tenants-Final-Consultation-Report.pdf accessed 10 May 2017

12 Pitt and Sherry, 2014: *Reporting the energy efficiency of residential tenancies in the ACT*

13 https://www.nccarf.edu.au/sites/default/files/attached_files_publications/PlanningBuildingInsuringFactsheet.pdf accessed 8 June 2017

Property damage after the 2003 Canberra Bushfires. Source: Flickr

Expert Commentary

A Climate Responsive Built Environment

Catherine Townsend, ACT Government Architect(Source Cameron Bloom)

Where are we on the road to a climate responsive built environment? Well, we have a destination and a path but no vehicle.

To make possible a response to climate change requires a rethink of how and what we require in the physical development of the built environment. The current Australian regulatory environment around development and construction casts a dead eye over the view forward. We need to reshape the way we think about regulation.

An important piece of the transition to the future has been overlooked – we have identified goals and outcomes in our response to climate change but have not created a regulatory delivery mechanism. To see real improvements in design and construction we have to enable those outcomes through regulation.

DESIGN QUALITY

We have inherited a regulatory legacy that drives ever more reductive planning approval processes. There is a direct correlation between the quality of process and quality of outcome: poor process supports poor outcomes. The drive to render a development application 'as simple as possible' is blind to the potential benefits and real complexities of city change.

We must also recognise the paralysing disconnect of our cumbersome planning instruments; that the rate of social, economic and political change far outstrip our planning responsiveness. Put simply, the Territory Plan is a behemoth of a document, lumbering in response to changing city pressures. Inevitably the market occupies a vacuum through opportunistic bids and pushing the City into a reactive stance.

The solution lies in creating a more nuanced development approval path; one that creates an informed conversation between the City and the Proponent, one that supports quality; one that achieves a city greater than the sum of its parts.

The ACT will introduce a Design Review Panel process as a path to Development Approval for significant projects. This process was developed in the UK by the Commission for Architecture and the Built Environment (CABE) and first adopted by South Australia. The measurable benefits have led other states to establish similar processes.

What does this process look like? It means that a Proponent is able to have a number of presentations with an independent professional panel (the Design Review Panel) to review critical project characteristics. In the current Development Application (DA) process, Proponents (and consultant team) take a lot of risk in the detailed interpretation of planning documents. This leads to design proposals being dumbed down to avoid risk – to avoid the delay of arguing interpretation and to avoid the cost of redesign.

The independent panel will be from a pool of suitably qualified professionals and will be able to provide direction and interpretation on the particular complexities or characteristics of individual proposals. The panel will provide a commentary about proposals and the final planning decision is by the planning authority.

Characteristics of the Design Review Panel process are:

- It provides a nimble, intelligent, informed and transparent mechanism for development applications
- It has a pool of appropriately qualified and experienced professionals to call upon
- It is an iterative experience; typically 3 or 4 presentations are undertaken
- The panel is able to interpret the City voice and provide useful flexibility
- It facilitates faster approval and greater certainty in the approvals process
- It is supported by professional staff

In summary, the benefits from a design review process where project characteristics are worked out before submission of the DA are:

- **Less risk to the Proponent**
- **Shorter approval time**
- **Lower cost**
- **Improved design quality – benefits the individual and the City**

Space Apartments, an example of enduring high quality urban and detailed design. Source: Ben Wrigley

CONSTRUCTION QUALITY

Australia currently is experiencing a wave of construction quality issues, most notably in apartment buildings – and the ACT is no exception. In fact, Australia lags behind our economic peers (USA, Canada, Japan, France, Spain, Italy and Germany) in failing to require any particular education or expertise or accountability of the individuals who author buildings. We have a rather last century view of building and design that would be cute if it wasn't precarious. Our laconic underestimation of the complexities in design and delivery of the urban hive that is apartment living must be corrected.

Our biggest step forward for sustainability in the built environment will be about achieving better quality construction and through new requirements that recognise the design and technical complexities of this building type:

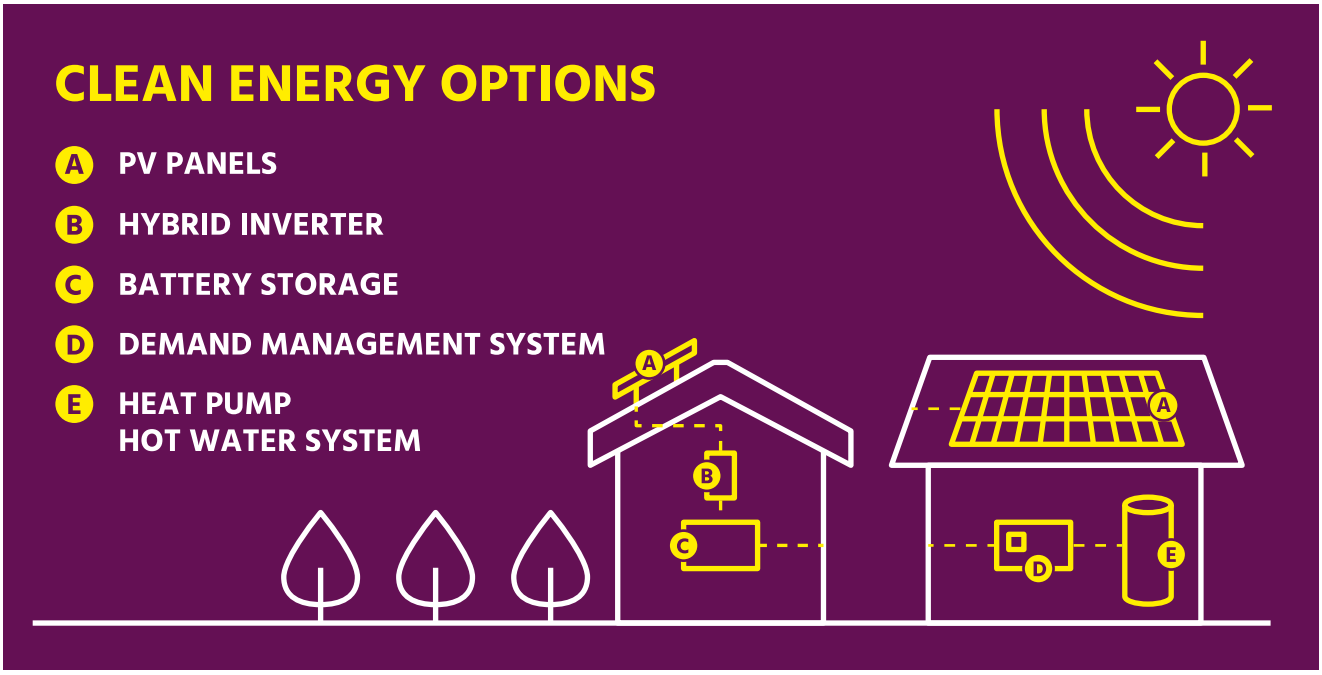
- **Requiring the use of a suitably qualified profession: a registered Building Author**
- **Requiring continuity of professional advice through design, documentation and construction**
- **Requiring construction documentation**

