

Living well with a changing climate

Findings of the 2018 ACT Longitudinal Survey on Climate Change

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SUMMARY

INTRODUCTION

In the ACT, climate change is expected to result in more frequent and severe heatwaves, storms, bushfire risk and drought. The ACT Government commissioned the University of Canberra to develop and undertake the first survey of the community that can be used to assess overall resilience to the expected effects of climate change, and areas of high and low resilience. The survey is intended to be repeated over time to track how successfully residents adapt. A survey of 2,671 people over 18 years old, living in the 'ACT region' (ACT, Queanbeyan, Googong) was undertaken during February and March 2018. A person who is highly resilient to *all* expected effects of climate change would have access to six types of resilience to help them adapt successfully:

1. *Individual resilience resources* such as income and good social networks that people use to cope and adapt to climate-related events
2. *Community resilience resources* including government and other institutions that provide support to reduce impacts of climate-related effects
3. *Heatwave resilience*: access to heat refuges and positive coping strategies, in particular a residence that can be affordably maintained at comfortable temperature
4. *Extreme weather resilience*: prepared for extreme weather events such as storms, bushfire and flood, including having insurance and clear emergency plans
5. *Drought resilience*: ability to maintain gardens and nature connection in dry times
6. *Awareness and support for action*: awareness of expected effects and confidence both to take individual action, and to support government adaptation action.

KEY FINDINGS

Two-thirds of adults in the ACT region (66.9%) have moderate to high resilience to the expected effects of climate change. One-third have low or very low (33.1%) resilience, and are highly vulnerable to negative impacts from the effects of climate change (Figure E1).

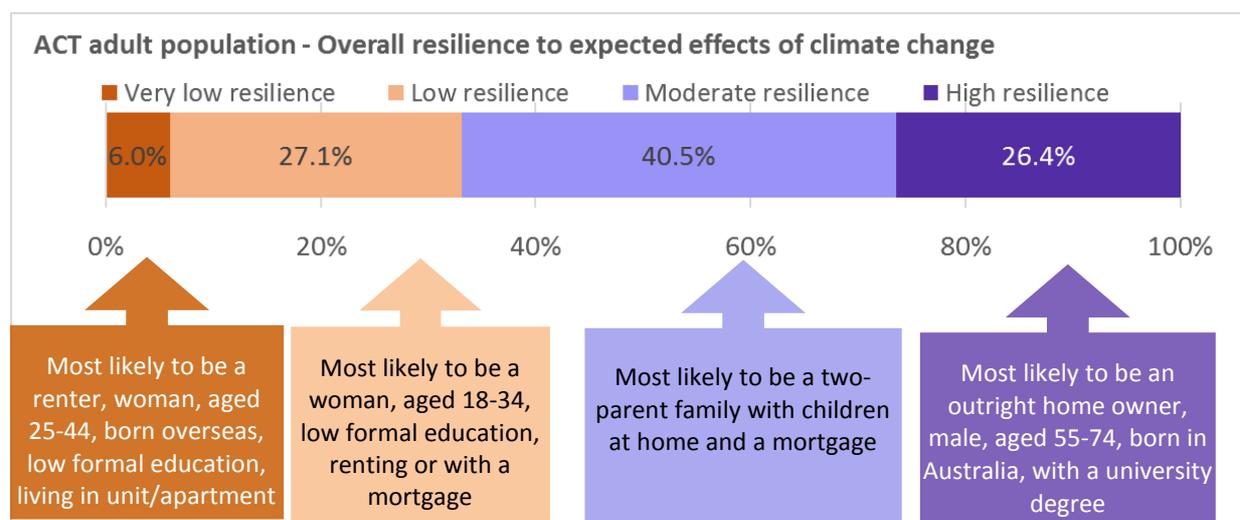


Figure E1: Types of people with lower and higher resilience

While the primary predictors of low resilience to climate change were age, type of housing lived in, and family structure, resilience varied across the ACT region. The findings were mapped to show the proportion of the population with low and very low resilience in different places in Canberra (Figure E2). A higher than average proportion of the population had low resilience to climate change in Gungahlin, Outer Belconnen and Tuggeranong South. Low resilience was least common in Belconnen East and Woden Valley.

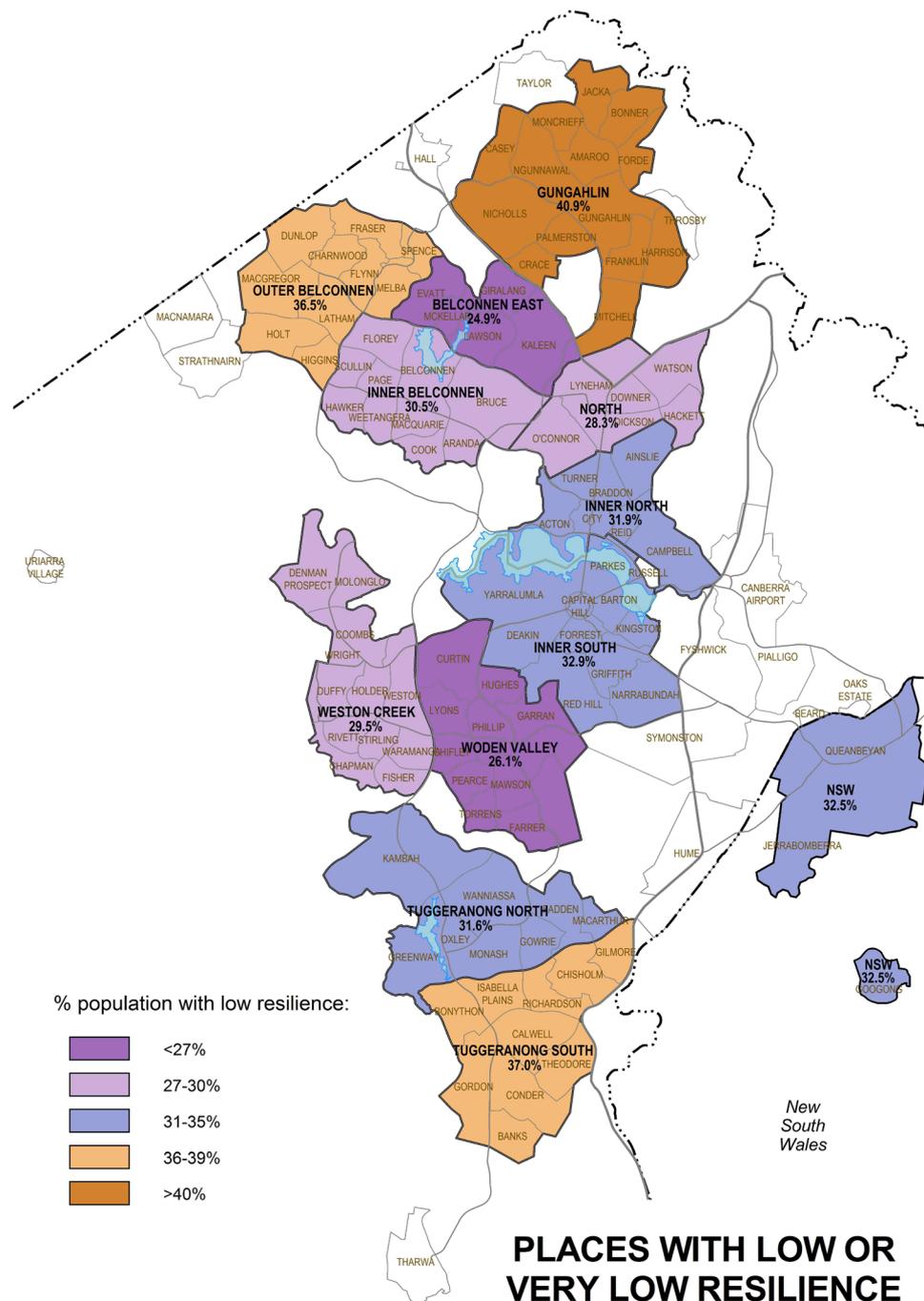


Figure E2 Proportion of population with very low or low resilience across the ACT region

RESILIENCE RESOURCES

Of the six dimensions of resilience resources examined, resilience was lowest in two areas:

1. Performance of dwellings in heatwaves: 35.9% lived in homes that perform poorly in heatwaves
2. Preparedness for extreme weather events: 39.4% had low resilience to these events.

These are the only two areas in which, when resilience was measured on a scale from 0 to 10, the average score across the ACT region was lower than 5.

Areas in which residents most often had high resilience were:

1. Awareness and support for action on climate change: Less than 5% had low resilience
2. Access to individual and community resources: Few had low levels of any of the types of resources examined.

CHANGES TO DWELLINGS

More than one-third of ACT region residents (35.9%) live in homes that perform poorly in heatwaves: they heat up quickly, cool down slowly, and high costs are incurred to cool them during extended heatwaves. Almost one-third (32.0%) cannot readily afford to cool their home in heatwaves. Renters, younger people, and those living in units/apartments are most vulnerable.

Renters and those living in units/apartments have less opportunity to adapt due to lack of ability to implement many actions in their residences that can improve preparedness and reduce impacts of events such as heatwaves. With renters comprising about one third of the population (29.8% in 2016), and an increasing proportion of the population (not just young single people) living in units/apartments (10.7% in 2016), it is important to identify what might need to change to enable successful adaptation.

EXTREME EVENTS: HEATWAVES, STORM, FLOOD, DROUGHT AND BUSHFIRE

More than one-third (39.4%) of the adult population of the region have low resilience to extreme weather events. This is often a result of insufficient planning or preparation: for example, only 20.2% have emergency kits in their home, and only 13.1% had discussed an emergency plan with others in their households in the last 12 months. Additionally, many have low rates of insurance to cover damage from these events. Renters, younger people, and those living in units/apartments are amongst the most vulnerable.

Urban areas experience the effects of drought differently to rural areas. As noted above, many have low preparation for the increased bushfire risk that often accompanies drought; while 25.9% have asthma or other respiratory conditions that increase their vulnerability to dust storms that can occur in severe drought. People who highly value keeping their garden green, and have a garden with high watering needs (17.2%) have low resilience to drought.

The effects of reduced amenity of nature areas and open spaces during drought on health and wellbeing were not explored in this survey and more information is needed.

More information is also needed to understand vulnerability to heatwaves. For example tracking heat-related health admissions and outcomes will help better understand health-related climate vulnerability, and interactions with dwellings and the city's living infrastructure.

CLIMATE CHANGE AWARENESS AND SUPPORT FOR ACTION

Almost nine in ten adults (89.7%) living in the ACT region felt climate change is a genuine problem for the future, and 86.9% felt it is important to act now to reduce effects of climate change.

Overall, only 4.8% had low awareness and willingness to act on climate change, and only 4.3% had low support for government action.

However, despite being willing to act, confidence in being able to easily adapt is low. Less than one third (31.5%) felt confident they could readily adapt to any climate change occurring in their lifetime. This low confidence can limit successful adaptation, and people need to be provided with support to adapt successfully. There is an ongoing need to provide feasible strategies to help prepare for and adapt to the effects of climate change.

Despite high support for ACT government action, many ACT government workers are not aware of how they can act to support achieving the government's climate change objectives, also suggesting a need to invest in increasing awareness and action across all of government.

There is high concern about low 'fitness for purpose' of dwellings and high support for government action to address this. Almost nine in ten (89.7%) support the ACT government introducing stricter regulations for buildings. Just over half (52.7%) support requiring retrofitting of private homes and this increases (67.6%) amongst renters.

RESILIENCE DISCUSSION

Successful climate change adaptation actions will help bolster the ACT's resilience. Based on the Rockefeller Foundation's Resilience Framework, the following indicators have been tailored for Canberra's community: reflective, inclusive, robust, flexible, resourceful, integrated, viable and capacity. The discussion below draws on the survey findings to illustrate how consideration of these characteristics help to achieve a resilient community.

REFLECTIVE

Reflective adaptation draws on past experience and learns from it to inform future decisions. The results of this study suggest that those who have most successfully engaged in proactive adaptation are those with high access to resilience resources. This group is better able to adapt without support from government. However, some with good access to

resilience resources have not drawn on these to engage in proactive adaptation actions to prepare for extreme weather events, heatwaves and drought. Building higher resilience through the whole population requires approaches to reach and provide options for (i) those with lower access to resilience resources who have less capacity to adapt, particularly to younger people, renters, apartment dwellers and those with low financial resources; and (ii) those with moderate to high resilience resources who are not currently drawing on these to invest in preparing for the expected effects of climate change.

INCLUSIVE

Inclusive adaptation requires shared ownership in decision making, and social license for outcomes. The survey findings show a high level of social license for government action, with most residents strongly supporting government climate change objectives and implementing climate change adaptation. There is somewhat less support for actions which impact on cost of living, such as mandatory retrofitting of private buildings.

Inclusive adaptation strategies require government support to help identify adaptation options people and groups can implement themselves and to build confidence to implement adaptation actions at the individual, household and community scale.

ROBUST

Robust adaptation involves ensuring the city's physical attributes, along with social and economic systems, are strengthened to be fit-for-purpose for the future climate. Adaptation for the city's buildings, places, parks and infrastructure requires reducing exposure to risks such as heatwaves, though being energy efficient and able to cool down after a hot day.

Public places and all buildings which perform poorly in heatwaves increase the risk of heat-related illness and anti-social behaviour. High reliance on air conditioning is maladaptive, it increases financial vulnerability for those less well off, adds more heat into the locality, plus increases electricity demand, which in turn increases the risk of blackouts.

FLEXIBLE

Flexible adaptation requires being able to respond to changing circumstances. Achieving and maintaining flexibility requires supporting all people, particularly those with low access to resilience resources, helping provide options for ways to adapt to both expected and unexpected events.

Flexibility is not static and varies throughout people's lives depending upon circumstances, however flexibility is not usually a feature of government processes and procedures. Timely monitoring of trends and evaluation of progress is essential to be flexible and avoid maladaptation.

CONCLUSIONS

Although resilience is moderate to high for most people in the ACT region, for one in three people, resilience is low. The reasons for low resilience vary, and opportunities for improvement exist with both individuals and government.

Even for those with moderate resilience, many dwellings do not protect them well from heatwaves, and they have low preparedness for extreme weather events. Addressing the high proportion of housing that is not fit-for-purpose for the future requires both government regulatory intervention and support, as well as increased investment by those who have the resources to increase resilience to dwellings to heatwaves and extreme weather events.

Residents of the region have high awareness and willingness to act on climate change. However, this is not currently translating into high preparedness for the effects of climate change, for two differing reasons. Amongst those with low and very low resilience, limited access to resilience resources is reducing ability to adapt: despite high willingness, these groups require support to adapt. Those with moderate resilience, however, typically have good access to resilience resources, but are not drawing on these to invest in adaptation actions. For this group, what is needed is investment in strategies to build confidence in and ease of investing in proactive adaptation to the expected effects of climate change.

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1. INTRODUCTION

The Australian Capital Territory (ACT) Government is a world leader in taking action on climate change. It has set greenhouse gas emissions targets that are amongst the leading regions in the world, and the most ambitious in Australia. Under the ACT Government's *Climate Change Strategy and Action Plan*, targets include achieving 100% renewable electricity by 2020 together with a 40% reduction in greenhouse gas emissions compared to 1990 levels, and zero net emissions by 2050.

However, despite worldwide action to reduce greenhouse gas emissions, changes will happen to the planet's climate. In the ACT these are expected to include experiencing warmer and drier conditions, with more frequent and severe extreme weather events and natural disasters such as heatwaves, storms, droughts, flash flooding and bushfires. The ACT *Climate Change Adaptation Strategy* sets out actions to increase the resilience of the ACT to the expected effects of climate change.

As part of this strategy, it is important to identify how successfully people in the ACT are adapting to the effects of climate change, including things such as being better prepared for events such as prolonged heatwaves, drought and storms, and having the capacity to cope with these and recover from them when they occur. Monitoring and evaluating who is more and less resilient to the expected effects of climate change, who is better versus less able to adapt successfully to these effects, and which actions are most effective in building resilience, is therefore an important part of the adaptation strategy.

To assist with monitoring and evaluation of adaptation to climate change, the University of Canberra was commissioned by the ACT Government to establish a longitudinal community survey that can be used to measure resilience as an outcome of successful adaptation to climate change. The objectives of the project were to develop measures that can be used to understand resilience to the expected effects of climate change in the ACT, particularly increasing incidence of (i) extreme events (storms, fire, floods), (ii) heatwaves and (iii) drought. In addition, community views about taking action to address climate change were examined, as the level of support for taking action is another critical aspects of resilience at the community scale.

This document reports findings of this project, focusing on:

- Identifying what should be measured to track resilience as an outcome of successful adaptation
- Presenting findings of the baseline survey of the adult population of the ACT and nearby regions of New South Wales (NSW) and implications for successful adaptation to climate change, and
- Recommendations for the survey instrument to be used as this survey is continued over time.

As this report presents findings of the first 'wave' of what is intended to be a longitudinal survey that continues over time, it is presenting a snapshot in time of the adult population of the ACT region. When survey is repeated, and measures collected at different points in time can be compared,, it will be possible to identify how successfully ACT residents and workers are adapting to the effects of climate change, and whether resilience is growing as an outcome of successful adaptation.

This report first examines what it means to adapt successfully to climate change, asking the question 'what does resilience as an outcome of adaptation look like?' in the context of the expected effects of climate change in the ACT. The methods used to develop the longitudinal survey instrument and deliver it are then explained, together with providing detailed information in appendices that can support delivery of subsequent the survey in future years. Findings of the survey are then presented, focusing on overall ('generalised') resilience, resilience to three key expected effects of climate change in the ACT (increased frequency and severity of heatwaves, storms/floods/bushfires, and drought), and views about taking action to address climate change. Implications of the findings of the survey for building resilience through successful adaptation strategies are then discussed. Finally, recommendations for repeating the survey in future are provided, focusing on how to ensure collection of robust data that provides practical and meaningful insight into human adaptation to effects of climate change in the ACT.

2. ADAPTING SUCCESSFULLY TO CLIMATE CHANGE: RESILIENCE AS AN OUTCOME OF ADAPTATION

2.1 EXPECTED EFFECTS OF CLIMATE CHANGE IN THE ACT

This report examines adaptation and resilience to climate change amongst people living and working in the ACT. A first step in this is understanding what it is that ACT residents and workers are adapting to: in other words, the expected effects of climate change for the region.

Current climate change projections suggest that in the ACT region, climate change will have the following effects (ACT Government and NSW Office of Environment and Heritage, 2014; ACT Government 2016):

- Increase in heatwaves and in days in which heat stress is experienced: The number of hot days is expected to increase; overall increases in minimum and maximum temperatures are projected with fewer cold nights.
- Decreased spring rainfall: Rainfall is projected to decrease in spring and increase in summer and autumn. There is potential for increased incidence of drought associated with reduced rainfall, although modelling about overall patterns of drying is less clear than model projections related to temperature, meaning that increased drought and overall drying is a possible outcome but overall increase in rainfall (albeit with shifted timing during the year) is also a possibility.
- Increased incidence of severe storms: Projected changes in both temperature and rainfall are associated with increased risk of severe storms that can cause flash flooding and property damage.
- Increase in fire risk: The number of severe fire weather days is projected to increase, with associated increased risk of bushfire.

These expected effects of climate change will have a range of impacts. The extent of these impacts on people living and working in the region will depend on how successfully the region adapts to expected effects, and how this adaptation contributes to overall resilience to the expected effects of climate change.

Based on the expected effects of climate change project for the region, this report focuses on understanding adaptation to the following predicted effects of climate change:

- Heatwaves
- Climate-related disaster/emergency events (storms, floods, bushfire)
- Drought.

It also examines overall awareness of climate change, which can help predict whether people are likely to take proactive adaptation action, and support for government climate change adaptation actions.

As the focus of the report is on understanding resilience as an outcome of successful adaptation, we also examine overall resilience, which is an indicator of the success of adaptation, and also confers some protection against effects of climate change more generally. This is examined further in the next section.

2.2 ADAPTATION AND RESILIENCE

The objective of the longitudinal survey is to understand ‘resilience as an outcome of successful adaptation’ amongst people living and working in the ACT. This requires developing specific indicators of resilience and adaptation, which in turn requires defining what is meant by the terms ‘adaptation’ and ‘resilience’.

2.2.1 ADAPTATION

Adaptation to climate change can broadly be defined as ‘an adjustment in ecological, social or economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities’ (Adger et al. 2005, p. 78), a definition similar to that used by the International Panel on Climate Change (IPCC). Some argue that ‘adaptation’ should be separated from ‘coping’. Coping is typically defined as engaging in short-term reactive efforts to cope with the immediate effects of an event, while adaptation is argued to be defined as longer-term adjustments made to reduce risk or prepare for events, increasing ability to reduce the effects of climate change on a person’s quality of life (e.g. Fazey et al. 2010, Smit and Wandel 2006).

It is also possible to conceptually distinguish the two based on their outcomes: coping can be defined as a reaction to an event that enables recovery from that but does not reduce impact or risk of loss from future similar events, while adaptation involves action – short-term or long-term – that reduces risk of harm from future similar events. For example, if a person’s home is damaged in a storm, a coping response would involve repairing it in a way that returns it to the original state but leaves the house similarly vulnerable to future storms; adaptation would involve repairing the home with improvements added to reduce the likelihood of damage from future similar events. This distinction is not typically made in the literature, although many refer to coping as often involving ‘temporary’ responses or adjustments, suggesting an interpretation similar to this one (Smit and Wandel 2006; Gallopin 2006).

In reality, it is challenging to distinguish between adaptation and coping responses, and some argue that coping is part of a continuum of adaptation:

Adaptation involves changes in social-ecological systems in response to actual and expected impacts of climate change in the context of interacting nonclimatic changes. Adaptation strategies and actions can range from short-term coping to longer-term, deeper transformations, aim to meet more than climate change goals alone, and may or may not succeed in moderating harm or exploiting beneficial opportunities. (Moser and Ekstrom 2010, p. 1)

Adaptation can occur in many ways. It can be deliberate (purposeful), i.e. an action planned and implemented with the intent to adapting to climate change, or non-deliberate, in which a person implements an action that assists adaptation, but does so for reasons unrelated to the effects of climate change. For example, a person may install a rainwater tank at their residence because they want to reduce their water costs, without recognizing that this may also contribute to adapting successfully to drought events, and to reducing impacts of high speed water flow in high rainfall events. While the motivation differs, the outcome can be similar, in the form of increased resilience to climate change resulting from adaptation actions.

Adaptation can also be differentiated based on the time frame: short-term adaptation actions are sometimes called 'reactive adaptation', in which a person takes action to respond to a specific event or problem once it has occurred. This is contrasted with longer-term proactive adaptation in which people actively plan and implement action to reduce effects of anticipated events. Adaptation can also involve systemic change – for example, rebuilding a home to improve resilience to storms – or incremental change, such as households implementing smaller-scale actions such as cleaning gutters more regularly to reduce risk of flooding in storms (Adger et al. 2005, Pelling et al. 2015, Smit et al. 2000). This incremental change is sometimes labelled 'autonomous' adaptation as it often involves gradual adaptation over time resulting from reactive incremental changes implemented to respond to specific events.

Some argue that proactive, planned and system-level adaptation is more commonly undertaken by institutions or larger social organisations, while reactive, autonomous and incremental adaptation is more commonly undertaken by individuals and households (Fankhauser et al. 1999). Proactive adaptation is also more likely if a person is aware of likely impacts of climate change and believes they can take action to address them, suggesting a need to assess views about climate change and actions to adapt to climate change when assessing resilience as an outcome of successful adaptation.

Adaptation should also be distinguished from maladaptation. The distinction between these is typically based on whether or not the adaptation action imposes negative externalities on others through increasing their exposure or vulnerability (Barnett and O'Neill 2010). For example, a person who installs landscaping that reduces the volume of water flowing across their garden in storms may reduce damage to their garden but increase damage in neighbouring garden areas to which the water flow has been diverted.

In this report, we consider ‘successful adaptation’ to be a situation in which people who live or work in the ACT have implemented actions to reduce risk of negative impact from the effects of climate change, both in the short-term (being able to successfully implement shorter term strategies when specific events such as heatwaves occur) and in the long-term (e.g. modifying their residence to reduce impacts of future events such as storms or drought). These adaptations could take many forms, and may include having access to adaptations designed and provided by others (for example, having access to heat refuge areas established by the ACT government), as well as proactively developing their own adaptation actions.

This means that, in this report, successful adaptation is considered to have occurred if a person has either implemented an adaptation action (whether or not it was for the purpose of adapting to climate change), or has access to the resources created through adaptation actions of others – as long as these adaptations do not increase the vulnerability of others.

Adaptation to climate change can occur at multiple scales. While this report predominantly examines the individual and household scale, it also considers adaptation action by the government, by examining the extent to which people living and working in the ACT support the government implementing adaptation actions at scales that go beyond what is possible with individual and household-scale action.

2.2.2 RESILIENCE

Resilience has a wide range of definitions depending on the body of literature being examined (see for example Brand and Jax 2007, Meerow et al. 2016). Earlier definitions of resilience focused on defining it quite narrowly as being able to return to the same state held before a person or community experienced an event that impacted them, and in the urban context has often focused on the ability to maintain functions and structures of cities (Chelleri 2012). However, this focus on ‘structure’ has largely been rejected, with a shift to focusing on resilience as meaning the ability to maintain desired outcomes such as human wellbeing, quality of life or others, whether this occurs through maintaining existing systems, or through transitioning systems through incremental change to adapt to climate change, or transforming urban systems so they can better persist in the face of climate change (Chelleri 2012).

Many studies on urban resilience to climate change focus largely on designing, planning and managing resilient cities, with a focus on how governments can design, plan and manage for resilience (see for example Collier et al. 2013, Desouza and Flanery 2013, Jabareen 2013), or on resilience of specific parts of urban systems such as water infrastructure (e.g. Horne 2016). This study is different, as it focuses on diagnosing resilience and adaptation amongst the people living in the city, rather than on overall city systems design. It is thus focused on identifying areas of risk that need to be responded to in climate change adaptation planning and policy, following Henstra’s (2012) call for assessing not only projected climate hazards,

but for specific assessment of community vulnerabilities to enable more targeted policy development to address these, and Jabareen's (2013) argument for more specific definition of measurable concepts of the 'resilient city'.

When considering human adaptation, resilience is more generally defined as having the ability to cope with adversity and to adapt positively to changing circumstances. This does not always mean returning to the same state, but can involve a person or household choosing to change aspects of their lives to adapt to events (adopting a transition or transformation approach rather than assuming resilience requires a person, or the urban system they live in, staying 'the same').

In this report, we therefore define resilience as *the ability of a person, household or community to successfully adapt to adversity and to capitalise on opportunities* (Schirmer and Hanigan 2017). Resilience should be understood as helping people to both cope with adversity (see for example Walker and Salt 2012, Fletcher and Sarkar 2013, Zebrowski 2013), and also as enabling people, households and communities to capitalise on opportunities. Long-term successful adaptation to effects of climate change requires both ability to cope with adversity and to adapt to and take advantage of new opportunities.

Having high levels of resilience can assist a person to adapt successfully to the expected effects of climate change. Adapting successfully can in turn influence subsequent levels of resilience, further enabling people to cope with adversity and capitalise on opportunities.

Resilience is usually agreed to be a process in which people draw on a range of 'resilience resources' (also sometimes called capitals¹) to enable them to cope and adapt to difficult and good times. Resilience resources are the resources a person draws on to cope with or adapt to change: for example, they can include social networks who provide support to help a person cope with damage from a storm (such as emotional support and practical help cleaning up damage), and financial resources such as a person's savings.

This means that successful adaptation to climate change should be further defined as adaptation that maintains or grows a person's resilience resources and hence their adaptive capacity to a point where they can successfully cope with the effects of climate change over time. Maladaptation, in turn, may involve not only imposing negative effects on others, but can also be defined as adaptation actions that reduce the total stock of resilience resources a person has to draw on. To give an example, a person who experiences damage to their home in a storm and for whom repairs can only be made by going into high levels of financial stress has likely reduced their overall stock of resilience resources (in the form of financial resources). Because of these, they are more likely to experience negative impacts

¹ For simplicity, we refer to these as 'resilience resources' in this report.

from future storms or effects of climate change as they have fewer financial resources remaining to use to help cope with these future events. In contrast, a person who has sufficient financial resources to repair their house without experiencing financial stress (either through using savings or being able to readily afford to take out a loan to cover repairs), and is able to afford modifications to reduce likelihood of damage from future similar storm events, is more likely to be maintaining or increasing access to resilience resources over time.

This approach helps address concerns raised in some studies on urban resilience to climate change about a lack of focus on how the social and economic context of a person or household affects their ability to adapt successfully to climate change (Chelleri et al. 2015, Heltberg et al. 2009). These studies have criticised the focus of much of the urban climate change resilience literature on disaster management and adaptation to specific events, and pointed to a need to understand issues such as social inequality, poverty and access to mechanisms such as insurance. Assessing access to resilience resources enables assessment of this social and economic context.

2.3 MEASURING ADAPTATION AND RESILIENCE

Despite multiple reports and papers examining the concepts of adaptation, there has been less development of measures and associated principles that can be used to assess the extent to which adaptation is occurring, and the factors that influence this extent, an issue noted in the literature on climate change adaptation (Adger et al. 2005, Berrang-Ford et al. 2015). To guide our development of measures, we therefore first developed an overall conceptual framework identifying what a community that is successfully adapting to climate change and maintaining and growing resilience through this adaptation would look like. The framework provides a basis for measuring the trajectory of resilience processes over time, which can inform assessment of the effectiveness of government investment in building resilience to the expected effects of climate change, as well as the success of the community in maintaining their resilience resources more generally.

The framework is based on an understanding of resilience as an ongoing dynamic process in which individuals and communities having changing levels of resilience over time depending on their exposure to challenging events, level of sensitivity, and access to resilience resources (adaptive capacity). These processes come together to result in either overall growth, maintenance or decline in resilience over time. This is represented conceptually in Figure 1.

The framework shown in Figure 1 highlights the importance of measuring not just specific responses to different aspects of climate change, but also measuring change in access to 'resilience resources' over time. A person who is adapting successfully to climate change will be able to maintain their level of resilience resources over time while coping with the effects of climate change: in other words, after coping with an event such as a storm or heatwave their resilience resources will not be permanently decreased and may even grow.

A person who is not adapting successfully will likely experience declining resilience resources over time as these resources are depleted through being 'overdrawn' to cope with the effects of climate change. For example, a person may find the number of friends who can help them repair storm damage has declined as those friends have no more time to give after having to support multiple people with recovering from storm damage; or may have spent all their savings recovering from a storm event and then experiences another storm and has no savings left to draw on. A person who is adapting successfully will build sustainable resilience resources that enable coping: for example they might invest in insurance that covers financial costs of storms so their savings do not decline, or they might invest in preparedness activities that reduce the amount of damage experienced to their residence in a storm. Figure 1 focuses on adaptation by individuals, and it is important to recognise that the actions of each person have potential to impact others. For example, a person who undertakes maladaptive actions may cause direct harm to others (for example, increasing risk of flooding on a neighbour's property through installing landscaping that redirects flow to others). More generally, a person who is experiencing loss of resilience resources is likely to be less able to provide support to others, meaning that their loss of resilience flows on to impact on the resilience of others. Conversely, a person who is increasing resilience may be better able to provide support to others. Figure 1 is also a conceptual representation: in reality, any given person is likely to be engaging in multiple processes that require drawing on resilience processes at any given point in time.

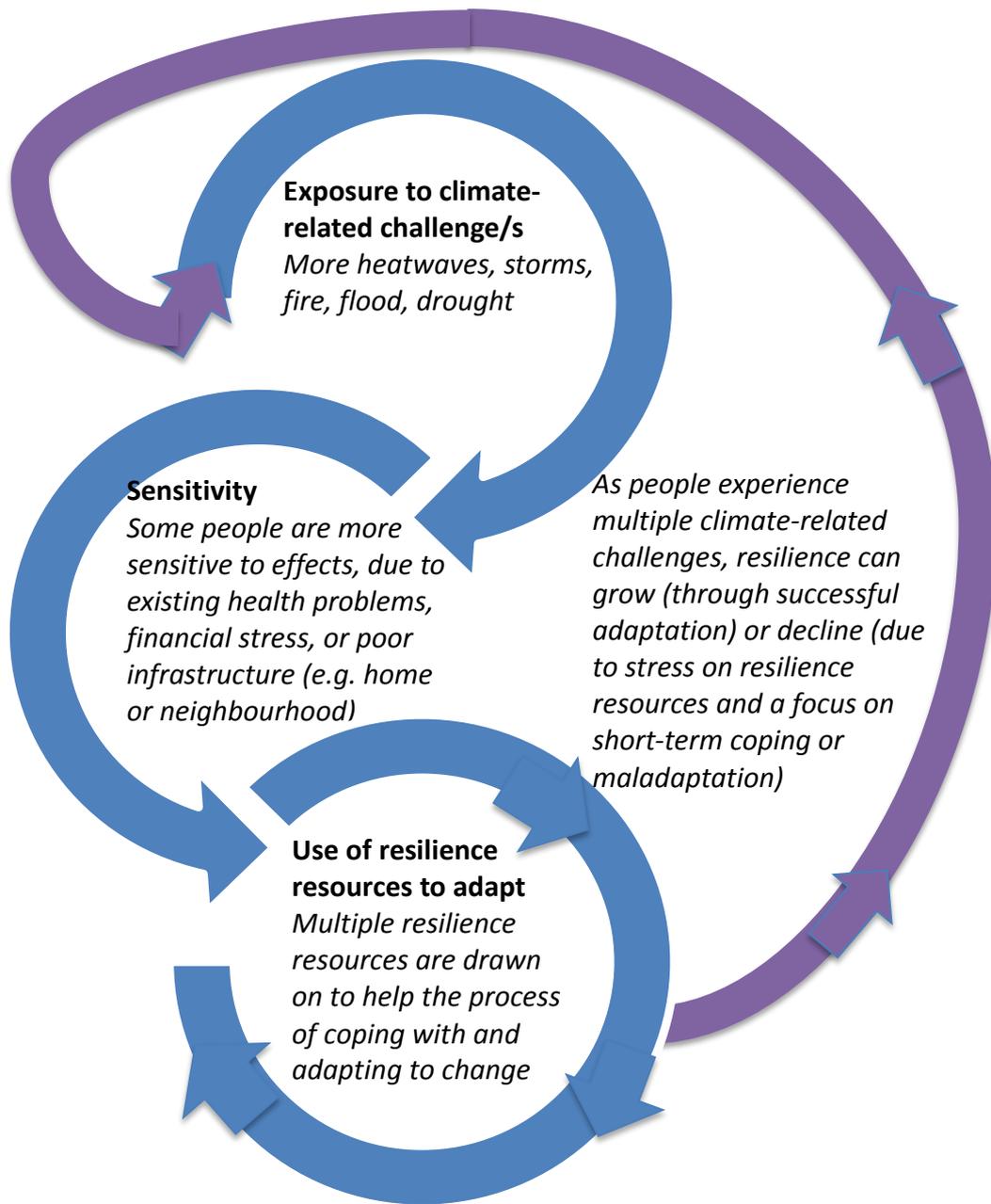


Figure 1 Building resilience through successful adaptation

It is therefore important to measure not only whether a person is ‘exposed’ to the effects of climate change or particularly sensitive to them (for example, living in a home that is highly vulnerable to being damaged in storms), but also to measure how they are preparing for and adapting to these effects, and whether they are managing to maintain or grow their overall resilience resources over time. Ideally, the extent to which a person has sufficient

resilience resources to successfully adapt to the effects of climate change should be assessed, to better understand the extent to which investment in building resilience resources is needed.

Figure 2 represents this process of adaptation more simply, showing how adaptation can occur both as a proactive and reactive measure in response to multiple exposures to events, and how the process of resilience can be thought of as involving processes of feedback between resilience resources, proactive and reaction adaptation, exposure to effects of climate change and sensitivity to that exposure. It highlights that successful adaptation occurs if a person, through their proactive and reactive adaptation, is able to maintain their resilience resources. Maladaptation occurs if a person has to 'draw down' on their resilience resources in order to cope with a climate-change related event such as a heatwave, storm, flood, bushfire or drought, and is unable to subsequently replenish those resources before having to cope with another climate change-related event. The total stock of resilience resources may increase or decrease depending on whether proactive and reaction adaptation measures are effective in achieving successful coping with exposure to the effects of climate change. Resilience resources will also change in response to circumstances un-related to climate change; for example, a person who loses their job, retires, has a new child, or experience ill-health will likely have resulting changes in access to resilience resources as a consequence of these changes.

This overall framework informed development of measures for different elements of the framework, specifically:

- Access to resilience resources
- Sensitivity, preparedness and coping strategies related to key expected effects of climate change:
 - Heatwaves
 - Storm, flood and bushfire - climate-related disaster/emergency events
 - Drought.

The measures developed are described as they are presented in the results section.

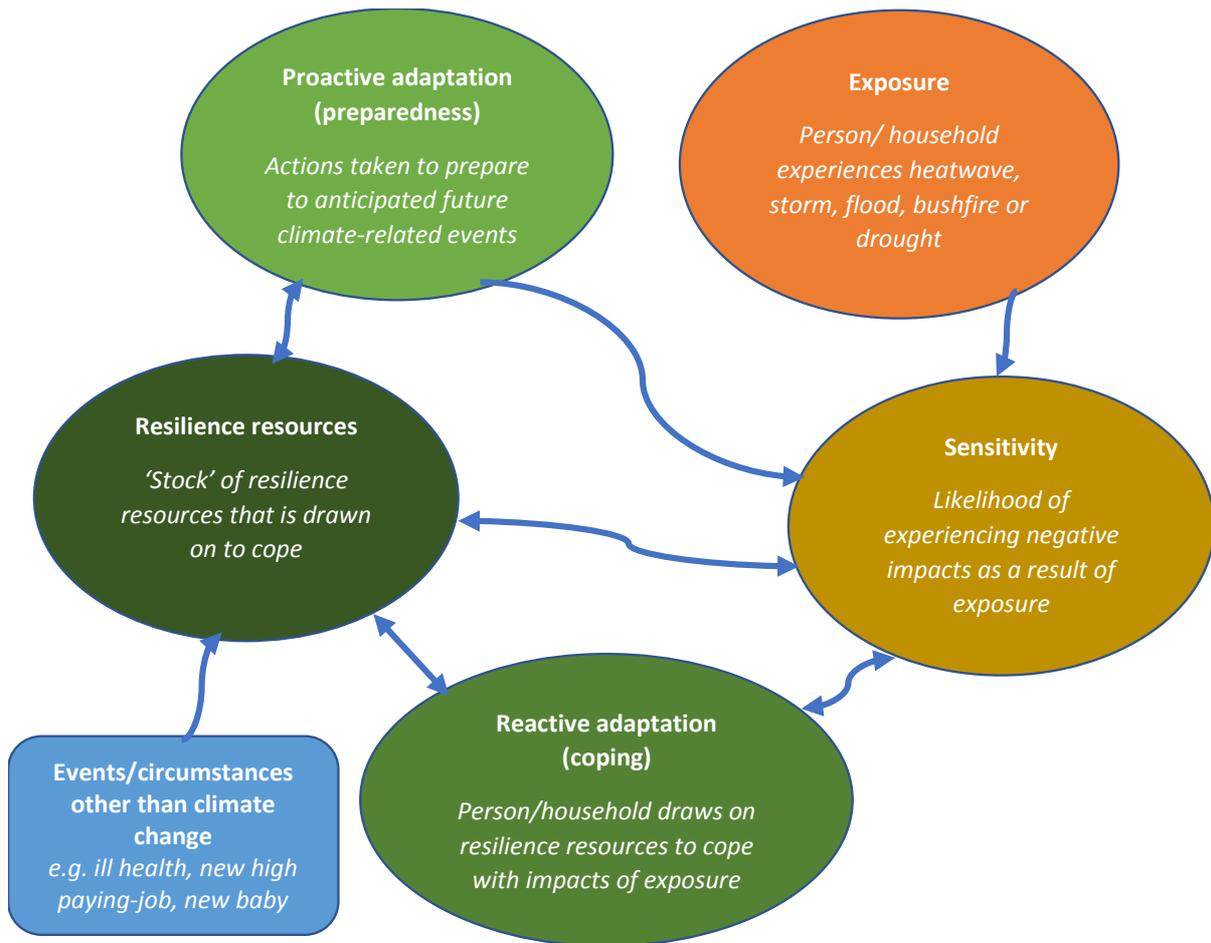


Figure 2 Resilience and adaptation to expected effects of climate change in the ACT

3. METHODS

We designed a survey instrument that can measure resilience as an outcome of successful adaptation to climate change. Design of the survey was informed by a literature review, and the methods used are described in this section.

3.1 LITERATURE REVIEW

A literature review was conducted to identify factors known to influence resilience and adaptation to climate change in urban settings. While many studies identify the importance of resilience and adaptation, and discuss the theory and process of resilience and adaptation, few have sought to quantify levels of resilience using surveys, with most resilience and adaptation studies instead focusing on reviews of policy or qualitative data such as interviews. Surveys of the community about climate change have predominantly focused on understanding awareness, beliefs and attitudes towards climate change rather than resilience and adaptation to it.

A range of relevant work has been undertaken that has examined resilience and adaptation to the impacts of heatwaves, drought, more extreme storms and flash flooding, and identifying factors influencing preparedness for these. Not all these studies examined climate change specifically, with a range of literature examining these events more generally of relevant to understanding resilience and adaptation to them in a climate change context. We reviewed these studies in addition to work specifically focused on climate change adaptation as they provide important insight into adaptation to the effects of climate change expected in the ACT.

Literature was reviewed for two purposes: to identify processes and factors identified as influencing resilience and adaptation (as described in the previous section), and to identify any measures used in past surveys that could be replicated in this study.

We identified relatively few past survey measures that could be replicated in the survey conducted for this study without alteration, as most survey measures in other studies have been developed for specific circumstances that did not necessarily translate readily to the ACT context. While we found relatively few measures that could be replicated, and therefore the survey designed for the ACT contains mostly new measures, we were able to use the literature review to identify the concepts that informed design of these new measures.

3.2 SURVEY DESIGN

The literature review informed initial design of survey content, together with consultation with staff of the Climate Change and Sustainability Division of the ACT Government's Environment Planning and Sustainable Development Directorate. An initial set of survey questions were drafted. These were then discussed in a consultation meeting with representatives from different ACT Government Directorates, including representatives

involved in managing health, urban design, and emergency responses. Their feedback was used to revise the survey. This was followed by pilot testing of the survey instrument with a small sample of 20 people. Final revisions were then made in consultation with the ACT Government. This process ensured that survey questions were easily understood and answered by survey participants (pilot testing and online survey) and met the needs of those who will use the data.

Table 1 summarises the survey topics and where results from each topic are presented in this report. The full questionnaire is provided in Appendix 1.

Table 1 Summary of survey topics

Survey topic	How data from this topic were analysed in this report
<p>How you find living in the region: What are your views about the liveability of your local area?</p> <p>Participants were asked their views about the liveability of their local area including availability of jobs, equity and fairness, decision making, safety, friendliness, and local neighbourhood facilities such as parks. They were also asked how often they engaged in different types of social activities such as staying in touch with family and friends.</p>	<p>These survey measures were used to analyse access to ‘generalised’ resilience resources, specifically community financial, social, institutional and liveability resources, and a person’s individual social resilience.</p>
<p>Your health and wellbeing</p> <p>Participants were asked to self-assess themselves using several commonly used health and wellbeing measures used in both national and international surveys. They were then asked to identify if they experienced any of a number of specific health issues that may be exacerbated by the effects of climate change, and whether they noticed these worsening during hot weather or other weather changes such as storms.</p>	<p>These survey measures were used to assess individual human resilience resources in the form of health and wellbeing, as well as health-related resilience to heatwaves.</p>
<p>Liveability of your home: how does your home and garden do during heatwaves and dry times?</p> <p>Participants were asked about the type of housing they lived in, how it performed in hot and cold weather in terms of heating up and cooling down, actions taken or planned that improve energy efficiency or reduce greenhouse gas emissions. Those who had access to a garden area were also asked how they managed their garden during dry times, and susceptibility of garden vegetation to drought.</p>	<p>These survey measures were used to assess resilience of residential infrastructure to heatwaves and resilience to drought.</p>
<p>Coping with extreme weather events - heatwaves</p> <p>Participants were asked what types of strategies they use to cope with heatwaves, whether they have experienced negative social interactions in heatwaves. If they worked, they were asked to answer questions about coping with heatwaves at work.</p>	<p>These measures were used to assess social and work-related resilience to heatwaves.</p>
<p>Coping with extreme weather events</p> <p>Participants were asked to rate their self-perceived level of exposure to extreme weather events (bushfire, severe storms and flooding), and their level of preparedness for these events around their residence and in the form of insurance. They were also asked about their past experiences with extreme weather.</p>	<p>These measures were used to assess resilience to extreme weather events.</p>

Survey topic	How data from this topic were analysed in this report
<p>ACT Government employees work-related climate change action</p> <p>Survey participants who identified they worked for the ACT Government were asked whether they felt they understood the ACT Government’s climate change policies and could contribute to achieving them.</p>	<p>These measures were used to examine how well those working in different ACT Government workplaces feel they can both implement climate change adaptation in their workplace and use their role to help achieve the ACT Government’s climate change policies more broadly.</p>
<p>Environment and climate change views</p> <p>Survey participants were asked about the extent to which acting to protect the environment formed part of their conscious decision making day-to-day, their views about climate change and addressing its expected effects, how they accessed information about climate change, which information sources about climate change they trusted</p>	<p>These data were used to assess resilience in the form of awareness of climate change and support for engagement in adaptation to its effects.</p>
<p>Views about ACT Government climate change policy</p> <p>Participants were asked their views about the ACT Government’s climate change policies, specifically whether they supported existing policies and whether they would support specific types of additional action being undertaken in future.</p>	<p>These data were used to assess resilience in the form of support for government action to address expected effects of climate change.</p>
<p>Socio-demographic and geographic characteristics</p> <p>A range of information about socio-demographic and geographic characteristics of participants was collected, including age, gender, income, cultural background, household structure, formal educational attainment, residence type, length of residence in the region, suburb/town/locality of residence, household financial wellbeing, and occupation.</p>	<p>These data were used to analyse which groups in the broader population were more and less resilient to the expected effects of climate change.</p>

3.3 SURVEY DELIVERY

The survey was delivered online, using the Qualtrics online survey software. This provides a platform that can be easily accessed by different people at different times. It was designed so that the participants did not have to complete the survey in one sitting. Those who experienced internet drop-out or did not have time to complete the survey in a single session could return to the website, which would then automatically resume the survey at the point they had previously reached. The survey was open from 9 February to 9 March 2018.

Survey participants were given the option to choose a short or regular version of the survey. This encouraged participation by those who did not have enough time to complete a longer version of the survey. The shorter survey took around 13 minutes to complete while the longer version took around 20 minutes to complete. In total, 8.5% of survey participants selected the short version and 91.5% selected the longer version.

3.4 SURVEY RECRUITMENT

A range of different recruitment methods were used to encourage participation in the survey. These were designed to achieve as representative a sample as possible from the target population: adults residing in the ACT and surrounding areas of NSW (particularly Queanbeyan, Jerrabomberra, Murrumbateman and Yass). People living in nearby areas of

NSW were included in the survey as many work in the ACT and also use ACT health and other services. Participants were asked to participate in the survey using (i) emails inviting participation, (ii) webpage promotion, (iii) social media promotion, (iv) flyers delivered to letterboxes, and (v) a prize draw.