I'm fascinated in what happens at the intersection of public and private interests: where the powerful motivations of personal gain rub up against the notions of community amenity and legacy. This leads to an exploration of the mechanisms that we have for changing development behaviour. My view is that regulation and process are our tools to shape the behaviour that makes a city; let's be smart with the tools we have. Good regulation should be the lightest possible touch delivered in concert with intelligent processes. Carrots as well as sticks; support as well as control. Such changes to the regulatory environment will enable the quality of design and construction that are essential to a climate responsive built environment.

A No-gas Development

There is much deliberation about the future role of gas supply in the ACT. With 100 per cent renewable electricity supply imminent and improvements in electric technology for space and water heating and cooking, a low emissions household may not have gas supply at all. There are some cultural paradigms to overcome to address this, as well as careful consideration of its implications on peak loads on the network and the limitations in some industries.

Developers of Ginninderry have been on a journey engaging with Canberrans to raise awareness of the possibilities of a no gas home. They are actively encouraging their residents to lean towards efficient electric heating and cooking with no gas.



Clean energy options, Adapted from: Ginninderry

Case study

TORRENS EARLY LEARNING CENTRE: LEADING THE COMMERCIAL SECTOR

A Canberra childcare centre is set to become Australia's most energy-efficient commercial building. The Torrens Early Learning centre will be the first commercial "*Passivhaus*" structure in the southern hemisphere, once construction is complete.14

Torrens Early Learning Centre Under Construction. Source Natalie Colbert

Passivhaus, or passive house, is a world-leading standard of energy efficiency, with a particular focus on being air-tight. Achieving *Passivhaus* certification, designed in Germany, is like achieving a 10-star green energy rating in Australia.

Passive houses achieve energy savings of between 70 per cent and 90 per cent compared to conventional constructions.[15]

Besides the economic and environmental benefit, they are also positive for the health of its inhabitants, since they include aspects such as the intelligent renovation of air, the incidence of sunlight and the use of materials that help reduce conditions such as asthma or fibromyalgia.

The Torrens Early Learning Centre will include a 30 kilowatt solar system and is expected to be energy positive. Triple glazed windows, cross laminated timber flooring and an energy recovery ventilation system will also be featured in the buildings. The centre is expected to open in September 2017 and will be tested in its first year of operation to confirm the built performance against the design.

The National and Global Movement

Decarbonisation of the building sector plays a key role in achieving the Paris Agreement long-term temperature goal. A national policy road map released by ASBEC in May 2016 recommended: *a zero carbon buildings plan, stronger minimum standards, ambitious action by industry and governments, targeted incentives and programs, energy market reform and a suite of critical enabling data, information, education and training measures.*

Analysis by *Climate Action Tracker*,[16] an independent research organisational group tracking global climate action, has shown that to get the building sector onto a pathway consistent with limiting global warming to 1.5 degrees Celsius requires urgent and highly ambitious action. A scenario where *new buildings are zero-energy by 2020 in OECD countries, and by 2025 in non-OECD countries, combined with deep renovation rates of 5 per cent and 3 per cent per year respectively, could bring the building sector onto a 1.5 degrees Celsius compatible pathway*.

14 http://www.allhomes.com.au/news/canberra-childcare-centre-the-southern-hemispheres-first-passivhaus-build-20170430-gvw1g8/ accessed 25 May 2017
15 http://www.activesustainability.com/construction-and-urban-development/learnsustainability-passive-houses/ accessed 29 May 2017
16 http://climateactiontracker.org/assets/publications/briefing_papers/CAT_Decarb_Buildings_Final_2016.pdf accessed 25 May 2017

Case Study

INNOVATIVE PROGRAMS IMPROVING ENERGY EFFICIENCY IN EXISTING BUILDINGS

City of Seoul. Source: Flickr

A report was released by C40 Cities in February 2017 titled *Urban Efficiency II: Seven Innovative City Programmes for Existing Building Energy Efficiency.*[17] Highlights included:

- Seoul offers low-interest loans with 'generous' repayment and grace periods to help building owners afford retrofits. The city financed more than 4,000 residential and commercial energy efficiency upgrades from 2012 to 2015.
- The *Retrofit Chicago Energy Challenge* supports voluntary energy efficiency steps in commercial, institutional and private buildings. The *Challenge* aims to help participants reduce energy consumption by 20 percent over five years.
- Mexico City and Tokyo have implemented sustainable building certification programmes that aim to make data about energy usage more transparent. '*Carbon report cards*' about individual building performance versus industry benchmarks help tenants gauge usage and costs.
- In Boston, a public-private partnership called the *Renew Boston Trust* directs private investor funds into energy projects in commercial properties.
- London's *Business Energy Challenge* is a voluntary initiative that gives the private sector a lead role in helping businesses wean themselves from fossil fuels. The focus is on reducing emissions that contribute to climate change. The most successful businesses receive mayoral recognition and awards.
- The ACT became a signatory of C40 Cities in 2015

Case Study

MUSEUMS VICTORIA GOES GREEN

Australia's largest public museum organisation has entered into an innovative energy partnership with Siemens to reduce greenhouse gas emissions by 35 per cent, electricity costs by 32 per cent, and water usage by six per cent.[18]

The new energy management program – financed in part by the Victorian government – includes the installation of a new building management system to ensure energy, heating and lighting are all used more efficiently.

Melbourne Museum. Source: Free Aussie Shutterstock

Siemens is currently rolling out the *Desigo CC*, its latest building management and control solution, at both Melbourne Museum and the Immigration Museum. This software component sits across the buildings management system and integrates with security and fire systems to create a holistic control centre on one platform.

Immigration Museum. Source: Wikimedia Commons

Part of the control strategy employed at these buildings is ventilation demand control optimisation and an optimised chiller plant strategy. Within this system, heating and cooling plants are managed so that they are not fighting each other.