Email promotion occurred in two ways. First, 2,703 survey participants from two previous studies were emailed an invitation to participate in the survey. Only those who had given permission in the previous study to be contacted again were included. This formed the primary recruitment mechanism, and was used as these previous studies had recruited survey samples shown to be relatively representative of the ACT adult population, with the exception that they under-sampled younger people. Second, ACT Government employees were invited via an all-staff email message, encouraging them to participate. The survey was promoted by the ACT Government, who included information on relevant webpages encouraging participation in the survey and providing a link to it.

As the sample who received emails was known to be biased to older people, and to under-represent young people, social media promotion was used to better reach those in younger age groups. Three Facebook posts encouraging participation in the survey were designed. Paid 'boosting' (advertising) of these posts on Facebook feeds was then used to increase participation in the survey, with the ads boosted to people living in the study region with a greater focus on those known to be typically under-represented when using other recruitment methods: those aged 18 to 34. Additionally, survey flyers were distributed on university campuses to further encourage participation by younger adults (the flyer is shown in Appendix 2).

Halfway through the survey period, responses to date were assessed to identify how representative responses were from different suburbs/towns across the study region. Geographic areas under-represented in the survey responses to date were identified, and flyers encouraging participation in the survey were delivered to a random sample of residences in these regions to improve representativeness of responses. A total of 17,000 flyers were distributed (see Appendix 3 for list of distributions). A further 3,000 flyers were distributed at the Multicultural Festival in February 2018 and at orientation week at the Australian National University and University of Canberra.

Finally, prize draw of seven prizes worth a total of \$2,000 was offered as an incentive to participate in the survey. Prize draw winners had a choice of a Flight Centre, Coles-Myer, WISH or Bunnings gift card to the value of the prize they won.

3.5 SURVEY RESPONSES AND REPRESENTATIVENESS

In total, 2,720 people participated in the survey. Of these, 2,671 lived in the ACT or in surrounding areas of NSW, and this 2,671 formed the valid sample analysed in this report.

The representativeness of the sample of 2,671 was analysed by comparing characteristics of the sample to population data from the 2016 Australian Bureau of Statistics (ABS) *Census of*

Population and Housing. Overall, responses were reasonably representative, and suitable for weighting (see next section) to ensure data was representative of the adult population of the study region.

Responses were reasonably representative by place (groups of adjacent suburbs) (Figure 3): Belconnen East, Inner and Outer, Canberra North, Weston Creek and Tuggeranong North were slightly over-represented, while Gungahlin, Inner South, Tuggeranong South, and Woden Valley were slightly under-represented (see Appendix 4 for a list of the suburbs/towns included in each of the places listed in Figure 3).

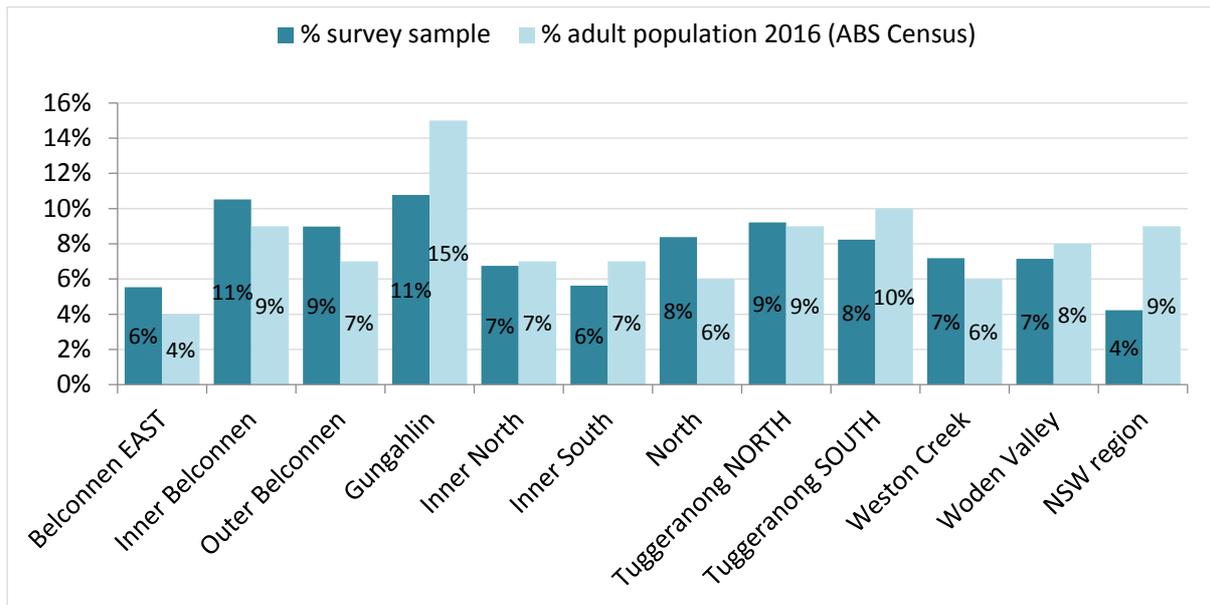


Figure 3 Comparison of survey sample to adult population – by place

As shown in Figure 4, most age groups were reasonably represented in the sample, although there was some under-representation of younger people (predominantly those aged under 25) and over-representation of older age groups, particularly those aged 55 to 64. Those aged 75 and over were under-represented. Women were also over-represented in the sample (Figure 5). The distribution of household income reported by survey participants was very similar to that recorded in the 2016 Census (Figure 6).

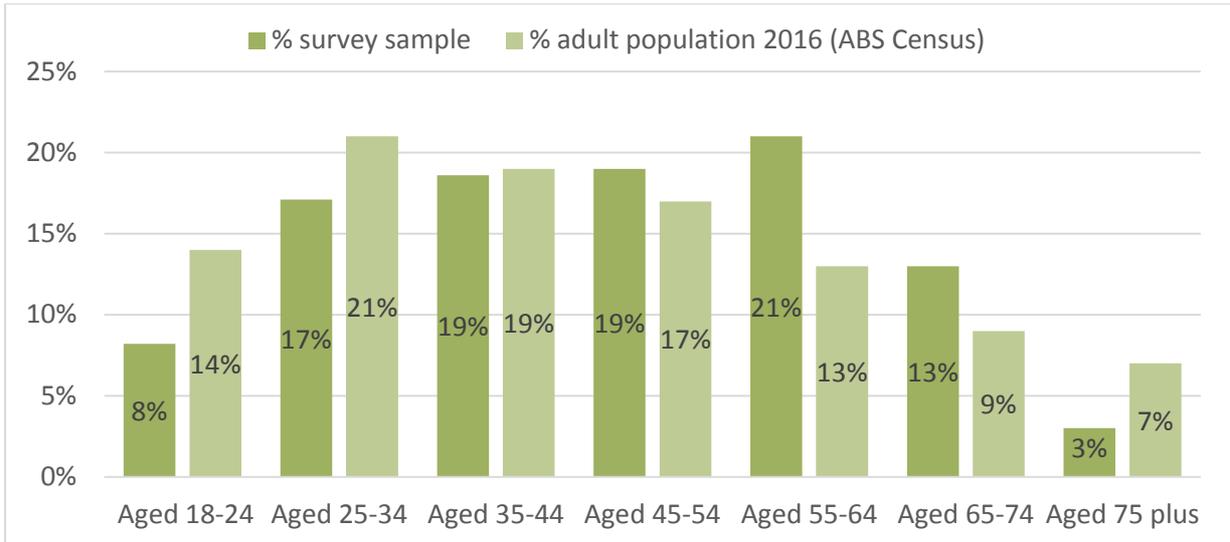


Figure 4 Comparison of survey sample to adult population – by age group

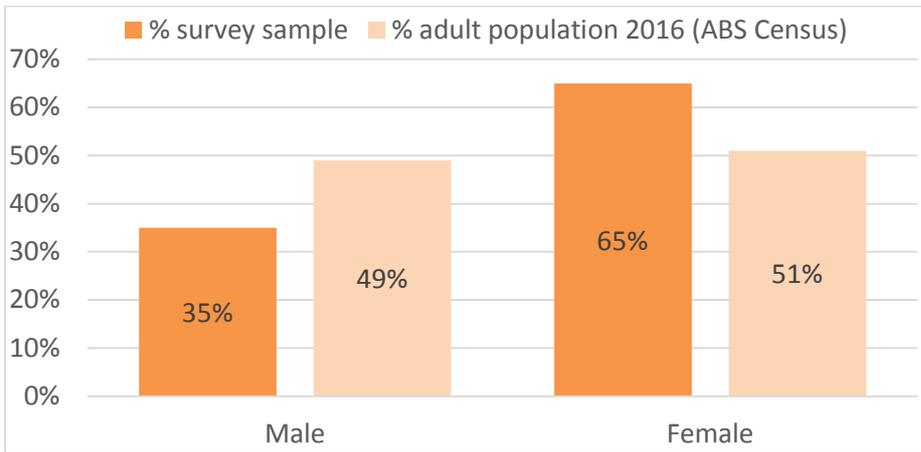


Figure 5 Comparison of survey sample to adult population – by gender

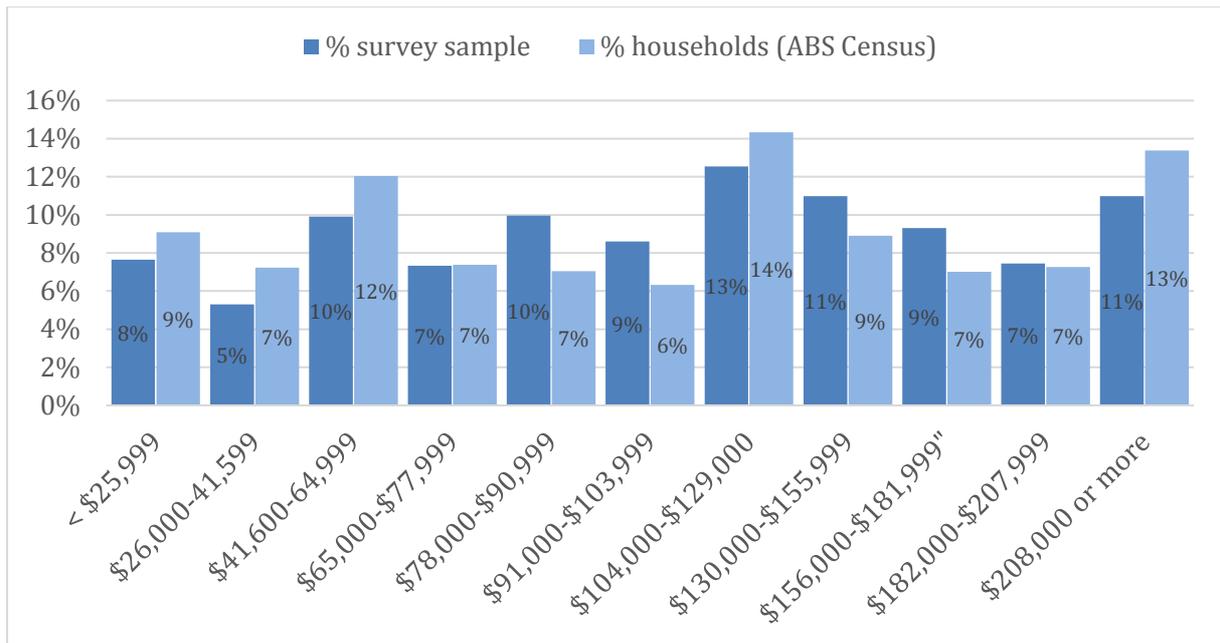


Figure 6 Comparison of survey sample to population – household income

The assessment of representativeness showed that the sample was suitable for analysis, with use of data weighting to correct for the areas in which some response bias was identified.

3.6 DATA WEIGHTING

While the sample was reasonably representative, there was some under- and over-representation of particular groups. However, a minimum sample of at least 100 people in each key demographic group was still achieved, and this mean the sample could be weighted to produce data representative of the adult population of the region. ‘Weighting’ refers to a statistical process in which known biases in the responses received are corrected for. Weighting was used to correct for bias to female and older respondents, and to correct for the small geographic biases identified. The weighting of responses involves adjusting the relative contribution each survey respondent makes to the whole when analysing survey results, so analysis of the sample more accurately represents the population from which it was drawn (in this case, people living in rural and regional Australia). Weighting doesn’t change the answers people gave to survey items.

Data were weighted based on the 2016 Australian Bureau of Statistics (ABS) Census of Population and Housing. The benchmarks used were age (18-24, 25-34, 35-44, 45-54; 55-64; 65-75; 75+) gender (female, male), and geographical location (as defined in Appendix 4). Weighting has been applied to all analyses in this report, unless otherwise specified.

3.7 DATA ANALYSIS

Prior to data analysis, survey data were processed and cleaned. This involved formatting and coding survey data and removing invalid survey responses. Data were then analysed using Microsoft Excel and the Statistical Package for Social Sciences (SPSS).

A number of 'index' variables were calculated, each of which measures different aspects of resilience. The methods used to calculate each are provided in Appendix 5. When calculating these, survey measures that formed part of the index were reversed when appropriate to ensure that higher scores indicated higher resilience and lower scores indicated lower resilience. This applied in particular to the following question items:

- 'Many people keep to themselves around here',
- 'Many people in this area drink too much alcohol or abuse drugs', and
- 'There is a high crime rate in this area'

This report provides basic descriptive results for the study population, and also identifies differences between groups (see below). When examining differences between groups, bivariate tests of statistical significance were used to assess whether some groups differed significantly to the average. Depending on the outcome variable and the number of groups compared, the following tests were conducted: Chi Square Independence Test, Kruskal-Wallis test, Mann-Whitney test and One-Way ANOVA. In the main report, **bold** font is used in table to indicate that there were significant differences between groups.

Throughout the report, data is provided on key resilience and adaptation characteristics of different population sub-groups, specifically people of different gender, age, cultural background, formal educational attainment, household structure, residence type, and living in different places within the study region. For simplicity, the total number of people who responded to each survey item is not displayed when presenting results. However, it is important to note that the 'n' – the number of people who answered each survey question – does vary. While the large majority of survey participants answered every survey question, not all questions applied to all people, and some people chose not to answer some questions. Table 3 lists the groups who are analysed in this report, the labels used to refer to this group in tables in this report, and the highest and lowest numbers of people from this group who responded to different survey items. In most cases, the 'n' for a survey item will be at or close to the 'highest n' reported in Table 2. The lowest n will usually apply to questions about household finances, and some indexes in which answers to multiple survey items were combined into a single index with participants who did not respond to one or more of those items excluded from the index.

3.8 ETHICS

The ACT Climate Change survey was approved by the University of Canberra Human Research Ethics Committee, protocol number HREC 17-214.

Table 2 Range of response numbers by groups

Group - label	Description (where applicable)	Highest n	Lowest n
ACT region	ACT region adult population (including ACT and nearby areas of NSW – Queanbeyan, Jerrabomberra)	2671	1920
Gender	Male	1164	697
	Female	1281	1194
Age	18-24	330	181
	25-34	528	349
	35-44	465	365
	45-54	402	385
	55-64	318	381
	65-74	234	188
	75 plus	172	46
Cultural background	Australian born	1904	1503
	Born overseas in English speaking country	341	261
	Born overseas in non-English speaking country	233	152
Formal education	No university degree	857	624
	University degree	1621	1290
Household structure	Married or defacto with no children - All people who lived with a partner with no children living at home	910	675
	Married or defacto with children - All people who lived with a partner with children living at home	905	788
	Single parent or sharehouse - People who are single parents living with children or people who live in a sharehouse	432	286
	Single household - People who live by themselves	234	166
Home status	Renting	722	503
	Mortgage holder	957	808
	Outright owner	649	502
Home type	House	1682	1376
	Townhouse	344	229
	Unit/apartment	375	249
Place	ACT Belconnen EAST	106	98
	ACT Gungahlin	401	207
	ACT Inner Belconnen	238	197
	ACT Inner North	193	124
	ACT Inner South	163	114
	ACT North	148	174
	ACT Outer Belconnen	208	167
	ACT Tuggeranong NORTH	217	163
	ACT Tuggeranong SOUTH	249	151
	ACT Weston Creek	143	135
	ACT Woden Valley	201	131
	NSW Queanbeyan, Googong, Jerrabomberra	218	81

4. FINDINGS

4.1 PRESENTATION OF FINDINGS

To assess resilience to climate change in the ACT, six dimensions of resilience were examined. These were then used to create an overall resilience index.

This section (Section 4) explains the different dimensions of resilience examined. Sections 5 to 10 examine findings for each of the six dimensions of resilience examined.

- **Generalised resilience:** *access to resources that help people adapt to a wide range of expected effects of climate change*
 - *Individual resilience resources (Section 5)*
 - *Community resilience resources (Section 6)*
- **Specific resilience to expected effects of climate change:** *vulnerability and access to resources to cope with and adapt to different effects of climate change*
 - **Resilience to heatwaves** – *the extent to which residents and workers are vulnerable to and can cope successfully with severe heatwaves (Section 7)*
 - **Resilience to storms, floods and bushfire** – *the extent to which residents are prepared for these events and likely to be able to recover successfully from them if impacted by them (Section 8)*
 - **Resilience to drought** – *the extent to which residents are likely to experience negative impacts at their residence as a result of an extended period of low rainfall (drought) (Section 9)*
 - **Climate change awareness and willingness to act** – *whether residents and workers are willing to act to address climate change, and to support the government taking action, and feel able to cope with climate change (Section 10)*

Section 11 then presents findings on overall resilience.

INTERPRETING FINDINGS

All findings presented in the next sections are representative of the adult population of the ACT. Data weighting (described in Section 3) has been used to ensure representativeness of data. The data can therefore be interpreted as providing information on the ACT region adult population, rather than simply representing the survey sample.

4.2 UNDERSTANDING RESILIENCE SCORES

Throughout Sections 5 to 12, ACT region residents are given scores for different dimensions of resilience, measured from 0 (low resilience) to 10 (low resilience).

Resilience scores were developed for each dimension of resilience based on answers to key survey questions. Figure 7 summarises the measures used to assess each dimension of resilience.

Additional questions beyond those used to assess resilience were also asked, to help further explore resilience and improve understanding. These are also presented in each chapter, to provide a more in-depth understanding of resilience. Appendix 5 provides detailed explanations of how resilience scores were calculated for each dimension of resilience.

Each section first explains overall findings about resilience, and then explores the responses to each survey item to explain how these overall findings were arrived at.

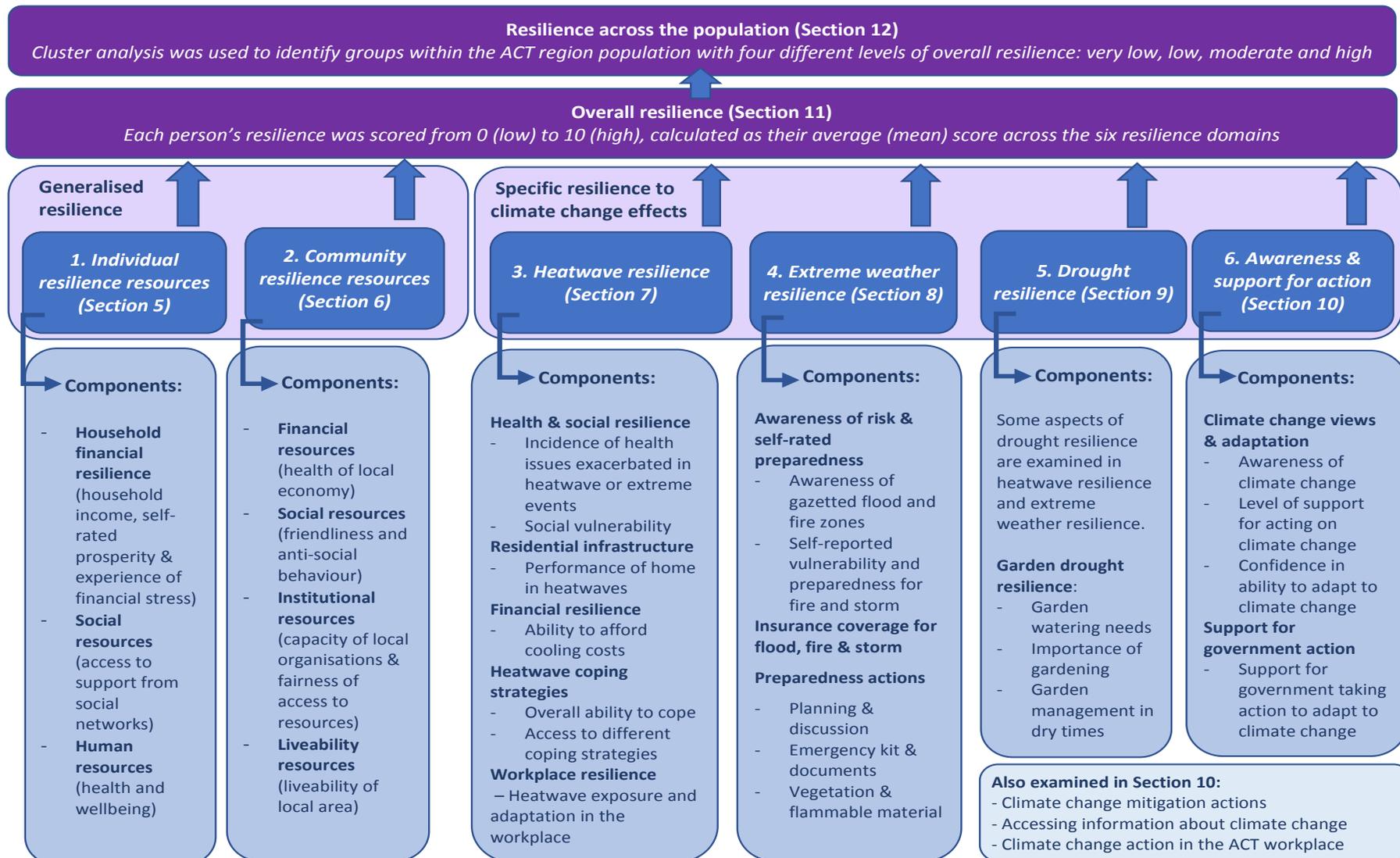


Figure 7 Assessment of six dimensions of resilience, and overall resilience, to expected effects of climate change

5. INDIVIDUAL RESILIENCE RESOURCES

As described earlier in this report, resilience is a process in which a person draws on their resources to adapt to ongoing changes, such as the events that are expected to occur more often as a result of climate change, and ideally learns through these processes how to best achieve their goals in an often changing, and sometimes adverse, environment.

A key part of the process of adapting successfully to the expected effects of climate change is having access to ‘resilience resources’, meaning resources that a person can draw on help them cope with difficult times and to capitalise on opportunities. These include financial resources (access to money when needed), human resources (being able to draw on your skills, knowledge, psychological outlook and health), social resources (help from friends, family, and community members), institutional resources (help from local government, community organisations, and others), and natural and physical resources (access to good services and infrastructure and good levels of liveability in the local neighbourhood).

Resilience resources can be specific to particular effects of climate change. For example, a person who has better insurance coverage for damage to their house in a storm will typically experience fewer financial impacts if their house is damaged in a storm compared to a person who has no insurance. They can also be ‘generalised’, meaning having access to a resource that helps a person or household cope with a wide range of types of change. For example, having financial savings can help people cope with a wide range of adverse events, including but not limited to those associated with climate change.

This section examines these ‘generalised’ resilience resources, focusing on those that are available at the ‘individual’ scale, meaning resources held by the individual or the household they live in. The next section (Section 6) then examines community resilience resources, which are properties or attributes of the community a person lives in.

5.1 UNDERSTANDING INDIVIDUAL RESILIENCE RESOURCES

Individual resilience resources are the resources a person has that do not depend on the location or community they live in: they belong to the person or their household. Individual resilience resources are ‘transportable’: for example, a person who has high individual resilience resources may choose to shift to a new suburb in response to an event such as a bushfire affecting their suburb, using their resilience resources to do so. Individual resilience resources can take many forms. The widespread literature on personal resilience suggests that critical resources are financial, human, and social resources. At the community scale (examined in the next section), other resources are also important including liveability of the local area, institutional resources, and the local economy.

Financial resources: The extent to which a person or household can access financial resources when they need to is an important measure of individual resilience. A household

that is experiencing financial stress is less likely to be able to adapt successfully to effects of climate change, as they will be both less likely to have the ability to proactively invest in actions that reduce impacts (for example, comprehensive insurance coverage, improving comfort of their residence in heatwaves), and less able to afford to manage impacts when they occur (for example, being able to afford repairs to their home after a storm, or to afford to use air conditioning for extended hours during a heatwave). Measuring levels of household financial wellbeing is therefore an important measure of overall resilience.

Human resources: ‘Human resources’ refers to a person’s own physical and mental attributes, including their health, skills and capacity to cope with change. Two dimensions have been identified as important to adapting successfully to climate change. The first is a person’s health and wellbeing (including physical and mental health). A person who has better overall health is likely to be better able to adapt successfully. The second is ‘self-efficacy’, meaning a person’s confidence in being able to achieve desired outcomes in life. Self-efficacy is an important predictor of adaptation, as people who have a high sense of self-efficacy are more likely to take action to prepare to change and better able to respond to change when it occurs.

Social resources: Multiple studies have identified the importance of access to social resources for successful adaptation to change. A person who has strong social networks is better able to call on friends, family and acquaintances for support when they experience challenging times. For example, when a person experiences damage to their home from a storm, they are likely to recover more rapidly if they have friends or family who can offer both emotional support and tangible support such as free accommodation while their home is repaired, acquaintances who can recommend the best tradespeople to use for the repair job, and people who can help them with action such as storing food in a blackout, or moving personal possessions. Social resources take multiple forms. At the individual level, we used frequency of social interaction as an indicator of access to social support. Individual social resources are distinguished from community scale social resources by their lack of reliance on geography: they are social connections that do not rely on living in a specific area.

5.2 INDIVIDUAL RESILIENCE RESOURCES – OVERALL FINDINGS

Individual resilience resources were assessed based on assessing access to (i) financial resources, (ii) social resources, and (iii) human resources. Overall, most people living in the ACT region reported good access to individual resilience resources, with an average score of 6.5 out of a possible 0 (very low resilience) to 10 (very high resilience) (Figure 8). However, access to each of the three components making up individual resilience resources was different: financial and human resilience were generally higher (average score of 6.6 and 7.2 respectively), and social resilience poorer (average score of 5.7).

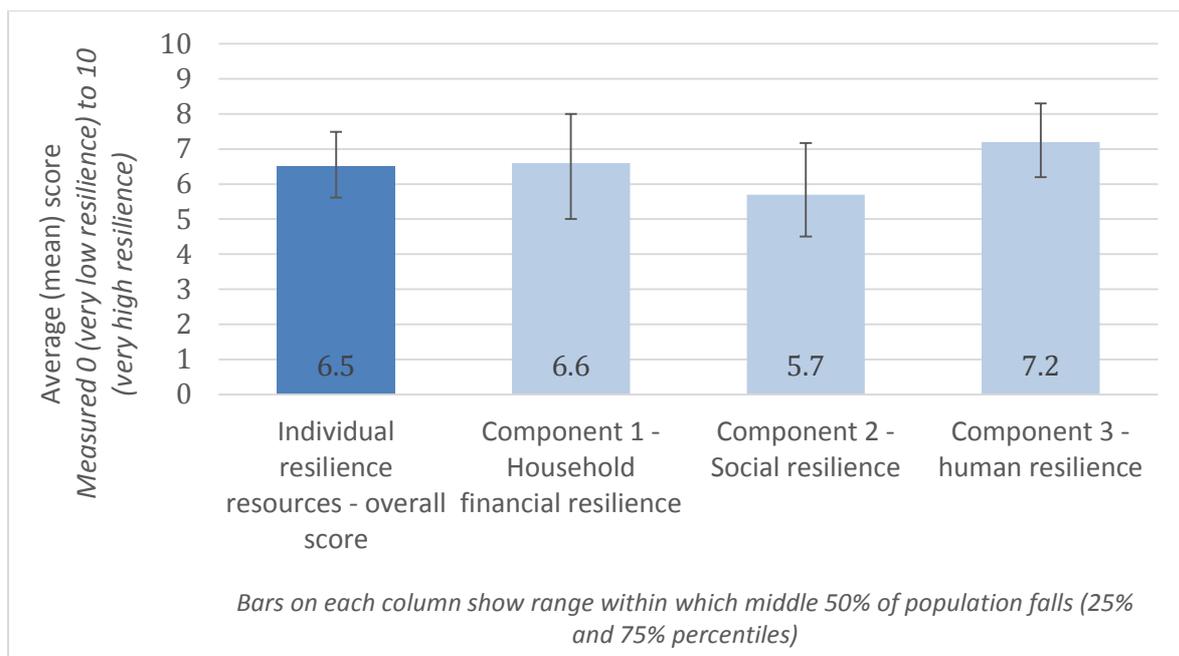


Figure 8 Access to individual resilience resources – average scores

However, average scores can be misleading in some cases: for example, a group of people who all have a score of 6 will have the same average score as a group in which half have a score of 4 and half have a score of 8. It is important to understand the distribution of resilience within a population, as well as the ‘average’ across the population. To understand this, the proportion of the population reporting low resilience and high resilience for each dimension of individual resilience resources was examined, shown in Figure 9.

Low resilience was defined as having a score of 4 or less for each of the components making up the index, as this meant that a person reported having financial resources that were just getting along or poorer, did not regularly socialize with other people, and did not report overall good health. A high resilience score was defined as a score of 8 or more, as people with this score reporting very good access to each resource.

Overall, 5.0% of the ACT population had low access to all three individual resilience resources, and 12.6% had high access to all three. This masked large differences in each of the three dimensions of individual resilience resources:

- Household financial resilience: 19.7% of households have low household financial resilience and 46.2% have high financial resilience, highlighting large differences in access to finance
- Social resilience: 21.1% had low access to support from social networks and only 13.3% very high access, further reinforcing that access to social networks is the area most commonly driving lower individual resilience
- Human resilience: Very few (5.0%) had poor resilience and 33.3% had high resilience.

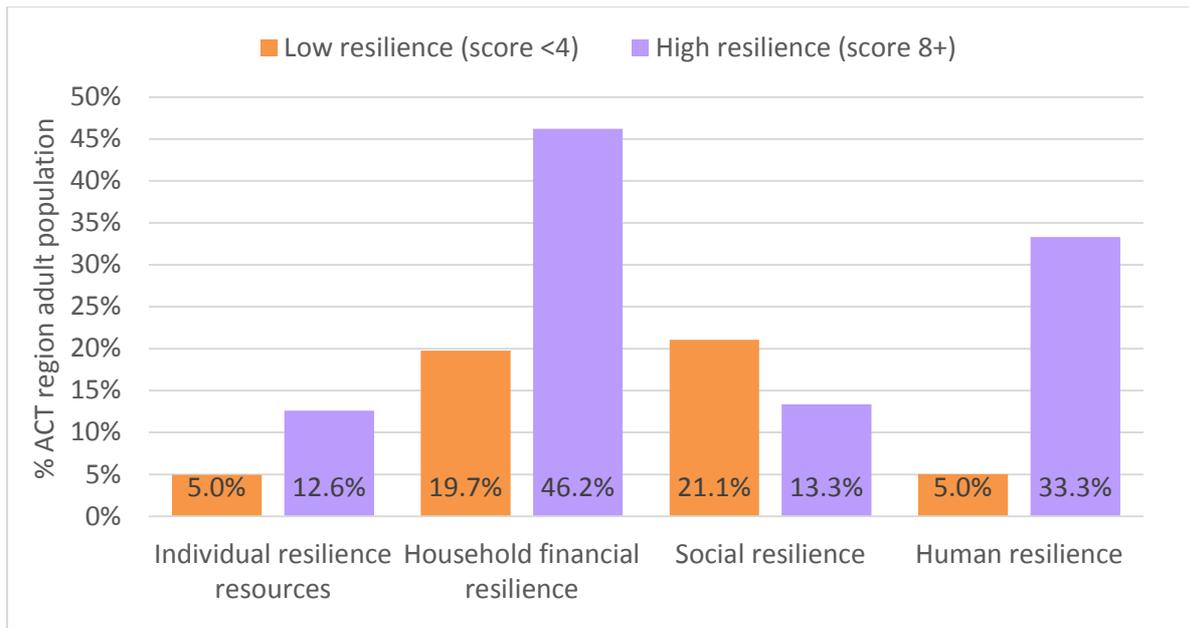


Figure 9 Access to individual resilience resources – proportion of population with low and high resilience

Table 3 examines access to individual resilience resources for people in different groups and living in different places, showing both average scores and the proportion of people with low and high resilience for each aspect of individual resilience resources. This shows that overall, the following groups had poorer than average access to individual resilience resources:

- Renters (lowest average score of all groups, at 5.9)
- Those aged under 35 (average score of 6.3)
- Those with no university degree (average score of 6.1)
- Single parents, those living in sharehouses, and single person households (average scores of 6.1 and 6.2)
- Those living in units/apartments (6.2)
- Those living in Tuggeranong South (6.1)

The following groups had better than average access to resilience resources:

- Those aged 55 and older (scores of 6.8 or above)
- Those who owned their home outright (7.1)
- Those living in the Inner South and Woden Valley (6.8).

The following sections examine the specific measures used to assess financial, social and human resilience in detail.

Table 3 Access to individual resilience resources, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		Average individual resilience score <i>Measured from 0 (low) to 10 (high)</i>	Average individual resilience score <i>Measured from 0 (lowest) to 10 (highest)</i>			% for whom household financial resilience was...		% for whom social resilience was...		% for whom human resilience was...	
			Household financial resilience	Social resilience	Human resilience	Low (≤4)	High (8+)	Low (≤4)	High (8+)	Low (≤4)	High (8+)
	ACT region	6.5	6.6	5.7	7.2	19.7%	46.2%	21.1%	13.3%	5.0%	33.3%
Gender	Male	6.5	6.8	5.5	7.1	17.0%	50.5%	24.9%	12.3%	3.8%	33.4%
	Female	6.5	6.4	5.9	7.0	22.0%	42.7%	17.7%	14.4%	6.0%	33.3%
Age	18-24	6.2	6.2	5.6	7.2	24.7%	35.6%	27.4%	13.2%	7.1%	30.8%
	25-34	6.3	6.6	5.3	6.9	19.6%	43.3%	27.5%	10.2%	3.4%	31.3%
	35-44	6.2	6.1	5.6	7.1	29.1%	38.2%	22.1%	9.7%	6.4%	27.5%
	45-54	6.4	6.5	5.5	7.3	20.0%	46.0%	22.7%	10.8%	6.7%	33.1%
	55-64	6.8	7.0	6.1	7.5	13.8%	57.2%	13.1%	15.8%	3.7%	38.6%
	65-74	7.1	7.4	6.6	7.3	8.6%	63.2%	8.3%	24.4%	3.6%	45.8%
	75 plus	6.9	7.1	6.3	7.1	10.5%	54.6%	13.3%	19.5%	2.3%	34.8%
Cultural background	Australian born	6.5	6.6	5.8	7.3	20.6%	45.9%	21.2%	14.0%	5.3%	32.1%
	Born o/s, English	6.6	6.7	5.7	7.2	15.4%	47.2%	18.8%	10.0%	4.7%	39.0%
	Born o/s, other	6.5	6.7	5.6	6.8	18.8%	47.0%	22.4%	12.8%	3.4%	35.4%
Formal education	No univ. degree	6.1	5.9	5.7	7.3	29.4%	33.9%	23.3%	13.8%	7.7%	27.1%
	Univ. degree	6.7	7.0	5.8	7.3	14.6%	52.8%	19.9%	13.1%	3.7%	36.6%
Household structure	Partner only	6.7	7.1	5.9	7.3	12.9%	56.9%	20.2%	15.3%	4.5%	37.4%
	2 parent family	6.5	6.4	5.7	6.8	22.7%	43.4%	20.1%	12.8%	3.7%	35.8%
	Single parent/ sharehouse	6.1	6.1	5.6	6.6	26.5%	33.5%	23.9%	11.7%	6.5%	24.7%
	1 person h'hold	6.2	6.3	5.6	6.7	22.7%	38.4%	23.0%	11.2%	9.4%	24.0%
Home status	Renting	5.9	5.7	5.3	7.2	33.0%	30.0%	28.1%	10.9%	9.0%	25.7%
	Mortgage	6.5	6.5	5.7	7.5	20.0%	43.2%	21.2%	11.9%	3.0%	34.1%
	Outright owner	7.1	7.7	6.3	7.2	4.9%	69.0%	12.3%	19.5%	3.3%	41.2%
Home type	House	6.6	6.8	5.8	7.0	17.6%	49.7%	18.5%	14.2%	4.5%	34.6%
	Townhouse	6.3	6.4	5.6	7.1	24.5%	40.6%	23.5%	12.7%	5.6%	28.3%
	Unit/apartment	6.2	6.2	5.2	7.2	25.3%	37.3%	30.7%	8.8%	5.8%	34.3%
Place	Belconnen E.	6.7	6.7	6.1	7.2	13.0%	50.3%	11.3%	15.0%	3.0%	33.3%
	Gungahlin	6.4	6.5	5.5	7.3	22.6%	42.9%	27.8%	10.5%	5.0%	30.8%
	Inner Belconnen	6.6	6.7	6.0	7.3	16.9%	44.4%	15.8%	12.5%	4.5%	33.1%
	Inner North	6.7	7.0	5.7	7.6	14.4%	48.5%	23.5%	15.1%	2.8%	36.6%
	Inner South	6.8	7.1	5.7	7.3	11.1%	58.3%	20.1%	11.8%	3.5%	50.3%
	North	6.6	6.9	5.7	6.8	15.4%	50.9%	19.2%	12.7%	4.5%	37.5%
	Out. Belconnen	6.3	6.4	5.5	7.1	25.0%	45.3%	24.3%	10.4%	6.9%	26.7%
	Tuggeranong Nth	6.5	6.5	5.9	6.8	20.8%	46.7%	16.8%	15.0%	4.7%	31.0%
	Tuggeranong Sth	6.1	6.0	5.5	7.1	31.3%	34.0%	26.3%	13.3%	7.9%	28.4%
	Weston Creek	6.6	6.6	6.0	7.4	20.4%	48.1%	21.7%	23.0%	5.3%	34.8%
	Woden Valley	6.8	7.0	6.1	6.8	14.5%	56.6%	12.8%	17.7%	2.9%	38.3%
	NSW areas	6.3	6.4	5.6	7.2	20.2%	41.4%	21.4%	9.6%	7.3%	28.3%

5.3 FINANCIAL RESOURCES – HOUSEHOLD FINANCIAL WELLBEING

The financial wellbeing and stress of households in the ACT was examined using four measures, each of which examines different dimensions: household income, self-rated prosperity, experience of financial stress events, and ability to access financial resources. These were then used to calculate a household financial wellbeing index, shown in Table 4 (see Appendix 5 for details of calculation of the index).

Household income: Household income simply identifies the total annual income of a household. Average household income in the ACT is higher than the Australian average (ABS 2017) (see the methods section for data on the distribution of household income in the ACT and in the survey sample) However, this does not necessarily mean higher resilience, as it cannot be assumed that a household with higher income necessarily has greater financial resources. As living costs and financial commitments vary substantially between regions and households, income is a relatively poor indicator of overall household financial wellbeing. A single person household living in a home they own outright will need less annual income to have high resilience resources compared to a large family living in a house with a significant mortgage. For this reason, household income was not used on its own to assess household financial wellbeing as a resilience resource.

Self-rated prosperity: Multiple surveys in Australia use a simple measure of self-rated prosperity to assess household financial wellbeing. In this measure, people are asked to self-rate whether they and their family are very poor, poor, just getting along, reasonably comfortable, very comfortable, or prosperous. This measure enables people to self-assess how well they are able to cover their living costs with their available income, however it is also influenced by perceptions of what it means to be poor versus prosperous. Figure 10 shows how residents living in the ACT and nearby region self-rated their prosperity. Despite the wide range of household incomes reported, the majority of respondents rated their household as being reasonably comfortable (48%) or very comfortable (20%), highlighting that income alone is not the best predictor of financial status. A further 26% rated themselves as 'just getting along', 4% as poor or very poor, and 2% as prosperous².

² As explained in Section 4, all data presented in this and subsequent sections are representative of the adult population of the ACT region. The methods section explains how representativeness of data was assessed and the process used to ensure representativeness in analysis.

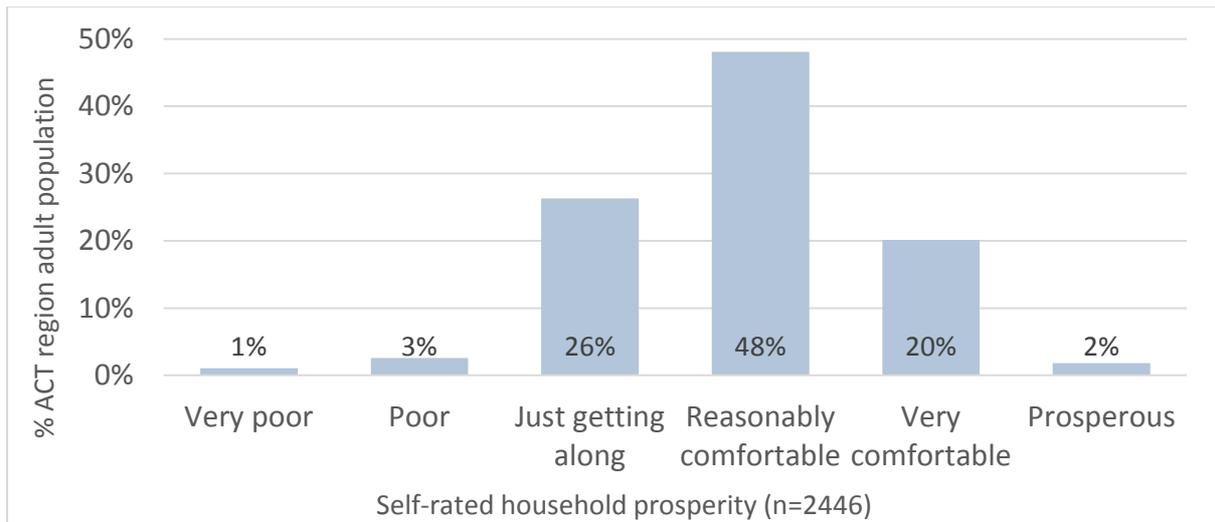


Figure 10 Self-rated household prosperity

Financial stress events: This measure asked people whether in the last year they experienced any of four types of financial stress event, including ‘milder’ stress events (postponing a holiday), and more severe stress events (being unable to pay bills on time, going without meals or heating or cooling, and asking for financial help from friends or family). Figures 11 and 12 show the proportion of people in the region who reported experiencing different types of financial stress (Figure 11), and the total number of financial stress events reported (Figure 12).

Just over half of people reported experiencing no financial stress events in the last year (56%), while 39% had to delay or cancel some non-essential purchases, 17% experienced being unable to pay important bills on time, 15% asked for financial help from friends or family, and 8% went without meals or were unable to heat or cool their home. Some people reported experiencing more than one of these types of financial stress events: as shown in Figure 12, just over one in five people (22%) had experienced one financial stress event (usually delaying or cancelling non-essential purchases), while 11% had experienced two events, and 9% had experienced three or four types of financial stress event.

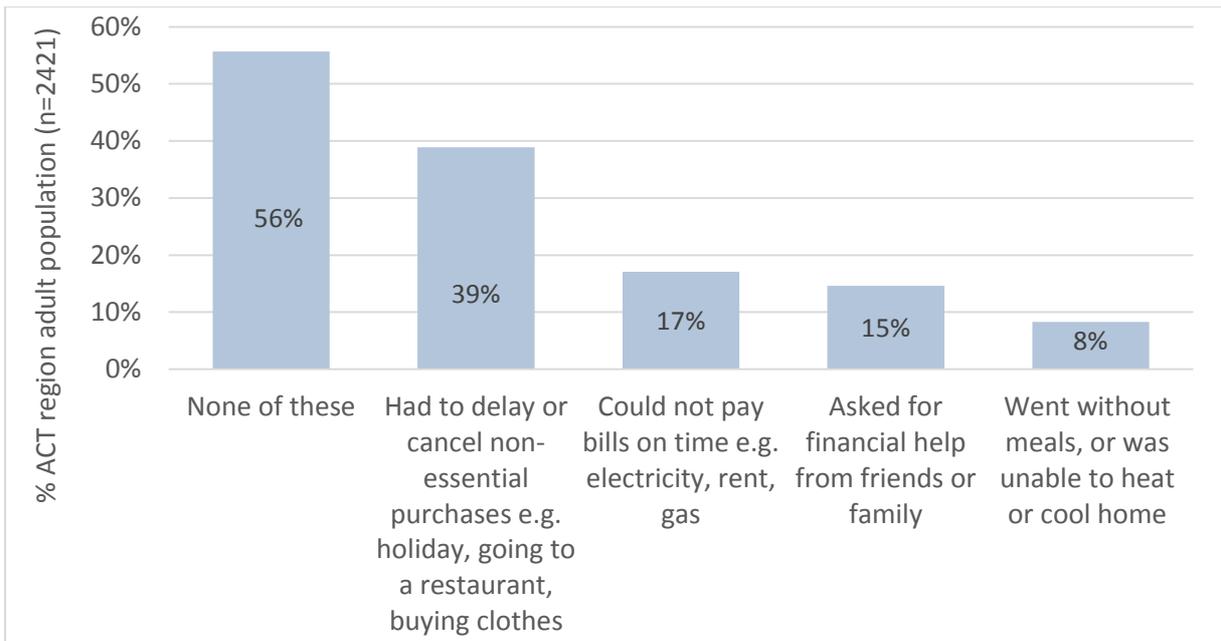


Figure 11 Types of financial stress events experienced in last 12 months

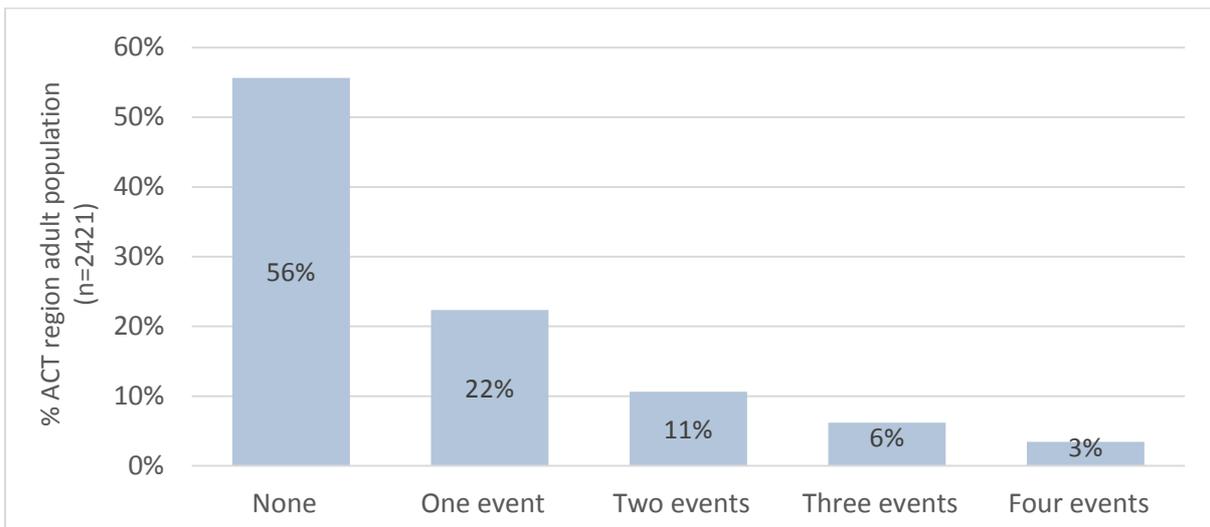


Figure 12 Number of financial stress events experienced in the last 12 months

Ability to access financial resources: This measure asks how a person would cover an unexpected \$2,000 expense if it happened in the next month. This helps identify whether households have the ability to cope with unexpected expenses such as an unusually high power bill following high use of air conditioning in a heatwave, or sudden repairs required to home after a storm. Figure 13 shows the proportion of people who would use different methods to cover this type of expense. The large majority – 72% - reported that they could use their savings, while 28% would use their credit card or a short-term loan. Less than 20% would use other methods including borrowing from family or friends (18%), delaying paying for other items (15%), pawning or selling belongings (8%) or asking for help from a charity (2%). Just over one in ten (11%) felt they would be unable to raise this amount of funds if needed.

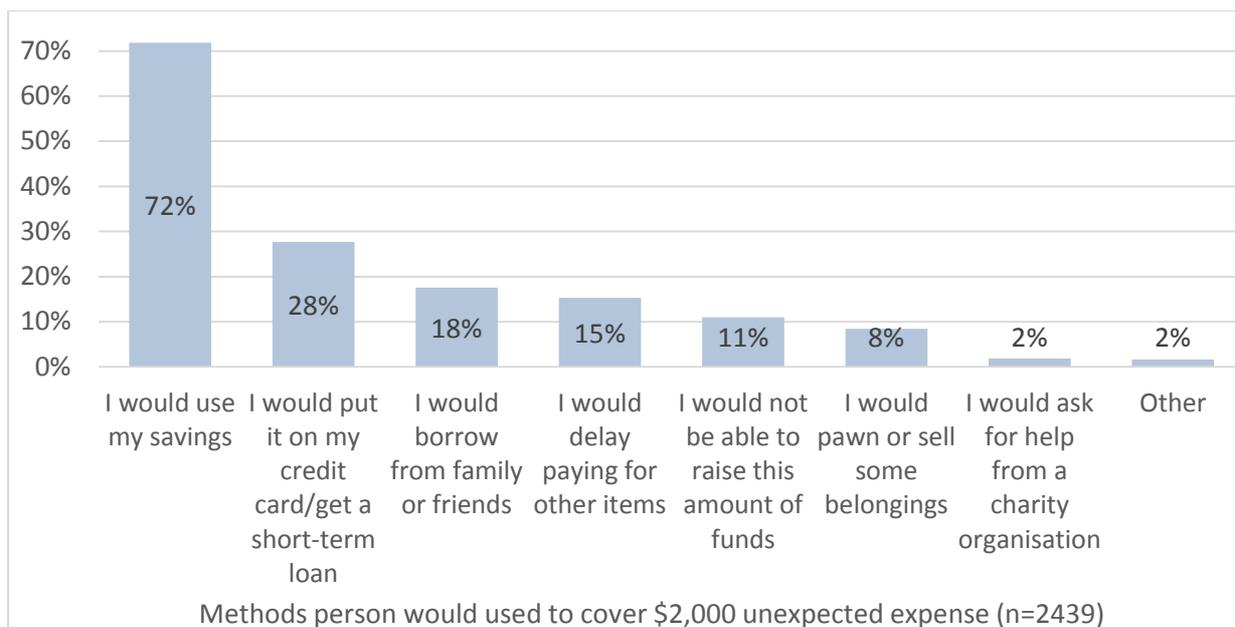


Figure 1 Ability to cope with a \$2,000 unexpected expense

The **household financial resilience** index shown in Table 3 was calculated as an index for all survey participants, scored out of 10 (0 indicates very low financial resilience, and a score of 10 indicates very high household financial resilience). The calculation process is described in Appendix 5.

Overall, as shown in Table 3, 19.7% of residents had low household financial resilience, while 46.2% had high financial resilience. This finding compares to recent data showing that 9.2% of the ACT are living below the poverty line (ACT Council of Social Services 2018): the poverty line is an indicator of extremely low financial resources, and our measure is intended to identify those who are less able to manage covering unexpected expenses, something that can be a problem for many living above the poverty line. The large proportion of people with high household financial resilience reflects the overall high household incomes of many ACT households compared to the Australian average (ABS 2017).

While there were some differences between men and women (with women less financially resilient than men), larger differences occurred between other groups.

Low financial resilience was more common than the average of 19.7% for the following groups:

- **Age:** Those aged 35-44 (29.1%)
- **Formal education:** Those with no university degree (29.4%)
- **Household structure:** Single parent/sharehouse residents (26.5%)
- **Home status:** Renters (33.0%)
- **Home type:** Townhouse (24.5%), unit/apartment (25.3%)
- **Place:** Tuggeranong South (31.3%), Outer Belconnen (25.0%).

High financial resilience, meanwhile, was more common than the average of 46.2% for the following:

- **Gender:** Men (50.5%)
- **Age:** Those aged 55 and above (54.6% or above for all age groups from 55 and up)
- **Formal education:** Those with a university degree (52.8%)
- **Household structure:** Those living in a home with a partner and no children (56.9%)
- **Home status:** Those who owned their home outright (69.0%)
- **Place:** Belconnen East (50.3%), North (50.9%), Woden Valley (56.6%) and Inner South (58.3%).

This suggests that, overall, people (particularly men) with higher levels of education, living with a partner in a home they own outright with children who have left home are most likely to have high financial resilience, and are particularly clustered in parts of Belconnen and inner suburbs of Canberra. Those with lower financial resilience tend to be younger, but with a particular cluster amongst those aged 35-44 and those who are renting or single parents, and are more commonly living in Tuggeranong South and Outer Belconnen.

5.4 SOCIAL RESOURCES

Different people develop varied types of social networks which can provide social support to them. This can vary from relying predominantly on family, to having strong networks of friends in informal or formal groups. In general, as shown in Figure 14, people living in the region have varied levels of social activity. Overall, 57% of adults living in the ACT region regularly keep in touch with friends, 46% regularly attend community events, 36% regularly chat with neighbours or spend time doing things with family members who don't live with them, 35% are a member of one or more hobby or community groups, 30% regularly take part in organized sporting activities, 24% regularly volunteer and 8% volunteer for environment-related groups.

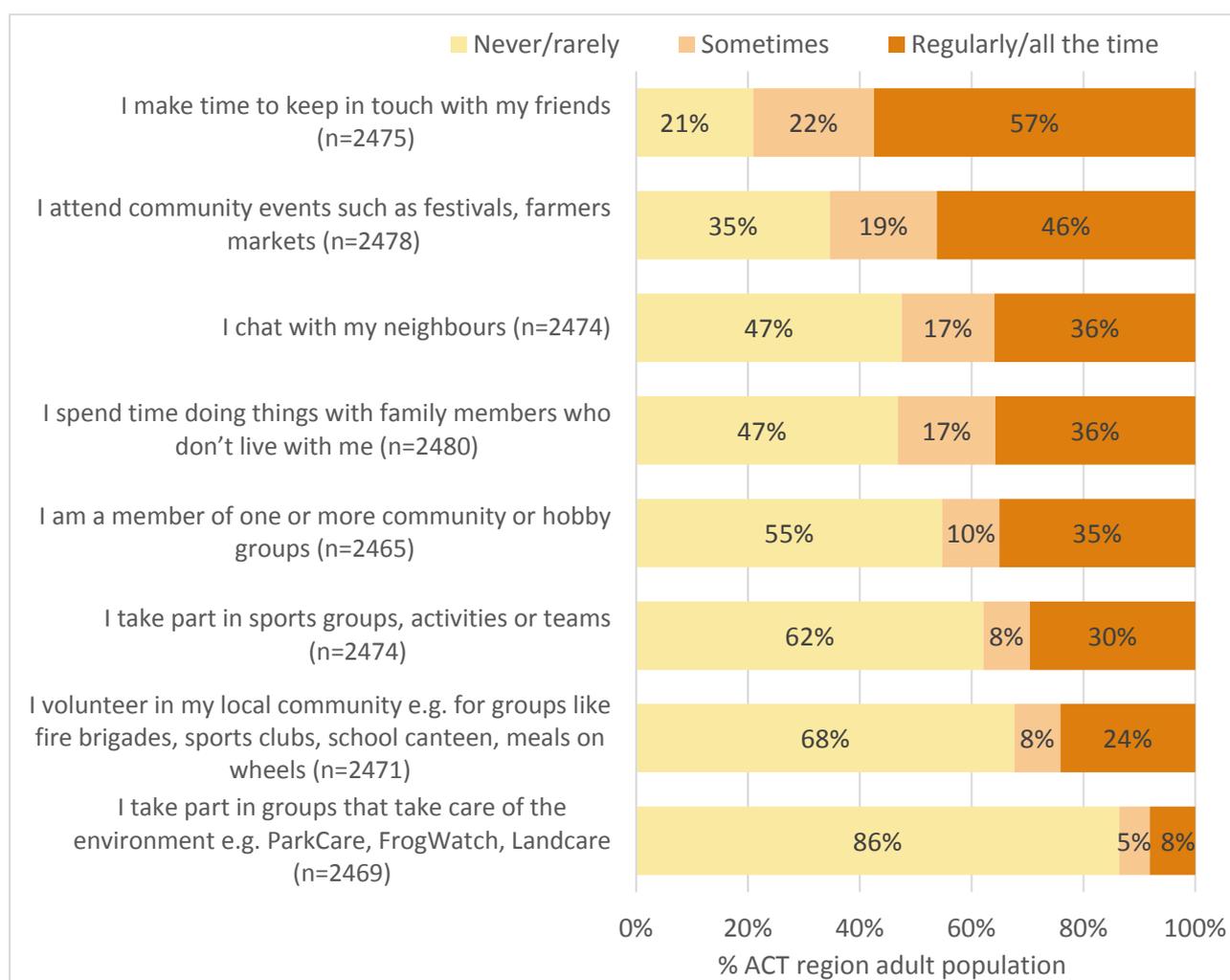


Figure 14 Social capital: Frequency of different types of social interaction

Not all of the activities shown in Figure 14 necessarily confer the same level of social resources: for example, taking part in groups that take care of the environment is a useful measure of whether a person invests in action to care for the environment, but not necessarily of whether that person has access to significant social resources that can assist in adaptation. Attending community events does not indicate the extent to which a person

can ask for help from others, whereas those who spend more time keeping in touch with friends are likely to have a wider range of people they can ask for assistance compared to those who do not keep in touch with friends.

Given this, overall social resilience was calculated based on the extent to which a person reported having access to (i) social networks of family and friends, which typically provide close social support, and (ii) highest levels of social interaction reported outside friends and family, irrespective of the nature of this interaction (see Appendix 5 for detailed description). The resulting index had a total score from 0 to 10 in which 0 indicated little to no social interaction of any type, while 10 indicated a person engaged frequently in more than one types of social interaction, suggesting a breadth and depth of social networks indicative of high access to a variety of forms of social support.

Overall, 21.1% of the ACT regional adult population had low social resilience, defined as a score of four or less in the index, while 13.3% had high social resilience. Low social resilience was more common for some groups:

- **Gender:** Men (24.9%)
- **Age:** Those aged 25-34 (27.4%) and 35-44 (27.5%)
- **Home status:** Renters (28.1%)
- **Home type:** Unit/apartment (30.7%)
- **Place:** Gungahlin (27.8%) and Tuggeranong South (26.3%).

High social resilience was more common amongst a relatively small number of groups (and not particularly common even amongst these):

- **Age:** Those aged 65-74 (24.4%) and 75 and older (19.5%)
- **Home status:** Outright owners (19.5%)
- **Place:** Weston Creek (23.0%).

Overall, this suggests that there is a lack of social resources for many younger people at early stages of their working life, particularly those renting or living in units/apartments. While high social resilience was somewhat more common amongst those aged 65 and older, it was not substantially higher.

5.5 HUMAN RESOURCES

Human resources were examined by measuring (i) health and wellbeing, and (ii) self-efficacy – a person’s confidence that they have the ability to achieve their desired outcomes in life, something shown in several studies to predict both resilience and adaptation. Health and wellbeing were measured using four overall measures that are used in a number of health and wellbeing surveys across Australia and internationally, with summary findings shown in Table 4):

- **General health:** Participants were asked to rate their general health as excellent, very good, good, fair, or poor. Most ACT region residents reported very good or excellent health (56.7%).
- **Global life satisfaction:** This measure of wellbeing measures wellbeing on a scale from 0 to 10 based on how satisfied a person is with their life, with higher scores indicating higher wellbeing. Most residents (50.2%) reported ‘typical’ levels of life satisfaction while 24.5% reported low life satisfaction and 25.3% reported high life satisfaction.
- **Personal Wellbeing Index:** This measure of wellbeing measures how satisfied people are with several different dimensions of their life, on a scale from 0 to 10. A total score is then calculated out of 100. Similar to global life satisfaction index, 47.3% reported ‘average’ or typical wellbeing levels, 25.3% low wellbeing and 27.4% high wellbeing.
- **Psychological distress (K6):** This measure examines the extent to which a person has experienced symptoms of psychological distress in the last four weeks, with higher scores indicating higher levels of psychological distress. In general, scores of 13 or higher are considered to indicate presence of moderate psychological distress which may be associated with a diagnosable mental illness, and scores of 19 or over to indicate probable presence of serious mental illness (ABS 2012). As is typical of adult Australians, 69.1% of ACT region adult residents reported low distress, while 21.5% reported moderate distress levels and 9.4% high distress levels.
- **Self-efficacy:** A person’s overall confidence in being able to achieve desired outcomes in life was measured by asking them to rate the extent to which they agreed or disagreed that ‘I am confident I can achieve the things I want in life’. Overall, 79.4% of the adults in the region were confident they could achieve the things they wanted to in life.

Table 4 Human resources

Measure	Results
General health (n= 2478)	Excellent health: 16.1% Very good health: 40.6% Good health: 28.5% Fair health: 11.0% Poor health: 3.7%
Global life satisfaction (n=2483)	Low life satisfaction (score of 0-6): 24.5% Average life satisfaction (score of 7-8): 50.2% High life satisfaction (score of 9 or 10): 25.3%
Personal Wellbeing Index (n=2238)	Low PWI (score of 60 or less): 25.3% Average PWI (score of 61-80): 47.3% High PWI (score of 81 or higher): 27.4%
Psychological distress (K6) (n=2472)	High distress (score 19 or higher): 9.4% Moderate distress (score 13-18): 21.5% Low distress (score <13): 69.1%
Self-efficacy (n=2461)	Disagree that can achieve desired outcomes in life: 10.3% Neither agree or disagree: 10.3% Agree that can achieve desired outcomes in life: 79.4%

Overall health-related resilience related to human resources was then measured out of 10, drawing on a subset of these measures. Self-efficacy was not included due to the relatively high proportion of people who felt confident in being able to achieve desired outcomes in life: given the overall high confidence level, it was decided that the best measure of human resilience should focus on health and wellbeing. The Personal Wellbeing Index was also not included in the calculation of the overall health-related resilience as this measure had similar distributions to the Global Life Satisfaction measure. Human resilience related to health was measured as an index scored from 0 to 10, where 10 indicated high resilience and 0 low resilience.

Overall, 5.0% of residents had a low score for human resilience, and 33.3% had a high score, with the majority having 'typical' resilience (Table 3). Low resilience was slightly more common amongst people living in single person households (9.4%) and those who were renting (9.0%). High health-related human resilience was more commonly reported by those aged 55-64 (38.6%) and those aged 65-74 (45.8%), largely reflecting that in older age groups while physical health is often poorer, there are typically higher levels of wellbeing and lower levels of psychological distress. Outright owners of houses were also more likely to report high resilience (41.2%) as were those in the Inner South (50.3%), North (37.5%) and Woden Valley (38.3%), all areas with higher proportions of residents in the older age groups with higher wellbeing.

5.6 IMPLICATIONS FOR SUCCESSFUL CLIMATE CHANGE ADAPTATION

Resilient cities will put in place strategies for climate change adaptation and resilience that are reflective, inclusive, robust, flexible, resourceful, integrated, have contingencies, and are viable (Patel and Nosal 2016). This section considers what our findings about access to individual resilience resources mean for achieving resilience to climate change in the ACT.

Overall, an **integrated** approach to climate change should consider the adaptive capacity of residents and ensure that adaptation strategies are designed to both leverage existing strengths, and to help support adaptive capacity for those groups who reported poorer capacity. A **reflective** approach ensures that past experiences and information about existing context are used to inform future decisions. While ACT region residents mostly have high individual resilience resources, one in five have low financial resilience. This means cost of living is a 'pressure point': any adaptation actions that increase living costs will place pressure on adaptive capacity, particularly for more vulnerable people with fewer financial resources (particularly renters and younger residents). Similarly, the lower level of social resources available to many people is low, suggesting some challenges for achieving **inclusivity**. Adaptation actions need to either explicitly build social resources, or be designed to be implemented without requiring people to draw heavily on their social networks for support. On the other hand, the high incomes and high skills of much of the population create opportunities that can be leveraged to achieve positive adaptation, suggesting high capacity for **resourceful** (innovative and smart) responses that identify new and different ways to adapt to the expected effects of climate change.

The findings suggest several areas where social systems can be supported to build more **robust** capacity to adapt to change. In particular, strengthening social systems to enable those who are renting and in younger age groups to build greater adaptive capacity can reduce the risk of these groups losing resilience rapidly when they experience climate-change related impacts. As monitoring continues over time, it will be possible to further analyse whether those with access to particular types of resources are better able to be **flexible** in terms of being able to respond successfully to changing circumstances. A key issue in flexibility appears to be supporting flexibility amongst renters and younger residents, who often have lower access to individual resilience resources. These residents need to be supported through provision of options for adapting to climate change that are **viable** for their circumstances – being affordable within their often more limited financial capacity, and not requiring people to rely on obtaining high levels of assistance from social networks in particular. The findings suggest that many residents have capacity to cope with unexpected impacts from climate change, with many having high financial capacity. However, **contingency** capacity can still be further built, particularly through building social resources, and providing strategies to build the financial capacity of some key groups so they are better able to cope with unexpected impacts of climate change.

6. COMMUNITY RESILIENCE RESOURCES

Community resilience resources are the resources a person has access to in the place they live in – in this case, the ACT region. For example, if a community has a strong economy, this provides resilience resources as a person can relatively easily find additional work if needed. A community that is friendly is one in which it is likely to be easier to find support and assistance compared to one that people experience as unfriendly, or where there are high rates of anti-social behaviour. A community where everyone has equal opportunity is one where people are not unfairly disadvantaged in accessing resources. A community with good leadership is likely to better respond to emergency situations than one with poor or ineffective leadership. A community with good services and infrastructure, including providing safe places to live, and places where people can easily socialise or exercise near their homes, is typically experienced as a better place to live than one which has poor services and infrastructure.

6.1 UNDERSTANDING COMMUNITY RESILIENCE RESOURCES

Access to community resilience resources was measured by examining how residents rate the current financial, social, institutional and physical liveability of the ACT region, as well as how they feel these things are changing:

- **Financial resources** (perceptions of local economic health) were examined by asking survey participants to rate how much they agreed or disagreed that (i) there are plenty of jobs available in this region at the moment, and (ii) living costs are affordable here e.g. food, petrol, housing. The way financial resources were perceived to be changing was measured by asking participant to rate the extent to which ‘the local economy’ was getting worse or getting better.
- **Social resources** (perceptions of friendliness and anti-social behaviour) were examined by asking people to rate how much they agreed or disagreed that ‘I feel part of the community here’, ‘Many people keep to themselves around here’, ‘Many people in this area drink too much alcohol or abuse drugs’. The way social resources were perceived to be changing was measured by asking the participant to rate the extent to which ‘friendliness of my local area’ was getting worse or getting better.
- **Institutional resources** (fairness of access to resources and capacity of local institutions to cope with change) were examined by asking people to rate how much they agreed or disagreed that ‘Most people get a fair go in this region’, ‘I can get involved in local decision-making processes if I want to’ and ‘This community copes pretty well when faced with challenges’.
- **Liveability resources** (overall liveability of the local area including ability to feel safe and have access to healthy living options) were examined by asking people to rate how much they agreed or disagreed that ‘I would recommend this region to others as a good place

to live’, ‘This is a safe place to live’, ‘There is a high crime rate in this area’, ‘My suburb/neighbourhood has lots of vegetation (e.g. trees, shrubs)’, ‘There are parks, green spaces or nature reserves within easy walking distance of my home’. Change over time in liveability was measured by asking the participant to rate the extent to which ‘the liveability of my local area’ and ‘the local landscape and surrounds’ were getting worse or better.

6.2 COMMUNITY RESILIENCE RESOURCES – OVERALL FINDINGS

Overall, most people living in the ACT region reported moderately good access to community resilience resources, with an average score of 6.1 out of a possible 10 (Figure 15). However, access to each of the components making up community resilience resources was different: liveability and institutional resilience were generally higher (average score of 6.5 and 6.8 respectively), and financial and social resilience poorer (average score of 5.7 for both).

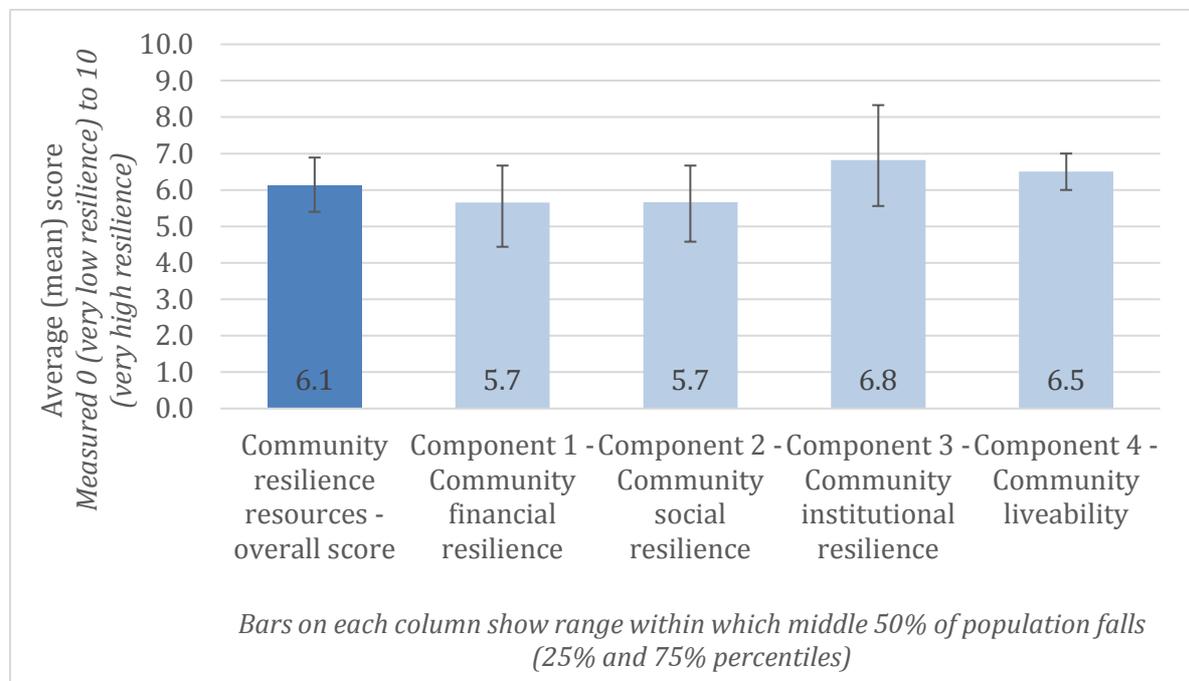


Figure 15 Access to community resilience resources – average scores

Overall, 4.4% of residents had a low community resilience resource score and 4.0% a high score (Figure 16).

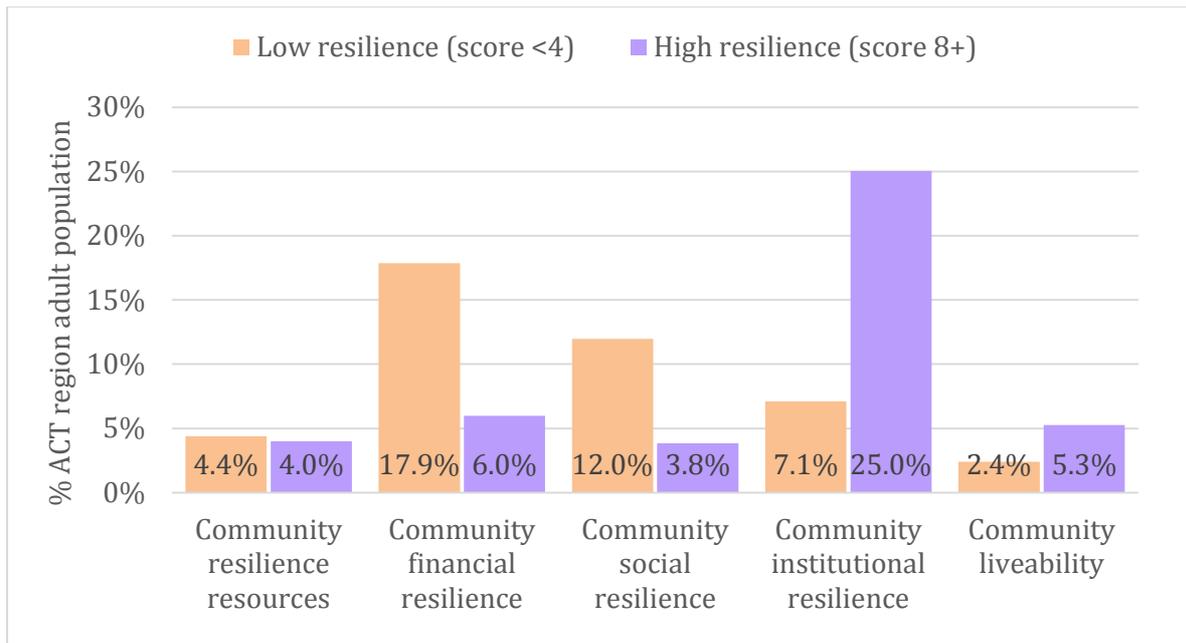


Figure 16 Access to community resilience resources – proportion of population with low and high resilience

Table 5 examines access to community resilience resources for people in different groups and living in different places. There was much less difference in community resilience scores than individual resilience scores. This suggests that most people experience their community in similar ways across the ACT region. Only three groups had poorer than average access to community resilience resources, and even amongst these the difference to the average was relatively small:

- Renters (average score of 5.9)
- Single person households (5.9)
- Those aged 25-34 (who are often renting) (5.9)
- Tuggeranong South residents (5.9).

These groups have substantial overlap, with those aged 25-34 more likely to be renting and living in single person households than those in other age groups.

The following groups had better than average access to community resilience resources:

- Those aged 65 to 74 (6.5)
- Those living in the Inner South (6.4), North (6.4) and Woden Valley (6.4).

The following section examines the specific measures used to assess each dimension of community resilience resources in more detail.

Table 5 Access to community resilience resources, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		Average community resilience score Measured from 0 (low) to 10 (high)	Average community resilience score Measured from 0 (lowest) to 10 (highest)				% economic resilience		% social resilience		% institutional resilience		% liveability	
			Economic resilience	Social resilience	Institutional resilience	Liveability resilience	Low (≤4)	High (8+)	Low (≤4)	High (8+)	Low (≤4)	High (8+)	Low (≤4)	High (8+)
	ACT region	6.1	5.7	5.7	6.8	6.5	17.9%	6.0%	12.0%	3.8%	7.1%	25.0%	2.4%	5.3%
Gender	Male	6.1	5.7	5.6	6.7	6.5	18.1%	6.0%	13.1%	4.0%	8.3%	24.6%	2.7%	5.1%
	Female	6.1	5.6	5.7	6.9	6.5	17.3%	6.2%	10.9%	3.7%	5.7%	25.7%	2.2%	5.4%
Age	18-24	6.1	5.7	5.6	6.7	6.5	13.3%	6.0%	10.2%	1.8%	4.9%	16.2%	1.4%	4.3%
	25-34	5.9	5.6	5.5	6.5	6.4	19.7%	6.7%	12.8%	2.1%	7.7%	17.4%	3.5%	4.6%
	35-44	6.1	5.5	5.7	6.9	6.4	19.8%	5.7%	14.5%	5.2%	6.0%	24.7%	2.1%	3.6%
	45-54	6.1	5.7	5.6	6.8	6.5	17.3%	4.3%	12.7%	3.3%	6.5%	26.0%	2.2%	4.5%
	55-64	6.3	5.8	5.8	7.1	6.6	17.5%	7.5%	9.9%	3.5%	6.2%	31.3%	2.1%	7.0%
	65-74	6.5	6.0	6.1	7.2	6.7	12.2%	7.1%	7.4%	9.1%	9.0%	38.4%	1.5%	8.3%
	75 plus	6.2	5.3	5.8	7.0	6.7	25.7%	3.3%	14.1%	7.5%	12.9%	31.9%	2.6%	8.8%
Cultural background	Australian born	6.1	5.6	5.7	6.8	6.5	17.8%	5.9%	12.2%	3.8%	7.0%	24.5%	2.3%	4.8%
	Born o/s, English	6.1	5.6	5.6	6.8	6.5	17.2%	4.4%	12.1%	5.2%	6.9%	26.2%	2.3%	4.8%
	Born o/s, other	6.2	5.8	5.7	6.9	6.5	19.1%	9.3%	9.6%	2.3%	8.3%	28.1%	3.5%	9.8%
Formal education	No univ. degree	6.0	5.5	5.6	6.7	6.4	20.4%	4.8%	12.3%	2.9%	9.4%	23.6%	4.0%	4.4%
	Univ. degree	6.2	5.7	5.7	6.9	6.6	16.6%	6.7%	11.8%	4.4%	5.9%	25.8%	1.6%	5.7%
Household structure	Partner only	6.2	5.7	5.7	6.9	6.5	18.4%	5.0%	12.3%	3.6%	8.7%	25.7%	2.2%	4.7%
	2 parent family	6.2	5.7	5.8	6.9	6.5	16.7%	7.5%	10.9%	5.4%	5.4%	26.9%	2.6%	6.3%
	Single parent/ sharehouse	6.0	5.6	5.5	6.7	6.4	15.4%	5.8%	12.5%	1.4%	6.5%	20.1%	1.5%	4.3%
	1 person h'hold	5.9	5.3	5.4	6.6	6.4	27.0%	3.4%	14.7%	3.0%	9.0%	24.3%	4.3%	4.9%
Home status	Renting	5.9	5.4	5.4	6.6	6.4	22.7%	4.8%	13.3%	2.0%	7.8%	19.8%	3.3%	4.3%
	Mortgage	6.2	5.7	5.8	6.9	6.5	17.0%	7.1%	12.8%	5.2%	6.7%	25.9%	1.8%	6.1%
	Outright owner	6.3	5.8	5.8	7.1	6.6	14.7%	5.7%	9.4%	4.5%	7.6%	31.5%	2.9%	5.5%
Home type	House	6.2	5.7	5.7	6.9	6.5	17.4%	5.9%	11.3%	4.4%	7.0%	26.7%	2.7%	5.9%
	Townhouse	6.0	5.6	5.5	6.7	6.3	15.1%	5.5%	15.2%	2.0%	6.7%	24.3%	2.2%	2.1%
	Unit/apartment	6.0	5.7	5.4	6.6	6.5	20.2%	7.4%	11.9%	3.0%	7.8%	18.1%	1.2%	5.5%
Place	Belconnen E.	6.3	5.7	5.9	7.0	6.6	13.6%	5.3%	4.7%	5.6%	5.4%	28.2%	1.7%	5.3%
	Gungahlin	6.0	5.7	5.7	6.8	6.4	15.8%	5.8%	8.8%	2.4%	6.2%	26.4%	3.6%	4.4%
	Inner Belconnen	6.3	5.7	6.0	6.8	6.7	21.6%	4.0%	8.9%	6.0%	7.4%	22.4%	2.0%	6.2%
	Inner North	6.1	5.7	5.7	6.6	6.6	17.1%	7.2%	10.1%	5.0%	10.6%	22.9%	.5%	6.1%
	Inner South	6.4	6.1	5.7	7.1	6.9	9.9%	12.4%	14.0%	5.2%	3.7%	27.9%	1.6%	9.5%
	North	6.4	5.8	6.1	7.0	6.7	15.7%	5.2%	7.9%	4.3%	4.8%	24.0%	.3%	5.9%
	Out. Belconnen	5.9	5.3	5.4	6.7	6.4	23.5%	5.4%	18.7%	3.3%	9.1%	27.2%	2.7%	4.0%
	Tuggeranong Nth	6.0	5.6	5.5	6.8	6.5	17.7%	5.7%	12.7%	3.5%	5.5%	24.6%	1.8%	5.0%
	Tuggeranong Sth	5.9	5.4	5.3	6.9	6.3	23.7%	3.9%	15.9%	1.3%	9.6%	30.2%	4.7%	4.2%
	Weston Creek	6.1	5.5	5.6	6.7	6.3	20.5%	7.0%	12.5%	4.3%	8.0%	25.2%	4.3%	4.1%
	Woden Valley	6.4	5.5	6.0	7.0	6.8	17.1%	5.2%	6.0%	4.8%	5.5%	26.3%	1.7%	8.7%
	NSW areas	6.1	5.8	5.4	6.7	6.3	15.8%	6.3%	19.1%	3.7%	8.1%	15.0%	1.7%	2.1%

6.3 ACCESS TO DIFFERENT COMMUNITY RESILIENCE RESOURCES

Overall, most residents felt the region had high levels of resources in the form of a strong economy, friendly community, good institutions and high liveability, as can be seen in Figures 17 and 18, as well as from Table 5:

- **Financial resources (economic resilience):** just over half felt there were plenty of jobs locally, and 46% felt the local economy was getting better versus only 14% who felt it was getting worse. However, only 30% felt living costs were affordable, while 44% disagreed, suggesting the key strain on financial wellbeing in the region is high costs of living such as food, petrol and housing. Table 5 shows 17.9% felt they had limited access to a strong local economy, while 6.0% felt very confident in the local economy. People were more likely to feel negative about local economic conditions if they were aged 75 and over (25.7%), lived in a one-person household (27.0%), were renting (22.7%), or lived in Outer Belconnen (23.5%) or Tuggeranong South (23.7%). Those more likely to feel very confident about local economic conditions (compared to the average of 6.0%) were those living in the Inner South (12.4%).
- **Social resources (social resilience):** While 67% reported feeling part of their community and only 16% felt many local people in their region drank too much alcohol or abused drugs, 64% also felt that many people kept to themselves in their local area. Few felt that friendliness was declining in their area (10%), and 44% felt it was getting better. This suggests a mixed picture of local communities across the ACT region as friendly but reserved with not all feeling there was high social interaction, consistent with the data reported for individual social resources. Overall, 12.0% of residents had a low social resilience score and 3.8% had a high social resilience score. Low community social resilience was reported more commonly in Outer Belconnen (18.7%), Tuggeranong South (15.9%) and NSW regions (19.1%) and high community social resilience reported more often by those aged 65 to 74 (9.1%) and 75 and older (7.5%).

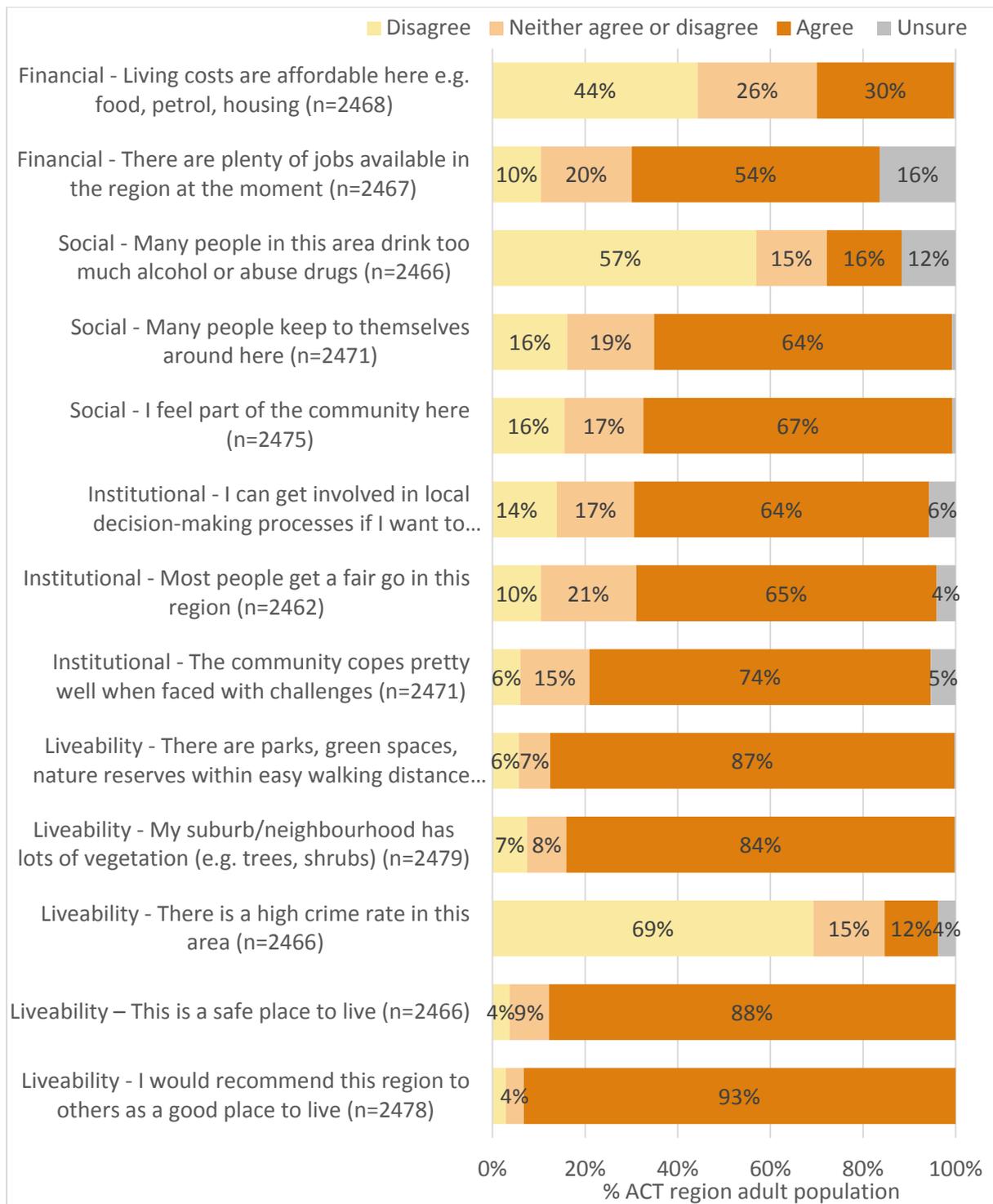


Figure 17 Access to community resilience resources

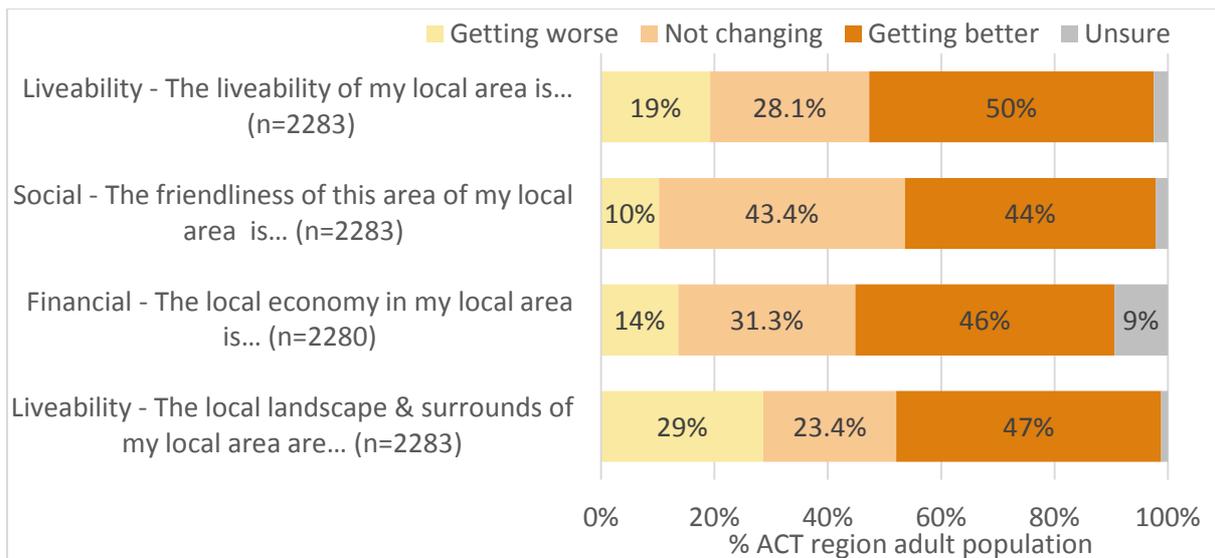


Figure 18 Perceived change in community resilience resources

- Institutional resources:** The majority of residents felt that most people are treated fairly in the region (65%), and the community copes well with challenges (74%), suggesting high institutional resilience. Only 7.1% of residents had low institutional resilience scores compared to 25.0% with high scores. The only group more likely than average to report low levels of institutional resilience was those aged 75 and older (12.9%). Those who were older (aged 55 or older) were more likely to report high institutional resilience, including those aged 75 and older who were both more likely to report poor and good institutional resilience.
- Liveability:** Residents predominantly reported very high liveability, with 87% reporting having parks, green spaces or nature reserves within easy walking distance; 84% reporting their neighbourhood having a lot of vegetation, 88% finding their neighbourhood a safe place to live, and 93% stating they would recommend the region to others as a good place to live. Only 2.4% had low liveability scores, and 5.3% had high liveability scores. No groups were more likely to report having very low liveability than others, and only one group – those born overseas in non-English speaking countries – was more likely than average to report high liveability (9.8%).

Overall, these results highlight that the ACT region has moderate levels of community resilience resources with high liveability and institutional resilience, and moderate financial and social community resilience. These findings were relatively uniform across different groups and places, although people living in Outer Belconnen and Tuggeranong South were more likely to report low levels of community resilience resources, and those in the Inner South, North and Woden Valley more likely to report high levels of community resilience.

6.4 IMPLICATIONS FOR SUCCESSFUL CLIMATE CHANGE ADAPTATION

Access to community resilience resources was much more homogenous than access to individual resilience resources: most people reported similar levels of access, and mostly they report moderate to good access. The most common stress reported was health of the local economy, which combined with the identification of a significant minority of people experiencing household financial stress in Section 5, reinforces that cost of living in the region is a 'pressure point': any adaptation actions that increase living costs will place pressure on adaptive capacity of vulnerable households, particularly renters, people in some younger age groups, and those living in Tuggeranong South and Outer Belconnen. Just over one in ten find limited social support in the ACT region, finding their local community unfriendly or unwelcoming, indicating a need to build social networks that can provide support that assists with coping with the effects of climate change. High trust in local organisations, together with good liveability of the region, create opportunities for adaptation action that can be leveraged to achieve positive adaptation.

Overall, strengthening social systems to enable those who are renting and in younger age groups to build greater adaptive capacity can reduce the risk of these groups losing resilience rapidly when they experience climate-change related impacts.

7. RESILIENCE TO HEATWAVES

Climate change is predicted to result in more frequent and more severe heatwaves in the ACT region. A range of factors can increase a person's vulnerability to heatwaves, and residents can use a wide range of strategies to cope with heatwaves when they occur, and to adapt their circumstances to reduce the impact of heatwaves. This section examines current sensitivity to heatwaves in the form of health-related and financial vulnerability, examines how 'fit for purpose' residential infrastructure is for heatwaves and adaptations made to increase resilience of home to heatwaves. It also examines the extent to which residents use different strategies to cope with heatwaves when they occur, and experience of heatwaves at work.

7.1 UNDERSTANDING RESILIENCE TO HEATWAVES

Multiple factors can influence resilience to heatwaves. Overall, a person who is resilient to heatwaves will have ready access to refuges from heat suitable to protecting their health and wellbeing during an extended heatwave, including adequate refuge at home and at work. They will be able to enact suitable coping strategies without placing stress on their resilience resources, for example through being able to afford to keep their home cool without experiencing financial stress as a result. They will be able to maintain their health and wellbeing, both through maintaining a suitable level of physical activity, not experiencing an increase in negative social interaction, and being able to avoid exacerbation of existing health conditions. This can be achieved in a range of ways, from long-term proactive adaptation in which residents invest in adapting their residence to reduce impacts of heatwaves, to short-term coping strategies such as visiting cool places during heatwaves.

To assess overall resilience to heatwaves, five dimensions of resilience were examined:

- **Health and social vulnerability:** The extent to which the region's residents experience health conditions known to increase sensitivity to heatwaves (health vulnerability), and negative social interactions during heatwaves (social vulnerability) was examined.
- **Residential infrastructure:** Some people live in homes that heat up quickly and cool down slowly; others live in homes that remain comfortable during even extended heatwaves. The extent to which a person's home is 'fit for purpose' to provide a comfortable place during a heatwave was examined to understand their overall resilience to heatwaves.
- **Financial vulnerability:** Some households can readily afford to cool down their homes during heatwaves while others cannot, with financial vulnerability to a heatwave a consequence of both overall household financial wellbeing and of the performance of their home during heatwaves and associated cost of cooling their residence. Because financial vulnerability to heatwaves is a result of both these factors, survey participants were asked to directly rate how easy or difficult they

found it to afford to cool their home during heatwaves (as well as warm their home in winter).

- **Heatwave coping strategies:** A person’s access to different options for coping with heat was assessed; for example, this includes whether they can access suitable heat refuges on hot days such as cool places outside their home, and whether they can still maintain physical activity during a heatwave.
- **Workplace:** Some people are exposed to impacts of heatwaves in their workplace. To examine this, survey participants were asked about the type of work they did, and suitability of policies in place to reduce impacts of heatwaves.

The next section presents overall findings on heatwave resilience. Findings for each of the five dimensions of heatwave resilience are then examined in more detail.

7.2 HEATWAVE RESILIENCE – OVERALL FINDINGS

Overall, resilience to heatwaves is lower than access to resilience resources, with the average heatwave resilience score being 5.9 out of a possible 10 (Figure 19). However, resilience to different aspects of heatwaves differs substantially: a large proportion of residents live in homes that perform poorly in heatwaves, with an average score of only 4.5 for performance of residential infrastructure in heatwaves. Many people also find it difficult to afford to cool their home to a comfortable level during heatwaves, with an average score of 5.0 for financial resilience in heatwaves.