17 https://issuu.com/c40cities/docs/urbanefficiencyii_final_hi_res__1_ accessed 25 May 2017

18 http://www.architectureanddesign.com.au/suppliers/siemens-building-technologies/museums-victoria-goes-green-with-siemens-energy-pa accessed 25 May 2017

ADVANCING THE PLAN

- Develop an appropriate mix of minimum standards and incentives to drive energy efficiency covering residential and commercial, new and existing buildings, and owner and rental properties.
- Validate energy efficiency ratings to ensure that the end product meets design and regulation intent.
- Set targets and benchmarks for energy productivity in built environment sectors to encourage market movement.
- Promote understanding of consumer options in relation to energy supplies and appliances early in planning and approval processes.
- Develop and promote leading building examples for Government facilities.
- Leverage market influence through Government procurement, for example minimum energy star ratings for all business accommodation bookings.
- Drive delivery of climate adaptation and risk mitigation through community engagement and insurance industry evolution.

9. Natural Environment

‘Evidence over the last decade has shown that ecological change in response to climate change is unavoidable; it will be widespread and it will be substantial.’

CSIRO[1]

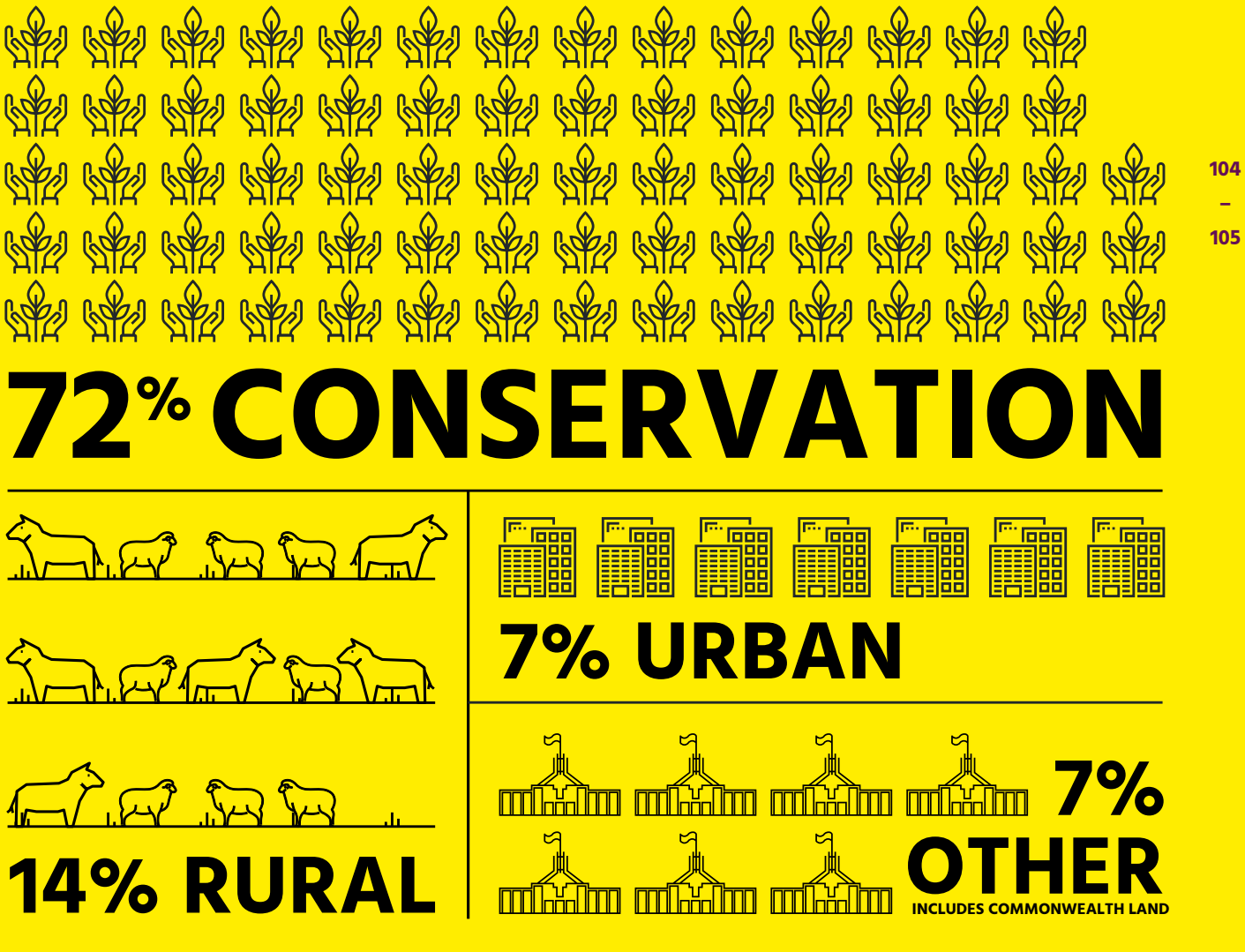
The proportion of species likely to persist in their current location in the ACT under a future climate scenario by 2050: plants 40–60 per cent, mammals 70–80 per cent, reptiles 40–70 per cent and amphibians 60–80 per cent.

Introduction

Climate change poses severe challenges for natural ecosystems, both as a direct threat and by heightening the stresses living things face.[2] *AP2* recognises this in Action 17 and seeks to improve ecological resilience through its management actions. Climate change will impact the variety in species and ecosystems. Given the uncertainty of the impacts, a broad spectrum of actions is required to prepare for these changes.

The natural environment covered in this chapter includes areas in the national park, nature reserves, special purpose reserves, urban open space and urban streetscapes.

104 – 105



1 CSIRO, 2014 Implications of climate change for biodiversity, http://adaptnrm.csiro.au/biodiversity-impacts/ accessed 14 June 2017

2 Steffen, Burbidge, Hughes, Kitching, Lindemayer, Musgrave, Stafford, Smith, Werner, 2009: *Australia’s Biodiversity and climate changes: a strategic assessment of the vulnerability of Australia’s biodiversity to climate change.*

Climate Change Impacts on the Natural Environment

Under climate change, native species will likely experience different local environments and will need to adapt to environmental changes and expand or change their range, or they will go extinct.

In the ACT, the wildlife of the Murrumbidgee and North Canberra areas are considered to be under the greatest pressure from climate change.[3]

The expected increase in frequency and magnitude of fire may also have multiple negative impacts on biodiversity through ecosystem destruction and alteration, and the increased establishment of pest species following fire.[4]

Lower Cotter Catchment: Regeneration after Fire, spring 2007. Source: unknown.

> Within the next 60 years, the vast majority of species distributions of eucalypts (91 per cent) across Australia will shrink in size (on average by 51 per cent) and shift south on the basis of projected suitable climatic space. This research can be used to predict areas of biodiversity loss and important climate refugia for the future.[5]

Most Threatened Species

A 2015 study assessed the vulnerability of a wide selection of Australian species to the impacts of climate change.[6] Overall amphibians are identified as most highly vulnerable to climate change. They have small and fragmented distributions, and rely heavily on particular moisture regimes and aquatic habitats. Plants were the next most vulnerable group, because they cannot move freely like animals and rely on specific soil types. Birds, which are very good dispersers, are conceived as being less vulnerable to climate change, but scholarship demonstrates there is no ground for complacency and there is still considerable anxiety about how many birds will respond to climate change.[7] It is because of their responsiveness to climate change that birds are regarded as one of the great *indicia* of climate change impacts.

The Australian Museum[8] lists species that are vulnerable to extinction from climate change and includes the pink-tailed legless lizard. The pink-tailed legless lizard (or worm lizard) is listed as a threatened species in the ACT.[9]

Pink-tailed legless lizard. Source: SunofErat, Wikimedia commons.

3 Doerr et al 2013 in ACT Government, 2017: *Lower Cotter Catchment Draft Reserve Management Plan 2017*
4 Steffen and Hughes, 2013 in ACT Government, 2017: *Lower Cotter Catchment Draft Reserve Management Plan 2017*
5 Gonzalez-Orozco et al 2016: *Phylogenetic approaches reveal biodiversity threats under climate change*, Nature Climate Change, Letters.
6 http://theconversation.com/meet-the-australian-wildlife-most-threatened-by-climate-change-42310 accessed 29 June 2017
7 Janice Wormworth and Cagan Sekercioglu, 2011, Winged sentinels. Birds and climate change, Cambridge, University of Cambridge Press.
8 https://australianmuseum.net.au/australian-species-vulnerable-to-climate-change accessed 29 June 2017
9 http://www.environment.act.gov.au/cpr/conservation_and_ecological_communities/threatenedspecieslist accessed 17 July 2017

Local Actions

The review of the *Nature Conservation Act 2014* has assisted in the establishment of the necessary legislative building blocks to allow better management of our natural environment, taking into consideration the expected impacts of climate change. As an example, there is an embedded commitment in the Act to address climate change explicitly in the *Nature Conservation Strategy*[10] and in the Action Plans developed for the management of threatened species and endangered ecological communities. Delivery on the actions in these Action Plans is a critical outcome to support species resilience under a changed climate.

Actions to be taken to protect our natural environment are outlined in the *ACT Nature Conservation Strategy* and included in the *ACT Climate Change Adaptation Strategy* (Actions 20, 21 and 22).[11] The *ACT Nature Conservation Strategy* advocates 'whole of landscape' approaches and sets out the priorities for conservation action. A Progress Report on Implementation Plan 1 of this strategy outlines actions completed to December 2015.[12] This is an update on progress towards 104 milestones to achieve 33 identified actions.

The *Reserve Plans of Management* provide guidance and direction to the land custodian, visitors, neighbours, volunteers, and others with an interest in the area. The ACT currently has seven of these plans – Namadgi, Tidbinbilla, Jerrabomberra Wetlands, Canberra Nature Park, Murrumbidgee River Corridor, Lower Molonglo River Corridor and Lower Cotter Catchment.[13]

View from Mount Ginini. Source: Mark Jekabsons

10 ACT Government, 2013: *ACT Nature Conservation Strategy 2013–23*, http://www.environment.act.gov.au/__data/assets/pdf_file/0004/576184/ACT-Nature-Conservation-Strategy_web.pdf accessed 2 June 2017

11 ACT Government, 2016: *ACT Climate Change Adaptation Strategy, Living with a Warming Climate*, http://www.environment.act.gov.au/__data/assets/pdf_file/0004/912478/ACT-Climate-Change-Adaptation-Strategy.pdf accessed 2 June 2017

12 http://www.environment.act.gov.au/__data/assets/pdf_file/0007/866896/ACT-NCS-Implementation-Plan-1-Progress-Report.pdf accessed 11 July 2017

13 http://www.environment.act.gov.au/cpr/plans-of-management accessed 30 June 2017

Red Stringybark dieback in Aranda Bushland – an effect of climate change?

By Professor Ian Falconer and Mary Falconer, Friends of Aranda Bushland

Aranda Bushland is an area of Canberra Nature Park which is largely occupied by dry eucalypt forest, rising above frost hollow grassland. It occupies both sides of a ridge of Acton Shale, and consequently the soil is shallow, nutrient-poor and dries out quickly after rain. The tree vegetation changes with elevation rising from Yellow Box/Blakely's Red Gum on the grassy lower slopes, through Candle Bark/Apple Box/ Peppermint to the drier, higher slopes of Scribbly Gum/Brittle Gum/Red Box and predominantly Red Stringybark towards the top.

Stringybark and brittle gum at Aranda. Source: Ian Falconer.

The dieback appears mainly restricted to Red Stringybark *Eucalyptus macrorhyncha*, with smooth-barked eucalypts thriving. The effect is most obvious on the hotter and drier west-facing slope. A one hectare plot was surveyed on a western slope and all eucalypts with 1m above ground trunks larger than 40 cm were recorded, including canopy integrity (per cent of live branches). Approximately 20 per cent of the surveyed Red Stringybark were dead with only 56 per cent canopy integrity.

Rainfall is extremely variable in the area ranging from 384 mm in 2006 to 1052 mm in 2010. Slow deterioration of these trees has been witnessed in the last 20 years.

The question being asked is whether this dieback can be attributed to climate change and if so what management strategies can we apply to assist the ecosystem to adapt to these changes?[14]

14 http://fennerschool.anu.edu.au/education/programs/honours/past-honours-projects/whats-killing-trees-investigation-eucalypt-dieback accessed 11 July 2017

Initiatives to Address Climate Change

The following case studies demonstrate a variety of initiatives that are addressing climate change impacts on the natural environment.