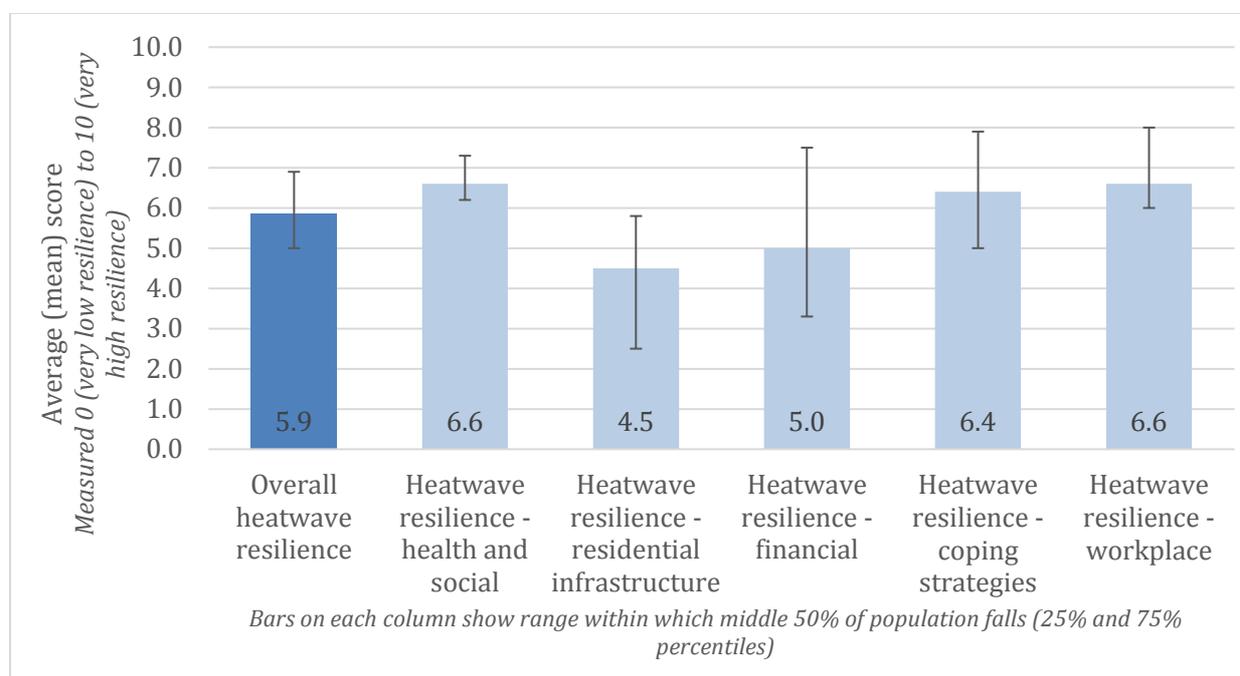


Figure 19 Heatwave resilience – average scores

As shown in Figure 20, around one in three adults living in the ACT region have a home that performs poorly in heatwaves (35.9%), and have difficulty affording to cool their home in

heatwaves (32.0%). Most people reported high levels of health and social resilience, good access to coping strategies during heatwaves such as access to heatwaves, and good heatwave resilience in their workplace. However, 15.9% had limited access to heatwave coping strategies such as going to a cool place (e.g. a shopping centre or pool) during a heatwave. Additionally, the high scores for health and social resilience to heatwaves may reflect lack of awareness of health risks during heatwaves, and hence may not be a good indicator of actual health-related vulnerability to heatwaves. As discussed further later in this section, there is a need to understand actual incidence of heatwave-related health problems and compare these to self-rated health problems, in order to better understand the extent to which data collected in this study reflect low awareness versus high resilience.

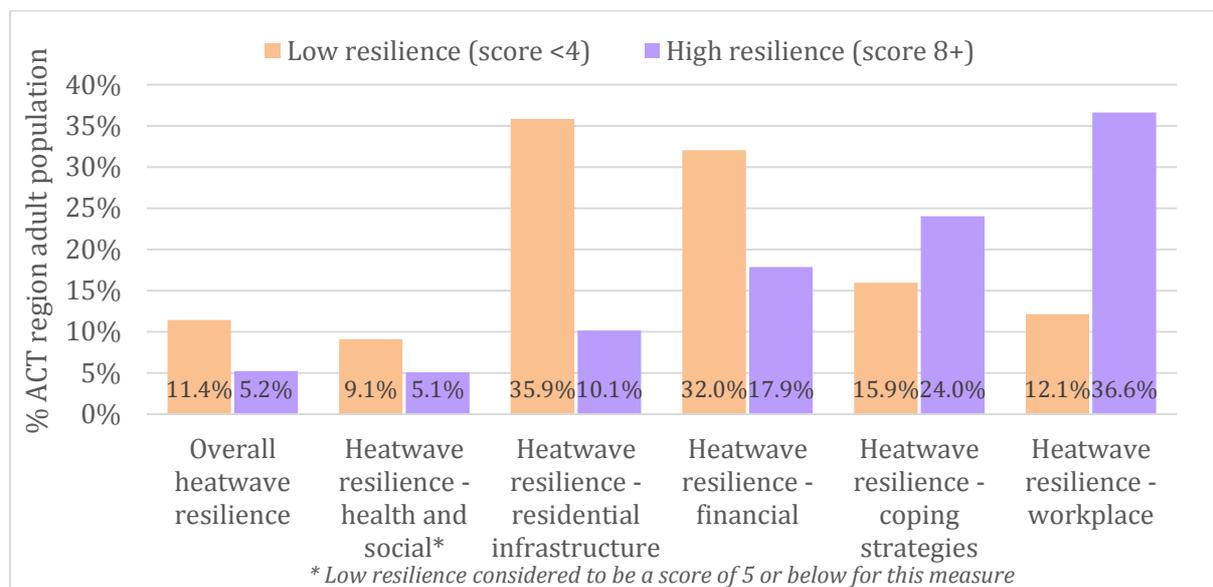


Figure 20 Heatwave resilience - proportion of population with low and high resilience

Table 6 examines heatwave resilience for people in different groups and living in different places. For all groups and places, residential infrastructure was the key area of vulnerability for which resilience to heatwaves was lowest, followed by financial vulnerability. Those aged 65 and older had slightly higher resilience to heatwaves than the average, largely due to better performing residential infrastructure and lower exposure to anti-social behaviour in heatwaves compared to younger people. Overall, those with the lowest resilience to heatwaves were:

- Renters (average score of 5.2)
- Single parent and sharehouse households (5.3)
- Those aged 18-24 (5.4)
- Those with no university degree (5.5)
- Those living in NSW areas (5.6).

The following sections examine the specific measures used to assess each dimension of heatwave resilience in more detail.

Table 6 Heatwave resilience, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		Average heatwave resilience (Measured 0 to 10)	Average heatwave resilience score (Measured 0 to 10)					Health & social		Residential infrastructure		Financial		Coping strategies		Workplace	
			Health & social	Residential infrastructure	Financial	Coping strategies	Workplace	Low (≤5)	High (8+)	Low (≤4)	High (8+)	Low (≤4)	High (8+)	Low (≤4)	High (8+)	Low (≤4)	High (8+)
	ACT region	5.9	6.6	4.5	5	6.4	6.6	9.1%	5.1%	35.9%	10.1%	32.0%	17.9%	15.9%	24.0%	12.1%	36.6%
Gender	Male	6.0	6.8	4.7	5.3	6.6	6.7	4.2%	6.1%	32.4%	9.2%	27.9%	20.6%	12.9%	25.9%	12.3%	39.0%
	Female	5.7	6.4	4.4	4.8	6.2	6.6	13.2%	4.2%	38.8%	11.1%	35.5%	15.5%	18.3%	22.5%	12.1%	34.1%
Age	18-24	5.4	6.4	4.1	4.4	6.1	5.8	10.0%	5.0%	40.2%	3.3%	42.4%	9.3%	18.4%	20.5%	25.8%	22.9%
	25-34	5.7	6.7	3.8	4.9	6.2	6.7	7.4%	5.3%	46.2%	5.0%	33.8%	16.8%	17.2%	21.0%	10.5%	38.0%
	35-44	5.7	6.5	4.2	4.8	6.3	6.8	12.9%	3.4%	42.5%	7.4%	34.0%	15.3%	16.6%	19.4%	10.0%	38.4%
	45-54	5.9	6.5	4.6	5.1	6.5	6.9	9.8%	5.8%	33.7%	10.2%	30.2%	17.9%	15.5%	26.5%	7.8%	40.5%
	55-64	6.1	6.6	4.9	5.5	6.5	6.9	9.0%	5.4%	29.7%	12.7%	27.0%	23.6%	16.3%	28.4%	7.6%	42.1%
	65-74	6.3	6.6	5.6	5.8	6.7	6.3	6.7%	4.3%	20.9%	19.3%	23.7%	27.8%	12.0%	30.4%	24.0%	38.4%
	75 plus	6.2	6.7	6.2	5.0	6.8		4.9%	6.3%	13.7%	29.7%	30.8%	18.9%	9.0%	32.1%		
Cultural background	Australian born	5.9	6.5	4.5	5.0	6.5	5.8	9.7%	4.9%	37.0%	10.5%	31.6%	17.6%	14.2%	25.7%	12.7%	37.1%
	Born o/s, English	5.8	6.7	4.4	5.0	6.2	6.6	8.3%	4.8%	38.2%	7.5%	35.5%	21.3%	18.1%	19.9%	10.4%	32.5%
	Born o/s, other	5.8	6.7	4.9	5.0	5.8	6.6	5.2%	6.4%	24.0%	11.2%	30.0%	14.6%	27.2%	16.8%	8.6%	39.4%
Formal education	No univ. degree	5.5	6.5	4.2	4.3	6.1	6.9	10.9%	4.6%	39.0%	6.6%	41.0%	11.7%	20.5%	22.5%	19.6%	32.5%
	Univ. degree	6.0	6.6	4.7	5.4	6.5	6.3	8.2%	5.2%	34.2%	12.0%	27.5%	21.0%	13.5%	24.8%	8.1%	38.8%
Household structure	Partner only	6.1	6.6	4.9	5.5	6.6	6.8	8.1%	4.9%	31.5%	14.6%	26.6%	25.3%	14.6%	28.8%	9.9%	39.2%
	2 parent family	5.9	6.6	4.4	4.9	6.4	6.7	9.2%	5.2%	36.2%	8.6%	33.0%	14.5%	13.5%	20.7%	9.4%	39.9%
	Single parent/ sharehouse	5.3	6.5	3.9	4.2	5.9	6.8	9.6%	4.5%	44.3%	3.1%	42.0%	8.4%	21.6%	20.2%	21.7%	25.1%
	1 person h'hold	5.7	6.5	4.5	4.9	6.1	6	11.2%	5.7%	36.2%	11.4%	33.6%	17.2%	19.8%	26.5%	13.7%	34.3%
Home status	Renting	5.2	6.4	3.5	4.1	5.7	6.7	12.7%	4.0%	51.0%	4.7%	47.0%	11.6%	26.1%	18.9%	13.8%	32.6%
	Mortgage	6.1	6.6	4.7	5.2	6.6	6.5	8.8%	4.7%	33.8%	9.3%	27.9%	17.3%	11.6%	23.6%	9.5%	41.3%
	Outright owner	6.3	6.7	5.4	5.9	6.8	6.8	5.8%	6.2%	22.3%	18.7%	20.7%	27.3%	10.2%	31.2%	12.2%	37.1%
Home type	House	5.9	6.6	4.7	5.1	6.5	6.7	8.9%	4.5%	32.5%	10.5%	30.1%	18.1%	13.9%	23.5%	13.0%	36.8%
	Townhouse	5.8	6.5	4.2	4.8	6.5	6.6	8.4%	6.0%	40.9%	8.9%	38.4%	17.3%	14.4%	26.3%	8.5%	38.8%
	Unit/apartment	5.7	6.5	4.0	4.9	6.1	6.7	10.8%	5.8%	45.8%	9.4%	34.4%	17.8%	22.5%	27.0%	9.6%	36.5%
Place	Belconnen E.	5.9	6.6	4.3	5.1	6.6	6.7	8.7%	2.1%	35.6%	5.2%	27.8%	18.2%	8.9%	25.2%	12.3%	34.5%
	Gungahlin	5.8	6.6	4.6	5.0	6.2	6.6	9.0%	4.5%	34.7%	9.7%	31.2%	13.4%	18.2%	21.7%	13.8%	37.9%
	Inner Belconnen	6.0	6.6	4.7	5.4	6.3	6.6	7.6%	7.8%	28.7%	10.4%	33.3%	27.9%	22.6%	25.5%	11.0%	32.1%
	Inner North	6.0	6.7	4.4	5.4	6.4	6.6	8.8%	8.6%	40.0%	14.0%	29.6%	23.1%	16.7%	26.2%	10.4%	40.8%
	Inner South	6.1	6.7	4.9	5.5	6.6	6.8	7.3%	4.0%	29.3%	15.0%	23.2%	23.5%	15.6%	31.5%	8.2%	36.1%
	North	6.1	6.7	4.7	5.6	6.4	6.7	4.5%	4.2%	36.9%	12.8%	26.9%	28.8%	15.4%	23.8%	10.7%	38.7%
	Out. Belconnen	5.7	6.5	4.0	4.7	6.3	6.7	11.3%	3.5%	47.1%	5.7%	37.8%	18.1%	15.4%	19.6%	11.9%	32.2%
	Tuggeranong Nth	5.7	6.5	4.1	4.7	6.6	6.6	9.7%	6.9%	40.8%	7.3%	34.4%	11.0%	13.0%	26.2%	15.3%	39.5%
	Tuggeranong Sth	5.8	6.5	4.7	4.5	6.5	6.6	11.2%	6.2%	30.6%	7.9%	38.0%	14.1%	14.0%	24.1%	12.9%	28.1%
	Weston Creek	5.9	6.6	4.5	5.1	6.3	6.4	7.6%	3.7%	33.9%	8.8%	31.3%	18.3%	14.0%	20.4%	10.9%	60.8%
	Woden Valley	6.0	6.6	5.0	4.9	6.5	7.3	8.4%	6.2%	30.8%	16.5%	31.8%	13.4%	17.2%	29.1%	9.7%	38.1%
	NSW areas	5.6	6.3	4.3	4.9	6.2	6.7	12.3%	1.4%	42.7%	8.8%	32.1%	14.3%	13.8%	18.8%	14.2%	30.8%

7.3 HEALTH AND SOCIAL VULNERABILITY

Some health problems are commonly exacerbated by heatwaves, with people who experience them often reporting more severe symptoms or greater difficulty associated with these problems during extended periods of hot weather.

Survey participants were asked the extent to which they experienced a number of health issues that could be exacerbated by either experience of hot weather or, in a smaller number of cases, by other effects of climate change (food and animal allergies are predicted to increase by some climate studies due to increase in allergenicity of some pollens in particular). They were then asked, if they experienced a given health issue, whether they had noticed it worsening during hot weather in the past. This provides a useful indicator of the extent to which people are aware that heatwaves may worsen particular conditions, however it should be noted that it is possible for a person to have a health issue worsen in hot weather but lack awareness of this. In general, these data are more likely to reflect *awareness* of health issues rather than actual *incidence* of these issues amongst the population, with self-report surveys often under-reporting incidence of health problems amongst groups who are under-diagnosed or who do not recognize the severity of health problems they have.

While hay fever/pollen allergy, depression/anxiety and being overweight or obese were the three most common health issues reported (Figure 21), those most likely to be reported to worsen in hot weather were heat exhaustion/heat stroke incidence, asthma, hay fever/pollen allergy and migraine, with 40% or more of those who experienced these health problems finding that they worsened in hot weather (Figure 22). Some of these are health issues also exacerbated by some events associated with drought, such as dust storms, and hence the health issues described here provide some assessment of vulnerability to drought as well as heatwaves.

Overall, as shown in Figure 23 and Table 7, there were six health issues in which one in ten or more of the adult population experienced greater problems during heatwaves:

- 25% of the adult population experienced hay fever/pollen allergy illnesses that worsened in hot weather
- 17% experienced heat-related illnesses
- 12% had health issues related to being overweight or obese that worsened in hot weather
- 11% experienced asthma that worsened in hot weather
- 11% experienced depression/anxiety that worsened in hot weather
- 9% had migraines that worsened in hot weather.

Many people in the region experience symptoms associated with irritability, fatigue or anti-social behaviour during heatwaves. Most find it more difficult to sleep on very hot nights, with 50% reporting they find it much more difficult to sleep than usual (Figure 24). One quarter (26%) reported being much less social during very hot weather (and a further 46% are a little less social), 21% reported feeling much more irritable than usual and a further 48% reported feeling a little more irritable. One in five (20%) had often experienced other people being more angry or aggressive in hot weather, and 41% had sometimes experienced this. Just under one-third (29%) reported drinking a little or a lot more alcohol than usual in hot weather.

Overall, this suggests a significant proportion of the population are vulnerable to either worsening of existing health issues or exposure to anti-social behaviour during heatwaves. As these results reflect only those who are aware of their vulnerability, actual vulnerability in the population is likely to be higher, with some in the population experiencing issues without being aware of them.

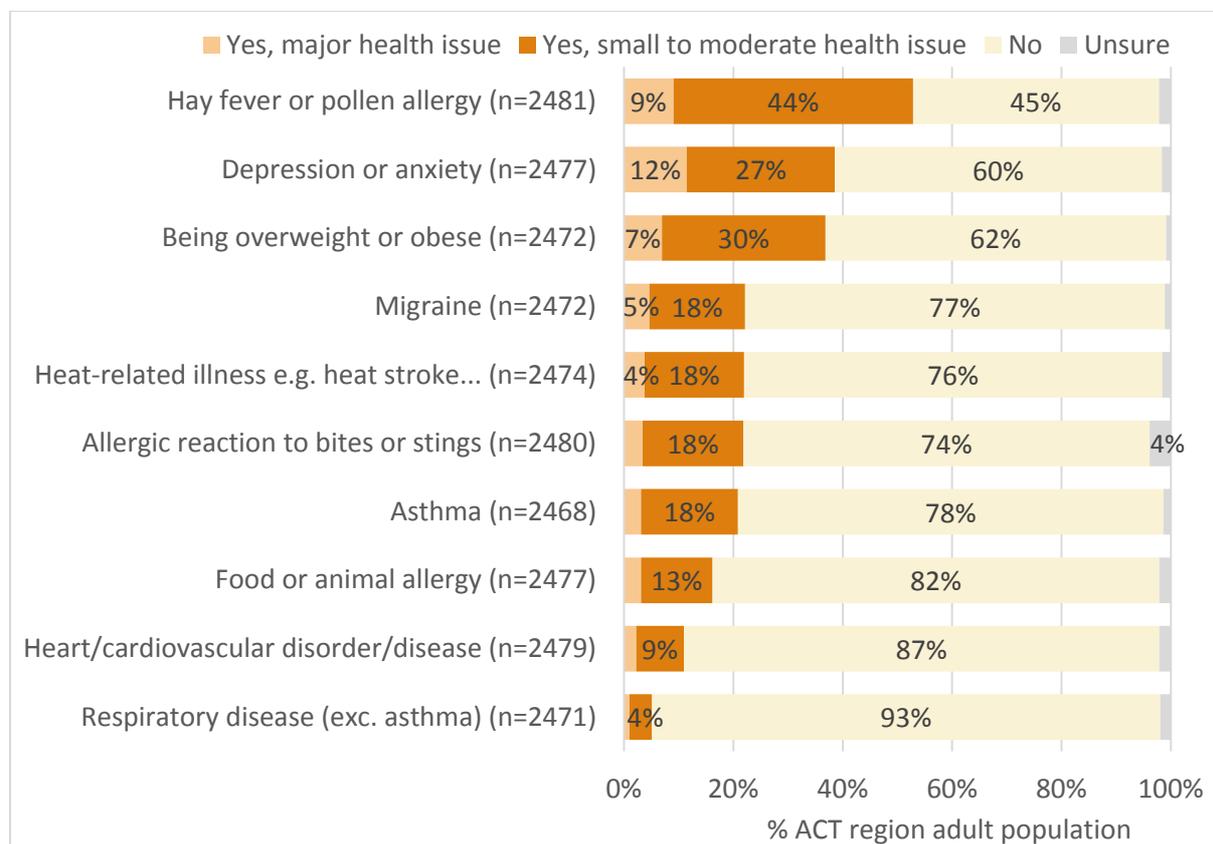


Figure 21 Do you personally experience any of these health issues?

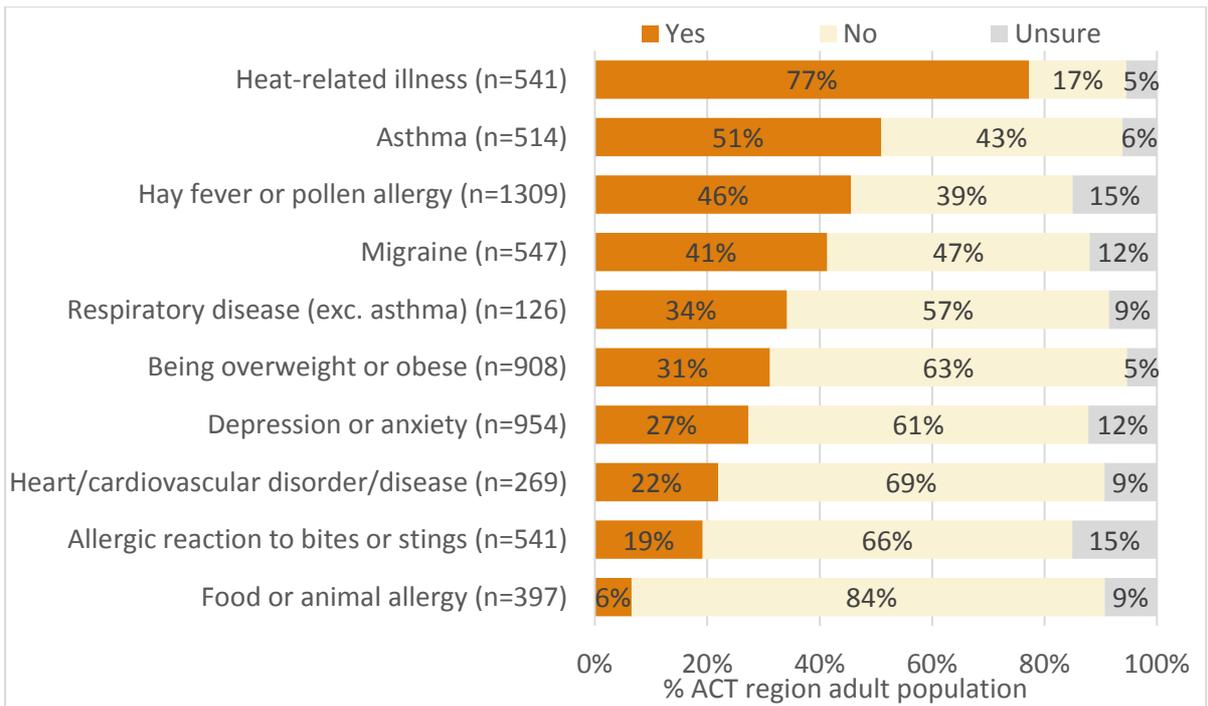


Figure 22 Is this health issue typically worse during hot weather or other changes in weather such as storms? (Asked only of those who had already indicated having the health issue)

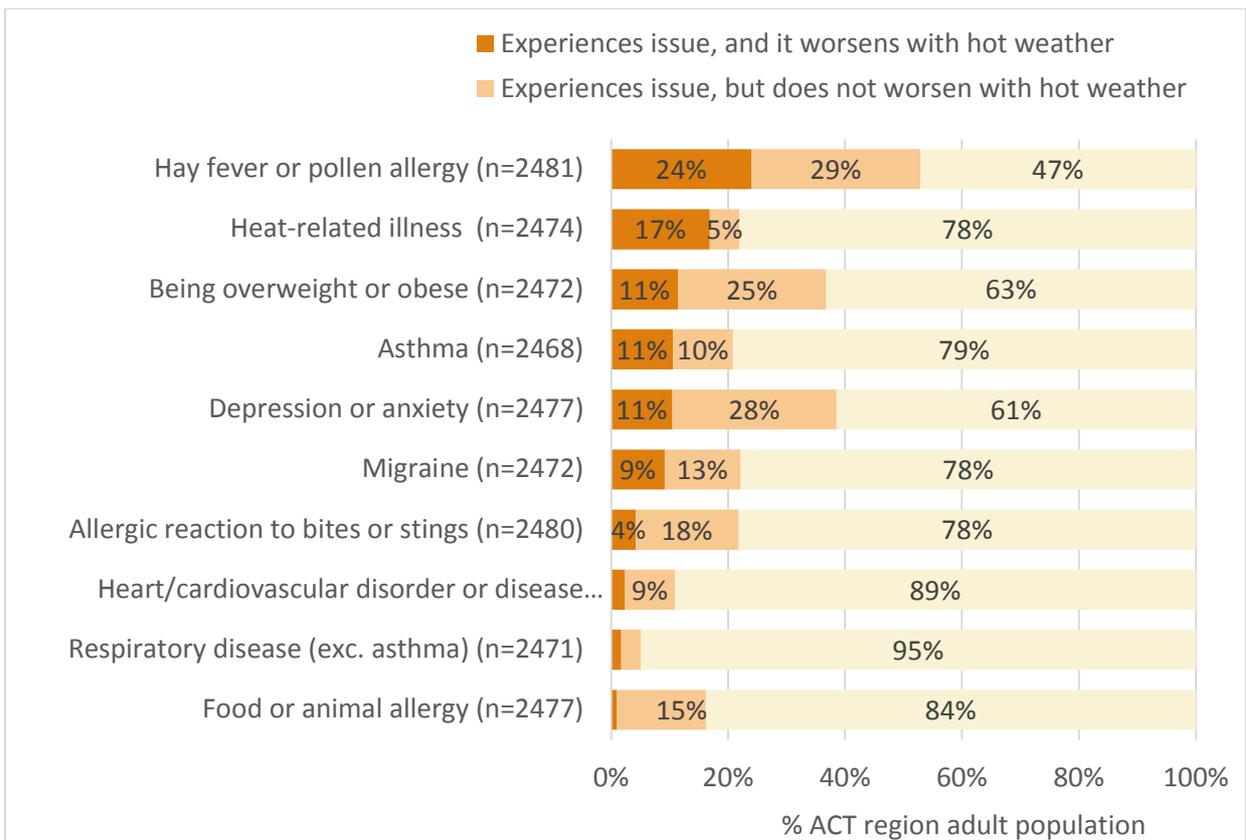


Figure 23 Proportion of the ACT region adult population who experience health problems and self-report that they worsen with hot weather

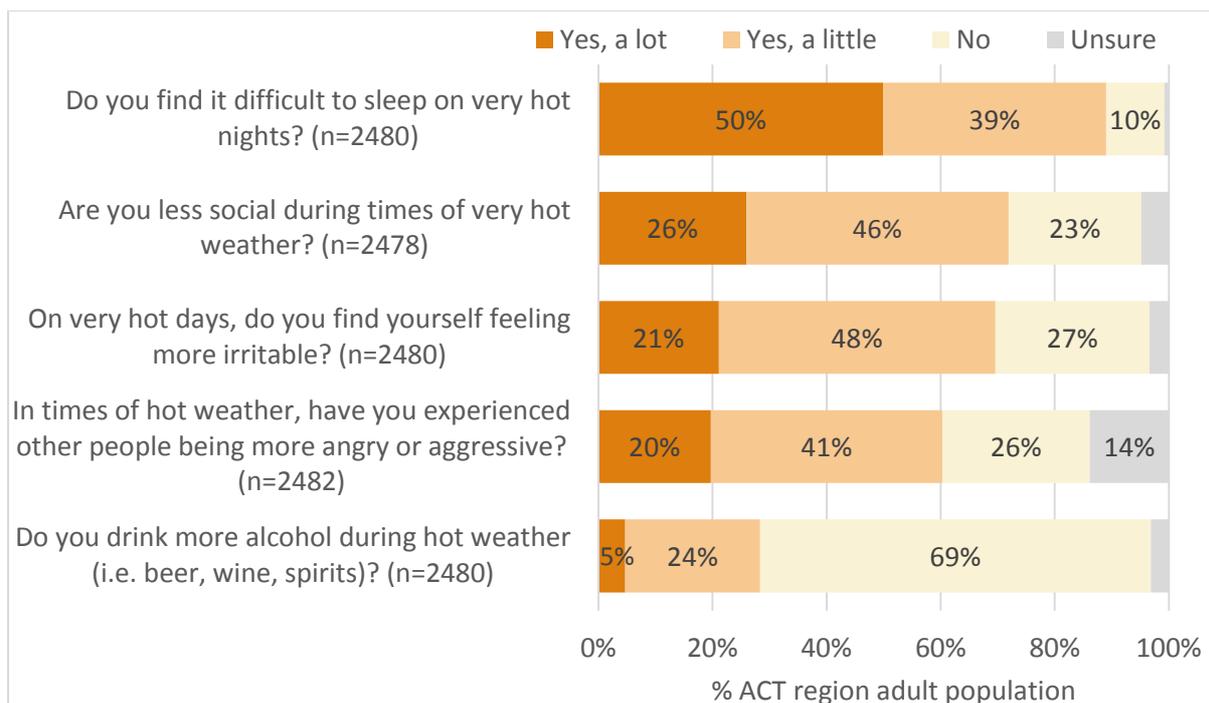


Figure 24 Past experiences of hot weather

Table 7 compares health and social vulnerability to heatwaves between groups and places. Overall, there was high variability in experience of specific health and social issues, while the overall health and social vulnerability index calculated (see Appendix 5 for details of calculation) showed less variation, largely because of the variation in experience of different specific health and social issues between groups which ‘evened out’ in the overall index. Key differences observed were:

- Gender:** Women were more likely than men to report experiencing almost all health and social issues, with one exception: men were more likely to report increasing their alcohol during hot weather (34.8%) than women (22.8%). This suggests that women are both more vulnerable to some health issues during heatwaves, but may also reflect women being more aware of and likely to report these issues, with men known to under-report health issues in surveys. Care is therefore needed in interpreting these results: they show that women are more likely to be aware of having health issues that worsen in hot weather than men, but this may actually indicate higher preparedness amongst women and better coping compared to men, due to this higher awareness.
- Age:** Younger people were more likely than older people to report experiencing hayfever/pollen allergies, heat illness, asthma, migraine, difficulty sleeping, reduced sociability, increased irritability, increased alcohol consumption and to a lesser extent increases in aggressive behaviour, during heatwaves. Those aged 35 to 64 were most likely to report exacerbation of health problems related to being overweight or obese during heatwaves. These findings again need to be interpreted with care: in particular, multiple past studies suggest that the elderly are particularly

vulnerable to heat related illness and adverse outcomes during heatwaves, yet in this study the elderly were less likely to report concerns about health problems during heatwaves. Rather than indicating lower incidence of health problems, this is likely to indicate lower awareness of potential health problems related to heatwaves, and this low awareness may contribute to poor health outcomes amongst the elderly through lowering their likelihood of investing in adaptation actions to reduce exposure to the effects of heatwaves. Some health-related problems, however, do appear to have higher incidence amongst younger people, such as asthma and allergies, suggesting a particular need to focus on reducing risk of worsening of symptoms during heatwaves for these groups.

- **Cultural background:** Those born in countries outside Australia with a non-English speaking background were in general less likely to report having health problems that worsen in heatwaves. This may again result from either lower incidence, or lower awareness, of these health problems. It suggests a need to raise awareness of potential health implications of heatwaves amongst this group as low awareness may reduce likelihood of taking action to reduce health impacts from heatwaves.
- **Formal education:** Those with lower levels of formal education were more likely than those with university-level qualifications to report experiencing heat-related illnesses, health problems related to being overweight or obese, depression/anxiety, and migraines. They were particularly more likely to report experiencing increases in aggressive behaviour from others (65.8% compared to 57.4% of those with a university qualification) and increasing their alcohol consumption in hot weather (31.5% compared to 26.6%).
- **Household structure:** Single parents and those living in sharehouses were most likely to report heatwave related health problems, particularly heat-related illnesses, depression or anxiety, difficulty sleeping, increased irritability, and increases in aggressive behaviour from others.
- **Home status:** Renters were more likely than those with mortgages or who owned their home outright to report experiencing all heatwave-related health and social problems, with the exception of increasing alcohol consumption.
- **Home type:** There were relatively few differences between those living in houses, townhouses and units/apartments, although those living in units/apartments were more likely to report difficulty sleeping during heatwaves (92.6%) compared to those in townhouses (91.4%) and houses (87.7%).
- **Place:** There were differences in health issues reported by people living in different districts. In particular, those living in Outer Belconnen were more likely to report experiencing hayfever/pollen allergy, problems related to being overweight or obese, asthma, depression or anxiety, being less social and more irritable in heatwaves, and experiencing increased aggressive behaviour during heatwaves.

Table 7 Experience of heat-related health and social vulnerability, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% adult population experience issue & find it worse in heatwaves						% who experience this issue during heatwaves					Heatwave resilience – health & social		
		Hayfever/ pollen allergy	Heat illness	Overw't/ obese	Asthma	Depression or anxiety	Migraine	Difficulty sleeping	Less social	More irritable	Aggressive behaviour	↑ alcohol consumption	Average (mean) score	% with low score (≤5)	% with high score (8+)
	ACT region	24.6%	17.2%	11.5%	10.7%	10.7%	9.2%	89.0%	71.9%	69.6%	60.3%	28.3%	6.6	9.1%	5.1%
Gender	Male	18.4%	9.8%	7.4%	6.8%	6.3%	4.6%	85.1%	68.2%	60.7%	58.5%	34.1%	6.8	4.2%	6.1%
	Female	29.9%	23.8%	15.2%	13.9%	14.4%	13.6%	92.4%	74.9%	77.7%	61.8%	22.8%	6.4	13.2%	4.2%
Age	18-24	28.8%	24.9%	9.0%	16.0%	16.7%	13.6%	92.5%	71.8%	81.5%	65.6%	36.5%	6.4	10.0%	5.0%
	25-34	26.8%	15.8%	11.6%	14.6%	10.9%	13.0%	91.4%	72.9%	76.4%	59.6%	34.0%	6.7	7.4%	5.3%
	35-44	28.3%	19.4%	15.3%	9.8%	12.6%	10.0%	90.7%	72.0%	75.4%	63.7%	27.8%	6.5	12.9%	3.4%
	45-54	26.5%	15.1%	12.8%	9.7%	9.6%	9.6%	89.9%	79.1%	69.6%	69.3%	30.0%	6.5	9.8%	5.8%
	55-64	18.5%	17.1%	12.4%	7.6%	6.8%	4.6%	89.6%	69.5%	58.7%	56.4%	25.1%	6.6	9.0%	5.4%
	65-74	20.0%	12.8%	9.1%	6.9%	8.6%	2.3%	83.2%	69.3%	56.1%	50.6%	18.9%	6.6	6.7%	4.3%
	75 plus	12.7%	12.5%	5.7%	5.9%	6.0%	5.5%	75.0%	59.2%	47.4%	42.8%	9.1%	6.7	4.9%	6.3%
Cultural background	Australian born	25.6%	17.5%	11.9%	11.5%	10.3%	9.3%	89.8%	72.6%	70.6%	59.5%	29.2%	6.5	9.7%	4.9%
	Born o/s, English	19.2%	17.3%	9.9%	9.7%	13.9%	7.1%	89.2%	72.5%	68.7%	62.5%	30.5%	6.7	8.3%	4.8%
	Born o/s, other	24.5%	14.7%	10.7%	6.4%	8.4%	11.7%	81.9%	65.3%	62.1%	63.0%	17.1%	6.7	5.2%	6.4%
Formal education	No univ. degree	23.8%	21.4%	14.4%	11.7%	13.3%	11.1%	88.4%	70.9%	71.7%	65.8%	31.5%	6.5	10.9%	4.6%
	Univ. degree	24.9%	15.0%	10.1%	10.3%	9.4%	8.3%	89.5%	72.4%	68.4%	57.4%	26.6%	6.6	8.2%	5.2%
Household structure	Partner only	22.7%	15.1%	9.8%	10.2%	8.8%	7.6%	88.0%	68.4%	66.1%	56.4%	26.3%	6.6	8.1%	4.9%
	2 parent family	25.9%	17.4%	12.7%	10.8%	9.9%	10.3%	87.7%	72.6%	71.8%	63.1%	30.2%	6.6	9.2%	5.2%
	Single parent/ sharehouse	26.0%	22.3%	12.4%	12.2%	15.8%	10.9%	94.1%	75.0%	78.5%	66.6%	32.6%	6.5	9.6%	4.5%
	1 person h'hold	23.8%	15.1%	12.6%	10.4%	11.6%	8.4%	88.5%	77.4%	57.9%	52.5%	20.1%	6.5	11.2%	5.7%
Home status	Renting	27.9%	22.9%	14.0%	13.4%	14.7%	13.1%	91.5%	75.8%	77.9%	64.8%	31.6%	6.4	12.7%	4.0%
	Mortgage	25.9%	16.1%	11.5%	11.5%	8.8%	9.9%	89.6%	72.4%	72.4%	61.8%	32.3%	6.6	8.8%	4.7%
	Outright owner	18.7%	12.7%	8.4%	5.8%	7.2%	4.6%	84.4%	66.1%	54.8%	49.7%	18.7%	6.7	5.8%	6.2%
Home type	House	23.3%	16.8%	11.2%	9.9%	10.4%	8.3%	87.7%	70.7%	68.5%	60.6%	28.5%	6.6	8.9%	4.5%
	Townhouse	24.8%	17.3%	14.6%	14.7%	9.9%	11.7%	91.4%	73.2%	71.1%	60.3%	31.3%	6.5	8.4%	6.0%
	Unit/apartment	27.2%	17.2%	10.0%	10.6%	11.7%	11.5%	92.6%	73.5%	70.7%	58.6%	27.4%	6.5	10.8%	5.8%
Place	Belconnen E.	27.1%	16.5%	9.8%	9.8%	10.8%	6.3%	89.9%	65.2%	70.5%	60.5%	27.0%	6.6	8.7%	2.1%
	Gungahlin	26.9%	18.1%	10.6%	11.6%	9.2%	10.3%	90.3%	72.7%	70.2%	62.0%	31.2%	6.6	9.0%	4.5%
	Inner Belconnen	20.4%	20.1%	10.0%	10.4%	11.2%	5.5%	86.6%	75.7%	72.4%	58.2%	28.7%	6.6	7.6%	7.8%
	Inner North	30.1%	12.2%	10.0%	7.4%	10.4%	8.3%	90.1%	73.6%	70.2%	54.5%	27.2%	6.7	8.8%	8.6%
	Inner South	16.8%	15.2%	7.1%	6.6%	5.3%	3.5%	91.9%	71.6%	55.4%	47.6%	24.1%	6.7	7.3%	4.0%
	North	20.2%	14.4%	9.0%	7.2%	9.7%	9.9%	89.7%	65.9%	66.3%	55.9%	28.8%	6.7	4.5%	4.2%
	Out. Belconnen	31.2%	20.9%	15.8%	15.7%	14.9%	6.8%	87.2%	74.8%	77.3%	69.5%	27.2%	6.5	11.3%	3.5%
	Tuggeranong Nth	21.0%	15.6%	14.8%	11.9%	11.2%	9.2%	88.4%	69.5%	73.9%	59.7%	29.3%	6.5	9.7%	6.9%
	Tuggeranong Sth	21.7%	19.7%	13.8%	10.6%	13.6%	11.7%	85.5%	66.1%	64.1%	62.7%	26.5%	6.5	11.2%	6.2%
	Weston Creek	24.6%	15.5%	12.0%	14.5%	11.9%	11.8%	88.5%	68.3%	66.4%	56.2%	29.8%	6.6	7.6%	3.7%
	Woden Valley	24.5%	14.5%	8.2%	8.3%	7.5%	7.6%	91.0%	79.9%	69.0%	57.2%	22.9%	6.6	8.4%	6.2%
NSW areas	28.1%	18.7%	15.0%	12.8%	12.1%	17.0%	89.7%	73.6%	74.1%	71.8%	33.2%	6.3	12.3%	1.4%	

7.4 RESIDENTIAL INFRASTRUCTURE

A person's residence is their key heat refuge during heatwaves. If their home heats up fast and takes a long time to cool down, they are likely to experience greater impacts from heatwaves compared to someone living in a house that takes a long time to warm up, and which can cool down quickly after a hot day. Over half of residents reported that their home warmed up very fast in hot weather (54% as shown in Figure 25), 48% used air conditioning or evaporative cooling in their home most days in summer, and 41% reported that their home did not cool down quickly after a hot day without use of air conditioning. Overall, this suggests around half of households were living in residential infrastructure that was not highly 'fit for purpose' for providing a heat refuge in an extended heatwave, particularly if a blackout occurs: this large proportion of the population either experiences high levels of discomfort or invests funds in extended periods of use of air conditioning in their home (or evaporative cooling).

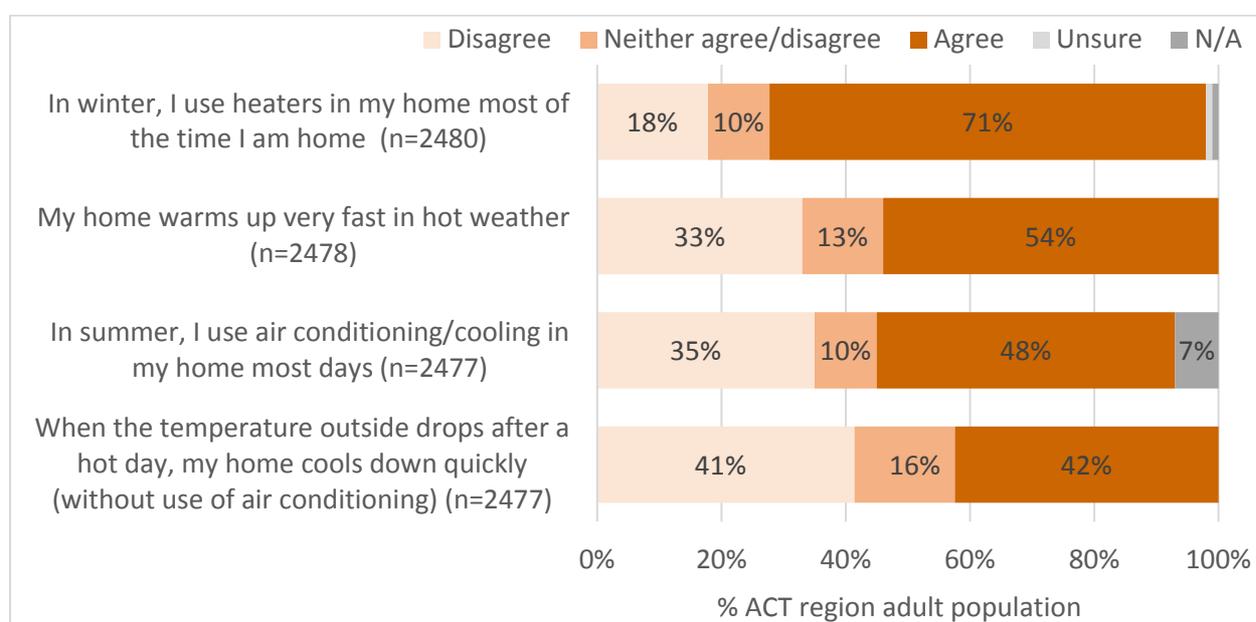


Figure 25 Performance of residence in hot and cold weather

A lack of 'fitness for purpose' can be a consequence of many things. This includes the consequences of original design of housing when first built, and of subsequent actions taken to adapt homes to improve fitness for purpose. Some people will be better able than others to invest in improving the resilience of their residence to heatwaves. To assess this, residents were asked if they or others had taken any of a number of actions to improve resilience of their residence to heatwaves, or if they were planning to in future (Figure 26). Residents were more likely to report reducing or planning to reduce use of their heater (66% and 7% respectively) than reducing use of air conditioner or planning to (57% and 5%). Two in five (41%) had invested in additional insulation of their home, while 12% planned to, 15% would like to do this but were unable to (usually due to living in a rented resident), and 14% did not plan to. Fewer had invested in energy efficient cooling (28% had done this,

while 17% planned to, 16% wanted to but were unable to, and 17% did not plan to), external awnings or shutters (26% had done this and 13% planned to), or double/triple glazed windows (18% had done this and 19% planned to). This suggests reasonable potential to encourage greater investment in some key actions known to reduce impacts of heatwaves in the home, particularly lower cost options such as installing external awnings or shutters.

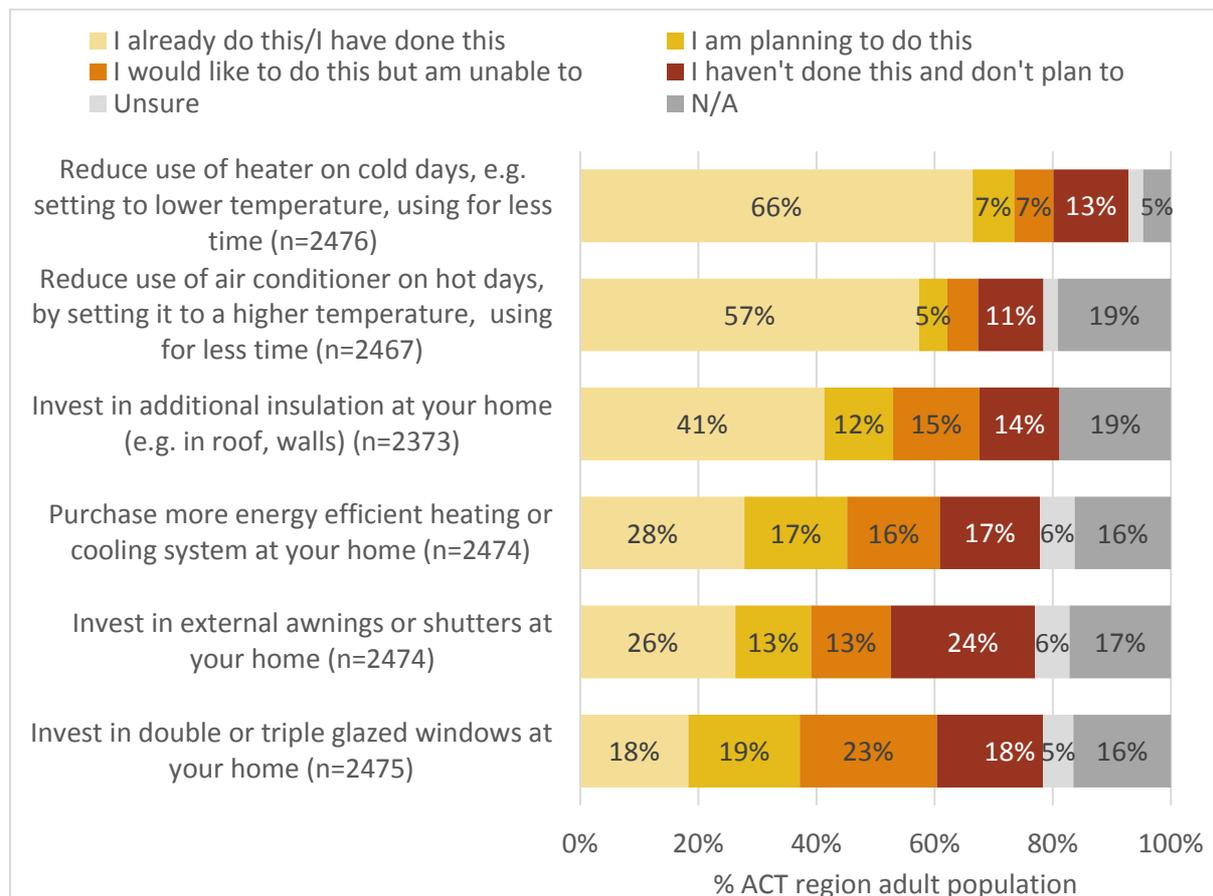


Figure 26 Actions/planned actions to improve performance of residence in hot and cold weather

Table 8 shows the proportion of different groups and people living in different places who reported good and poor performance of their residence in heatwaves, and who had undertaken actions to improve the ‘fitness for purpose’ of their residence. It also shows an index of overall resilience of residential infrastructure to heatwaves, scored from 0 (very low resilience) to 10 (very high resilience) and the proportion with low and high scores on this index (see Appendix 5 for details of how the index was calculated). Overall, just over one-third of residents (35.9%) lived in a residence which was not fit for purpose in heatwaves, while only 10.1% lived in a residence that was optimal for providing a refuge in heatwaves:

- Gender:** There were relatively few differences reported by men and women, although women were slightly more likely to report their home performed poorly in heatwaves than men.