Case Study

MANAGING A CATCHMENT IN A CHANGING CLIMATE

The Lower Cotter Catchment is 6350 ha of the Cotter River catchment, the major water supply catchment for the ACT. The western and southern boundaries adjoin Namadgi National Park and Tidbinbilla Nature Reserve. In 2003, a major bushfire that devastated parts of Canberra swept through the Lower Cotter Catchment, destroying more than 4000 ha of pine plantation. This has left the catchment with areas of poor ground cover resulting in significant erosion and poor water quality after storm events.

Regeneration in the Lower Cotter Catchment 2016. Source Kate Auty

Following these fires, the decision was made to restore the catchment to native vegetation with a priority on improving water quality. A *Draft Reserve Management Plan* was released for comment in early 2017.[15] The Plan noted the catchment needed to be managed under changed climate conditions: hotter and drier conditions, more frequent and severe fire conditions, and an increased demand on the catchment for water supply.

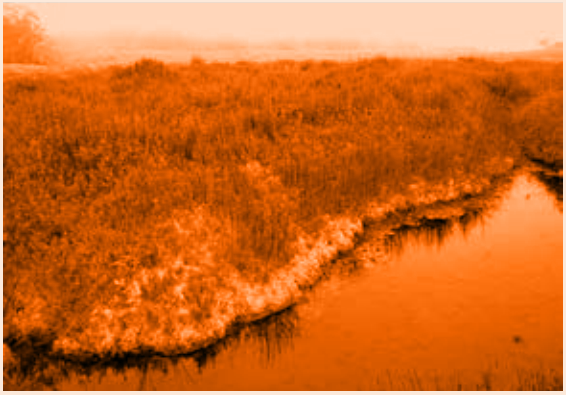
The Plan states that:

"Minimising the impact of climate change on water resources, biodiversity and other values is best achieved by building the resilience of natural ecosystems through restoring native vegetation, enhancing habitat connectivity across environmental gradients and reducing the impacts of other stressors such as weeds and pest animals."

The catchment is being managed to reduce the risk of extreme bushfire impacts, to protect vegetation and the risk to assets.[16] Fire management activities are undertaken in a manner that considers all attributes across the landscape and can promote vegetation recovery and reduce erosion risks.

The *Draft Lower Cotter Catchment Reserve Management Plan* also recognises particular ecological communities and species that are under direct threat from climate change.

For example, the 'Alpine Sphagnum Bogs and Associated Fens' is listed as an endangered ecological community under the Environment Protection and Biodiversity Conservation Act, and is recognised to have significant demonstrable threats from climate change and fire.[17] There is a sphagnum bog within the catchment at Blundells flat and the plan places priority on conserving this area.



Sphagnum Bogs, Cotter flats. Source Mark Jekabsons.

Actions that are identified in the Plan to promote resilience to climate change are:

- maintaining and restoring diversity in ecological communities,
- identifying, managing and protecting potential refugia and landscape connections, and
- maintaining large, well connected and genetically diverse populations.

15 ACT Government, 2017: *Lower Cotter Catchment Draft Reserve Management Plan.* The Commissioner made a submission to the draft plan and that submission can be found at http://www.environmentcommissioner.act.gov.au/publications/public-submissions/lower-cotter-catchment-draft-reserve-management-plan accessed 11 July 2017

16 The Commissioner is undertaking a review of the effectiveness of the restoration efforts in the Lower Cotter Catchment as recommended in the Auditor General Report 3 of 2015

17 http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=29 accessed 17 July 2017

Case study

HOW HAS CANBERRA'S BIRD POPULATION CHANGED?[18]

The bird population in Canberra has changed dramatically since European settlement. 98 per cent of the bird species that we see in the ACT today would not generally have been found here in the 19th Century.

The transformation of the land from woodlands to sheep paddocks, and then to suburbs, has led to winners and losers for our birds. Some species are opportunists and have adapted successfully, while other vulnerable species have reduced significantly in numbers or disappeared entirely due to competition with introduced species and loss of habitat. Climate change is thought to have contributed to some of the changes in our bird wildlife, particularly with increased numbers of parrots.

Superb Parrot. Source: Leo Flickr.

The Superb Parrot (currently listed as vulnerable in the ACT)[19] is one of the success stories of these changes. Once considered only rare visitors, there's now evidence of superb parrots breeding in the Molonglo Valley.

With a warming climate, the little corella and the rainbow lorikeet, which were virtually absent just a few years ago, are now also being seen in increasing numbers.

Case Study

CLIMATE CHANGE REFUGIA A 'PRIORITY ACTION' IN THE ACT *NATURE CONSERVATION STRATEGY*

The identification of climate change refugia is an important response to the challenges and threats of climate change.

Climate change refugia are areas where native plants and animals are most likely to remain under climate change. Identifying these areas will help fill knowledge gaps for policy, management and investment, and research. Information on the location, extent and nature of local biodiversity refugia can feed into targeted restoration and management interventions, more effective long-term protection of conservation assets and better understanding of the ecology and vulnerability of desirable species. Monitoring of refugia will also provide valuable information on how best to manage climate-related impacts.

'*Identifying biodiversity refugia under drought and climate change [conditions]*' has been recognized as a priority action in the *ACT Nature Conservation Strategy* and was also referred to as a key knowledge gap in the *Biodiversity Adaptation Pathways Project*.[20]

Using data from the hydro-geological (HGL) project,[21] climate change refugia reports will be developed and refugia sites will be identified.

Outputs from the climate change refugia project will include:

- models and maps of potential biodiversity refugia to help restore and manage desirable species under climate change,
- specification of project criteria used to identify those biodiversity refugia, and
- guidance for land managers to interpret and apply decision support tools (models, maps).

18 Allen, Craig, 17 April 2017: *How has Canberra's bird population changed?*, Curious Canberra, ABC News, http://www.abc.net.au/news/specials/curious-canberra/2017-04-17/how-has-canberras-bird-population-changed/8280706 accessed 2 June 2017

19 http://www.environment.act.gov.au/cpr/conservation_and_ecological_communities/threatenedspecieslist accessed 11 July 2017

20 ACT Government, 2016: *ACT Biodiversity Adaptation Pathways project*, http://www.environment.act.gov.au/act-nrm?a=825264 accessed 2 June 2017

21 http://www.environment.act.gov.au/__data/assets/pdf_file/0007/916567/ACT_HGL_Report_160225-Part1.pdf accessed 5 July 2017

Opportunities to Harness the Natural Environment to Respond to Climate Change

There are many examples of how our natural environment is being impacted by climate change and how we are progressing with our actions to support adaptation. With improvements in our scientific understanding of climate change, the role of the natural environment in assisting humanity to respond to climate change is expanding.

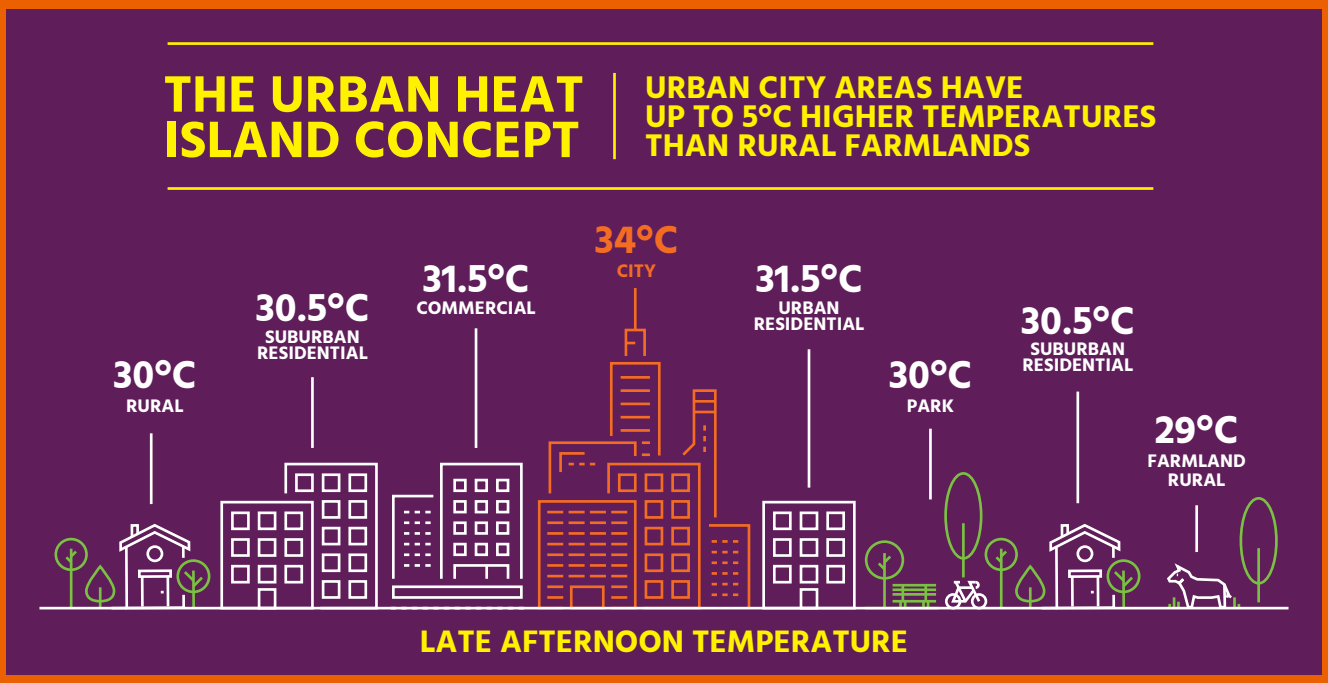
In particular, the natural environment operates to mitigate heat and sequester carbon, thereby becoming the cornerstone of our climate change actions.

There are several ways in which plants can alter the temperature of the Earth's atmosphere.

As plants 'breathe' and 'perspire' they help cool the atmosphere. Plants consume carbon dioxide – a significant greenhouse gas – in the process of photosynthesis.[22] The reduction of carbon dioxide in the atmosphere has an indirect cooling effect. Plants also cool the atmosphere because they release water vapour when they get hot, a process similar to sweating.

22 https://earthobservatory.nasa.gov/Features/LAI/LAI2.php accessed 5 July 2017

Urban Heat Island



The Urban Heat Island Concept – urban city areas have up to 5 degrees C higher temperatures than rural farmlands.

Australian cities can be up to 5 degrees Celsius hotter compared to surrounding areas because of a phenomenon known as the 'Urban Heat Island' (UHI).[23]

The UHI occurs when natural permeable surfaces including grass, plants, or bushland are replaced with concrete, asphalt and infrastructure all of which readily absorb heat. Cities tend to have higher air and surface temperatures than their rural surroundings because urban form and materials store and trap heat.[24]

Green infrastructure typically refers to an interconnected network of multifunctional green spaces strategically planned and managed to provide a range of ecological, social and economic benefits.[25]

Development of green infrastructure is attracting interest due to its potential as a climate change intervention.[26] Green infrastructure has a key role to play in reducing the amount of solar radiation that is absorbed into building materials such as walls, roofs and pavements, during the day after which it is released at night.

Modelling studies show that increasing the proportion of tree canopy cover in the urban environment can reduce both surface and air temperatures.[27] Analysis shows that under climate change scenarios a 20 per cent increase in green cover could reduce surface temperatures by 2 degrees Celsius in 2050.[28] Urban vegetation with higher canopy cover improves environmental conditions in terms of relative humidity and regularisation of extreme temperatures during the warm season. Furthermore, strategically located trees adjacent to residential buildings can reduce the energy required for household cooling during hot weather.[29]

The use of green roofs and lighter coloured surfaces (roofs, roads and footpaths) in urban areas can reduce the UHI.[30] The city of New York[31] determined that the cooling potential per area was highest for street trees, followed by living roofs, light covered surfaces, and open space planting.

23 http://www.news.com.au/technology/environment/climate-change/urban-island-heat-effect-rising-temperatures-in-aussie-cities-could-create-death-traps/news-story/0b035c4707ea8f81e32ee0df4fa546bf accessed 5 July 2017
24 Brenda B. Lin, Jacqui Meyers, R. Matthew Beaty and Guy B. Barnett, 2016: *Urban Green Infrastructure Impacts on Climate Regulation Services in Sydney, Australia*; Sustainability, 8, 788
25 Benedict, M.A.; McMahon, E.T, 2006: *Green Infrastructure: Linking Landscapes and Communities;* Island Press: Washington, DC, USA, 2006
26 Jim, C.Y.; Lo, A.Y, 2015: Byrne, J.A. Charting *the green and climate-adaptive city*. Landsc. Urban Plan, 138, 51–53.
27 http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0187-62362015000300005 accessed 5 July 2017
28 Emmanuel, R.; Loconsole, A, 2015: *Green infrastructure as an adaptation approach to tackling urban overheating in the Glasgow Clyde Valley Region, UK*. Landsc. Urban Plan, 138, 71–86
29 CSIRO: *Urban Green Infrastructure Impacts on Climate Regulation Services in Sydney, Australia*; Sustainability, 8, 788
30 https://essentialenvironmental.wordpress.com/2014/03/14/urban-heat-island-effect-how-do-we-stop-our-cities-from-baking/ accessed 5 July 2017
31 https://www.giss.nasa.gov/research/news/20060130/103341.pdf accessed 5 July 2017