- **Age:** There were large differences between age groups, likely reflecting the types of residences people living in at different life stages. In general, younger people were least likely to report their residence cooling down quickly, most likely to use cooling most days in hot weather, and least likely to have installed additional insulation, double or triple glazing, external awnings or shutters, or more efficient heating and cooling, while being slightly less likely than older people to report reducing use of air conditioning or heaters. Overall, the age group with the poorest performing residential infrastructure was those aged between 25-34, with 46.2% living in residences which perform poorly in heatwaves. People aged 55 and over were much more likely to have invested in adaptation actions that increase resilience of their residence to heatwaves.
- **Cultural background:** Those born overseas in non-English speaking countries were less likely than others to report reducing use of air-conditioning or heating, and to have invested in other actions to improve resilience of their residence to heatwaves.
- **Formal education:** Those with higher levels of education were less likely to report their residence was vulnerable to heatwaves, and more likely to have invested in several actions that increase resilience of the residence to heatwaves. However, even with these differences, 34.2% of those with a university degree reported having a home with poor resilience to heatwaves, compared to 39.0% of those with no university degree.
- **Household structure:** Single parents and those living in sharehouses reported lower residential heatwave resilience than others, with 44.3% in this group living in a home that performed poorly in heatwaves, compared to 36.2% of people living in two parent families or one person households, and 31.5% of people living in a home with a partner but no children. Only 34.2% of those living in single parent or sharehouse households lived in a home that cooled down quickly after a hot day without use of air conditioning.
- **Home status:** People living in a rented residence had the poorest performing residential infrastructure: 51.0% of renters lived in homes that perform poorly in heatwaves, compared to 33.8% of mortgage holders, and 22.3% of those who owned their home outright. Renters, unsurprisingly, were least likely to report investing in adaptation actions such as additional insulation, having very limited ability to make these types of modifications to their homes.
- **Home type:** People living in units/apartments were least likely to report their home had high resilience to heatwaves, with 45.8% reporting their residence performance poorly in heatwaves, compared to 40.9% of those living in townhouses and 32.5% of those living in freestanding houses. In particular, only 35.0% of those in units/apartments reported their home cooling quickly after a hot day, compared to 42.8% of those living in houses, and those living in units/apartments were much less likely to invest in adaptation actions such as additional insulation or external

awnings, many of which may not be easy to achieve (or in some cases may not be permitted by the body corporate).

- **Place:** Four places had a higher than average proportion of homes with poor resilience to heatwaves: Outer Belconnen (47.1% of homes), NSW areas of Queanbeyan, Googong and Jerrabomberra (42.7%), Tuggeranong North (40.8%) and Inner North (40.0%).

Table 8 Vulnerability of residence to heatwaves, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% who agreed				% who have done this						Heatwave resilience – residential infrastructure		
		Home warms up fast in heat	Home cools down quickly	In summer use cooling most days	In winter use heaters regularly	Invested in additional insulation	Invested in double or triple glazing	Invested in external awnings or shutters	Reduce use of air con	Reduce use of heater	Install efficient heating /cooling	Average (mean) score	% with low score (≤4)	% with high score (8+)
Gender	ACT region	53.9%	41.6%	48.3%	70.5%	41.3%	18.3%	26.3%	57.4%	66.4%	27.8%	4.5	35.9%	10.1%
	Male	51.3%	42.5%	47.1%	68.7%	45.4%	18.3%	27.8%	55.9%	62.4%	27.0%	4.7	32.4%	9.2%
	Female	55.7%	41.2%	49.2%	72.4%	37.8%	17.1%	24.5%	59.0%	70.7%	28.8%	4.4	38.8%	11.1%
Age	18-24	62.2%	37.4%	50.2%	64.7%	21.6%	19.8%	18.6%	49.3%	57.8%	18.4%	4.1	40.2%	3.3%
	25-34	62.1%	33.0%	54.9%	69.4%	21.2%	15.3%	11.7%	58.1%	64.2%	20.2%	3.8	46.2%	5.0%
	35-44	60.9%	37.6%	52.8%	77.1%	38.2%	7.8%	21.0%	59.6%	68.4%	28.3%	4.2	42.5%	7.4%
	45-54	51.9%	42.3%	45.8%	71.3%	48.5%	16.2%	27.9%	58.3%	72.1%	33.2%	4.6	33.7%	10.2%
	55-64	46.2%	43.4%	44.1%	74.1%	58.8%	20.1%	36.3%	60.6%	71.0%	32.6%	4.9	29.7%	12.7%
	65-74	39.4%	54.9%	38.8%	62.5%	65.7%	25.5%	48.2%	62.4%	65.1%	39.3%	5.6	20.9%	19.3%
	75 plus	30.0%	66.0%	42.5%	70.3%	61.9%	31.4%	47.6%	53.8%	66.6%	32.0%	6.2	13.7%	29.7%
Cultural background	Australian born	53.7%	40.9%	49.4%	70.7%	42.5%	25.8%	25.1%	58.2%	67.0%	28.0%	4.5	37.0%	10.5%
	Born o/s, English	58.9%	40.8%	45.8%	68.9%	40.5%	19.3%	35.1%	58.0%	68.0%	30.4%	4.4	38.2%	7.5%
	Born o/s, other	49.3%	48.0%	43.3%	71.3%	33.4%	15.6%	22.5%	50.3%	59.7%	22.3%	4.9	24.0%	11.2%
Formal education	No univ. degree	58.5%	36.7%	57.3%	70.8%	37.1%	14.4%	25.3%	54.3%	61.0%	26.6%	4.2	39.0%	6.6%
	Univ. degree	51.5%	44.3%	43.5%	70.3%	43.5%	14.3%	26.7%	59.0%	69.3%	28.3%	4.7	34.2%	12.0%
Household structure	Partner only	47.3%	45.5%	41.3%	65.4%	44.7%	20.5%	32.3%	62.4%	68.2%	28.8%	4.9	31.5%	14.6%
	2 parent family	55.7%	40.0%	56.8%	78.6%	45.2%	20.3%	24.7%	58.8%	69.2%	31.9%	4.4	36.2%	8.6%
	Single parent/ sharehouse	63.7%	34.2%	49.8%	67.4%	28.3%	19.9%	19.9%	51.3%	60.1%	20.2%	3.9	44.3%	3.1%
	1 person h'hold	55.2%	46.5%	39.7%	64.7%	35.7%	14.8%	20.2%	44.1%	60.4%	21.7%	4.5	36.2%	11.4%
Home status	Renting	69.3%	31.7%	47.1%	66.8%	7.3%	10.8%	7.0%	49.2%	58.6%	9.9%	3.5	51.0%	4.7%
	Mortgage	51.8%	43.4%	52.4%	75.6%	49.0%	2.9%	26.8%	61.5%	69.4%	33.9%	4.7	33.8%	9.3%
	Outright owner	38.1%	50.8%	42.2%	66.6%	67.9%	20.6%	47.2%	62.3%	72.5%	39.8%	5.4	22.3%	18.7%
Home type	House	51.4%	42.8%	48.5%	74.3%	50.9%	31.9%	32.4%	56.8%	67.9%	32.0%	4.7	32.5%	10.5%
	Townhouse	62.4%	41.9%	46.6%	67.1%	32.4%	22.5%	19.5%	63.1%	68.5%	25.4%	4.2	40.9%	8.9%
	Unit/apartment	57.5%	35.0%	50.9%	58.0%	8.5%	11.8%	6.8%	56.6%	59.9%	12.0%	4.0	45.8%	9.4%
Place	Belconnen E.	51.5%	36.4%	50.0%	74.1%	55.6%	8.2%	33.6%	53.0%	64.2%	32.5%	4.3	35.6%	5.2%
	Gungahlin	55.6%	43.7%	55.1%	68.3%	35.1%	21.6%	17.0%	61.7%	66.8%	26.8%	4.6	34.7%	9.7%
	Inner Belconnen	51.3%	49.5%	43.3%	66.1%	40.8%	10.3%	26.9%	48.1%	61.3%	26.2%	4.7	28.7%	10.4%
	Inner North	50.4%	41.1%	35.1%	58.8%	30.6%	20.1%	21.4%	55.5%	63.5%	20.3%	4.4	40.0%	14.0%
	Inner South	46.5%	49.7%	42.1%	69.1%	32.3%	24.5%	19.9%	58.2%	65.2%	26.8%	4.9	29.3%	15.0%
	North	53.3%	41.8%	34.1%	69.6%	44.1%	26.2%	20.4%	55.6%	65.7%	23.9%	4.7	36.9%	12.8%
	Out. Belconnen	61.1%	34.5%	55.6%	79.9%	44.7%	24.9%	26.9%	56.0%	71.5%	26.5%	4.0	47.1%	5.7%
	Tuggeranong Nth	59.0%	36.2%	59.8%	74.8%	41.6%	16.3%	33.0%	65.2%	70.1%	36.2%	4.1	40.8%	7.3%
	Tuggeranong Sth	54.1%	39.4%	57.3%	66.7%	48.6%	16.1%	35.2%	60.1%	69.7%	30.5%	4.7	30.6%	7.9%
	Weston Creek	52.3%	43.7%	51.0%	71.8%	48.5%	7.3%	22.2%	59.2%	69.8%	32.4%	4.5	33.9%	8.8%
	Woden Valley	48.9%	48.7%	38.3%	72.4%	48.6%	26.1%	35.6%	58.6%	64.5%	30.6%	5.0	30.8%	16.5%
NSW areas	57.7%	33.1%	45.7%	77.8%	37.1%	30.0%	28.6%	52.0%	63.9%	23.2%	4.3	42.7%	8.8%	

7.5 FINANCIAL VULNERABILITY

Some people are more financially vulnerable to heatwaves than others, as they live in a home that is vulnerable to heatwaves (e.g. having little insulation, heating up quickly or taking a long time to cool down), and have few financial resources to afford to use air conditioning. In total, 52% reported that rising electricity and gas prices have been hard to cope with in recent years (Figure 27); however, only 26% reported not being able to easily afford to keep their home cool in summer, indicating around one quarter of the adult population of the region is financially vulnerable to heatwaves. The majority of households spent between \$1,000 and \$3,000 on electricity and gas bills in the last 12 months (Figure 28).

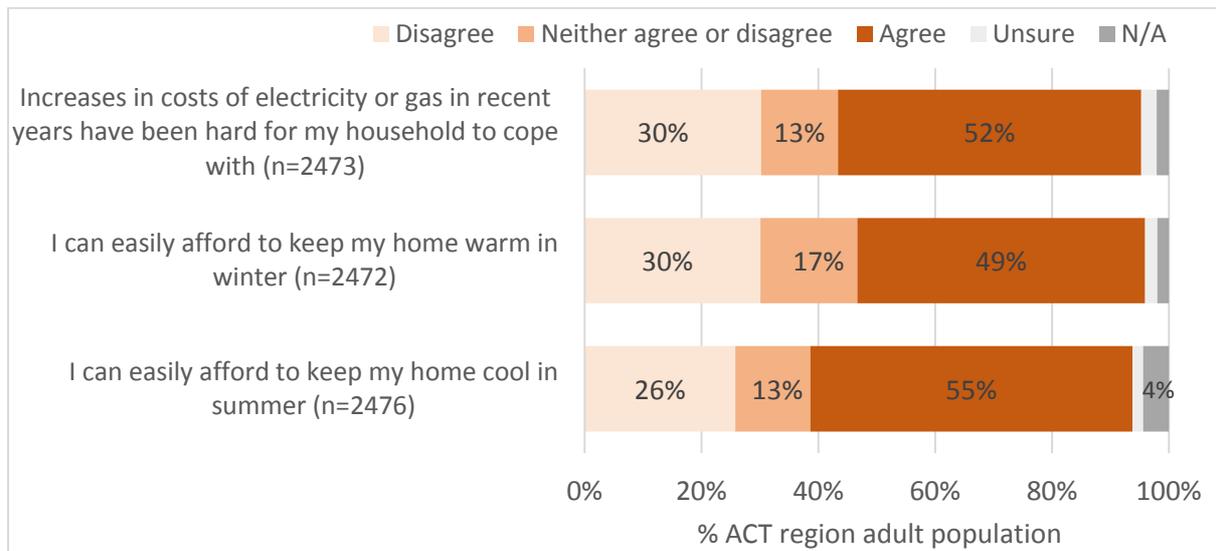


Figure 27 Financial vulnerability to extreme weather (heatwaves and cold snaps)

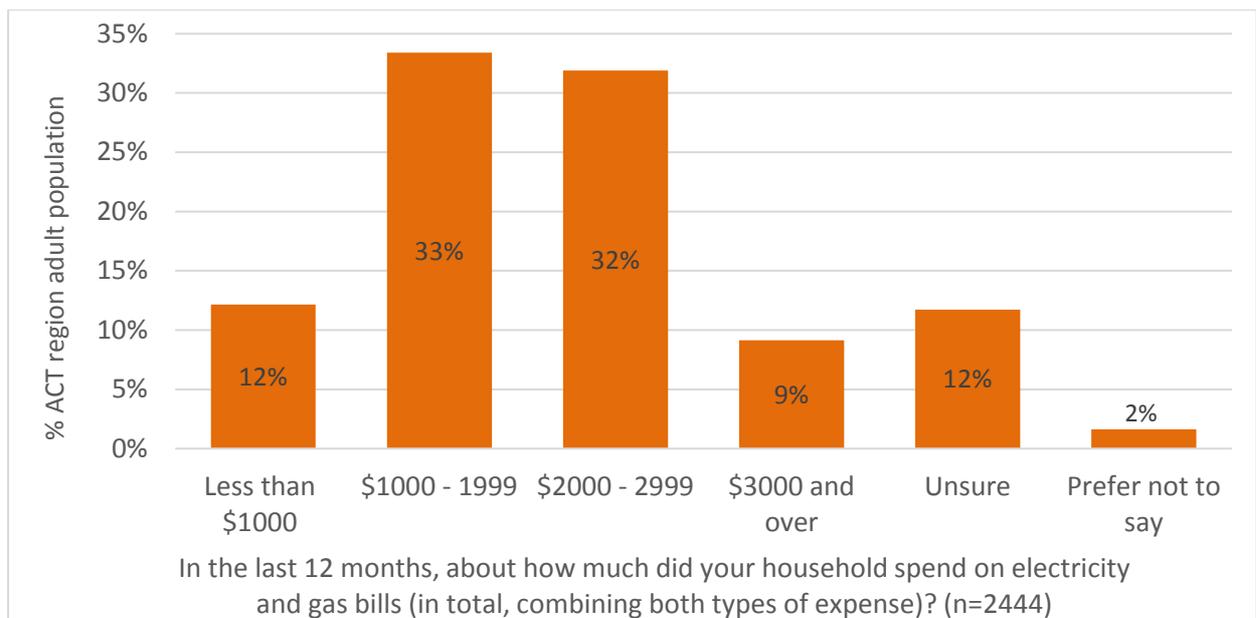


Figure 28 Household expenditure on electricity and gas in the last 12 months

An index of financial resilience to heatwaves was calculated, with each person given a score from 0 (low resilience) to 10 (high resilience) (see Appendix 5 for details of the calculation method). Overall, 32.0% of residents had poor financial resilience, finding it difficult to cope with increasing power costs or to afford to keep their home cool, while 17.9% had high financial resilience to heatwaves, being able to easily afford to keep their home cool (Table 9):

- **Gender:** Women more often reported low financial resilience to heatwaves (35.5%) than men (27.9%), with 51.6% of women reporting they could easily afford to keep their home cool compared to 59.7% of men.
- **Age:** Younger people, and those aged 75 and older, most commonly reported low financial resilience to heatwaves: 42.4% of those aged 18-24 had low capacity to cope with financial costs of increased cooling during heatwaves, with this proportion decreasing in older age groups, and less than 27% of those aged 55-74 finding it difficult to afford to cool their home in heatwaves, increasing to 30.8% of those aged 75 and older.
- **Cultural background:** There were no significant differences in financial resilience to heatwaves of those with different cultural backgrounds.
- **Formal education:** 41.0% of those without a university degree found it hard to afford increased costs associated with using cooling systems during a heatwaves, compared to 27.5% of those with a university degree.
- **Household structure:** Single parents and sharehouse residents were more likely to be financially vulnerable in heatwaves, with 42.0% finding it difficult to afford increased cooling costs.
- **Home status:** Renters were much more financially vulnerable to heatwaves than those with a mortgage and outright owners, with 47.0% of renters finding it difficult to afford cooling costs in heatwaves compared to 27.9% of mortgage holders and 20.7% of outright owners.
- **Home type:** Financial vulnerability to heatwaves differed only a little between home types, although those in units/apartments less likely to report being able to easily afford to keep their home cool (50.2%) compared to townhouse residents (53.3%) and house residents (57.0%).
- **Place:** Those living in Outer Belconnen and Tuggeranong South were most likely to be financially vulnerable to heatwaves, with 37.8% and 38.0% respectively having low financial resilience to heatwaves.

Table 9 Financial vulnerability to heatwaves, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% who agreed			% who spent this					Heatwave resilience - financial		
		Can easily afford to keep home cool	Can easily afford to keep home warm	Have found it hard to cope with increasing power costs	Unsure	Less than \$1,000	\$1,000-\$1,999	\$2,000-\$2,999	\$3000 and over	Average (mean) score	% with low score (≤4)	% with high score (8+)
	ACT region	55.1%	49.3%	51.9%	11.7%	12.2%	33.4%	31.9%	9.1%	5.0	32.0%	17.9%
Gender	Male	59.7%	54.4%	50.1%	10.3%	12.6%	33.1%	32.2%	9.8%	5.3	27.9%	20.6%
	Female	51.6%	44.9%	52.9%	12.8%	11.6%	34.1%	31.5%	8.6%	4.8	35.5%	15.5%
Age	18-24	36.1%	35.7%	47.8%	33.5%	16.0%	27.3%	12.9%	5.6%	4.4	42.4%	9.3%
	25-34	54.7%	46.2%	50.9%	12.1%	14.9%	37.3%	28.4%	5.1%	4.9	33.8%	16.8%
	35-44	55.7%	47.1%	57.0%	6.6%	8.1%	32.7%	39.7%	11.9%	4.8	34.0%	15.3%
	45-54	58.0%	52.5%	53.2%	5.5%	8.5%	36.7%	38.2%	10.2%	5.1	30.2%	17.9%
	55-64	62.3%	56.8%	47.4%	9.0%	10.6%	31.0%	36.4%	12.6%	5.5	27.0%	23.6%
	65-74	69.1%	62.8%	48.9%	5.8%	16.3%	31.3%	34.8%	10.3%	5.8	23.7%	27.8%
	75 plus	57.3%	53.8%	58.5%	9.5%	12.6%	36.7%	30.5%	10.6%	5.0	30.8%	18.9%
Cultural background	Australian born	54.8%	48.7%	51.4%	11.9%	11.5%	33.2%	32.5%	9.2%	5.0	31.6%	17.6%
	Born o/s, English	55.6%	48.7%	52.5%	9.7%	16.0%	31.3%	32.1%	9.1%	5.0	35.5%	21.3%
	Born o/s, other	57.4%	55.7%	54.3%	13.8%	12.2%	38.6%	26.0%	8.5%	5.0	30.0%	14.6%
Formal education	No univ. degree	46.6%	42.1%	59.4%	15.7%	11.3%	28.8%	33.3%	8.6%	4.3	41.0%	11.7%
	Univ. degree	59.7%	53.2%	47.9%	9.7%	12.7%	35.9%	31.1%	9.4%	5.4	27.5%	21.0%
Household structure	Partner only	60.4%	57.8%	45.1%	7.9%	14.6%	37.9%	32.0%	6.8%	5.5	26.6%	25.3%
	2 parent family	57.8%	47.7%	57.7%	8.5%	7.7%	27.1%	41.3%	14.0%	4.9	33.0%	14.5%
	Single parent/ sharehouse	37.3%	34.7%	51.6%	27.1%	11.4%	30.9%	20.9%	6.5%	4.2	42.0%	8.4%
	1 person h'hold	57.0%	49.4%	56.4%	10.4%	21.6%	45.9%	15.1%	4.4%	4.9	33.6%	17.2%
Home status	Renting	40.1%	35.4%	55.6%	14.5%	14.8%	37.6%	23.7%	6.9%	4.1	47.0%	11.6%
	Mortgage	62.4%	52.2%	54.0%	7.9%	8.4%	34.5%	37.2%	11.2%	5.2	27.9%	17.3%
	Outright owner	67.0%	64.5%	46.1%	7.8%	15.0%	30.6%	37.0%	9.1%	5.9	20.7%	27.3%
Home type	House	57.0%	49.6%	52.1%	11.6%	9.6%	29.1%	36.0%	11.9%	5.1	30.1%	18.1%
	Townhouse	53.3%	50.2%	53.2%	10.2%	13.2%	42.2%	30.0%	3.4%	4.8	38.4%	17.3%
	Unit/apartment	50.2%	50.9%	50.2%	10.9%	22.2%	47.0%	15.8%	2.9%	4.9	34.4%	17.8%
Place	Belconnen E.	55.5%	55.1%	48.4%	7.8%	13.9%	38.5%	31.6%	8.2%	5.1	27.8%	18.2%
	Gungahlin	56.1%	50.2%	52.6%	14.3%	13.5%	33.8%	28.5%	8.1%	5.0	31.2%	13.4%
	Inner Belconnen	53.8%	51.9%	42.1%	16.6%	16.5%	29.4%	26.7%	8.5%	5.4	33.3%	27.9%
	Inner North	53.5%	43.9%	40.5%	17.4%	14.0%	35.3%	21.1%	7.2%	5.4	29.6%	23.1%
	Inner South	62.0%	60.9%	44.9%	13.1%	21.9%	32.9%	27.6%	4.1%	5.5	23.2%	23.5%
	North	57.9%	52.2%	39.1%	13.3%	13.7%	37.5%	24.9%	8.9%	5.6	26.9%	28.8%
	Out. Belconnen	53.2%	45.9%	57.2%	8.8%	8.0%	27.2%	43.2%	11.0%	4.7	37.8%	18.1%
	Tuggeranong Nth	52.8%	48.0%	56.8%	6.7%	5.0%	35.6%	41.9%	8.6%	4.7	34.4%	11.0%
	Tuggeranong Sth	52.1%	42.1%	64.9%	10.0%	10.8%	32.1%	35.4%	9.9%	4.5	38.0%	14.1%
	Weston Creek	56.6%	53.8%	52.5%	9.5%	11.9%	29.3%	38.6%	10.1%	5.1	31.3%	18.3%
	Woden Valley	54.9%	54.5%	57.0%	7.2%	14.5%	39.6%	28.7%	9.4%	4.9	31.8%	13.4%
NSW areas	56.0%	41.0%	57.0%	11.8%	4.9%	32.6%	35.6%	14.9%	4.9	32.1%	14.3%	

7.6 HEATWAVE COPING STRATEGIES

A person's residence is not the only place that is an important refuge during heatwaves. People can use a range of strategies to cope with heatwaves, which may vary in their effectiveness. To better understand this, survey participants were asked how easy or difficult they found it to cope with heatwaves overall, and whether they used any of a number of common strategies to cope with heatwaves.

While more than half of the population (59%) found it easy to cope with heatwaves when they happen, 25% reported that they could not easily cope, and 17% 'neither agreed or disagreed', indicating they sometimes find it difficult to cope with heatwaves (Figure 29). As shown in Table 10, those least confident in their ability to cope with heatwaves were those living in rented accommodation, with only 46% finding it easy to cope with heatwaves compared to the average of 59%. Those who were born overseas in non-English speaking countries and those aged under 35 were also significantly more likely to find it difficult to cope with heatwaves, although living in a rented residence was the single biggest predictor of difficulty coping, more so than a person's age or cultural background. Those aged 65 and over, and those who owned their home outright, were most likely to report finding it easy to cope in a heatwave.

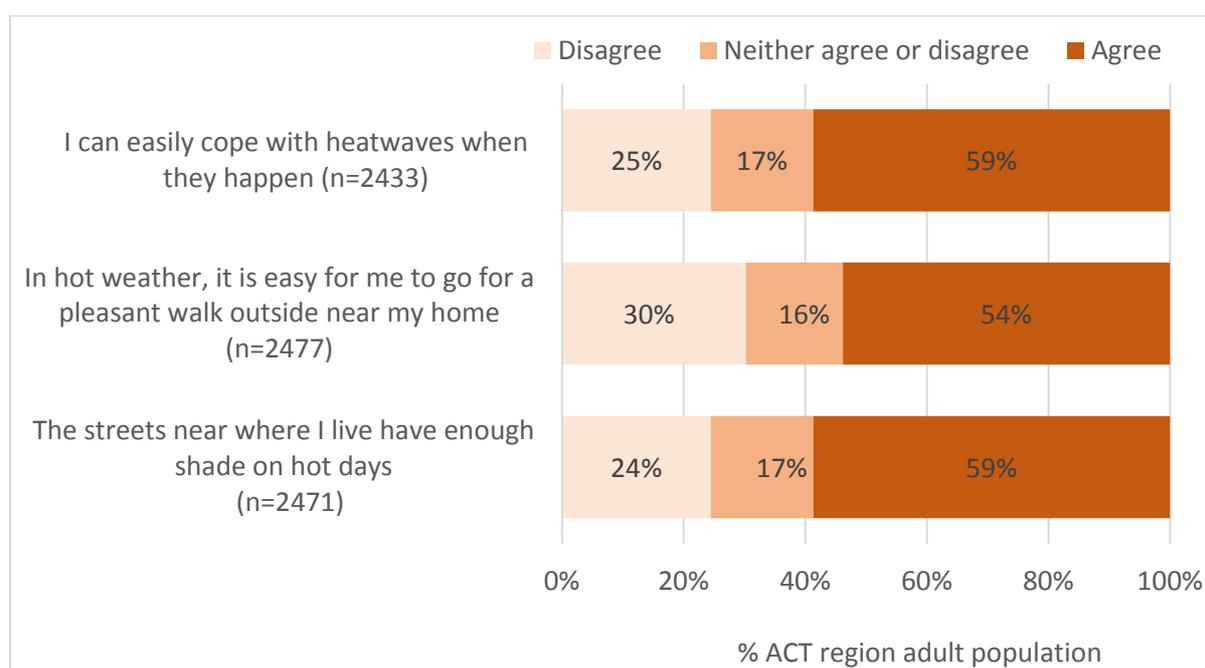


Figure 29 Ability to spend time outside in the local neighbourhood on hot days

The heatwave strategies most commonly used to cope during a heatwave (Figure 30) were staying indoors and drinking water more than usual, with almost all people reporting doing these two things. Most people also reduced strenuous activity such as exercise, housework and gardening, and used fans or air conditioning to stay cool in their home. Many – 42% - changed the time they exercised during a heatwave (and a further 37% sometimes did this).

Other heatwave coping strategies were used less often, with several being ‘sometimes’ strategies, in others words they were coping strategies that many people use sometimes, but few use regularly, to cope with heatwaves:

- 58% sometimes go to a cool indoor place such as a shopping centre to cope with a heatwave, while 25% regularly do this
- 41% sometimes change the type of exercise they do, while only 17% regularly do this
- 53% sometimes go to an outdoor area with shade during a heatwave while 11% regularly do this
- 40% sometimes go to a swimming pool while 15% regularly do this
- 43% sometimes travel to a cooler location such as the coast while 8% do this regularly
- 25% stay at work extra hours and 8% regularly do this.

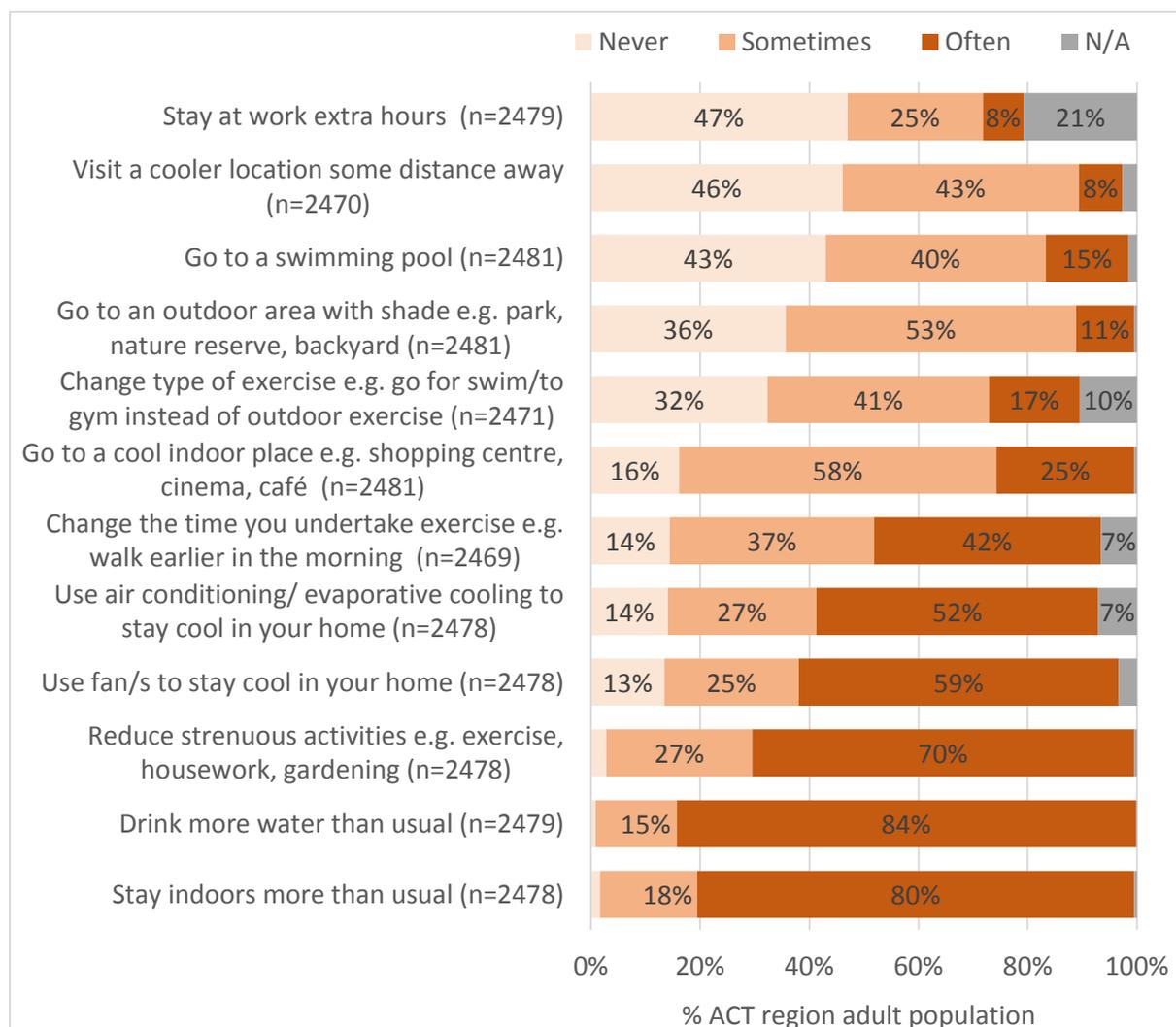


Figure 30 Actions residents take to cope during a heatwave

In some cases, a person might not use a particular strategy, or use it only occasionally, because they find it difficult to use that strategy. To better understand this, participants were asked how difficult or easy they found it to use different heatwave coping strategies (Figure 31). The strategies found easiest were those used most often: drinking more water, using fans, staying indoors, and using air-conditioning or evaporative cooling, with less than 20% finding any of these actions difficult to use.

The actions more people reported being most difficult to use were staying at work extra hours (difficult or very difficult for 37%), visiting a cooler location some distance away (difficult for 47%), and going to a swimming pool (26%).

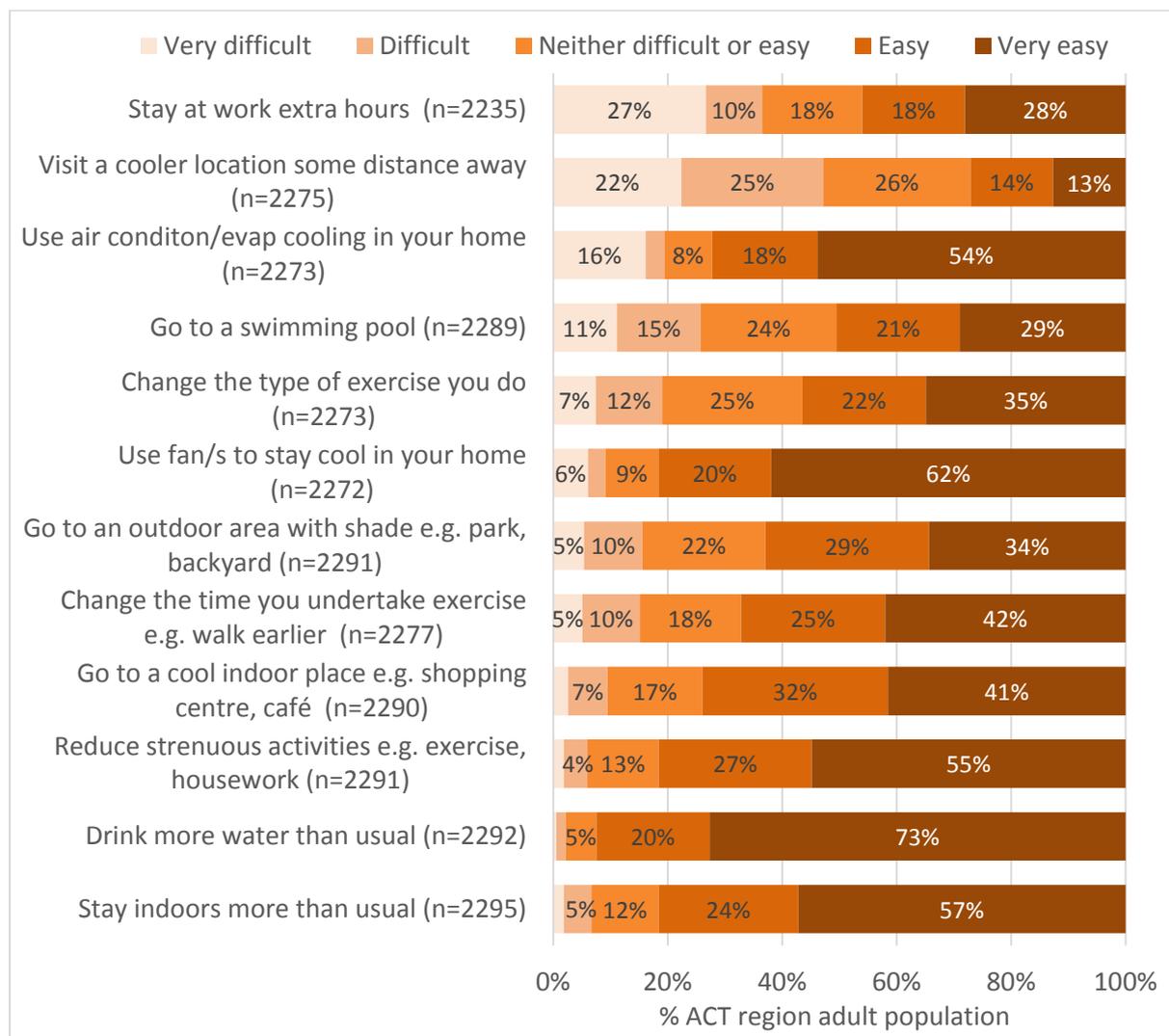


Figure 31 Difficulty in coping during a heatwave

As shown in Table 10, beyond differences in overall ability to cope with heatwaves, there were a number of differences in coping strategies used:

- Walking outside with enough shade: Those living in Gungahlin and NSW areas were much less likely to feel there was enough shade in their local area on hot days and

that it was easy to go for a walk in their local area on hot days; this was also more commonly reported by younger people and those living in townhouses or apartments. Those living in the Inner South, Inner North, North and Woden Valley were most likely to report finding it easy to walk outside on hot days.

- Older people (aged 75 and over) were least likely to find it easy to travel to a cooler location, and to a lesser extent those aged under 25. Those aged 55-64 were more likely to report finding it easy to travel to a cooler location, and often lived in the Inner North and Tuggeranong North regions.
- Older people aged 75 and older were most likely to find it difficult to go to the pool, followed by those living in Tuggeranong South and Outer Belconnen, and single people. Those in the Inner North, North and South were most likely to find it easy to go to the pool.
- Difficulty using additional air conditioning was most commonly reported by those living in single person households, in the Inner North and North, those aged 75 and older, and those who were renting their residence.
- Difficulty going to an outdoor area with shade was most commonly reported by Gungahlin residents and by those born overseas in non-English speaking countries (of which there was a higher proportion than average living in Gungahlin), and by those aged 75 and older. This likely reflects more than one contributing factor, with lack of available shade contributing in Gungahlin, and lack of physical ability to get outside more likely to contribute to those aged 75 and older having difficulties.
- Those aged 75 and older, those living in single person households, NSW and Outer Belconnen residents, and those born overseas in non-English speaking countries were more likely to report experiencing difficulty going to a cool indoor place such as a shopping centre to escape heat.

An index of 'heatwave coping' was developed to identify whether any groups or places had overall lower or higher ability to cope with heatwaves, based on the combinations of coping strategies used (see Appendix 5 for details of calculation of the index). Overall, 15.9% of residents had poor access to coping strategies, while 24.0% had good access to a range of coping strategies (Table 10):

- **Gender:** Women were slightly more likely than men to have poor access to heatwave coping strategies (18.3% compared to 12.9%).
- **Age:** Young people reported slightly poorer access to coping strategies, and older people better access.
- **Cultural background:** Those who were born overseas in non-English speaking countries more commonly had poor access to coping strategies than others, with 27.2% having poor access, and only 16.8% very good access.

- **Formal education:** Those with lower levels of formal education were more likely to have poor access to coping strategies (20.5%) compared to those with a university qualification (13.5%).
- **Household structure:** Single parents and those living in sharehouses were more likely to report poor accessing to coping strategies than others (21.6%).
- **Home status:** 26.1% of renters had poor access to coping strategies, compared to 11.6% of mortgage holders and 10.2% of outright owners.
- **Home type:** People living in unit/apartments were more likely to have poor access to coping strategies (22.5%) than those living in townhouses (14.4%) or houses (13.9%).
- **Place:** There were fewer differences between regions: although those in Outer Belconnen and Tuggeranong South were more likely to report finding it difficult to visit a pool than others, their access to other coping strategies meant they were not more likely to have overall poor access to heatwave coping strategies than others. Those living in Inner Belconnen were more likely to report poor access to coping strategies (22.6%) than those in other places.

Table 10 Heatwave coping strategies, by region and socio-demographic group

		% who agreed			% who do this sometimes or often						% who find it difficult to do this						Heatwave res'ce – coping s		
		Have shade on hot days	Can walk outside in heat	Easily cope with heat	Travel to cooler region	Go to pool	Use cooling	Visit outdoor shade	Shift exercise time	Go to cool indoor place	Travel to cooler region	Go to pool	Use cooling	Visit outdoor shade	Shift exercise time	Go to cool indoor place	Average (mean) score	% low score (≤4)	% high score (8+)
	ACT region	53.8%	47.1%	58.7%	52.7%	56.3%	84.8%	64.1%	78.9%	83.7%	47.2%	25.8%	19.4%	15.6%	15.2%	9.5%	6.4	15.9%	24.0%
Gender	Male	54.7%	50.4%	63.9%	52.1%	49.6%	84.9%	66.3%	82.4%	79.5%	43.0%	23.7%	18.0%	15.1%	13.1%	10.1%	6.6	12.9%	25.9%
	Female	53.2%	44.4%	54.1%	63.8%	62.4%	84.9%	62.2%	86.4%	87.6%	50.6%	27.0%	20.5%	15.9%	17.3%	8.4%	6.2	18.3%	22.5%
Age	18-24	48.5%	43.6%	51.9%	59.0%	68.3%	79.8%	62.5%	84.4%	87.7%	53.1%	27.7%	22.1%	18.8%	18.1%	5.9%	6.1	18.4%	20.5%
	25-34	44.7%	37.0%	51.9%	60.1%	61.9%	88.4%	62.5%	81.7%	92.9%	43.0%	24.5%	17.6%	14.8%	18.0%	7.8%	6.2	17.2%	21.0%
	35-44	50.1%	43.7%	59.4%	55.2%	69.4%	84.2%	69.0%	85.1%	89.4%	44.8%	21.8%	19.2%	17.9%	17.7%	11.0%	6.3	16.6%	19.4%
	45-54	58.0%	49.0%	60.8%	45.8%	60.3%	83.9%	67.7%	86.5%	84.1%	48.0%	25.9%	20.1%	11.6%	14.1%	11.0%	6.5	15.5%	26.5%
	55-64	57.3%	55.4%	62.5%	32.9%	45.1%	87.3%	66.2%	85.1%	80.2%	40.9%	25.7%	16.6%	10.7%	9.9%	6.4%	6.5	16.3%	28.4%
	65-74	61.3%	56.7%	67.1%	21.2%	32.4%	85.0%	61.8%	88.7%	70.1%	50.2%	25.5%	17.4%	16.7%	9.2%	11.0%	6.7	12.0%	30.4%
	75 plus	74.8%	60.9%	67.6%	52.8%	24.2%	83.7%	47.8%	81.8%	56.4%	63.3%	39.6%	27.9%	21.8%	11.2%	17.2%	6.8	9.0%	32.1%
Cultural background	Australian born	54.5%	47.7%	60.2%	47.5%	57.4%	85.6%	64.4%	85.0%	84.4%	47.5%	24.6%	19.0%	14.4%	14.5%	8.8%	6.5	14.2%	25.7%
	Born o/s, English	53.0%	46.4%	55.4%	59.2%	53.0%	83.7%	62.1%	81.2%	80.5%	48.3%	28.2%	19.7%	15.5%	16.6%	11.2%	6.2	18.1%	19.9%
	Born o/s, other	49.3%	43.0%	50.1%	51.1%	52.9%	80.9%	65.6%	85.5%	82.6%	42.5%	31.1%	21.8%	25.0%	18.4%	12.7%	5.8	27.2%	16.8%
Formal education	No univ. degree	51.1%	43.9%	54.4%	53.4%	52.6%	86.0%	60.9%	79.8%	83.2%	50.7%	31.4%	18.5%	20.2%	16.3%	11.8%	6.1	20.5%	22.5%
	Univ. degree	55.2%	48.7%	60.9%	46.3%	58.2%	84.2%	65.8%	87.0%	84.1%	45.4%	22.8%	19.9%	13.1%	14.6%	8.3%	6.5	13.5%	24.8%
Household structure	Partner only	56.5%	50.3%	63.8%	60.8%	41.4%	84.9%	63.6%	86.9%	78.0%	45.1%	27.6%	19.3%	15.0%	10.4%	9.0%	6.6	14.6%	28.8%
	2 parent family	54.3%	46.5%	59.0%	56.7%	71.8%	88.1%	69.8%	84.1%	88.0%	46.1%	21.6%	14.8%	14.3%	18.4%	8.6%	6.4	13.5%	20.7%
	Single parent/ sharehouse	49.2%	43.5%	49.9%	36.9%	63.0%	80.2%	59.8%	83.7%	89.6%	50.8%	27.5%	23.3%	17.4%	18.0%	8.7%	5.9	21.6%	20.2%
	1 person h'hold	49.7%	43.1%	53.5%	58.4%	40.8%	79.9%	51.7%	78.5%	78.6%	52.7%	31.8%	30.6%	19.5%	14.5%	16.3%	6.1	19.8%	26.5%
Home status	Renting	51.3%	42.9%	45.6%	56.6%	58.8%	79.8%	62.3%	82.1%	91.5%	50.2%	31.4%	26.5%	19.2%	18.5%	11.4%	5.7	26.1%	18.9%
	Mortgage	51.6%	46.2%	63.7%	40.1%	64.4%	88.0%	67.3%	84.1%	85.9%	43.9%	22.4%	15.3%	14.3%	16.1%	8.8%	6.6	11.6%	23.6%
	Outright owner	61.0%	53.2%	66.6%	52.2%	40.3%	86.2%	62.2%	87.8%	71.4%	46.4%	23.5%	17.4%	13.8%	9.2%	9.0%	6.8	10.2%	31.2%
Home type	House	55.7%	47.8%	60.5%	52.7%	57.4%	85.2%	64.7%	84.4%	81.2%	46.0%	25.3%	18.7%	14.3%	15.3%	10.0%	6.5	13.9%	23.5%
	Townhouse	44.8%	44.5%	58.3%	57.1%	51.4%	84.3%	62.9%	86.3%	87.7%	46.0%	27.4%	17.1%	17.7%	12.1%	8.0%	6.5	14.4%	26.3%
	Unit/apartment	52.2%	47.4%	54.9%	53.5%	57.7%	84.8%	63.2%	85.8%	90.7%	51.5%	25.5%	23.0%	16.2%	15.1%	8.7%	6.1	22.5%	27.0%
Place	Belconnen E.	54.4%	49.8%	64.4%	53.3%	58.7%	88.3%	63.6%	80.7%	80.8%	45.6%	28.7%	20.4%	12.8%	16.3%	11.1%	6.6	8.9%	25.2%
	Gungahlin	33.1%	34.0%	53.8%	52.5%	54.1%	87.5%	60.0%	84.3%	88.3%	52.4%	25.6%	14.9%	23.6%	16.3%	8.5%	6.2	18.2%	21.7%
	Inner Belconnen	59.8%	51.2%	58.4%	54.8%	54.2%	80.0%	67.0%	86.5%	81.9%	45.9%	24.3%	21.8%	13.6%	12.0%	7.1%	6.3	22.6%	25.5%
	Inner North	70.6%	53.9%	62.0%	48.6%	56.8%	75.4%	73.5%	84.5%	91.6%	39.1%	21.2%	29.5%	9.7%	12.9%	5.8%	6.4	16.7%	26.2%
	Inner South	73.6%	68.6%	58.9%	62.6%	51.6%	80.8%	61.0%	86.8%	79.3%	48.4%	19.1%	20.4%	12.8%	15.1%	10.2%	6.6	15.6%	31.5%
	North	69.1%	59.3%	57.6%	51.0%	67.8%	79.3%	69.9%	83.4%	86.5%	45.7%	21.5%	29.6%	10.1%	15.4%	9.7%	6.4	15.4%	23.8%
	Out. Belconnen	53.5%	43.7%	59.1%	59.8%	52.3%	88.3%	60.3%	78.4%	82.7%	51.3%	33.0%	15.5%	18.4%	18.6%	14.4%	6.3	15.4%	19.6%
	Tuggeranong Nth	62.0%	47.0%	62.5%	44.3%	59.2%	88.8%	63.4%	86.0%	82.7%	38.8%	22.5%	16.1%	11.7%	16.2%	8.1%	6.6	13.0%	26.2%
	Tuggeranong Sth	53.2%	45.0%	63.1%	53.1%	51.3%	90.4%	65.2%	87.3%	79.3%	49.3%	33.2%	9.1%	12.9%	11.7%	6.7%	6.5	14.0%	24.1%
	Weston Creek	45.7%	39.4%	55.0%	44.6%	60.9%	88.2%	62.7%	84.6%	80.6%	55.0%	26.5%	14.4%	18.3%	20.6%	9.5%	6.3	14.0%	20.4%
	Woden Valley	65.1%	53.4%	56.5%	56.7%	50.1%	81.3%	62.2%	84.7%	78.8%	44.7%	23.4%	21.0%	15.2%	12.1%	7.6%	6.5	17.2%	29.1%
	NSW areas	32.2%	39.4%	58.2%	55.1%	66.1%	85.4%	64.9%	85.4%	87.2%	46.1%	27.7%	27.9%	17.8%	16.3%	16.8%	6.2	13.8%	18.8%

7.7 HEATWAVES IN THE WORKPLACE

The way a person's workplace manages work conditions in heatwaves can contribute significantly to heatwave resilience. Those who were employed were asked about the nature of their work, and how their workplace managed hot weather.

Heatwaves are a higher risk for workers who work outdoors, and those who have physically demanding jobs. The majority of workers in the ACT – 95% - work completely or mainly indoors, and only 5% work mainly or completely outdoors (Figure 32). In total, 15% of workers had jobs that were moderately or very demanding physically, and a further 27% had jobs that were sometimes physically demanding (Figure 33).