Chicago City Hall green roof.[32]

Urban Forests

The ACT is renowned as the '*garden city*' and *'bush capital'*, indicating the high value and appreciation of our urban forests. Canberra has over 750,000 trees in its urban spaces and it is one of the largest urban forests in Australia.[33]

Planning of our urban forests should take into account the vulnerability of species to a changed climate. A leading example of this research being undertaken is in the *City of Melbourne's Future Urban Forest* report.[34] The report, based on research by the University of Melbourne, assessed the vulnerability of around 3000 tree species to various climate scenarios ranging up to a 3 degree Celsius increase in average temperature. Of the 375 tree species that are currently planted in Melbourne, 39 per cent of species were found vulnerable to the current climate. This figure rises to 78 per cent under a 3 degree temperature increase scenario.

Melbourne's urban forest strategy is also unique in the way it engages its community.

Melbourne Queen's Park. Source: Donaldytong, Wikimedia commons.

Each of the 70,000 trees in the City of Melbourne has a unique identification number linked to an online map – *the Urban Forest Visual*[35] – which provides information on each tree's botanical identity, location, health and life expectancy. As a way to empower the community, each tree is also assigned an email address, which allows people to email the tree and report issues such as tree decline, vandalism and dropping branches. An unexpected outcome of the project has been a flood of love letters from around the world from people thanking the trees for their hard work.[36]

Internationally there is a considerable commitment to addressing the expected impacts of climate change on even small urban populations.

32 http://aasid.parsons.edu/decorationascomposition/sites/default/files/001-cityhall-roof1_0.jpg
33 http://www.cmd.act.gov.au/open_government/inform/act_government_media_releases/meegan-fitzharris-mla-media-releases/2016/a-celebration-of-canberras-urban-forest accessed 7 July 2017
34 https://www.nespurban.edu.au/publications-resources/research-reports/CAULRR02_CoMFutureUrbanForest_Nov2016.pdf accessed 7 July 2017
35 http://melbourneurbanforestvisual.com.au/ accessed 7 July 2017
36 http://www.smh.com.au/comment/ode-to-the-street-kids-of-northbourne-avenues-urban-forest-our-dying-river-peppermint-gums-20170317-gv0e9l.html accessed 7 July 2017

Case Study

MANAGING URBAN OPEN SPACE BY COMMUNITY OR CITIZEN SCIENCE

Managing urban open space is another action identified in the *ACT Nature Conservation Strategy*.

Water Sensitive Urban Design (WSUD) is one set of actions used to manage the urban environment. WSUD is necessary in areas of urban development, because it creates habitat for local ACT species, attracting birds and aquatic species.

Urban wetlands also play an important role in reducing the urban heat island effect, which will become more severe under climate change.[37] The constructed wetlands in North Canberra have restored areas to more natural habitat.

O'Connor wetlands. Source: Edwina Robinson.

Where creeks are still lined with concrete there is no native vegetation connectivity between the wetlands. Revegetating these areas is a recommended management approach to ensuring the long-term persistence of frog species in the urban environment, particularly as these areas face changes in the climate.[38]

Frogwatch is a very successful citizen science project which has started monitoring behavioural shifts in frogs in response to climate change. The early incidence of frogs breeding, due to increasing temperatures, is one matter which is being subjected to community scrutiny and reportage. This research could help inform future management of frog habitat areas.

The ACT Government is currently revising guidelines for the selection of appropriate plant species in urban parks and open space to enhance climate change adaptation of these areas.[39]

Case Study

CHINA'S URBAN FOREST PLANS REACH NEW HEIGHTS

The Liuzhou Forest City is set to challenge perceptions about urban living in the country and be a breath of fresh air – literal and metaphorical – for its 30,000 inhabitants.[40]

The new city, being built in southern China's mountainous Guangxi area, will bring nature to an urban setting, with over 40,000 trees and 1 million plants covering every building.

The green city follows a string of 'vertical forest' projects – high-rise buildings swathed in green – being built around the world. But Liuzhou Forest City, set to be completed by 2020, takes things to a whole new level.

Each year the trees will absorb 10,000 tons of carbon dioxide and 57 tonnes of pollutants. They should produce about 900 tonnes of oxygen annually.

The architects behind the idea, *Stefano Boeri Architetti*, are confident that the plant cover will also decrease the average air temperature, create noise barriers, and boost biodiversity by creating a habitat for birds, insects and small animals.

Source: Sano Boeri Architetti.

37 Patz, J., Campbell-Lendrum, D., Holloway, T. and Foley, J., 2005: *Impact of regional climate change on human health*, Nature 438, 310–317 (17 November 2005)

38 Hoefer, A., and D., Starrs, 2016: *One pond fits all? Frogs as an indicator of urban wetland health. Final Report to the Upper Murrumbidgee Waterwatch*, Ginninderra Catchment Group, Canberra, http://www.ginninderralandcare.org.au/sites/default/files/files/Hoefer_Starrs_Wetland_Indicator_Final_Report%20(1).pdf, accessed 2 June 2017

39 ACT Government, 2013: *ACT Nature Conservation Strategy 2013–23*, http://www.environment.act.gov.au/__data/assets/pdf_file/0004/576184/ACT-Nature-Conservation-Strategy_web.pdf, accessed 2 June 2017