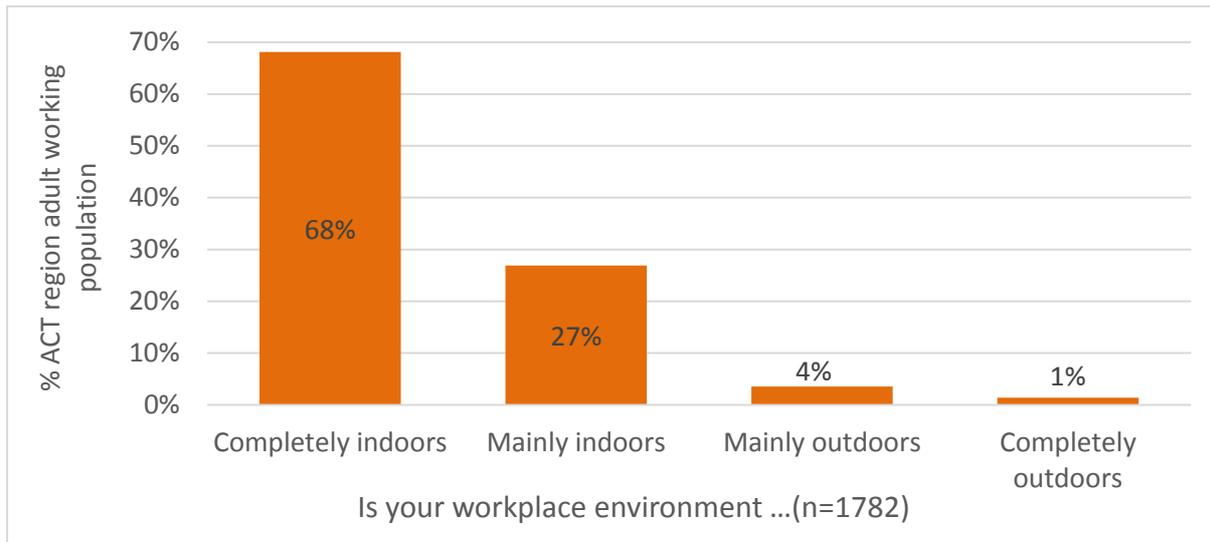


Figure 32 Proportion of ACT workers who worked indoors and outdoors

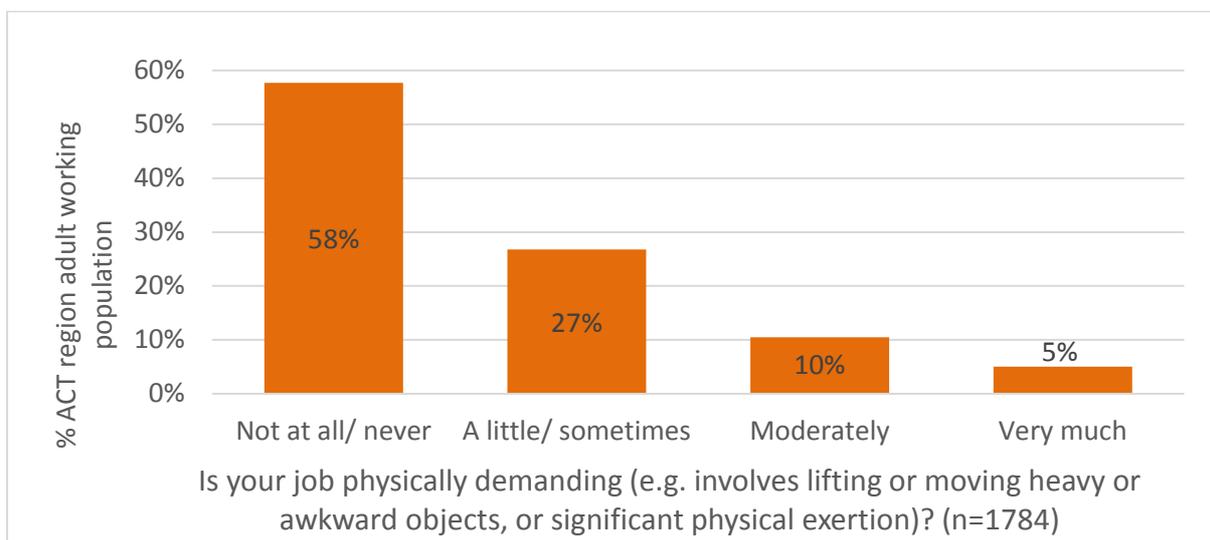


Figure 33 Proportion of working ACT population with physically demanding jobs

Sixty two per cent of ACT workers were satisfied with the measures their workplace used to reduce risk of heat illness during very hot weather, and 58% were able to adjust their working conditions as needed to cope with hot weather (Figure 34). However, 52% reported

that their workplace did not have guidelines for working during very hot weather, and few – 7% - had attended training courses about prevention of heat-related illnesses at work.

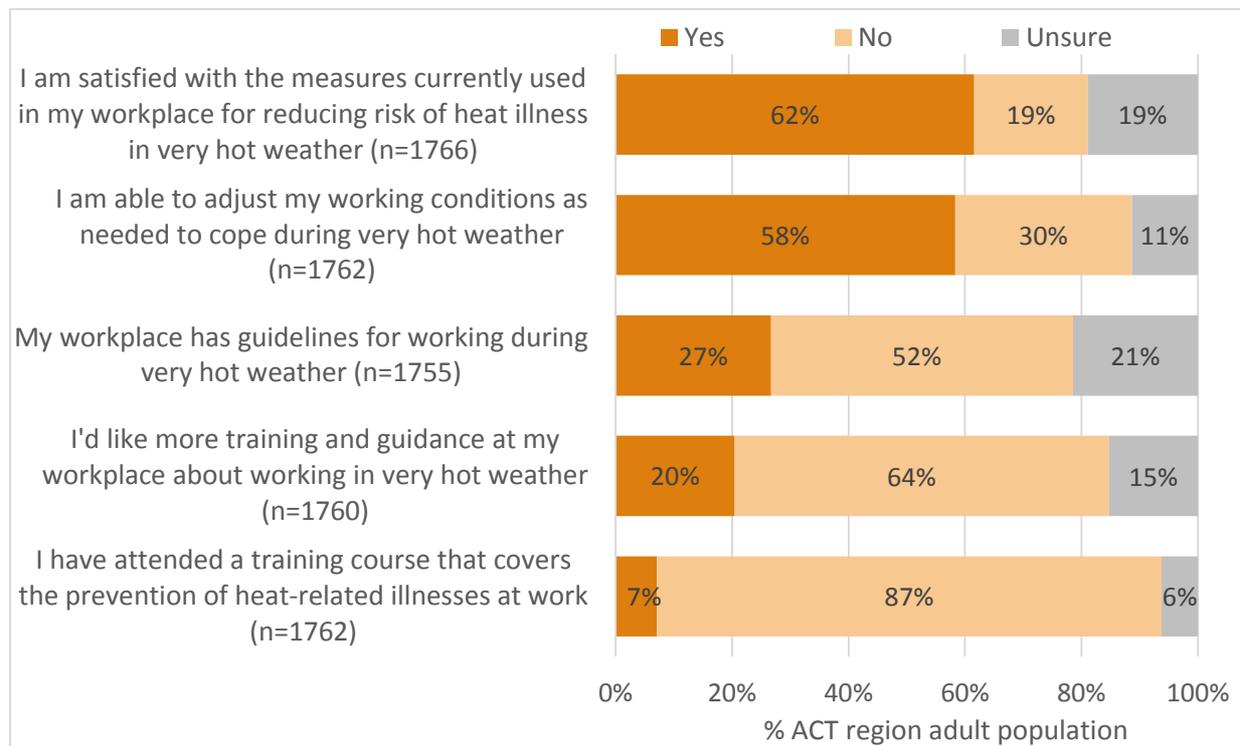


Figure 34 Workplace preparedness and action to reduce heatwave impacts

An overall work-related heat resilience index was calculated from 0 to 10, where a score of 0 would indicate a person worked in a job in which they were both highly exposed to the effects of heatwaves (e.g. working outdoors and/or in physically demanding work), and their workplace had poor implementation of practices to reduce impacts of heatwaves. A score of 10 would indicate a person worked in a job with little to no exposure to heatwave impacts, and their workplace had good policies and practices in place to reduce the risk of negative impacts of heatwaves for their workers. As shown in Table 11, only 12.6% of workers were employed in workplaces with poor heatwave management and high exposure, while 36.6% had workplaces with high resilience to heatwaves:

- **Gender:** There were few differences between men and women, although men were somewhat more likely to be employed in workplaces with high resilience to heatwaves (39.0% compared to 34.1%)
- **Age:** There were strong age-related patterns of exposure to heatwave risk at work. Just over a quarter of workers aged 18-24 had low heatwave resilience at work and were at risk of negative impacts from heatwaves; this dropped to 10% or less for workers aged 25 to 64. While there were not large numbers of workers aged 65 or older, amongst this group there were many outdoor workers and physical labourers, and 24.0% had low heatwave resilience. This indicates a need to consider the needs

of both younger and older workers who have high vulnerability to heatwaves at work.

- **Cultural background:** There were no significant differences between people of different cultural backgrounds.
- **Formal education:** Those who did not have a university qualification were more often employed in jobs with high vulnerability to heatwaves (19.6%) compared to those with a university qualification (8.1%).
- **Household structure:** Single parents and those living in sharehouses were more commonly employed in jobs with high vulnerability to heatwaves (21.7%) than those in other types of households.
- **Home status:** There were few differences between renters, mortgage holders and outright owners.
- **Home type:** There were few differences between those living in houses, townhouses and unit/apartments.
- **Place:** There were few differences between places, although those living in Weston Creek were much more likely to have a workplace with high heatwave resilience than those in other places.
- **Workplace type or industry:** Those working in government workplaces were less likely to have high vulnerability to heatwaves and more likely to have high resilience to heatwaves. Those working in construction, mining, manufacturing or transport (24.6%); retail, hospitality or tourism (38.4%); and agriculture, fishing or forestry (36.5%) were most likely to have jobs in which they were highly vulnerable to the effects of heatwaves.
- **Work type:** Those working in casual jobs (27.4%) or self-employed (23.2%) were more likely than others to have poor heatwave resilience in their workplace than those working part-time (15.8%) or full-time (7.6%).

Table 11 Workplace management of heatwaves, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% who work mainly or completely outdoors	% with physically demanding jobs	% who answered 'yes'					Heatwave resilience - workplace		
				Have attended hot weather training	Workplace has guidelines for hot weather	Would like more hot weather guidance	Satisfied with hot weather measures	Able to adjust working conditions during hot weather	Average (mean) score	% low score (≤4)	% high score (8+)
	ACT region	5.0%	15.5%	7.1%	26.7%	20.5%	61.6%	58.3%	6.6	12.1%	36.6%
Gender	Male	7.5%	15.9%	9.9%	30.1%	16.8%	66.8%	64.4%	6.7	12.3%	39.0%
	Female	2.9%	15.5%	4.8%	24.0%	23.0%	57.2%	53.2%	6.6	12.1%	34.1%
Age	18-24	5.0%	35.7%	9.8%	22.0%	32.1%	52.8%	51.1%	5.8	25.8%	22.9%
	25-34	4.6%	12.4%	7.4%	24.1%	22.7%	60.2%	55.7%	6.7	10.5%	38.0%
	35-44	3.7%	11.7%	6.8%	29.1%	16.9%	63.9%	60.0%	6.8	10.0%	38.4%
	45-54	4.2%	11.4%	5.2%	29.1%	15.9%	66.2%	61.3%	6.9	7.8%	40.5%
	55-64	6.4%	11.0%	5.3%	31.7%	17.7%	66.1%	62.1%	6.9	7.6%	42.1%
	65-74	13.2%	16.2%	7.1%	19.8%	18.8%	55.2%	75.4%	6.3	24.0%	38.4%
Cultural background	Australian born	5.1%	16.1%	6.9%	26.3%	19.3%	62.3%	57.7%	5.8	12.7%	37.1%
	Born o/s, English	4.0%	12.0%	4.6%	23.7%	22.5%	62.3%	57.6%	6.6	10.4%	32.5%
	Born o/s, other	5.7%	14.5%	11.8%	35.0%	28.5%	54.7%	65.8%	6.6	8.6%	39.4%
Formal education	No univ. degree	8.4%	26.4%	8.8%	28.6%	23.4%	62.1%	57.7%	6.9	19.6%	32.5%
	Univ. degree	3.2%	9.8%	6.1%	25.8%	19.0%	61.3%	58.8%	6.3	8.1%	38.8%
Household structure	Partner only	6.9%	14.0%	6.5%	29.1%	15.9%	63.8%	58.4%	6.8	9.9%	39.2%
	2 parent family	4.1%	10.7%	7.1%	27.4%	18.2%	64.2%	62.0%	6.7	9.4%	39.9%
	Single parent/sharehouse	3.9%	30.8%	6.3%	21.4%	34.3%	52.5%	50.8%	6.8	21.7%	25.1%
	1 person h'hold	4.7%	11.1%	10.5%	26.1%	19.2%	59.5%	56.5%	6.0	13.7%	34.3%
Home status	Renting	5.3%	18.0%	7.6%	22.5%	23.5%	59.2%	53.3%	6.7	13.8%	32.6%
	Mortgage	4.1%	11.8%	6.8%	29.2%	16.5%	63.4%	61.2%	6.5	9.5%	41.3%
	Outright owner	7.1%	14.0%	6.8%	28.2%	19.6%	64.2%	62.6%	6.8	12.2%	37.1%
Home type	House	5.1%	16.4%	7.2%	27.9%	21.0%	61.7%	58.5%	6.7	13.0%	36.8%
	Townhouse	6.2%	15.0%	8.1%	28.7%	18.8%	63.3%	57.1%	6.6	8.5%	38.8%
	Unit/apartment	3.5%	11.6%	6.4%	21.7%	18.9%	61.3%	60.6%	6.7	9.6%	36.5%
Place	Belconnen E.	2.6%	17.8%	7.3%	25.1%	20.7%	53.9%	56.4%	6.7	12.3%	34.5%
	Gungahlin	3.2%	18.3%	7.7%	28.9%	24.5%	62.8%	58.4%	6.6	13.8%	37.9%
	Inner Belconnen	4.0%	14.0%	5.7%	24.3%	25.7%	58.7%	57.4%	6.6	11.0%	32.1%
	Inner North	4.6%	12.1%	7.7%	21.3%	19.7%	59.2%	61.1%	6.6	10.4%	40.8%
	Inner South	3.2%	9.7%	4.7%	22.2%	13.8%	63.4%	57.9%	6.8	8.2%	36.1%
	North	4.6%	12.5%	3.7%	21.7%	17.1%	59.2%	58.4%	6.7	10.7%	38.7%
	Out. Belconnen	4.4%	13.9%	6.5%	32.8%	15.1%	61.9%	58.3%	6.7	11.9%	32.2%
	Tuggeranong Nth	9.0%	20.0%	7.8%	31.7%	20.8%	65.0%	60.1%	6.6	15.3%	39.5%
	Tuggeranong Sth	8.4%	19.2%	5.7%	23.5%	17.3%	68.1%	61.9%	6.6	12.9%	28.1%
	Weston Creek	4.8%	10.6%	11.6%	33.9%	16.9%	70.3%	62.5%	6.4	10.9%	60.8%
	Woden Valley	5.3%	14.8%	9.8%	33.1%	26.2%	60.4%	54.2%	7.3	9.7%	38.1%
NSW area	5.3%	16.7%	7.3%	20.5%	21.0%	54.6%	53.7%	6.7	14.2%	30.8%	

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% who work mainly or completely outdoors	% with physically demanding jobs	% who answered 'yes'					Heatwave resilience - workplace		
				Have attended hot weather training	Workplace has guidelines for hot weather	Would like more hot weather guidance	Satisfied with hot weather measures	Able to adjust working conditions during hot weather	Average (mean) score	% low score (≤4)	% high score (8+)
Workplace type	ACT Government (n=558)	4.3%	12.2%	8.0%	50.3%	26.2%	75.7%	63.4%	6.8	9.1%	38.8%
	NSW or Commonwealth Government (n=499)	2.0%	4.0%	4.7%	27.5%	17.3%	79.1%	68.6%	7.2	3.9%	49.8%
Industry of work	Construction, mining, manufacturing or transport (n=64)	24.8%	29.5%	21.1%	52.5%	23.5%	85.2%	81.9%	6.0	24.6%	35.7%
	Retail, hospitality or tourism (n=170)	2.9%	51.5%	10.2%	25.3%	41.4%	59.8%	52.0%	5.2	38.4%	13.9%
	Education (n=225)	5.5%	18.2%	4.4%	38.9%	35.9%	73.7%	62.3%	6.2	13.4%	19.8%
	Health or social Services (n=169)	3.7%	21.7%	8.8%	28.2%	28.5%	75.0%	62.8%	6.4	11.8%	26.3%
	Agriculture, fishing or Forestry (n=39)	31.1%	35.8%	13.3%	45.7%	12.0%	82.8%	70.8%	5.5	36.5%	19.5%
	Professional services (n=161)	2.5%	5.1%	6.1%	26.3%	15.2%	75.2%	73.8%	7.0	4.6%	46.8%
	Other (n=94)	18.7%	32.6%	5.0%	19.3%	24.5%	62.3%	56.8%	5.6	32.5%	21.5%
Work type	Self-employed (n=163)	11.1%	23.6%	4.5%	24.5%	23.5%	79.9%	69.6%	6.1	23.2%	27.6%
	Full-time (n=1154)	3.2%	9.3%	7.4%	36.1%	21.4%	77.7%	66.3%	6.9	7.6%	41.1%
	Part-time (n=344)	5.0%	20.8%	7.9%	33.6%	28.0%	75.1%	67.1%	6.5	15.8%	35.9%
	Casual (n=236)	11.5%	35.2%	9.1%	28.1%	38.6%	66.8%	58.2%	5.5	27.4%	16.8%

7.8 IMPLICATIONS FOR SUCCESSFUL CLIMATE CHANGE ADAPTATION

This section considers what our findings about resilience to heatwaves mean for achieving resilience to climate change in the ACT.

Reflecting on past experiences and studies suggests that elderly people are more vulnerable to heatwaves, however our results are mixed: elderly people were less aware of health problems that might be exacerbated in heatwaves, but also typically lived in residences that were more ‘fit for purpose’ for heatwaves than younger residents. Older people were more vulnerable financially when aged over 75, and when aged over 75 also found it harder to engage in multiple heatwave coping strategies, highlighting a need to support this group in particular. Those who were working past the aged of 65 often had jobs with high exposure to heatwaves, increasing vulnerability amongst this sub-group of older people.

However, when going beyond health-focused vulnerability to identify how multiple vulnerabilities intersect using an **integrated** approach, younger people also emerged as often highly vulnerable to heatwaves, through a mixture of having specific health issues known to worsen in hot weather, greater exposure to negative social behaviours in heatwaves, living in residences that performed poorly in heatwaves, and being more likely to work in jobs that have exposure to heat. This highlights a need to consider strategies for supporting younger people in heatwaves as well as the elderly.

Renters were one of the most vulnerable groups, living in residences that were often performing poorly in heatwaves and also having often low financial resilience to heatwaves. Poor performance of residential infrastructure was perhaps the greatest challenge, highlighting that **inclusive** strategies should enable adaptation to heatwaves amongst this highly vulnerable group, which includes many younger people with fewer financial resources, and who in general have lower capacity to implement **resourceful** and **flexible** responses to cope with heatwaves, due to limited financial capacity and limited ability to make changes to their residence or workplaces. These residents need to be supported through provision of options for adapting to heatwaves that are **viable** for their circumstances – being affordable within their often more limited financial capacity, and not requiring people to rely on modifications.

The findings suggest several areas where social systems can be supported to build more **robust** capacity to adapt to change. In particular, it is important to identify strategies to support renters and those living in Outer Belconnen, groups in which many residents had multiple vulnerabilities to heatwaves, compounding overall vulnerability.

The findings suggest that many residents have capacity to cope with heatwaves in terms of using responses such as increased use of air conditioning, with the exception of some members of key groups noted above. However, this can be considered a potentially maladaptive strategy as it draws on financial resources (reducing **contingency** resources available for adaptation to other effects of climate change) and contributes to use of fossil

fuels. Addressing this requires identifying ways to improve the 'fitness for purpose' of much of the residential infrastructure in the region. This is particularly important for units and apartments, many of which have poor performance in heatwaves.

8. RESILIENCE TO STORMS, FLOOD AND BUSHFIRE

An increase in frequency and severity of climate-related emergencies and disasters is one of the projected effects of climate change in the ACT region. In particular, there is predicted to be an increased risk of damage from severe storms, from flash flooding associated with heavy rainfall, and increased risk of bushfire. Some of these extreme events are also associated with drought, such as higher bushfire risk. Work to reduce exposure to these events often focuses on the landscape scale through implementing actions such as land use planning, bushfire risk reduction activities (e.g. fuel reduction burning), and other centrally planned actions. This type of centralized action to reduce risk is common to disaster preparedness and management planning and policy across Australia and in other countries (Booth and Williams 2012).

In addition to landscape-scale action, there is scope for residents to take action to build resilience to storms, flood and bushfire, and investing in these types of household-scale adaptation actions can further reduce risk (Booth and Williams 2012). This section examines household-scale resilience to extreme weather events.

8.1 UNDERSTANDING HOUSEHOLD RESILIENCE TO EXTREME WEATHER EVENTS

Building resilience to extreme weather events through successful adaptation requires understanding the types of actions that can reduce risk. A number of studies have identified what factors predict greater success in recovering from disaster events; many of these have highlighted the importance of having access to the resilience resources examined earlier in this report, particularly social support, good community services, financial resources and psychological resources such as self-efficacy (e.g. Cutter et al. 2010, Masten and Obradovic 2008).

In addition to having access to individual and community resilience resources, a range of actions at the household scale can assist people to reduce the risk of damage from storms, floods and fire at their property. These include:

- Being aware of risk, with awareness a key first step in taking action to prepare for events and engage in adaptation action that reduces risk.
- Engaging in preparedness actions. These can take many forms, and different types of preparedness are relevant for different people. However, the following types of preparation are important indicators of proactive adaptation action:
 - Planning: Actively making a plan, and regularly reviewing that plan with others in the household, to ensure all in the household know what to do in an emergency.
 - Insurance: Investing in appropriate levels of insurance to reduce financial cost of repairing damages if a person is affected by an emergency event, or otherwise investing in building savings to draw on in emergencies.

- Reducing residential exposure: Engaging in actions to reduce the risk of damage in an event, for example through removing overhanging vegetation, reducing flammable material near the house, clearing gutters, preparing an emergency kit, and safely storing important documents.

Reflecting this, one of the key objectives of bushfire management in the ACT is to improve community preparedness for bushfires, through both supporting growth in awareness of bushfire risk and increase in adoption of actions that can minimize risk from bushfires (ACT Government 2014). However, there is a noted lack of studies examining the effectiveness of these types of actions in building resilience to climate change. For example, in a review of the role of insurance in climate change adaptation, Booth and Williams (2012) concluded that insurance had an important role to play in successful adaptation, but that many aspects of its role remained poorly studied or understood, with a need to invest in further work.

Household resilience to extreme weather events was assessed by examining:

- Awareness of risk and self-rated preparedness
- Household insurance coverage for extreme weather events, and
- Engagement in specific preparedness actions that can reduce risk of damage to the home in extreme weather events.

8.2 RESILIENCE TO EXTREME WEATHER EVENTS – OVERALL FINDINGS

Many households in the ACT region have low resilience to extreme weather events. The average resilience score was 4.4 out of a possible 10, with low levels of preparedness, and for some groups low levels of insurance coverage, driving this low resilience. Overall, 39.4% had low resilience to extreme weather events, and only 6.0% had high resilience. As Table 12 shows, the groups most likely to have low resilience to extreme weather events (compared to the average of 39.4%) were:

- Renters (62.0%)
- Those living in units/apartments (60.7%)
- Single parents and those living in sharehouses (56.0%)
- Younger people, with low resilience more common amongst those aged 18 to 24 (52.6%) and 25 to 34 (56.1%)
- Those born overseas in non-English speaking countries (52.0%)
- Women (45.5% had low resilience, compared to 32.2% of men)
- Those living in three places with high concentrations of units and apartments compared to some other parts of the ACT region: the Inner North (52.7%), Inner South (47.4%) and North (49.6%).

Low resilience amongst renters and those living in units/apartments was driven both by low levels of insurance coverage, and by low levels of investment in preparing for extreme

weather events. In some cases the low insurance coverage may be due to body corporates having insurance for building damage in extreme events, with some survey respondents potentially not identifying as having personal insurance due to this. However, even excluding low levels of insurance, preparedness was lower amongst renters and those living in units/apartments compared to others. High resilience was somewhat more common than the average of 6.0% for the following groups:

- Those aged 65 to 74 (10.0%) and 75 and older (9.4%)
- Those living in Weston Creek (9.9%) and Tuggeranong North (9.3%).

The next sections examine each aspects of resilience to extreme weather events in more detail.

Table 12 Overall resilience to extreme weather events, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		Extreme weather resilience index		
		Average (mean) score	% low score (≤4)	% high score (8+)
	ACT region	4.4	39.4%	6.0%
Gender	Male	4.8	32.2%	7.3%
	Female	4.1	45.5%	4.6%
Age	18-24	3.8	52.6%	5.5%
	25-34	3.5	56.1%	2.3%
	35-44	4.3	41.3%	4.7%
	45-54	5.0	30.2%	7.4%
	55-64	5.0	29.8%	7.3%
	65-74	5.4	22.1%	10.0%
	75 plus	5.3	19.3%	9.4%
Cultural background	Australian born	4.5	38.2%	6.6%
	Born o/s, English	4.5	37.5%	4.9%
	Born o/s, other	3.7	52.0%	1.6%
Formal education	No univ. degree	4.6	38.6%	7.5%
	Univ. degree	4.4	39.8%	5.1%
Household structure	Partner only	4.7	34.8%	7.7%
	2 parent family	4.5	36.0%	5.2%
	Single parent/ sharehouse	3.6	56.0%	4.3%
	1 person h'hold	4.4	39.9%	5.2%
Home status	Renting	3.3	62.0%	3.5%
	Mortgage	4.7	31.4%	5.7%
	Outright owner	5.2	27.3%	8.4%
Home type	House	4.7	34.9%	6.8%
	Townhouse	4.4	37.4%	4.7%
	Unit/ apartment	3.4	60.7%	3.2%
Place	Belconnen E.	4.8	34.9%	8.2%
	Gungahlin	4.3	43.2%	3.7%
	Inner Belconnen	4.4	40.4%	8.6%
	Inner North	3.8	52.7%	3.7%
	Inner South	3.9	47.4%	2.7%
	North	3.8	49.6%	3.1%
	Out. Belconnen	4.4	41.1%	6.4%
	Tuggeranong Nth	4.9	30.7%	9.3%
	Tuggeranong Sth	4.9	30.3%	7.5%
	Weston Creek	4.7	33.7%	9.9%
	Woden Valley	4.5	37.0%	4.6%
	NSW areas	4.7	33.5%	5.1%

8.3 AWARENESS OF RISK AND SELF-RATED PREPAREDNESS

Different parts of the ACT have differing levels of flood and bushfire risk, and some areas are gazetted as higher risk zones. The large majority of residents answered 'no' when asked if their home was in a gazetted flood zone (71%) or bushfire zone (53%); 10% reported living in a gazetted bushfire zone and 2% in a gazetted flood zone, while 27% were unsure whether they lived in a gazetted flood zone and 37% were unsure if they lived in a gazetted bushfire zone (Figure 35). These results suggest many people have low awareness of the risk of fire or flood where they live, given the high proportion of people who answered that they were unsure. Around 20,000 of the ACT region's approximately 165,000 homes are located in bushfire risk zones - just over 12% - while 10% of residents reporting living in gazetted bushfire zones, suggesting that while most people are aware, there are some people living in bushfire zones who are unaware of this zoning.

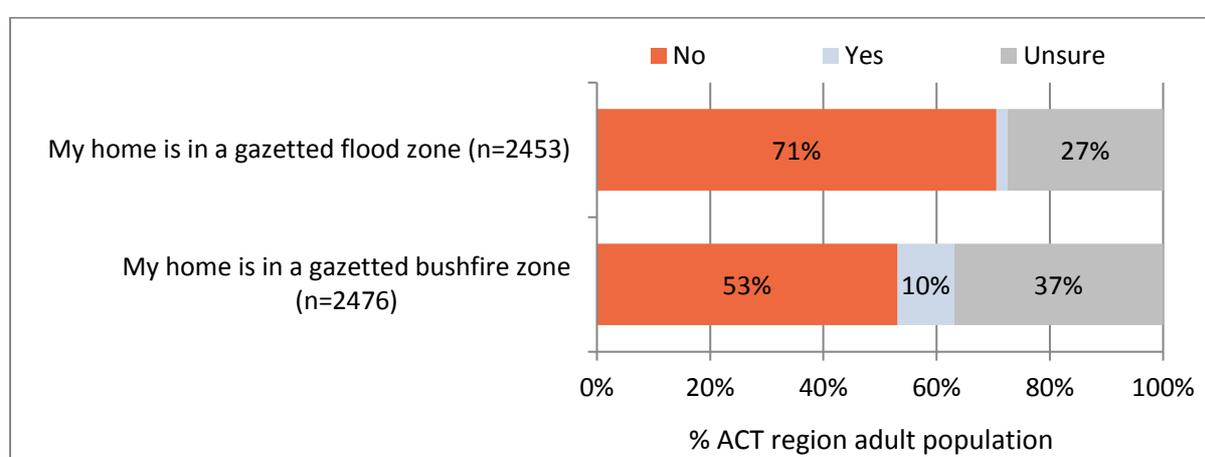


Figure 35 Perception of whether residence is located in a gazetted flood or bushfire zone

More generally, residents were asked whether they believed their home could be easily damaged by severe storms or if there was a high risk of bushfire where they lived (Figure 36). Responses were split, with 37% feeling their home could be easily damaged by severe storms and 38% disagreeing, while 35% felt there was a high risk of bushfire where they lived and 42% did not. This again suggests that for some groups there is low awareness of risk, with many homes in the ACT at risk of damage in storms in particular. As shown in Table 13, those least likely to view themselves as at risk from storms were younger people and the very elderly, those born overseas in non-English speaking countries, those living in units/apartments, Gungahlin, Inner North and Inner South residents (with these places having higher concentrations of units/apartments than most other places).

When asked if they were well prepared for bushfires or for severe storms if they happened near their homes (Figure 36), 26% felt well prepared for bushfire and 49% did not (with the remaining 25% being unsure or neutral), while 30% felt well prepared for a severe storm and 42% did not. This suggests low levels of preparedness amongst many residents for the expected higher incidence of storms and bushfire in future. Those who were younger, born

overseas in non-English speaking countries, and renting, were least likely to report being well-prepared (Table 13).

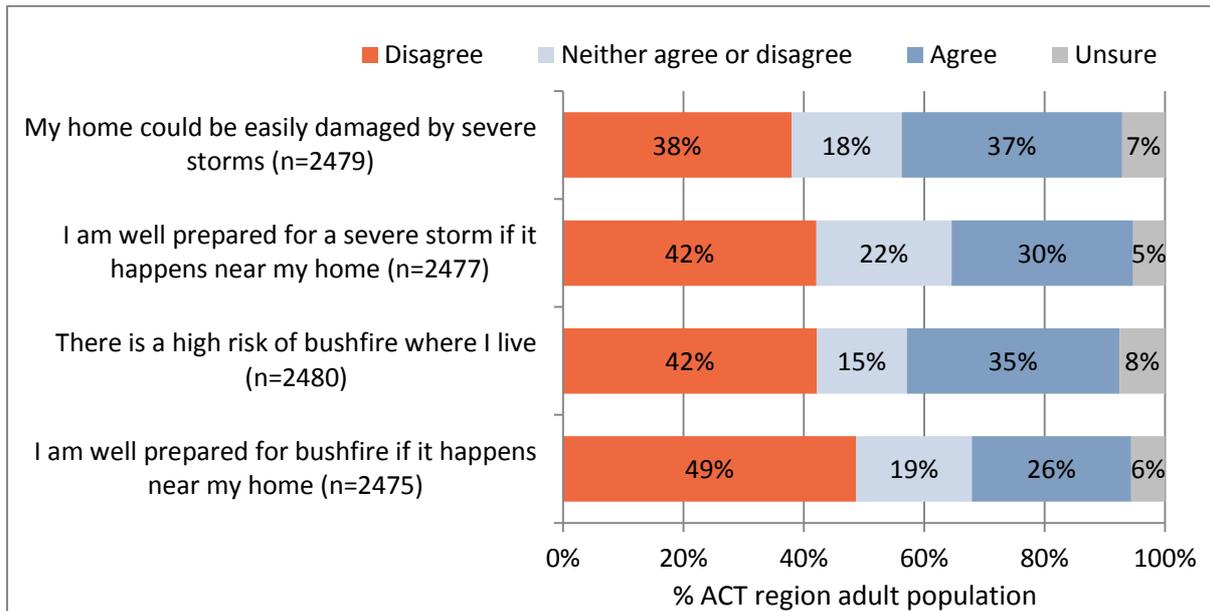


Figure 36 Perception of risk of and overall preparedness for storms and bushfires

Table 13 Resilience to extreme weather events, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% who agreed				Has no insurance coverage for...				% who answered 'yes'						
		Home at risk from storm	Prepared for storm	High risk of bush-fire	Prepared for bush fire	Flood due to rising water	Flash flooding from storm	Bush-fire	Storm damage	Vegetation cleared	Gutters cleaned	Knows what to do in bush fire	Important docs stored safely	Knows what to do in storm/flood	Has emergency kit	Has discussed emergency plan
	ACT region	36.6%	30.1%	35.4%	26.5%	25.5%	19.4%	17.3%	16.1%	48.2%	45.5%	39.2%	35.4%	28.9%	20.2%	13.1%
Gender	Male	34.4%	35.3%	30.8%	30.9%	27.1%	19.0%	16.9%	15.4%	51.7%	50.6%	46.7%	36.9%	36.5%	25.2%	14.7%
	Female	38.6%	25.2%	39.3%	22.3%	23.8%	19.3%	17.1%	16.2%	44.8%	41.4%	32.2%	33.8%	21.9%	15.5%	11.2%
Age	18-24	22.5%	30.1%	38.0%	25.2%	27.5%	25.9%	26.4%	25.3%	41.1%	33.3%	21.1%	32.8%	12.5%	9.5%	10.5%
	25-34	33.3%	21.1%	27.4%	16.4%	33.8%	30.7%	29.0%	28.0%	36.1%	29.6%	26.5%	27.5%	16.2%	13.4%	8.4%
	35-44	44.3%	27.4%	42.3%	23.6%	24.9%	19.7%	16.1%	16.2%	43.0%	39.2%	38.5%	32.2%	27.4%	15.0%	14.8%
	45-54	43.6%	37.6%	39.5%	32.7%	23.3%	15.8%	14.3%	12.1%	52.9%	52.8%	47.7%	36.9%	37.4%	26.1%	14.4%
	55-64	42.4%	33.8%	33.4%	34.1%	18.8%	9.8%	6.5%	5.5%	60.5%	59.7%	47.0%	39.3%	39.8%	22.9%	18.0%
	65-74	37.7%	38.7%	34.3%	36.9%	19.8%	8.1%	5.1%	3.3%	60.4%	64.1%	55.0%	42.8%	44.1%	30.5%	17.1%
	75 plus	24.5%	28.4%	27.3%	24.5%	25.3%	13.5%	10.3%	8.4%	64.0%	66.7%	60.4%	51.6%	45.4%	45.5%	8.5%
Cultural background	Australian born	38.1%	32.0%	37.1%	27.3%	25.6%	19.3%	17.2%	16.1%	48.7%	45.5%	40.2%	34.9%	29.6%	19.9%	13.0%
	Born o/s, English	37.2%	26.6%	33.6%	28.7%	21.8%	16.1%	12.5%	11.1%	51.0%	49.3%	42.6%	41.5%	32.5%	22.9%	16.5%
	Born o/s, other	24.8%	20.4%	23.7%	15.9%	30.6%	25.1%	24.4%	23.6%	40.3%	39.4%	26.8%	30.8%	18.9%	18.5%	8.9%
Formal education	No univ. degree	37.1%	33.4%	38.2%	31.4%	27.7%	23.3%	21.0%	19.4%	48.9%	46.2%	41.0%	36.7%	30.8%	19.9%	15.9%
	Univ. degree	36.5%	28.3%	33.8%	23.8%	24.4%	17.4%	15.4%	14.4%	47.7%	45.0%	38.3%	34.8%	28.0%	20.4%	11.6%
Household structure	Partner only	35.3%	32.2%	31.3%	28.4%	26.6%	18.1%	15.5%	14.3%	50.5%	49.8%	46.8%	38.4%	34.4%	25.2%	15.2%
	2 parent family	42.2%	30.5%	40.3%	27.1%	20.1%	14.6%	11.5%	10.8%	52.4%	48.0%	37.7%	35.1%	29.5%	17.4%	15.7%
	Single parent/ sharehouse	31.7%	25.5%	35.8%	21.9%	29.8%	27.5%	27.0%	26.5%	38.8%	37.9%	26.2%	29.3%	15.4%	12.3%	7.6%
	1 person h'hold	29.7%	29.2%	31.2%	24.8%	34.6%	28.0%	28.2%	24.7%	40.0%	32.6%	40.2%	35.9%	30.9%	26.2%	4.7%
Home status	Renting	32.6%	22.6%	29.8%	19.9%	51.8%	50.9%	49.3%	48.6%	32.4%	23.4%	26.9%	28.5%	16.3%	13.9%	8.3%
	Mortgage	41.9%	32.1%	38.8%	27.0%	13.7%	6.0%	4.2%	2.5%	51.8%	48.8%	41.4%	35.5%	31.7%	18.3%	15.5%
	Outright owner	36.4%	34.3%	35.5%	32.5%	16.9%	6.7%	3.6%	2.0%	60.3%	64.2%	51.4%	43.1%	41.5%	30.2%	15.3%
Home type	House	40.0%	31.8%	38.6%	28.0%	18.4%	11.4%	8.8%	7.8%	52.1%	53.7%	43.0%	37.7%	32.4%	21.3%	14.5%
	Townhouse	35.0%	30.3%	33.5%	25.5%	29.7%	24.0%	22.6%	20.5%	51.1%	36.0%	37.1%	29.8%	25.6%	19.2%	12.7%
	Unit/ apartment	24.3%	25.3%	23.7%	21.4%	50.9%	47.9%	48.0%	45.6%	30.0%	20.3%	26.8%	30.1%	20.0%	15.0%	7.8%
Place	Belconnen E.	46.1%	31.4%	22.1%	29.2%	21.3%	17.0%	12.8%	12.7%	53.1%	58.0%	51.3%	36.5%	31.8%	22.6%	13.6%
	Gungahlin	27.8%	27.5%	28.4%	24.0%	22.6%	17.1%	16.6%	15.1%	41.8%	33.0%	34.9%	33.7%	19.9%	16.2%	12.0%
	Inner Belconnen	32.3%	27.6%	34.3%	24.3%	28.5%	22.0%	21.6%	19.6%	47.0%	44.1%	39.1%	37.1%	25.2%	20.0%	10.4%
	Inner North	28.5%	23.2%	21.9%	14.9%	37.7%	29.6%	28.8%	27.2%	41.3%	38.8%	32.8%	33.9%	27.5%	21.7%	9.1%
	Inner South	22.4%	30.0%	13.8%	25.5%	34.0%	26.7%	26.6%	21.9%	51.2%	46.9%	29.4%	34.5%	21.3%	15.2%	6.8%
	North	40.9%	23.7%	32.3%	15.8%	27.6%	23.2%	20.0%	20.0%	47.6%	53.4%	28.3%	31.0%	22.9%	14.5%	9.2%
	Out. Belconnen	40.8%	30.7%	43.7%	28.2%	22.7%	17.5%	12.9%	12.4%	46.4%	48.4%	37.6%	35.3%	30.5%	18.1%	10.8%
	Tuggeranong Nth	52.7%	33.0%	47.6%	30.7%	22.3%	16.3%	12.2%	12.4%	52.5%	58.6%	52.3%	40.0%	36.6%	26.5%	22.9%
	Tuggeranong Sth	40.2%	36.3%	42.6%	34.5%	23.9%	17.0%	12.2%	12.2%	51.1%	51.6%	47.8%	36.1%	36.0%	21.1%	19.1%
	Weston Creek	39.5%	32.0%	59.2%	29.6%	15.6%	11.1%	7.3%	6.9%	58.4%	51.9%	45.4%	34.9%	29.9%	25.3%	14.4%
	Woden Valley	40.7%	33.6%	32.7%	25.5%	22.6%	14.7%	13.9%	12.7%	47.9%	45.0%	40.3%	35.3%	31.9%	23.4%	9.5%
	NSW areas	38.3%	32.5%	44.6%	34.0%	28.4%	22.2%	21.9%	20.1%	50.8%	36.6%	36.3%	36.0%	39.1%	21.2%	16.3%

8.4 INSURANCE COVERAGE

Survey participants were then asked if they had insurance coverage for their home and/or contents for four types of event (Figure 37): flooding due to rising water in rivers, lakes or dams; flash flooding from storm run-off; bushfire; or storm damage from heavy rain, wind or hail. Not all residents will need insurance coverage for these different events, however some are relevant to people across all types of residential location (such as storm damage from heavy rain, wind or hail).

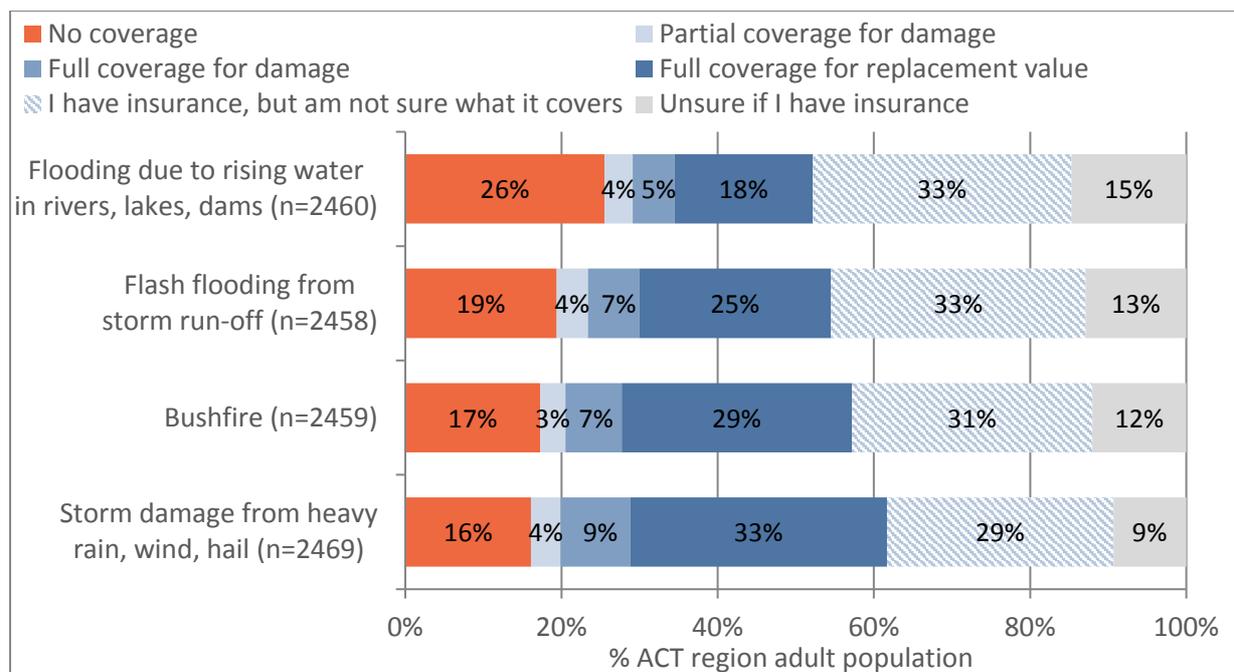


Figure 37 Type of insurance coverage held for extreme weather events

One quarter of people (26%) reported having no coverage for flooding due to rising water, an event that is primarily relevant for people who live in areas where this is a risk; 19% are not covered by insurance for flash flooding from storm run-off, 17% have no insurance coverage for bushfire, and 16% had no insurance for storm damage. A significant proportion – between 9% and 15% for each type of insurance – were unsure if their household had insurance, while around one-third knew they had insurance but were unsure what it covered. While 27% had full or partial coverage for damage from flooding due to rising water, 36% for flash flooding, 39% for bushfire and 46% for storm damage, the findings suggest low levels of awareness of types of insurance held and the extent to which insurance held covered different events. This may mean that many residents are likely to be underinsured for damage likely to result from storms, floods or fire; underinsurance has been regularly identified as a problem during processes of recovery from major disaster events, including the 2003 Canberra bushfires (Booth and Williams 2012). Our findings suggest high likelihood of underinsurance amongst a substantial proportion of the population, given the high level of uncertainty and lack of knowledge of insurance policies reported by survey participants.

The groups least likely to have insurance were those aged under 35, those born overseas in non-English speaking countries, single parents and those living in sharehouses, single person households, and those in the Inner North and Inner South (Table 13). However, the biggest predictor of lack of insurance was being a renter and living in a unit/apartment, with around half of renters and those living in units/apartments reporting having no insurance for any of the events listed. This may in part reflect that many people living in rented accommodation will have no home insurance and will only have contents; some of these may have misread the survey question and answered based on having no home insurance. Similarly, many unit/apartment dwellers have building insurance through their body corporate rather than holding it themselves. However, even given this (and future studies should separate questions about home and contents insurance), the results suggest there are likely low rates of contents insurance amongst these two groups. Table 14 compares insurance coverage reported by renters living in different types of dwellings, and shows that more than 45% of those living in townhouses and more than 55% of those in townhouses reported having no insurance compared to around 75% of those living in units and apartments. Those who have a mortgage or were outright owners, meanwhile, much less commonly reported having no insurance, ranging from less than 10% of those living in a house or townhouse for all types of insurance other than insurance for rising water, and increasing to 20% for those living in units/apartments. Both renting and living in a unit/apartment were therefore important predictors of lack of insurance, but particularly renting.

Table 14 Proportion of renters and mortgage holders/owners reporting no insurance coverage, by dwelling type

	No coverage for bushfire	No coverage for flooding due to rising water	No coverage for flash flooding from storm run-off	No coverage for storm damage from heavy rain, wind, hail
Renter - living in a house (n=267)	47.6%	52.8%	51.5%	45.9%
Renter - living in a townhouse (n=93)	56.9%	59.5%	57.1%	55.0%
Renter - living in unit/apartment (n=168)	74.7%	75.2%	75.0%	72.8%
Mortgage holder or outright owner - living in a house (n=1418)	2.5%	15.5%	5.5%	3.9%
Mortgage holder or outright owner - living in a townhouse (n=186)	6.2%	19.0%	9.1%	4.2%
Mortgage holder or outright owner - living in a unit/apartment (n=100)	20.7%	28.0%	16.9%	10.3%

8.5 ENGAGEMENT IN SPECIFIC PREPAREDNESS ACTIONS

Survey participants were asked whether they had engaged in any of a number of preparedness activities that can either reduce risk of damage from storms, floods and/or bushfire, or facilitate recovery from these events (Figure 38). They could answer that they did not undertake the activity, they 'sort of' engaged in it, or they engaged in it. The 'sort of' option was included after pilot testing of questions indicated that many people felt they did a little bit of some activities, but did not engage in them fully, for example some said they had stored some important documents in a safe place but not all.