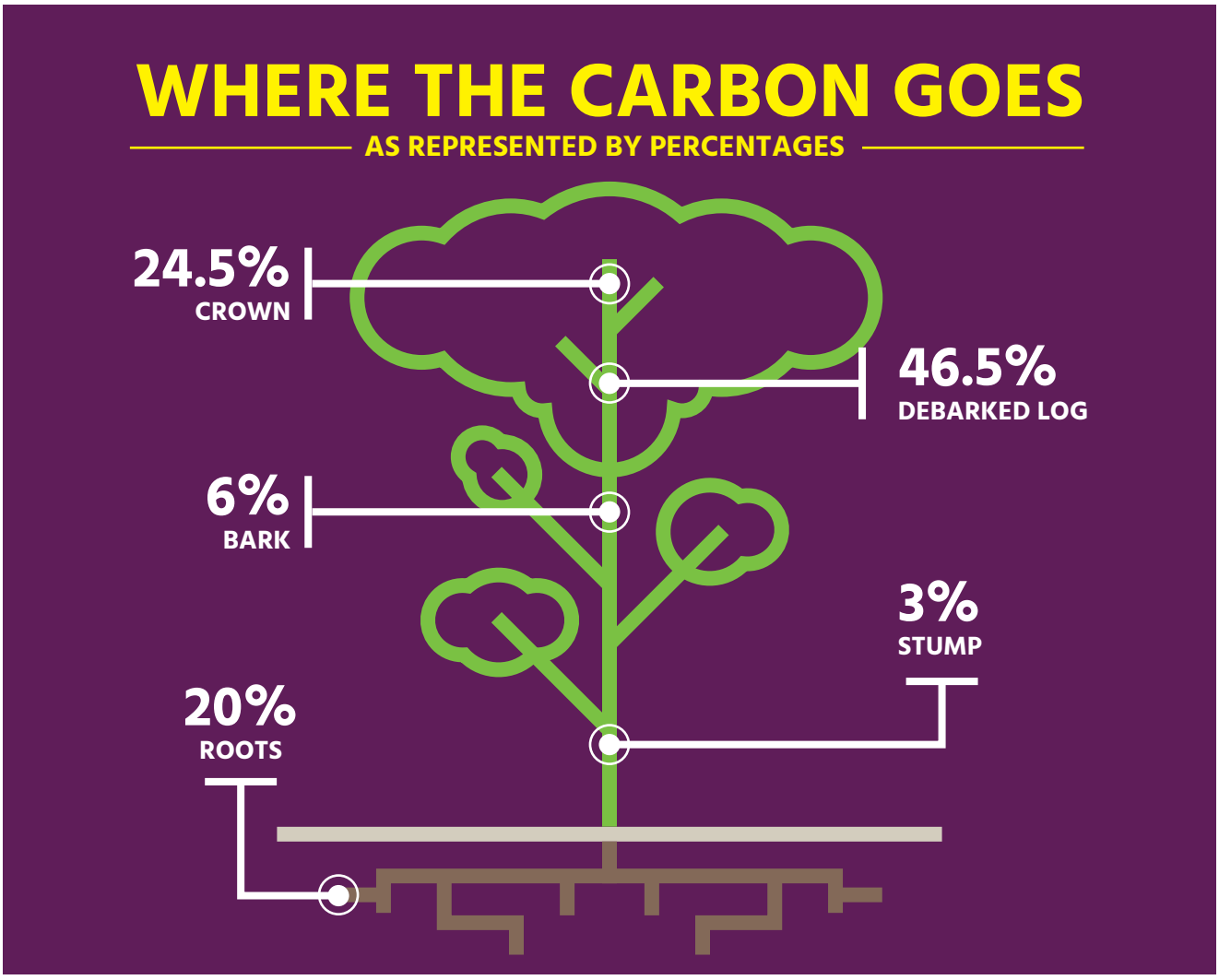
40 https://www.weforum.org/agenda/2017/07/welcome-to-china-s-urban-forest accessed 6 July 2017

Carbon in Our Plants

Carbon sequestration is the general term used for the capture and long-term storage of carbon dioxide. This can occur at the point of emission or through natural processes.[41] Our natural environment serves to store carbon in our soil, trees, vegetation, geology and the ocean. Under climate change, ocean waters are storing more carbon resulting in problems for fish and other species, including lack of oxygen.[42]

Through the process of photosynthesis, plants use energy from the sun to draw down carbon dioxide from the atmosphere and then use it to create the 'waste product' oxygen[43] and the carbohydrates they need to grow. Since carbon dioxide is one of the most abundant greenhouse gases, the removal of the gas from the atmosphere may temper the warming of our planet as a whole.

By increasing the amount of plant life on earth, or altering it to plant types that store the most carbon, more carbon dioxide may be pulled out of the air and stored for a period of time. Australia's Chief Scientist Dr Alan Finkel reports that in Australia, forests are typically more than 10 times as effective as grasslands at storing carbon.[44] Carbon storage through carbon forest offsets is an emerging market.



Research at the University of Melbourne shows how a eucalypt stores carbon.[45]

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41 http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/Browse_by_Topic/ClimateChangeold/responses/mitigation/carbon accessed 7 July 2017
42 https://thinkprogress.org/oxygen-levels-falling-2-to-3-times-faster-than-predicted-in-our-warming-oceans-7c1e9b48cd42 accessed 11 July 2017
43 http://sciencing.com/waste-product-photosynthesis-6175070.html accessed 11 July 2017
44 http://www.chiefscientist.gov.au/2009/12/which-plants-store-more-carbon-in-australia-forests-or-grasses/ accessed 7 July 2017
45 https://pursuit.unimelb.edu.au/articles/how-a-numbers-man-and-a-botanist-are-helping-business-go-green.amp accessed 7 July 2017

We Can't Live Without It

Even though there will be winners and losers, climate change will deleteriously impact the natural environment.

The natural environment will, however, also provide some respite from climate change impacts as it responds to the urban heat island effect and can be fostered as offsets. Vegetation has real potential to impact greenhouse gas emissions – but not as a single response.

It is important that we cultivate the natural environment for its intrinsic value; for its ecosystem services, including fresh air and clean water; and for its potential to shelter humanity and provide better carbon outcomes as we find ourselves dealing with the urgency of climate change.

None of these issues and attributes should be overlooked; each has an important role to play in addressing climate change in the ACT. Climate change policy will play a pivotal role in ensuring we meet the challenges.

ADVANCING THE PLAN

- Continue to include the expected impacts of climate change in Action Plans for the management of threatened species and ecological communities.
- Deliver the actions to assist the particular threatened species or ecological community adapt to climate change as set out in the Action Plans.
- Continue to identify and manage climate change refugia areas, as these will become vital for the protection of species as the climate changes.
- Use erosion hazard information to identify priority areas for environmental restoration.
- Improve the connectivity between wetlands by replacing the concrete in drains with native vegetation – this will help to increase biodiversity in urban areas.
- Develop an urban forest strategy for the ACT that includes planning provisions which are clear, encourage innovation, and adopt species selection which is appropriate for a changing climate.
- Ensure the information gained from the mapping is used to inform on-ground management of our urban open space, river corridors, hills, ridges, buffer zones and our nature reserves.

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