Very few households had written plans for bushfires (12% answered either yes or 'sort of') or for emergencies other than bushfire (10%); slightly more but still a relatively small proportion had discussed emergency plans with others in their household in the last 12 months (23% for general emergency planning and 29% for bushfire planning). This suggests low engagement in forward planning for emergencies, a concern given that forward planning is often argued to be critical for reducing risk, but only if planning processes are engaged in at a level of detail that enables the plan to provide a genuine guide to support taking action, and are well discussed and understood by all members of the household (see for example Handmer and O'Neill 2016). Perhaps reflecting the lack of engagement in planning, only 29% were confident they knew what to do if a severe storm or flooding caused damage to their home and 42% answered 'sort of'; and 39% felt they knew what to do if a bushfire threatened their home while 46% 'sort of' knew what to do.

More than half of households (58%) had no emergency kit, while 18% 'sort of' had one and 20% had a kit. Just over one third (35%) had copies of important documents stored safely while 23% 'sort of' did this. A majority did, however, report that their gutters were cleaned at least annually (59%), vegetation near the home was trimmed or cleared (68%) and little flammable material was stored around their home (74%).

Overall, the findings indicate relatively low investment in preparedness: while some key activities are undertaken relatively regularly by most households, such as clearing gutters, these are not linked to broader planning for how to protect the home or what to do in an emergency.

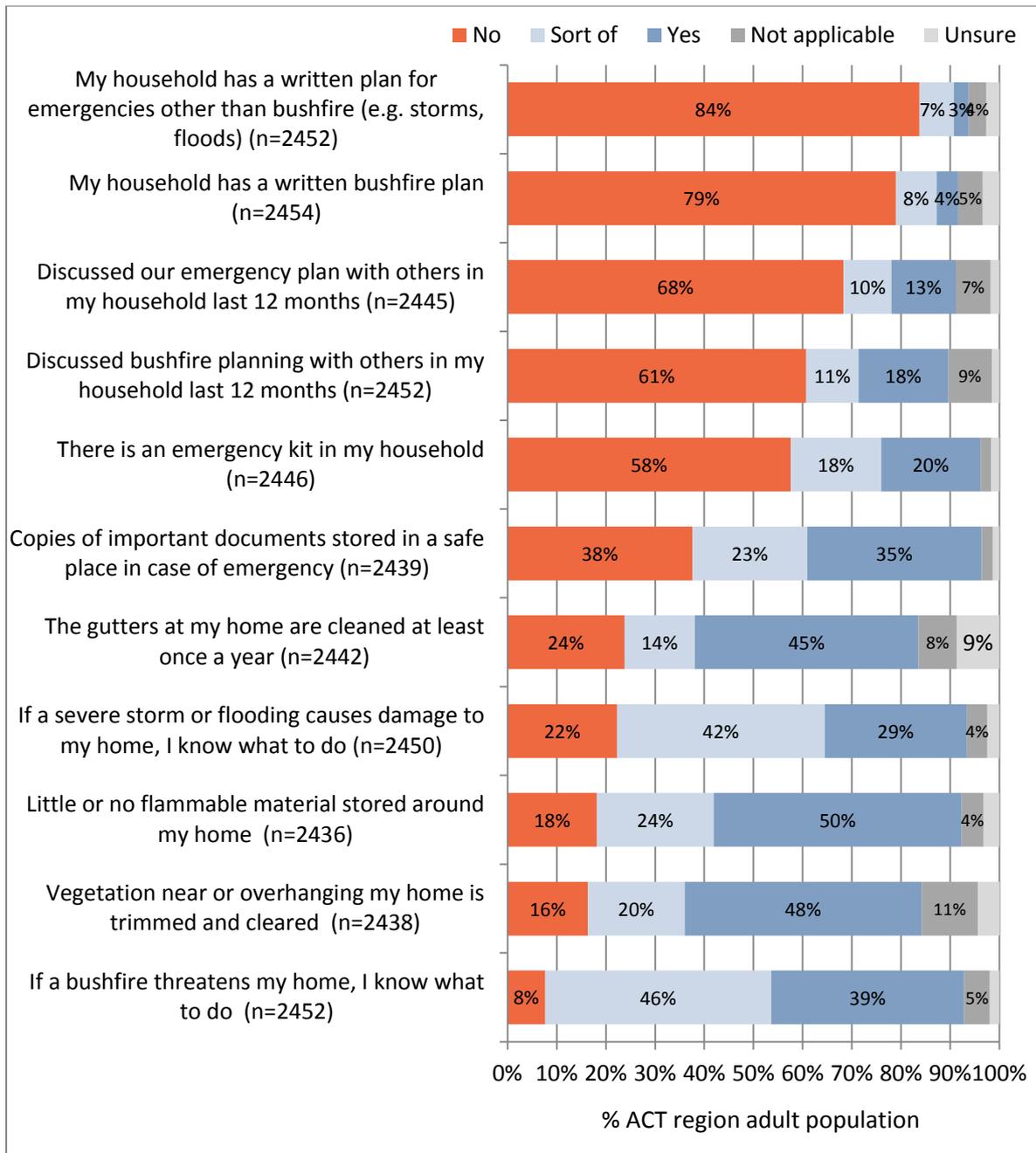


Figure 38 Level of preparedness for extreme events

8.6 IMPLICATIONS FOR SUCCESSFUL CLIMATE CHANGE ADAPTATION

This section considers what our findings about resilience to climate-related extreme weather events mean for achieving resilience to climate change in the ACT. Overall preparedness for flood, fire and storms was lower amongst renters, those living in units/apartments, younger people, those born in non-English speaking countries, and women. To some extent lower preparedness is associated with lower risk, with those living in inner suburbs of Canberra which often have lower risk of bushfire being less prepared for fire, for example. However, low insurance amongst renters suggests that many of those who are most financially vulnerable do not have home contents insurance, and thus have a higher risk of negative impacts if their residence is impacted by events such as storms that damage contents.

The findings suggest that investment in preparedness increases with age, likely due both to having greater investment in residential infrastructure that requires protection and due to learning from experience of extreme weather events once they have occurred. Older people have greater experience to support a *reflective* approach in which their past experiences motivate them to prepare. Identifying strategies for encouraging preparedness amongst younger people, particularly renters, is also important. To ensure preparedness messages reach all groups, there is a need to design more *inclusive* and *integrated* messages that reach those living in units/apartments and renters as well as those living in houses that they own.

Overall, there is a lack of awareness of insurance coverage suggesting high potential for under-insurance across many groups. The findings suggest a need to invest in assessing overall exposure risk amongst the groups who are more and less prepared, and to better understand whether groups identified in this report as less prepared are in fact at higher risk of damage, particularly the risk for renters of experiencing negative impacts such as loss of contents, difficulty finding accommodation if their home is damaged, or other impacts. If these groups are found to have less *robust* systems for coping with extreme weather events, building strategies to increase capacity for *resourceful*, *flexible* and *viable* responses amongst these groups is important. In particular, ensuring *contingency* capacity through supporting better investment in insurance or in building savings to reduce financial impacts of damage from extreme weather events is likely to be a useful strategy for reducing impact, in addition to encouraging higher engagement in preparing the home for extreme weather events.

9. RESILIENCE TO DROUGHT

One of the potential effects of climate change in the ACT region is increased incidence of drought and of periods of low rainfall. Resilience to drought is complex to examine, as drought can have a wide range of differing impacts. This section first briefly review the impacts of drought and which are relevant in the ACT. Those that are examined elsewhere in this report are then identified. Finally, the key area not examined elsewhere – the potential for drought to cause distress or financial impact resulting from impacts on gardens - is examined.

9.1 UNDERSTANDING RESILIENCE TO DROUGHT

IMPACTS OF DROUGHT

Drought can have multiple impacts that affect resilience, including loss of livelihood, mental health impacts such as increased distress, higher costs of food or water, malnutrition, dust-related disease, and increased incidence of bushfire (Stanke et al. 2013). Not all of these will be relevant to the ACT region, however. The impacts of drought were reviewed, drawing on Stanke et al.'s 2013 review paper, and those relevant to the largely urban population of the ACT identified:

- **Malnutrition:** The likelihood of drought causing malnutrition amongst residents of the ACT is considered very low, as food supply even in sustained droughts has not been affected in the region. This was therefore not examined further.
- **Loss of livelihood:** The ACT is predominantly urban and has a relatively small number of farmers and other rural landholders. These farmers and rural landholders will be impacted by drought, with financial and psychological impacts. However, understanding and addressing these impacts on rural landholders requires specific study of this group, which was not possible within the resources available for this study. Impacts of drought on this group, and their specific resilience to drought, should be examined through direct assessment of rural landholders in the region and their drought resilience. Urban residents in the ACT were unlikely to experience substantial direct livelihood impacts from drought, although widespread drought can lead to overall economic downturn which would affect household financial wellbeing – something examined in Section 5.
- **Higher food costs:** Drought can result in higher food costs. Vulnerability to higher food costs was examined as part of individual resilience resources, with household financial vulnerability being the key indicator of vulnerability to higher food costs. Section 5 should therefore be used as a guide to potential impacts of rising food costs during drought.
- **Water-related disease:** Poor water quality in drought and low water flow can result in increased incidence of water-related diseases, including algal blooms. The risk of

this directly impacting health of residents in the ACT is considered low due to water quality monitoring and public health protection guidelines in place.

- **Airborne and dust related disease:** Drought is often associated with increased airborne dust and duststorms. These can exacerbate some health problems, in particular asthma and respiratory problems. These were examined in Section 7, with the proportion of the population reporting respiratory-related disease likely to have lower resilience to airborne and dust related issues resulting from drought than others.
- **Increase risk of bushfire:** Drought is associated with increased risk of bushfire. Resilience to bushfire was examined in Section 8.
- **Mental health effects:** Drought can result in higher psychological distress and other negative mental health impacts. This is particularly related to seeing loss of vegetation and being unable to maintain personal assets such as gardens to the standard a person desires. In an urban setting, this can relate to finding drying or loss of vegetation distressing, either in the broader landscape or more specifically in a person's own garden. This is examined in this section.

IMPACTS OF DROUGHT ON URBAN GARDENS AND GARDENERS

Drought can lead to drying of gardens, through both reduced rainfall, imposition of restrictions on watering of gardens, and increases in costs of water. This can in turn affect the health of garden vegetation, with potential for negative impacts on quality of life resulting from death or reduced health of plants in the garden.

Multiple studies have shown that having access to 'green space' is positive for health and wellbeing, and several have shown positive links between physical and mental health and wellbeing and engaging in gardening activities (e.g. Adams et al. 2011). Some studies have found that health and wellbeing can be impacted negatively by experience of environmental degradation: one form of this can be drying or death of vegetation in drought (e.g. Albrecht et al. 2007; Warsini et al. 2014). This means that residents of the ACT region may be negatively impacted by drought through loss of vegetation, or through financial impacts if they decide to increase their use of mains water in order to maintain garden health.

However, these negative impacts will likely only affect those people who have a strong gardening 'identity' – meaning they find it important to keep their garden green and growing. Not all people gain positive health and wellbeing benefits from gardening, with these benefits derived by those who enjoy the activity of gardening and find it connected to fulfilment of psychological needs such as spirituality (e.g. Kamitsis and Francis 2013).

Examining resilience to drought and drought is challenging, as the impacts of drought will vary for different people. To help understand this, survey participants who had garden areas

(including front yards, backyards, or courtyards or balconies where they kept plants) were asked about three aspects of their garden management:

- **Watering needs:** How much of their garden required frequent watering in summer, an indicator of how likely garden vegetation is to become stressed during periods of drought or formal restrictions on watering of gardens.
- **Importance of gardening and garden appearance:** Participants were asked how important it was to them to garden and to keep their garden looking green, versus whether they found it acceptable to have dry or brown areas in their garden at times. This is an indicator of the extent to which people are likely to experience negative psychological impacts if their garden appearance or health is affected by dry periods.
- **Garden management in dry times:** Participants were asked which of a number of strategies they implemented in their garden in dry times, from increasing watering to increasing use of grey water and letting plants die.

9.2 DROUGHT RESILIENCE – OVERALL FINDINGS

ACT residents as a whole had moderate resilience to the impacts of droughts on urban vegetation, with an average score of 5.9 out of 10 for garden-related drought resilience (Table 15; see Appendix 5 for details of calculation of overall drought resilience). Overall, 17.2% of residents had low resilience to drought, while 7.3% had high resilience. Low resilience to drought was more common amongst younger people, those born overseas, renters, and those living in units/apartments:

- **Age:** Drought resilience was lower for younger groups, with 21.4% of those aged 25-34 having low drought resilience, compared to 12.4% of those aged 65-74.
- **Cultural background:** Those who were born overseas in non-English speaking countries were more likely to have low resilience to drought than others, with 22.2% having low drought resilience compared to 20.2% of those born in English speaking countries other than Australia, and 16.2% of those born in Australia.
- **Home status:** Renters were more likely to have low resilience to drought (22.9%) than those with a mortgage (18.6%) or outright owners (11.5%).
- **Home type:** Those living in townhouses and units/apartments were more likely to have low resilience to drought than those living in houses; however this is likely to be offset by the relatively small garden areas managed by people in these types of residences.
- **Place:** People living in three places were more likely to have low resilience to drought than others: those living in the Inner South (40.3%), those living in Gungahlin (24.9%) and those living in the Woden Valley (21.8%). However, this was driven by different factors: in the Inner South, low resilience resulted from a combination of many residents enjoying gardening, not finding it acceptable to have parts of the garden looking dry and finding it important to keep the garden looking

green while also feeling others in their neighbourhood expected this. In Gungahlin, low use of strategies such as mulching and low preparation for drought drove the lower resilience. In the Woden Valley, there were more people than in most other places (except the Inner South) who felt it was important to have the garden look green year-round, and who increased watering in dry times.

The following sections examine each aspect of drought resilience in more detail.

Table 15 Sensitivity to drought when managing garden, by region and socio-demographic group

		Much of garden needs watering most days	% who agreed that...						% who often did the following in extended dry periods						Drought resilience index		
			Enjoy garden- ing	OK if a lot of garden looks dry	Have prepared for drought	Important to have green garden all year	Spend a lot of time garden- ing	Others expect garden to look green	Increase use of mulch	Let lawn go brown	Water some plants & not others	Water garden more often	Water garden longer at a time	Increase use of grey water	Average (mean) score	% low score (≤4)	% high score (8+)
	ACT region	47.3%	68.1%	45.5%	43.2%	36.1%	38.1%	17.9%	58.5%	55.8%	46.2%	43.7%	30.4%	29.1%	5.8	17.2%	7.3%
Gender	Male	47.3%	67.5%	44.1%	45.8%	37.8%	40.0%	18.1%	59.0%	55.6%	46.3%	45.3%	31.7%	25.2%	5.7	18.1%	7.2%
	Female	47.6%	68.5%	46.1%	40.4%	34.9%	36.5%	17.7%	58.2%	55.9%	45.7%	42.6%	29.4%	32.5%	5.8	16.5%	6.8%
Age	18-24	49.8%	59.5%	49.0%	28.2%	31.6%	24.2%	22.1%	34.2%	48.5%	43.6%	34.2%	17.9%	32.5%	5.6	19.9%	6.0%
	25-34	52.2%	64.1%	40.8%	20.7%	31.9%	26.0%	17.2%	45.2%	48.6%	41.4%	45.5%	21.9%	24.6%	5.5	21.4%	4.1%
	35-44	47.0%	65.9%	48.9%	38.6%	33.8%	36.1%	17.5%	55.7%	60.2%	45.1%	47.3%	27.5%	25.8%	5.7	15.9%	5.2%
	45-54	42.8%	71.7%	49.0%	52.6%	34.9%	40.6%	16.1%	67.3%	63.6%	51.0%	41.3%	34.2%	31.2%	6.1	16.4%	12.6%
	55-64	40.7%	71.3%	50.1%	59.8%	36.7%	46.7%	17.5%	71.5%	61.7%	49.7%	38.9%	35.1%	32.6%	6.0	13.1%	8.4%
	65-74	44.5%	74.0%	42.0%	62.4%	47.2%	54.2%	18.9%	78.1%	52.0%	48.2%	51.5%	43.5%	28.8%	5.9	12.4%	8.3%
	75 plus	57.0%	76.4%	32.7%	74.3%	49.1%	56.0%	15.9%	74.2%	52.0%	44.6%	49.0%	47.3%	34.7%	5.7	20.1%	7.7%
Cultural back-ground	Australian born	47.1%	68.1%	45.9%	43.1%	34.7%	36.9%	17.3%	57.9%	55.8%	45.6%	42.9%	29.8%	28.4%	5.8	16.2%	7.1%
	Born o/s, English	48.3%	66.3%	46.5%	50.1%	36.1%	43.6%	19.4%	63.2%	58.1%	49.3%	44.3%	34.5%	33.3%	5.8	20.3%	8.9%
	Born o/s, other	48.2%	72.2%	38.5%	32.9%	49.5%	40.7%	21.2%	56.7%	51.2%	46.8%	50.5%	28.9%	29.1%	5.4	22.2%	5.3%
Formal educ'n	No univ. degree	48.1%	66.4%	46.7%	39.1%	36.5%	36.1%	18.8%	52.1%	58.8%	45.4%	37.1%	27.4%	30.3%	5.8	17.1%	7.5%
	Univ. degree	47.0%	69.0%	44.8%	45.2%	35.9%	39.2%	17.4%	61.9%	54.1%	46.5%	47.1%	31.9%	28.4%	5.8	17.3%	7.2%
Household structure	Partner only	49.7%	73.6%	43.4%	50.6%	41.3%	45.7%	18.5%	66.9%	52.0%	46.4%	47.2%	33.1%	30.0%	5.8	17.0%	6.2%
	2 parent family	47.2%	68.2%	45.8%	43.4%	36.5%	38.3%	17.5%	57.7%	60.7%	49.0%	45.8%	33.4%	28.5%	5.7	16.0%	5.9%
	Single parent/ s'house	47.6%	59.0%	47.7%	29.2%	27.2%	24.7%	19.6%	43.4%	56.3%	45.0%	35.8%	19.6%	31.9%	5.7	18.8%	7.8%
	1 person h'hold	36.6%	61.9%	48.6%	38.6%	28.9%	30.3%	13.5%	55.1%	48.7%	35.1%	34.0%	26.6%	21.6%	6.0	20.9%	18.3%
Home status	Renting	46.0%	65.5%	45.9%	21.4%	31.3%	28.6%	22.1%	38.1%	49.7%	38.7%	35.1%	19.2%	23.8%	5.5	22.9%	5.2%
	Mortgage	50.1%	68.3%	45.7%	45.0%	38.3%	36.8%	16.2%	63.0%	58.6%	49.8%	47.6%	31.3%	27.8%	5.7	18.6%	7.7%
	Outright owner	44.2%	73.1%	43.4%	66.6%	40.2%	51.8%	15.7%	74.4%	56.9%	47.7%	46.9%	41.2%	34.5%	6.1	11.5%	9.7%
Home type	House	47.6%	69.0%	47.6%	49.4%	35.5%	42.5%	18.0%	62.7%	64.1%	50.5%	44.3%	33.4%	30.9%	5.8	15.5%	7.7%
	Townhouse	46.9%	63.5%	42.0%	38.9%	39.6%	29.0%	20.6%	54.2%	43.2%	41.4%	44.2%	26.0%	24.7%	5.5	22.9%	5.1%
	Unit/apartment	48.2%	69.7%	38.0%	20.6%	38.5%	24.5%	15.5%	37.7%	21.4%	30.1%	41.0%	15.6%	21.2%	5.4	24.4%	6.6%
Place	Belconnen E.	48.4%	67.5%	52.7%	47.3%	33.2%	43.9%	10.6%	66.7%	67.1%	54.9%	41.9%	40.8%	39.8%	6.0	11.0%	5.3%
	Gungahlin	49.8%	64.8%	38.4%	36.2%	39.7%	29.5%	20.9%	47.1%	44.9%	38.5%	45.5%	27.9%	27.6%	5.3	24.9%	5.0%
	Inner Belconnen	42.2%	67.6%	50.6%	44.7%	35.9%	40.5%	13.7%	58.4%	55.1%	47.0%	39.9%	29.4%	27.7%	6.0	12.9%	8.6%
	Inner North	47.7%	69.2%	44.8%	38.5%	30.5%	37.5%	23.0%	56.1%	45.2%	40.4%	44.0%	32.2%	22.7%	5.8	17.4%	9.3%
	Inner South	53.7%	73.8%	34.4%	33.8%	47.1%	39.0%	31.3%	53.4%	41.3%	35.1%	47.9%	25.1%	24.2%	4.7	40.3%	1.3%
	North	41.1%	73.2%	49.6%	42.9%	28.4%	37.8%	8.1%	61.3%	58.5%	48.3%	48.4%	32.2%	29.9%	6.1	7.6%	11.0%
	Out. Belconnen	42.6%	63.3%	50.8%	47.5%	27.2%	38.6%	8.8%	55.6%	62.1%	49.3%	42.3%	30.9%	28.4%	6.2	7.2%	8.3%
	Tuggeranong Nth	47.5%	66.8%	51.3%	50.0%	32.4%	42.5%	14.1%	65.9%	66.8%	54.2%	42.6%	28.7%	33.4%	6.2	8.6%	8.8%
	Tuggeranong Sth	48.3%	66.5%	42.5%	44.1%	40.5%	36.8%	14.9%	66.6%	65.2%	49.4%	43.3%	26.0%	26.4%	5.7	17.4%	9.3%
	Weston Creek	50.8%	65.5%	41.7%	47.3%	36.0%	36.8%	18.9%	54.9%	57.0%	42.4%	47.5%	37.8%	26.0%	5.7	18.9%	4.5%
	Woden Valley	44.4%	77.7%	45.3%	48.5%	43.0%	50.8%	27.1%	66.0%	58.6%	48.4%	50.7%	28.4%	31.6%	5.7	21.8%	6.4%
	NSW areas	51.0%	67.5%	50.0%	43.8%	35.2%	34.2%	21.0%	59.8%	54.5%	51.3%	32.1%	34.8%	35.2%	5.8	17.7%	8.0%

9.3 WATERING NEEDS OF ACT RESIDENTIAL GARDENS

ACT region residents have a wide variety of gardens, with a wide variety of watering needs. Around one quarter of residents with gardens (27%) reported that a large amount of their garden needed watering most days in summer, while 26% reported that a large amount needed watering once or twice a week, and 20% had a garden that mostly needed watering less than once a week (Figure 39). Many reported having gardens in which parts needed watering most days, other parts once or twice a week, and some parts less than once a week. As shown in Table 15, the groups most likely to report that a large amount of their garden needed watering most days in summer were those aged 75 and older (57.0%), while there were only relatively small differences between most other groups.

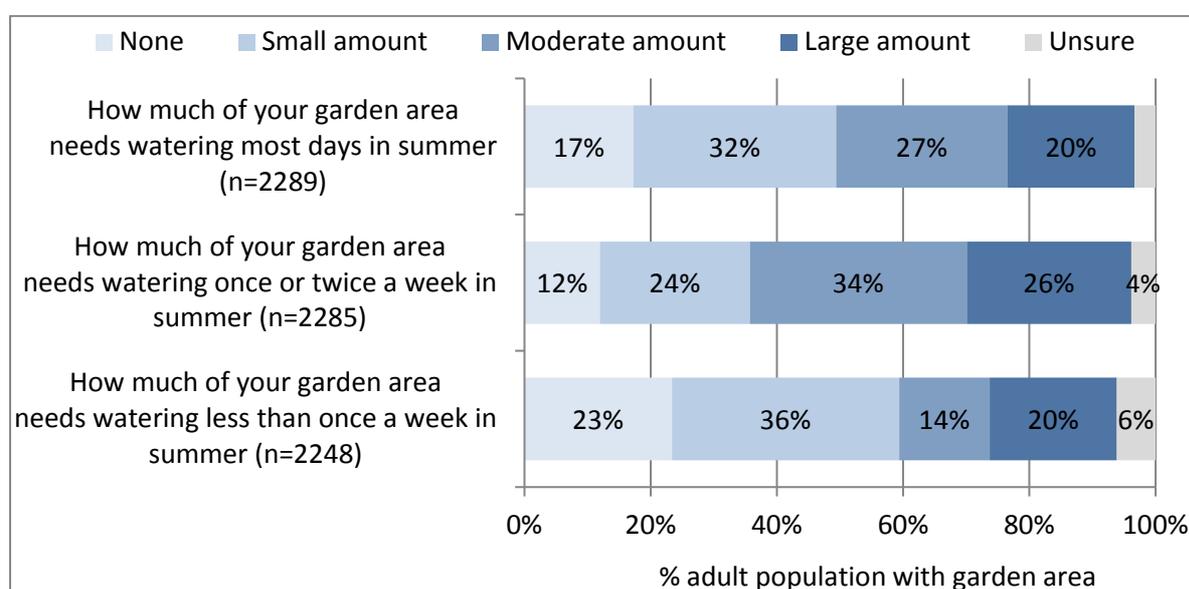


Figure 39 Watering requirements of gardens

9.4 IMPORTANCE OF GARDENING

Drought is likely to have a greater impact on those who enjoy gardening and for whom maintaining garden appearance is an important objective. In general, most ACT region residents enjoy gardening (68%), but fewer spend a lot of time gardening (38%), indicating reasonably strong gardening identity. Enjoyment of gardening increased with age, rising from 59.5% of those aged 18-24, to 76.4% of those aged 75 and older. It was also higher in the Woden Valley place (77.7%) (Table 15).

However, most don't mind if some of their garden looks dry some times of year (71%), and few feel that others living in their neighbourhood expect them to keep their garden looking green all the time (18%) (Figure 40). This suggests that despite strong interest in gardening, experiencing some drier periods is unlikely to be a significant source of psychological distress for most. However, only 45% said they did not mind a lot of their garden looking dry some times of year, and 36% said it was important to them to keep their garden green and

lush all year around, suggesting at least one-third of residents with gardens are likely to be negatively affected if they experience extended dry times.

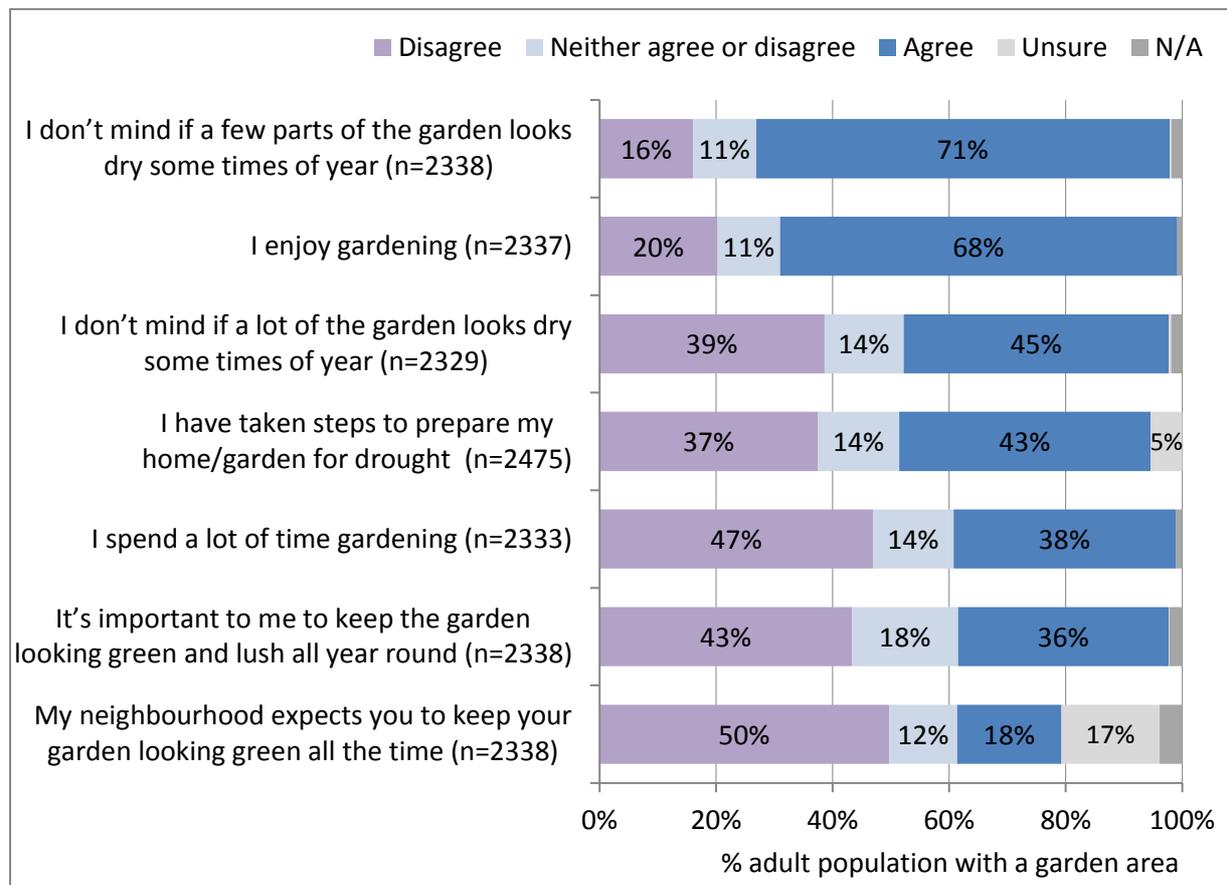


Figure 40 Views about importance of gardening and keeping the garden green

9.5 GARDEN MANAGEMENT IN DRY TIMES

When asked if they had taken steps to prepare their home and garden for drought, 37% had not, and 43% had done this (Figure 41), suggesting that not all people are well prepared for dry times at their residence. Preparation for drought was more common amongst older residents (Table 15), and mortgage holders and outright owners; it was less common amongst renters, and people living in units and apartments (who more often have balcony or courtyard gardens).

When asked whether they used any of a number of strategies to manage their garden during dry times, a mix of strategies was reported (Figure 41):

- Increasing use of water: Increasing use of watering can be viewed as a potentially maladaptive response, as it can act to further increase water stress in the region more generally, creating negative impacts, although it can also have benefits in the form of maintaining habitat in urban areas for some bird and animal species. While 44% reported regularly watering more during dry times, and 30% reported watering for longer at a time, only 17% reported they watered the lawn more often to keep it

green, suggesting most who water more often focus on watering highly important areas of the garden.

- Selectively watering: 56% reported they often let their lawn area go brown in dry times and only 15% never do this, while 46% regularly select particular plants to water and keep healthy while others are not watered. Only 30% report letting plants other than lawn go brown and die, highlighting that many are likely to experience negative impacts if plants important to them in the garden brown off or die, while areas of lawn are often considered unimportant to keep green.
- Reducing water needed or increasing water available: 59% reported increasing use of mulch around water sensitive plants, while only 29% increased use of grey water on the garden.

Use of different strategies varied between groups. Older people were much more likely to report using mulch, with 78.1% of gardeners aged 65-74 doing this compared to only 34.2% of those aged 18-24. Older people were also a little more likely than younger people to water their garden more often and for longer at a time (Table 15).

Overall, this suggests that residents focus on protecting plants important to them in their garden, around one-third rely on using increased volumes of watering in dry times, but many also use mulching to assist them in protecting areas of the garden important to them.

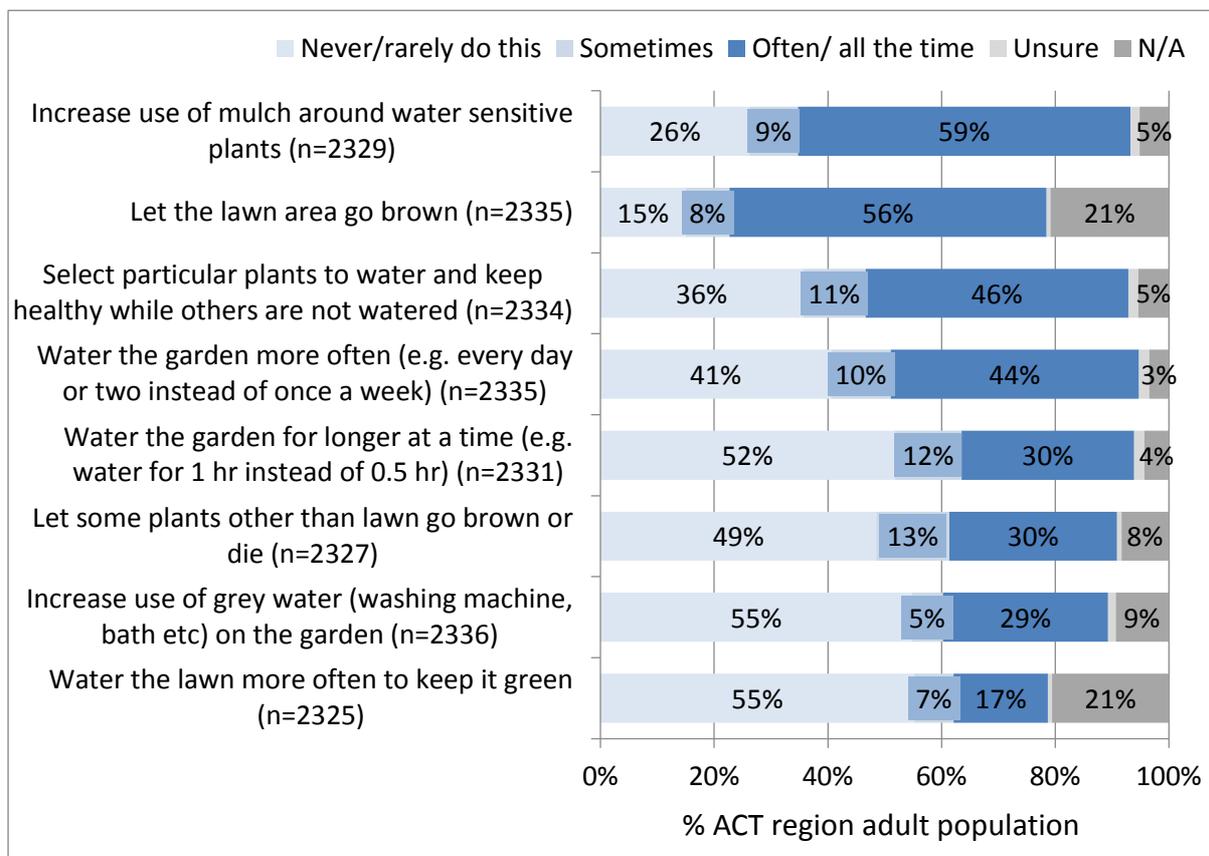


Figure 41 Management of garden during dry conditions

9.6 IMPLICATIONS FOR SUCCESSFUL CLIMATE CHANGE ADAPTATION

This section considers what our findings about resilience to drought mean for achieving resilience to climate change in the ACT. Drought is not a significant challenge for many ACT region gardeners, particularly shorter periods of low rainfall, with social norms in the region supporting letting areas of the garden become dry and ‘brown off’, particularly the lawn, suggesting high **flexibility** of responses to dry times amongst the region’s residential gardeners. However, lower rainfall is a challenge for those who wish to maintain a ‘green and lush’ garden, around one-third of gardeners, and many of these use both positive adaptation strategies such as mulching, but also often increase use of water to protect their garden. A **reflective** approach suggests that adaptation strategies need to consider how to enable gardeners to maintain their gardening activities without increasing demand on scarce water resources, given that many report increasing water use during dry periods.

The high enthusiasm for gardening also suggests potential to use **inclusive** approaches to co-develop **resourceful** (innovative and smart) responses that identify new and different ways to adapt gardens and gardening practices to the expected effects of climate change, and build **robust** responses to low rainfall that do not exacerbate drought challenges. Building **contingency** capacity that, for example, encourages design of gardens that cope better with longer periods of low rainfall, is likely to be an important strategy, particularly some groups such as renters who have fewer resources to draw on to keep gardens green in dry times, and who often report lower resilience to drought. However, this requires **viable** options that are affordable for these groups.

Overall, however, resilience to garden impacts of drought is higher than resilience to some other expected effects of climate change, with a need to improve understanding of how to encourage adaptation responses that are successful in reducing impacts without being maladaptive in nature through, for example, increasing demand on mains water. This requires helping gardeners understand the implications of watering decisions across the whole water cycle and system, enabling them to have an **integrated** understanding that informs choices made about managing gardens during dry periods.

10. CLIMATE CHANGE VIEWS AND SUPPORT FOR ACTION

Building resilience to climate change in many cases requires people to support taking actions that help in adaptation to the effects of climate change. Being aware of climate change and its expected effects, and supporting taking action, are therefore important aspects of resilience to climate change. This section examines views about climate change, confidence to act, and support for government action to adapt to the expected effects of climate change.

10.1 UNDERSTANDING CLIMATE CHANGE VIEWS AND SUPPORT FOR ACTION

Awareness of climate change is critical to achieving successful adaptation to the expected effects of climate change, as proactive adaptation action is more likely to occur if a person is aware of the expected effects of climate change, and of options for acting to reduce potential negative impacts (e.g. Moser and Ekstrom 2010; O'Neill and Nicholson-Cole 2009). Past studies have identified that lack of awareness of a problem, and of how a person can act to address that problem, as well as the extent to which a person believes their actions can make a difference, all affect the likelihood of a person implementing actions to address problems such as the challenge of expected effects of climate change (e.g. Whitmarsh 2009, Barr et al. 2011).

High awareness of climate change and its expected effects, feeling confident to take action to address these effects, and supporting government action to adapt, are all therefore important aspects of assessing resilience to climate change. These things in turn will be influenced by the information sources used to build understanding of climate change and adaptation to it. To examine this, survey participants were asked their views about climate change, confidence in being able to take action and support for government action. They were also asked about their engagement in action to mitigate expected effects of climate change, and sources of information they accessed about climate change.

10.2 CLIMATE CHANGE VIEWS AND ACTION – OVERALL FINDINGS

ACT region residents are highly aware of climate change and support taking action to adapt to it, with an average resilience score of 7.0 out of a possible 10 for awareness and action-related resilience (Figure 42). Support for both households taking action and for government action were both high, with the large majority of ACT residents supporting adaptation action: more than three quarters of the population had an average resilience score of 6 or higher, indicating support for taking a range of actions to adapt to climate change.

This is reinforced by Figure 43, which shows that overall, less than 5% of the adult population has low resilience, with moderate or high resilience amongst the other 95%. Almost one in four – 24.9% - had high resilience in the form of strongly supporting both household and government action and having high awareness of climate change.

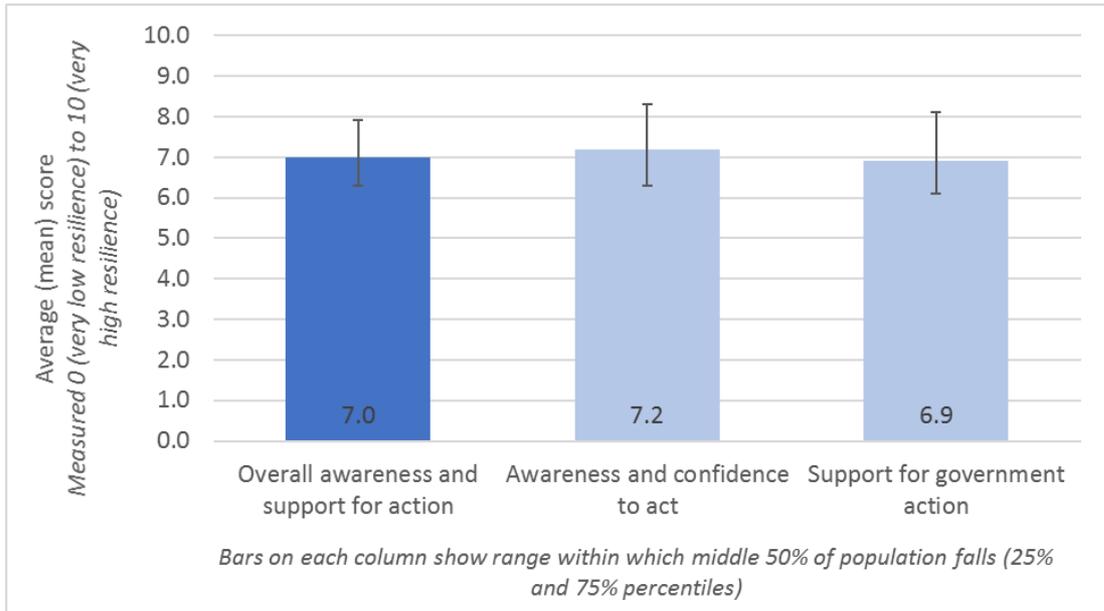


Figure 42 Awareness and support for action – average scores

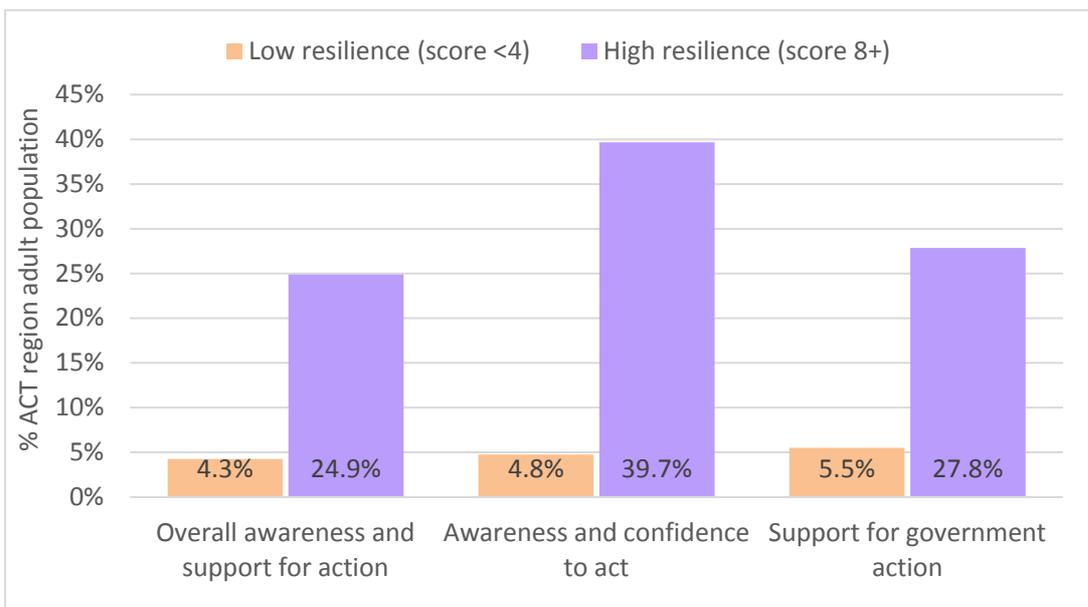


Figure 43 Awareness and support for action – proportion with low and high resilience

These results were highly consistent across different groups and places: as shown in Table 16, the only groups in which low resilience was more common than the average of 4.3% were those aged 75 and older (11.6% had low resilience in this area), and those born overseas in non-English speaking countries (8.4%). High resilience was more common than the average of 24.9% for the following groups: those living in Weston Creek (34.4%), renters (30.9%), women (30.6%) and those aged 18 to 24 (32.6%).

The next sections explore different dimensions of awareness and support for action in more detail.

Table 16 Awareness and support for action, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		Climate change awareness and support for action - overall	Climate change resilience – awareness and confidence to act	Climate change resilience – support for government action	Climate change awareness and support for action - overall		Climate change resilience – awareness and confidence to act		Climate change resilience – support for government action	
		Average (mean) score	Average (mean) score	Average (mean) score	% low score (≤4)	% high score (8+)	% low score (≤4)	% high score (8+)	% low score (≤4)	% high score (8+)
	ACT region	7.0	7.2	6.9	4.3%	24.9%	4.8%	39.7%	5.5%	27.8%
Gender	Male	6.7	7.0	6.6	6.5%	19.1%	6.9%	36.9%	7.6%	21.2%
	Female	7.2	7.3	7.2	2.1%	30.6%	2.8%	42.4%	3.4%	34.4%
Age	18-24	7.3	7.3	7.2	1.6%	32.6%	2.7%	39.1%	3.4%	36.4%
	25-34	7.0	7.2	7.0	2.8%	25.9%	3.9%	40.2%	4.0%	31.3%
	35-44	7.1	7.2	7.0	3.1%	24.7%	2.6%	39.0%	4.3%	30.5%
	45-54	7.0	7.2	6.8	4.7%	23.3%	4.8%	40.2%	6.7%	25.6%
	55-64	6.9	7.2	6.7	4.5%	22.8%	3.8%	40.0%	6.2%	22.3%
	65-74	6.9	7.2	6.7	5.4%	21.7%	6.3%	43.6%	6.9%	24.3%
	75 plus	6.5	6.7	6.4	11.6%	20.9%	14.1%	35.3%	9.0%	18.1%
Cultural background	Australian born	7.0	7.2	6.8	3.9%	24.0%	3.9%	40.9%	5.4%	25.2%
	Born o/s, English	6.9	7.1	7.0	3.5%	27.1%	5.6%	38.0%	4.7%	30.9%
	Born o/s, other	6.9	6.6	7.3	8.4%	28.1%	10.5%	30.7%	7.5%	44.8%
Formal education	No univ. degree	6.9	7.0	6.8	4.6%	22.6%	5.5%	35.7%	5.1%	26.2%
	Univ. degree	7.1	7.3	6.9	4.1%	26.1%	4.3%	41.7%	5.7%	28.7%
Household structure	Partner only	6.9	7.2	6.8	5.8%	21.9%	5.9%	40.6%	5.7%	24.1%
	2 parent family	7.0	7.2	6.9	3.8%	26.6%	3.9%	41.1%	5.6%	29.4%
	Single parent/ sharehouse	7.1	7.1	7.2	2.6%	28.6%	3.6%	35.3%	4.8%	35.8%
	1 person h'hold	6.9	7.1	6.6	3.3%	22.6%	5.9%	38.5%	5.5%	21.6%
Home status	Renting	7.2	7.1	7.3	2.2%	30.9%	3.0%	35.8%	2.7%	40.0%
	Mortgage	7.0	7.2	6.8	3.7%	23.1%	4.7%	40.9%	5.2%	24.8%
	Outright owner	6.8	7.1	6.5	7.5%	21.0%	7.1%	41.8%	8.9%	20.4%
Home type	House	7.0	7.2	6.8	4.9%	24.6%	5.4%	40.8%	5.9%	26.7%
	Townhouse	7.1	7.3	7.0	2.6%	24.8%	2.0%	38.0%	4.6%	29.3%
	Unit/apartment	7.1	7.2	7.0	3.5%	25.5%	3.8%	37.3%	5.1%	29.9%
Place	Belconnen E.	7.0	7.2	6.9	3.5%	22.0%	4.7%	38.5%	3.8%	28.1%
	Gungahlin	6.9	7.0	6.8	3.5%	21.5%	4.2%	34.9%	6.6%	25.2%
	Inner Belconnen	7.1	7.3	7.0	2.7%	28.4%	2.8%	45.3%	5.0%	33.6%
	Inner North	7.1	7.3	7.0	6.4%	28.2%	5.1%	49.0%	5.4%	32.4%
	Inner South	7.0	7.2	6.9	6.7%	22.4%	4.5%	36.1%	7.2%	27.8%
	North	7.3	7.5	7.1	0.6%	28.3%	1.2%	45.0%	3.1%	30.9%
	Out. Belconnen	6.9	7.0	6.8	5.5%	22.1%	5.0%	35.4%	6.1%	23.5%
	Tuggeranong Nth	6.9	7.0	6.9	5.1%	23.4%	6.5%	35.8%	5.7%	28.0%
	Tuggeranong Sth	6.9	7.1	6.8	6.2%	25.3%	6.5%	40.6%	5.3%	22.4%
	Weston Creek	7.2	7.5	6.9	1.8%	34.4%	3.0%	50.9%	6.2%	30.0%
	Woden Valley	7.1	7.4	6.9	5.8%	27.1%	3.6%	41.2%	7.2%	30.9%
NSW areas	6.8	6.8	6.7	2.8%	20.8%	8.9%	32.1%	3.0%	25.5%	

10.3 AWARENESS AND CONFIDENCE TO ACT

The large majority of ACT region residents feel that climate change is a genuine problem for the future (90%), that it is important to act now to reduce the effects of climate change (87%), and that their own actions contribute to climate change (79%) (Figure 44). Most are also aware of key expected effects of climate change, with 79% agreeing that more wild or extreme weather events will happen in the region as a result of climate change. Only 24% felt that the actions of any one person can't help address climate change, indicating high willingness to take action, although not all felt that climate change was the highest priority for action, with 37% feeling there are other issues in the region more important to act on than climate change.

However, only 31% felt they could easily adapt to climate change they expected in their lifetime, suggesting that low confidence in ability to adapt is a barrier to successful adaptation, despite overall high awareness of climate change and willingness for government action. This suggests a need to invest in building understanding and awareness of options for adaptation that can be implemented by individuals and households.

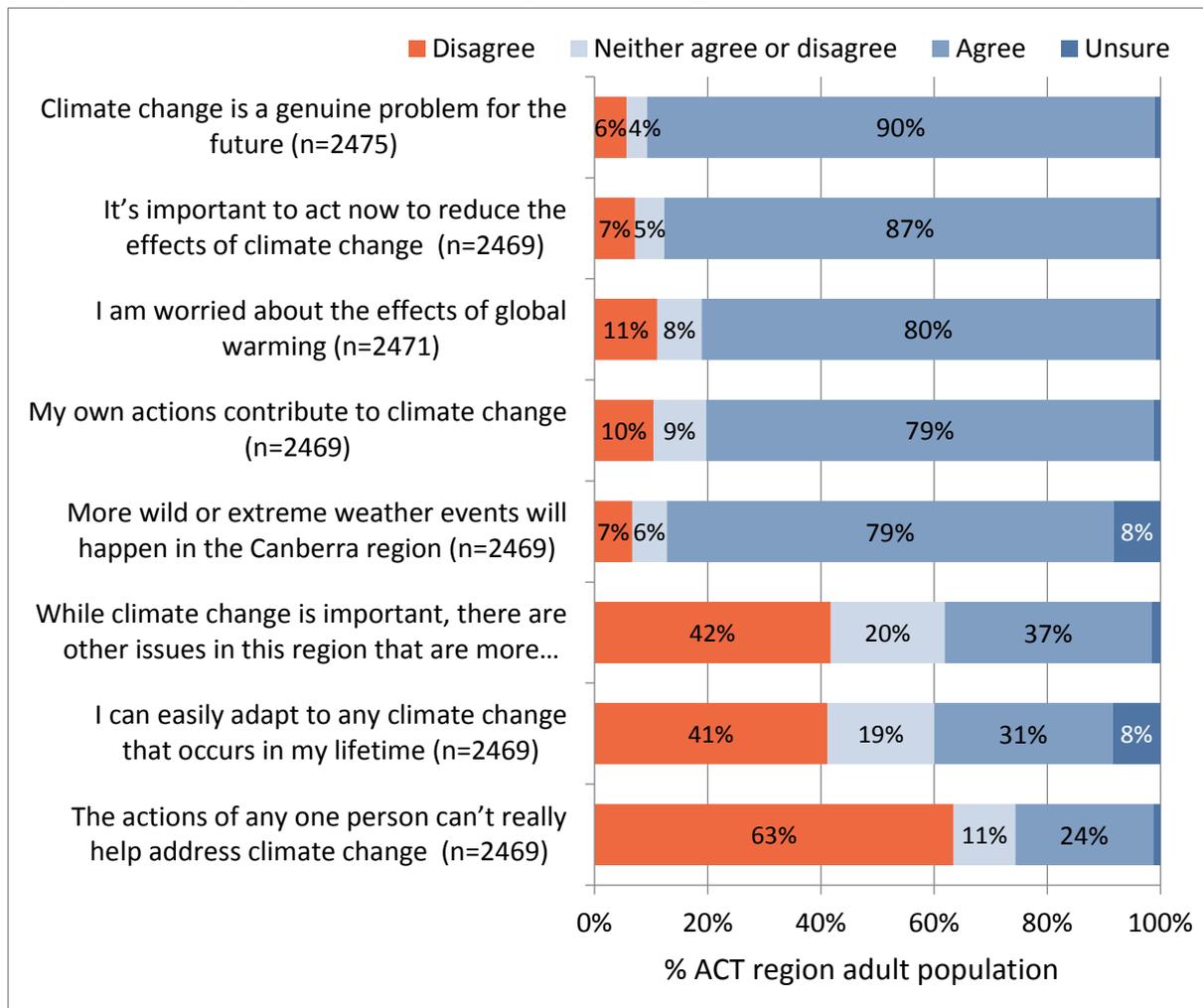


Figure 44 Views about climate change and taking action to address and adapt to it

As shown in Table 17, awareness and support for action to address climate change were somewhat lower amongst those aged 75 and older, those born overseas in non-English speaking countries, those who did not have a university qualification, and was particularly high amongst those living in the North place. Confidence in being able to adapt during their lifetime was lower amongst those aged 25-34, renters and those living in the North, and higher amongst those aged 75 and older and those born overseas in non-English speaking countries.

A resilience index was developed examining awareness and action, with 0 indicating low resilience (a person having both low awareness of climate change, low confidence in taking action, and low willingness to act would have a low score) and 10 high resilience. In total (Table 17), only 4.8% of ACT region residents had low resilience related to climate change awareness, while 39.7% had high awareness and action-related resilience:

- **Gender:** Men were somewhat more likely than women to have low awareness and willingness to take action related to climate change, although differences were small (for example, 2.8% of women had a low level of awareness and willing to act compared to 6.9% of men)
- **Age:** Awareness and willingness to act were similar for most age groups with the exception of those aged 75 and older, who were less aware or willing to take action.
- **Cultural background:** Those born overseas in non-English speaking countries were somewhat less likely to be aware and willing to act on climate change, although again differences were relatively small.
- **Place:** Those living in NSW areas were less likely to be aware and willing to act than those in all ACT places, possibly reflecting differences related to different government policies and campaigns related to climate change.

Table 17 Views about climate change and taking action to adapt to it, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% who agree that							Climate change resilience – awareness and action		
		Climate change genuine problem	It's important to act now	Own actions contribute	More extreme weather expected	Other issues more important	Can adapt	One person can't help	Average (mean) score	% low score (≤4)	% high score (8+)
	ACT region	89.7%	86.9%	79.1%	79.0%	36.6%	31.5%	24.4%	7.2	4.8%	39.7%
Gender	Male	87.3%	84.3%	74.8%	76.5%	38.1%	36.8%	28.4%	7.0	6.9%	36.9%
	Female	92.1%	89.4%	83.0%	81.5%	34.8%	26.6%	20.6%	7.3	2.8%	42.4%
Age	18-24	91.2%	92.2%	82.5%	80.1%	36.6%	30.6%	23.4%	7.3	2.7%	39.1%
	25-34	91.1%	88.5%	82.5%	80.5%	34.0%	26.6%	24.4%	7.2	3.9%	40.2%
	35-44	91.7%	87.2%	84.7%	78.8%	41.3%	28.4%	21.9%	7.2	2.6%	39.0%
	45-54	91.0%	86.2%	79.6%	76.7%	38.1%	31.9%	21.1%	7.2	4.8%	40.2%
	55-64	91.2%	87.2%	78.8%	80.5%	34.9%	34.2%	24.3%	7.2	3.8%	40.0%
	65-74	87.8%	83.2%	73.6%	82.0%	31.3%	35.2%	19.9%	7.2	6.3%	43.6%
	75 plus	76.8%	78.2%	57.3%	75.4%	38.0%	45.0%	46.3%	6.7	14.1%	35.3%
Cultural background	Australian born	90.8%	88.3%	80.6%	80.6%	35.1%	30.4%	22.0%	7.2	3.9%	40.9%
	Born o/s, English	89.0%	84.1%	75.6%	78.1%	36.3%	32.6%	27.7%	7.1	5.6%	38.0%
	Born o/s, other	82.3%	79.5%	71.7%	66.9%	49.4%	38.3%	39.3%	6.6	10.5%	30.7%
Formal education	No univ. degree	86.1%	82.7%	73.4%	74.9%	41.4%	33.1%	25.2%	7.0	5.5%	35.7%
	Univ. degree	91.7%	89.1%	82.2%	81.2%	34.2%	30.7%	24.0%	7.3	4.3%	41.7%
Household structure	Partner only	89.1%	85.8%	77.5%	79.5%	34.3%	34.4%	24.3%	7.2	5.9%	40.6%
	2 parent family	91.4%	88.7%	81.5%	78.9%	39.3%	29.5%	23.2%	7.2	3.9%	41.1%
	Single parent/s/h	90.0%	88.3%	79.7%	78.9%	35.6%	28.9%	27.2%	7.1	3.6%	35.3%
	1 person h'hold	85.5%	81.4%	74.5%	77.4%	36.7%	32.4%	23.4%	7.1	5.9%	38.5%
Home status	Renting	89.7%	86.5%	79.7%	76.8%	35.3%	27.1%	22.7%	7.1	3.0%	35.8%
	Mortgage	91.0%	87.8%	81.1%	81.2%	38.8%	31.5%	24.4%	7.2	4.7%	40.9%
	Outright owner	88.6%	85.5%	74.6%	78.3%	34.5%	35.7%	26.1%	7.1	7.1%	41.8%
Home type	House	90.0%	87.1%	79.5%	80.5%	35.8%	31.9%	24.8%	7.2	5.4%	40.8%
	Townhouse	89.5%	88.0%	77.3%	78.8%	37.7%	32.7%	24.6%	7.3	2.0%	38.0%
	Unit/apartment	89.5%	85.4%	79.0%	74.3%	38.7%	30.2%	21.0%	7.2	3.8%	37.3%
Place	Belconnen E.	90.6%	85.7%	83.3%	72.2%	32.9%	38.6%	25.9%	7.2	4.7%	38.5%
	Gungahlin	85.4%	87.8%	75.2%	76.3%	36.2%	30.6%	20.8%	7.0	4.2%	34.9%
	Inner Belconnen	93.3%	87.0%	79.7%	80.4%	33.5%	29.1%	22.1%	7.3	2.8%	45.3%
	Inner North	90.7%	87.9%	83.6%	76.3%	35.5%	28.7%	20.8%	7.3	5.1%	49.0%
	Inner South	91.0%	86.9%	80.2%	76.8%	33.9%	31.2%	29.4%	7.2	4.5%	36.1%
	North	98.4%	95.3%	90.4%	87.6%	26.5%	21.0%	17.5%	7.5	1.2%	45.0%
	Out. Belconnen	88.6%	84.7%	78.3%	79.3%	39.8%	32.6%	28.8%	7.0	5.0%	35.4%
	Tuggeranong Nth	86.6%	84.2%	73.3%	80.8%	36.7%	33.0%	25.0%	7.0	6.5%	35.8%
	Tuggeranong Sth	87.9%	84.0%	75.7%	78.9%	44.8%	31.0%	24.7%	7.1	6.5%	40.6%
	Weston Creek	93.6%	90.8%	82.5%	77.7%	30.6%	33.5%	22.7%	7.5	3.0%	50.9%
	Woden Valley	93.0%	90.5%	79.6%	80.7%	29.9%	32.7%	21.6%	7.4	3.6%	41.2%
NSW areas	86.5%	81.2%	78.7%	81.2%	50.4%	37.6%	35.5%	6.8	8.9%	32.1%	

10.4 SUPPORT FOR GOVERNMENT CLIMATE CHANGE ACTION

Successful adaptation happens at many scales, not just the individual and household scale focused on in much of this report, and individual and household scale adaptation will be more successful if there is also successful implementation of adaptation action at other scales. In the ACT region, the actions implemented by the government are particularly important drivers of successful adaptation. However, adaptation actions implemented by government will be successful in the long term only if supported by residents. It is therefore important to understand both overall levels of support for the ACT Government investing in taking action to address the expected effects of climate change, and more broadly to reduce greenhouse gas emissions, and survey participants were asked their views about a number of topics. Overall (Figure 45 and Table 18):

- 90% felt that stricter regulations should be introduced to make new buildings more energy efficient and comfortable, with relatively few differences between different groups and those living in different places about this issue.
- 81% supported the ACT government objective of zero net emissions by 2050, with support similarly high amongst most groups with the exception of the elderly (74.1% of those aged 75 and older), those with no university qualifications (75.3% compared to 84.2% of those with a university qualification), and those living in NSW areas (76.8%) and in Tuggeranong South (74.0%).
- 74% felt the ACT government should invest in ensuring availability of heat refuges during heatwaves, particularly women (79.9% compared to 68.0% of men), and younger people (82.0% of those aged 18-24 compared to 59.4% of those aged 75 and older), single parents and those living in sharehouses (80.7%) and renters (79.7%).
- 55% felt climate change was the most important issue the government should focus on. This was higher for those aged 18-24 (60.9%) and lower amongst those who were middle aged (50.0% of those aged 35-44 and 50.8% of those aged 45-54), increasing again amongst those aged 65-74 (60.7%). Those living in Gungahlin were least likely to agree (47.1%) and those living in Inner Belconnen (61.4%), Inner North (61.3%), Inner South (64.0%) and North (66.3%) most likely to agree.
- 53% felt the ACT government should require retrofitting of existing private homes to improve energy efficiency and comfort, and 76% that public buildings should be retrofitted. Men were much less likely to support retrofitting of private homes (46.9%) than women (57.8%). Support was much higher among younger age groups (62.4% of those aged 18-24) compared to older age groups (40.0% of those aged 75 and over). It was also higher for those born overseas in non-English speaking countries (61.9%), renters (67.6%), those living in units/apartments (57.6%) and amongst those living in the Inner North (59.8%), Inner South (64.3%) and North (60.1%).

- 21% felt the ACT should slow down its actions to reduce greenhouse gas emissions, while 67% disagreed. Those born overseas in non-English speaking countries were more likely to think action should be slowed down (33.3%) than other groups.

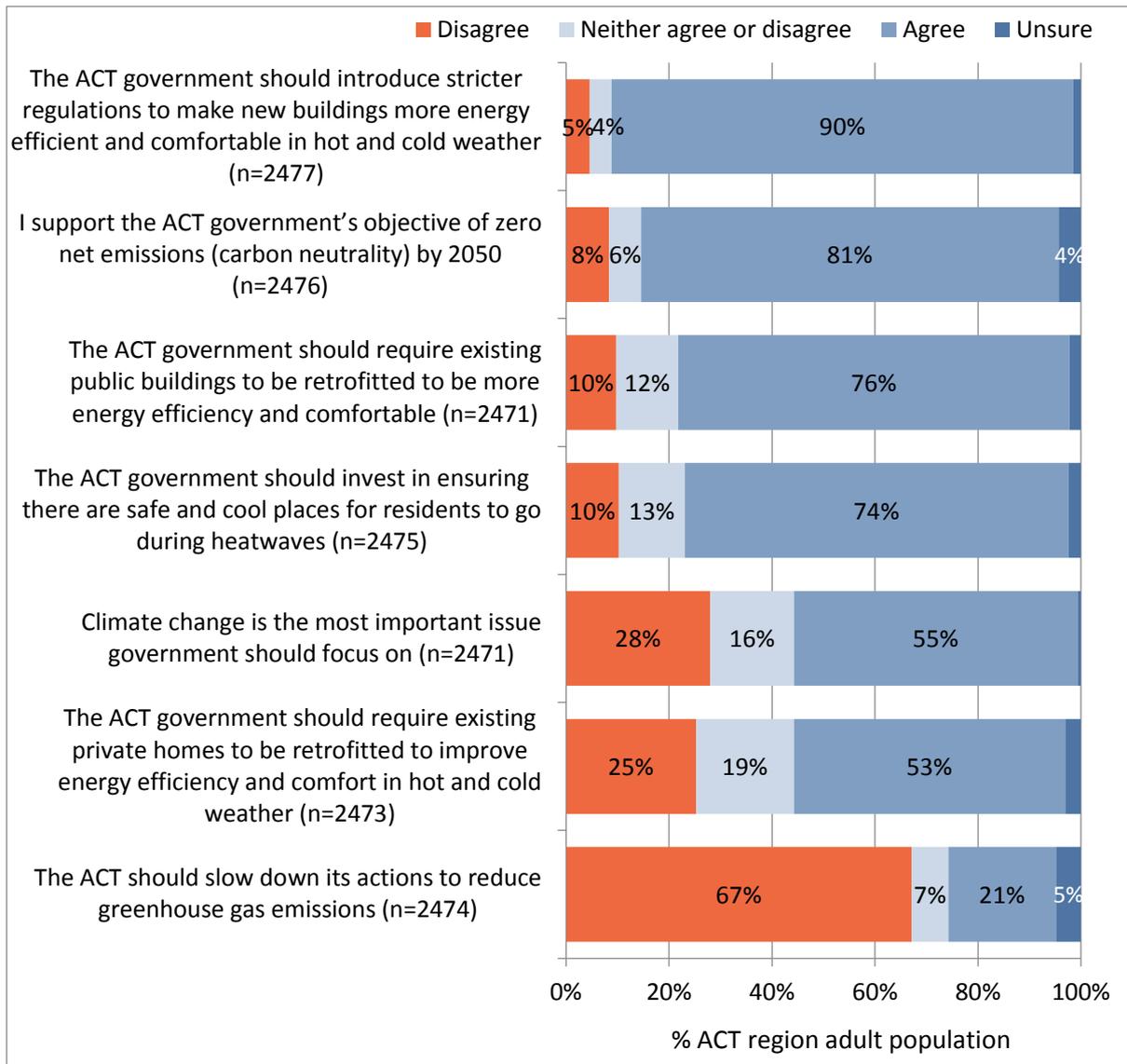


Figure 45 Views about actions ACT government should take to address and adapt to climate change

An index of support for government action was developed, scored from 0 (very low support for government action to support adaptation to climate change) to 10 (very high support; see Appendix 5 for method of calculation). Overall, 4.3% of residents had low support for government action, while 24.9% had high support:

- **Gender:** Women were more likely than men to have high support for government action on climate change (30.6% compared to 19.1%).

- **Age:** Younger people were more likely to have high support for government action than older people, with 32.6% of those aged 18-24 having high support compared to 20.9% of those aged 75 and older.
- **Cultural background:** There were only relatively small differences between people of different cultural backgrounds.
- **Formal education:** There were only small differences based on formal education.
- **Household structure:** There were only small differences.
- **Home status:** Renters were more likely to strongly support government action (30.9%) compared to those with mortgages (23.1%) and outright owners (21.0%).
- **Home type:** There were no significant differences.
- **Place:** There were relatively few differences between regions, although those living in Inner Belconnen (28.4%), Inner North (28.2%) and Weston Creek (34.4%) were more likely to highly support government action on climate change than those living in other places.

Table 18 Views about the government taking action on climate change, by region and socio-demographic group

		Climate change is the most important issue government should focus on	% who agreed that ACT govt should...						Climate change resilience – support for government action		
			... slow actions to reduce GHG	...require retrofitting of private homes	... invest in heat refuges	...retrofit public buildings	...work to zero net emissions by 2050	... introduce stricter reg'ns for new buildings	Average (mean) score	% low score (≤4)	% high score (8+)
	ACT region	55.1%	20.9%	52.7%	74.5%	76.0%	81.1%	89.7%	6.9	4.3%	24.9%
Gender	Male	54.6%	21.5%	46.9%	68.0%	71.9%	78.9%	88.3%	6.6	6.5%	19.1%
	Female	55.5%	20.1%	57.8%	79.9%	79.4%	83.9%	91.1%	7.2	2.1%	30.6%
Age	18-24	60.9%	25.1%	62.4%	82.0%	79.5%	81.1%	90.6%	7.2	1.6%	32.6%
	25-34	56.7%	18.5%	58.4%	76.5%	76.6%	86.2%	89.3%	7.0	2.8%	25.9%
	35-44	50.0%	20.3%	52.0%	76.2%	73.7%	80.1%	87.0%	7.0	3.1%	24.7%
	45-54	50.8%	20.8%	50.4%	74.3%	77.6%	80.5%	89.9%	6.8	4.7%	23.3%
	55-64	56.0%	19.1%	50.0%	73.4%	76.6%	82.4%	90.2%	6.7	4.5%	22.8%
	65-74	60.7%	21.1%	45.9%	68.7%	77.8%	78.3%	93.2%	6.7	5.4%	21.7%
	75 plus	57.2%	23.1%	40.0%	59.4%	67.7%	74.1%	92.8%	6.4	11.6%	20.9%
Cultural background	Australian born	54.1%	18.5%	51.1%	74.1%	75.6%	81.7%	90.2%	6.8	3.9%	24.0%
	Born o/s, English	60.7%	25.2%	55.1%	77.6%	77.8%	80.0%	90.3%	7.0	3.5%	27.1%
	Born o/s, other	54.9%	33.3%	61.9%	73.0%	76.3%	78.0%	84.5%	7.3	8.4%	28.1%
Formal education	No univ. degree	52.6%	22.4%	51.8%	74.4%	72.3%	75.3%	87.9%	6.8	4.6%	22.6%
	Univ. degree	56.5%	20.1%	53.2%	74.6%	78.0%	84.2%	90.6%	6.9	4.1%	26.1%
Household structure	Partner only	56.4%	20.3%	48.5%	72.4%	76.5%	81.0%	92.3%	6.8	5.8%	21.9%
	2 parent family	52.0%	20.8%	52.9%	74.9%	75.0%	82.7%	88.5%	6.9	3.8%	26.6%
	Single parent/ sharehouse	58.0%	22.9%	62.9%	80.7%	79.2%	82.7%	87.4%	7.2	2.6%	28.6%
	1 person h'hold	56.3%	19.5%	49.0%	69.2%	71.8%	72.5%	87.7%	6.6	3.3%	22.6%
Home status	Renting	54.9%	22.3%	67.6%	79.7%	81.7%	80.6%	90.3%	7.3	2.2%	30.9%
	Mortgage	53.1%	19.1%	47.2%	74.7%	73.4%	83.2%	90.8%	6.8	3.7%	23.1%
	Outright owner	55.9%	21.5%	43.6%	67.4%	72.6%	79.1%	88.4%	6.5	7.5%	21.0%
Home type	House	55.2%	21.2%	50.9%	73.5%	74.9%	81.1%	89.3%	6.8	4.9%	24.6%
	Townhouse	51.2%	21.7%	53.8%	75.9%	76.5%	82.5%	92.7%	7.0	2.6%	24.8%
	Unit/apartment	56.1%	17.9%	57.6%	76.0%	76.8%	80.4%	88.7%	7.0	3.5%	25.5%
Place	Belconnen E.	48.1%	25.4%	53.2%	75.4%	72.6%	80.8%	91.1%	6.9	3.5%	22.0%
	Gungahlin	47.1%	24.4%	52.3%	75.3%	72.3%	80.3%	88.0%	6.8	3.5%	21.5%
	Inner Belconnen	61.4%	17.5%	55.7%	74.2%	80.2%	82.1%	91.3%	7.0	2.7%	28.4%
	Inner North	61.3%	17.6%	59.8%	78.1%	79.1%	81.6%	89.1%	7.0	6.4%	28.2%
	Inner South	64.0%	16.8%	64.3%	68.6%	79.5%	81.4%	86.3%	6.9	6.7%	22.4%
	North	66.3%	16.9%	60.1%	76.2%	82.5%	91.0%	95.1%	7.1	.6%	28.3%
	Out. Belconnen	53.3%	24.2%	49.4%	75.9%	74.1%	80.8%	88.3%	6.8	5.5%	22.1%
	Tuggeranong Nth	53.4%	22.6%	50.0%	73.1%	76.8%	79.1%	89.0%	6.9	5.1%	23.4%
	Tuggeranong Sth	55.4%	21.6%	47.6%	71.8%	74.4%	74.0%	89.0%	6.8	6.2%	25.3%
	Weston Creek	55.5%	22.2%	48.4%	75.6%	76.3%	84.1%	90.7%	6.9	1.8%	34.4%
	Woden Valley	56.7%	18.1%	56.8%	76.2%	78.0%	86.8%	91.8%	6.9	5.8%	27.1%
	NSW areas	47.2%	22.3%	42.0%	74.1%	71.2%	76.8%	87.5%	6.7	2.8%	20.8%

10.5 ENGAGEMENT IN CLIMATE CHANGE ACTION

To further understand willingness and interest in adopting actions that can contribute to reducing impacts of climate change more generally (mitigation rather than adaptation actions), survey participants were asked whether they had already, or would in future, engage in five actions that can reduce use of fossil fuels (Figure 46 and Table 19):

- Increasing use of cycling and walking: while one in four (24.7%) had not done this and didn't plan to, 42% did this already and 13% were planning to, while 16% would like to but were unable to. The groups most likely to state they hadn't done this and did not plan to were those aged 65 and older, and those living in Outer Belconnen and Tuggeranong South. This suggests that age-related health issues and distance were two key barriers to doing this.
- Purchasing a fuel efficient car: Only 18% stated they would not do this, while others either already had (36%), were planning to (23%) or would like to but were unable to (18%). Men were more likely than women to state they would not do this (24.3% compared to 12.2%), and others who more often stated they would not do this were those aged 65-74 (22.3%) and 75 and older (34.4%).
- Increasing use of public transport: A relatively large proportion of people – 35% - had not done this and did not plan to, while 32% had done it and 16% were unable to. People least likely to do this or to plan to in future were those aged 55-64 (41.1% stated they did not do this and did not plan to), those living in two parent family households (40.5%), mortgage holders (39.2%), and those living in the places of Belconnen East (41.5%), Outer Belconnen (41.9%), Tuggeranong North (40.1%), Tuggeranong South (43.1%) and Weston Creek (46%). This suggests that those with high family commitments requiring driving to multiple destinations (typically with children living at home) and those in places more distant from key town centres (which in many cases may have less frequent public transport services) are least likely to do this.

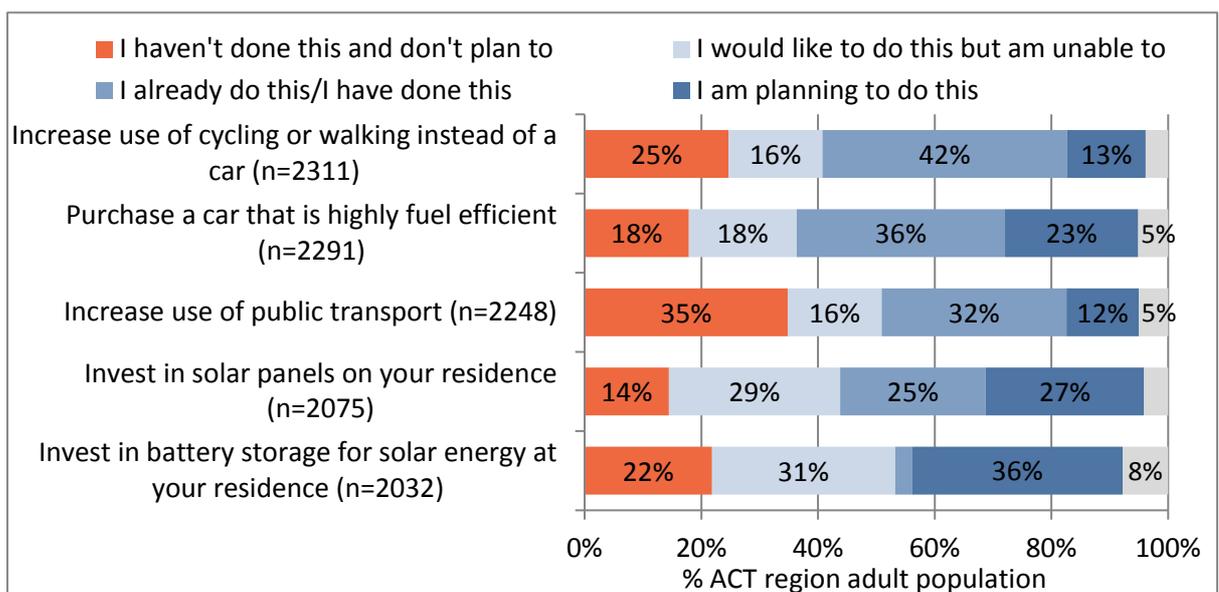


Figure 46 Extent of engagement in actions that contribute to addressing climate change

- Installing residential solar panels: Only 14% would not invest in solar panels, 29% (predominantly renters) would like to but were unable to, 25% reporting having done this and 27% were planning to. The main predictor of being unwilling to do this in future was aged, with those aged 75 and older in particular less likely to do this or be planning to in future.
- Installing battery storage for solar energy: While 22% would not do this and 31% were unable to (often due to renting their residence), there was high interest with 36% interested in doing this in future. The main predictor of being unwilling to do this in future was aged, with those aged 75 and older in particular less likely to do this or be planning to in future.

Table 19 Engagement in actions that contribute to addressing climate change, by region and socio-demographic group

<i>Bold numbers indicate that there were statistically significant differences between groups within this category.</i>		% who haven't done this and don't plan to				
		Increase use of cycling/walking	Purchase fuel efficient car	Increase use of public transport	Invest in solar panels on residence	Invest in solar battery storage
	ACT region	24.7%	17.9%	34.8%	14.5%	21.8%
Gender	Male	26.5%	24.3%	37.9%	16.0%	24.2%
	Female	23.5%	12.2%	32.5%	13.1%	19.8%
Age	18-24	15.7%	9.0%	21.6%	12.0%	14.6%
	25-34	22.9%	17.8%	34.7%	15.7%	21.0%
	35-44	22.3%	19.5%	36.6%	10.3%	17.3%
	45-54	24.3%	15.8%	38.5%	12.2%	18.6%
	55-64	25.9%	16.3%	41.1%	14.2%	21.0%
	65-74	33.8%	22.3%	36.4%	14.6%	29.0%
	75 plus	46.2%	34.4%	34.5%	32.4%	46.9%
Cultural background	Australian born	24.3%	17.4%	36.1%	13.8%	21.1%
	Born o/s, English	30.3%	18.9%	36.5%	17.2%	24.3%
	Born o/s, other	19.2%	20.6%	22.3%	16.3%	24.8%
Formal education	No univ. degree	27.4%	16.5%	35.3%	14.4%	21.0%
	Univ. degree	23.3%	18.5%	34.6%	14.5%	22.3%
Household structure	Partner only	27.5%	19.6%	34.8%	18.8%	27.2%
	2 parent family	25.2%	18.9%	40.5%	10.2%	17.2%
	Single parent/s/h	18.3%	12.5%	23.0%	12.8%	19.0%
	1 person h'hold	23.8%	16.7%	34.2%	18.1%	25.1%
Home status	Renting	16.6%	13.2%	28.6%	15.9%	19.2%
	Mortgage	27.5%	18.4%	39.2%	11.5%	18.4%
	Outright owner	31.0%	22.3%	38.3%	18.8%	29.4%
Home type	House	27.4%	18.7%	38.9%	13.3%	21.4%
	Townhouse	24.6%	17.2%	32.2%	16.1%	24.2%
	Unit/apartment	12.0%	14.6%	20.2%	19.1%	21.9%
Place	Belconnen E.	20.8%	19.0%	41.5%	17.4%	23.3%
	Gungahlin	25.4%	14.9%	29.8%	15.8%	24.5%
	Inner Belconnen	20.5%	16.2%	27.2%	11.0%	16.0%
	Inner North	10.7%	20.3%	30.1%	22.7%	26.6%
	Inner South	24.0%	15.1%	31.1%	18.4%	25.1%
	North	7.8%	15.8%	24.5%	10.9%	18.1%
	Out. Belconnen	37.1%	20.5%	41.9%	15.8%	25.4%
	Tuggeranong Nth	30.7%	21.0%	40.1%	12.3%	17.7%
	Tuggeranong Sth	37.9%	18.7%	43.1%	14.7%	24.0%
	Weston Creek	24.7%	19.1%	46.0%	13.4%	24.6%
	Woden Valley	20.9%	20.1%	30.9%	12.9%	22.3%
NSW areas	25.6%	16.7%	38.6%	10.3%	14.7%	

10.6 ACCESSING INFORMATION ABOUT CLIMATE CHANGE

Survey participants were asked where they accessed information about climate change (Figure 47) and the extent to which they trusted different sources of information they had accessed (Figure 48). The most common sources used to access information about climate change were ABC radio or TV (78%), social media (60%), the Canberra Times (60%) and online news sites such as news.com.au (57%). Almost half (47%) accessed information from the ACT Government. The least commonly used sources of information were The Australian newspaper, (18%), the Canberra Environment Centre (18%), commercial radio (25%) and commercial TV programs such as A Current Affair (26%).

The most trusted sources of information about climate change were university researchers and environment groups (Figure 48), all trusted by 85% or more of those who accessed information from them, followed by ABC radio or TV (83%), and the ACT Government (77%). The Canberra Times was trusted by 62%, while the least trusted sources of information were social media (distrusted by 48% and trusted by 19%), commercial TV (distrusted by 36% and trusted by 37%) and commercial radio (distrusted by 30% and trusted by 35%).

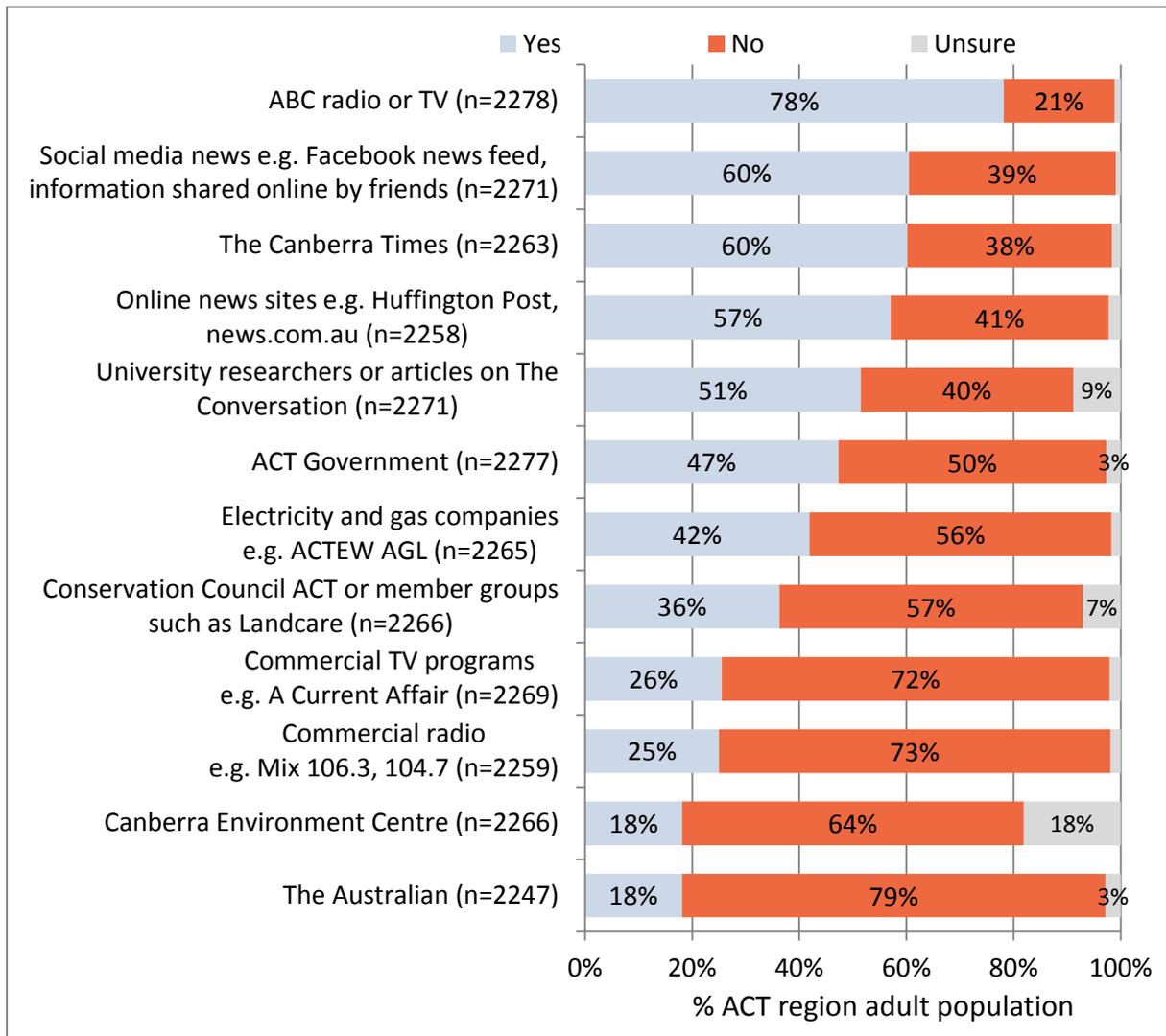


Figure 47 Sources used to access information about climate change or environmental issues

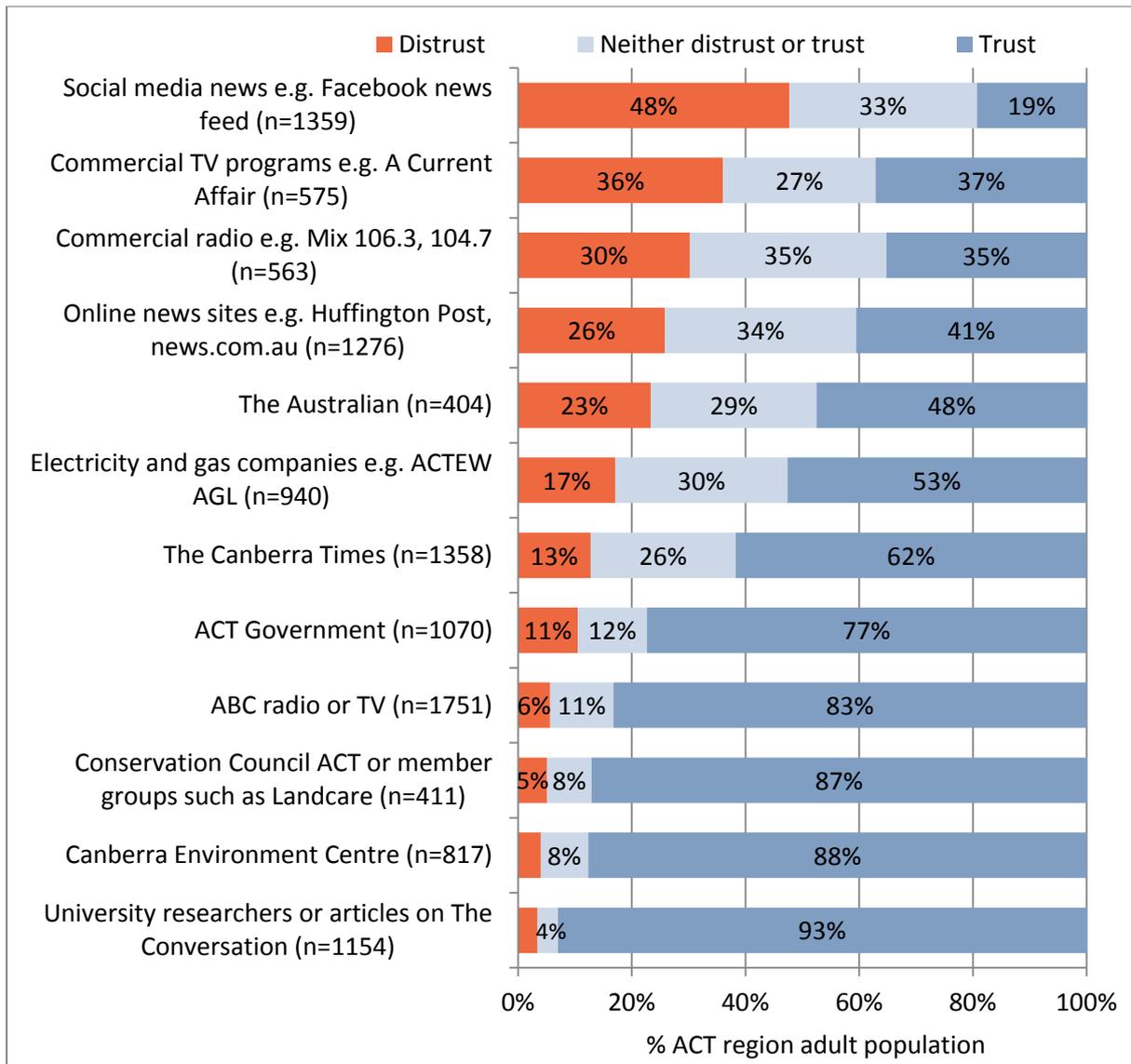


Figure 48 Level of trust in different sources of information about climate change

10.7 ACT GOVERNMENT EMPLOYEE VIEWS ABOUT CLIMATE CHANGE ACTION IN THE WORKPLACE

The ACT government has ambitious climate change targets. Building a whole-of-government approach to achieving targets can increase the likelihood of success, but can also be challenging, with studies of achieving ‘pro-environmental behaviour’ in workplaces highlighting that achieving change requires those being asked to implement changes to view them as consistent with the overall priorities of their workplace, as not conflicting with key objectives, and as being possible to achieve (Unsworth et al. 2013).

ACT government workers were encouraged to take part in the survey, and 550 did, including people employed across all ACT government directorates (Figure 49) and in a range of roles, with many having more than one role in their workplace (Figure 50).

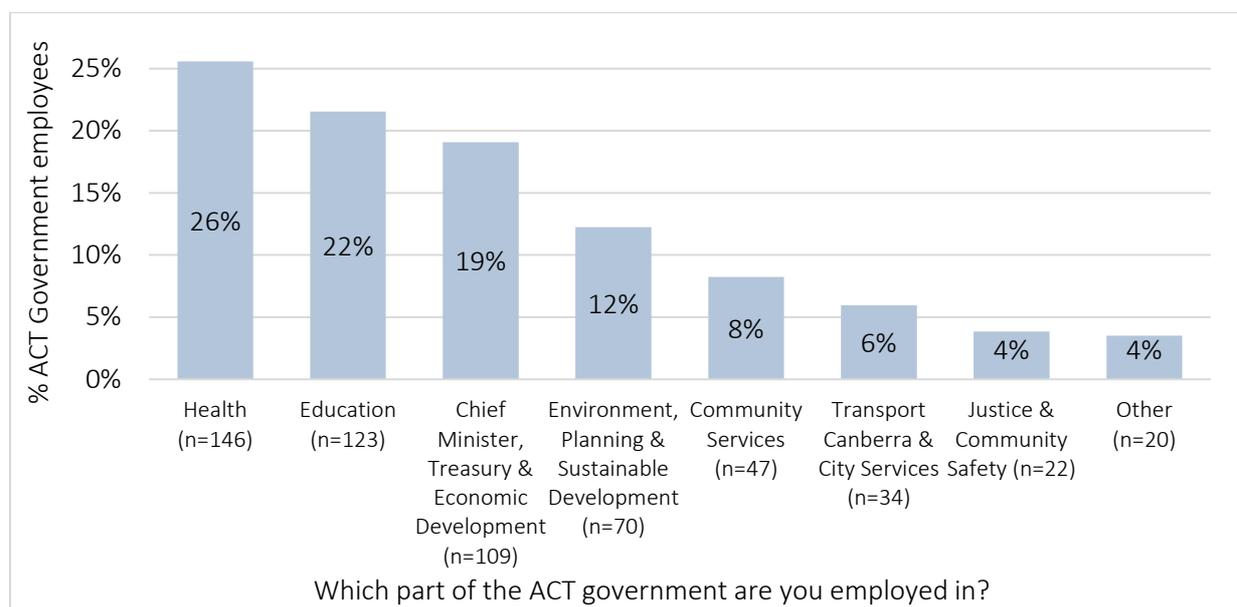


Figure 49 Proportion of ACT government employees working in different ACT government directorates

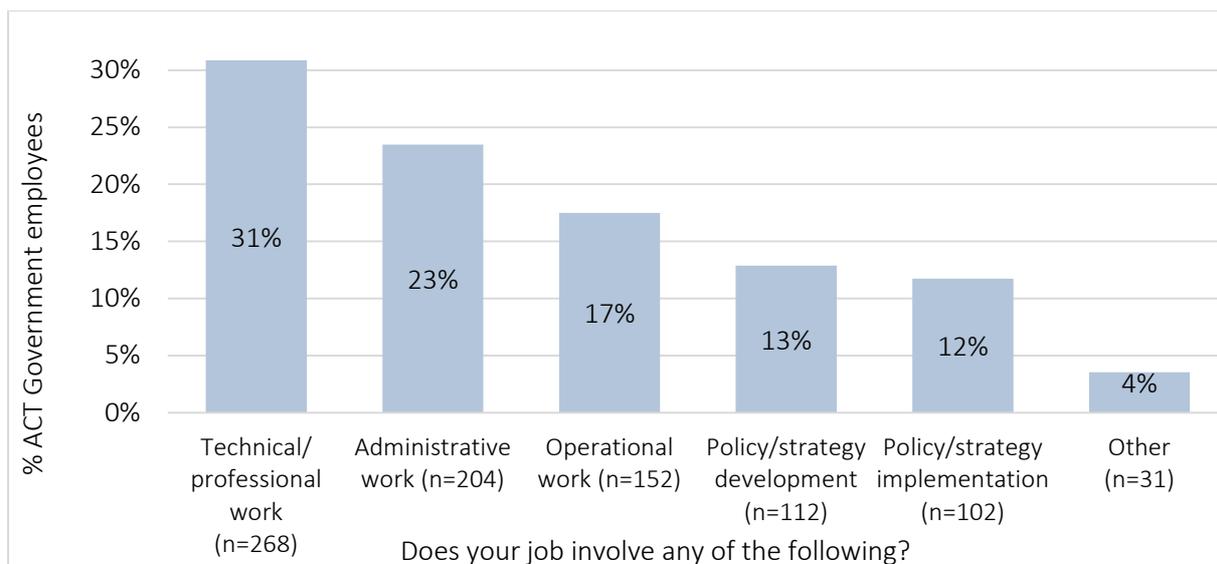


Figure 50 Types of work undertaken by ACT government employees who participated in the survey

ACT government staff were then asked the extent to which they agreed or disagreed with five statements about climate change (Figure 51), and the results were compared by directorate and by type of work (Table 20). Overall:

- 49% reported taking action to reduce energy use when at work, while 30% did not. Taking action to reduce energy was most common for those working in the Environment, Planning and Sustainable Development (EPSD) directorate (66.8%), followed by Education (60.7%); it was lower in Health (40.5%) and the Chief Minister, Treasury and Economic Development (CMTED) directorate (45.6%). Administrative workers were least likely to do this of any job type (45.6%), and those involved in developing policy/strategy the most likely to (61.3%).
- 36% reported having a good understanding of the ACT government’s climate change policies, while 45% did not. This was highest amongst EPSD workers (59.4%), and CMTED (42.2%) and much lower amongst those in Health (30.0%) and Education (24.8%). Those engaged in operational (25.7%), technical/professional (32.8%) and administrative work (39.9%) were less likely to have a good understanding and those involved in policy/strategy development (57.3%) and implementation (56.4%) more likely to.
- 34% reported having opportunities to help achieve reductions in energy use in the workplace, while 43% did not. This was highest for EPSD (59.2%) and Education (43.6%) staff and lower for CMTED (28.7%) and Health (23.9%) workers. There was less difference between job types, ranging from 31.3% of administrative and 33.8% of those with operational jobs, up to 46.7% of those involved in policy/strategy implementation.

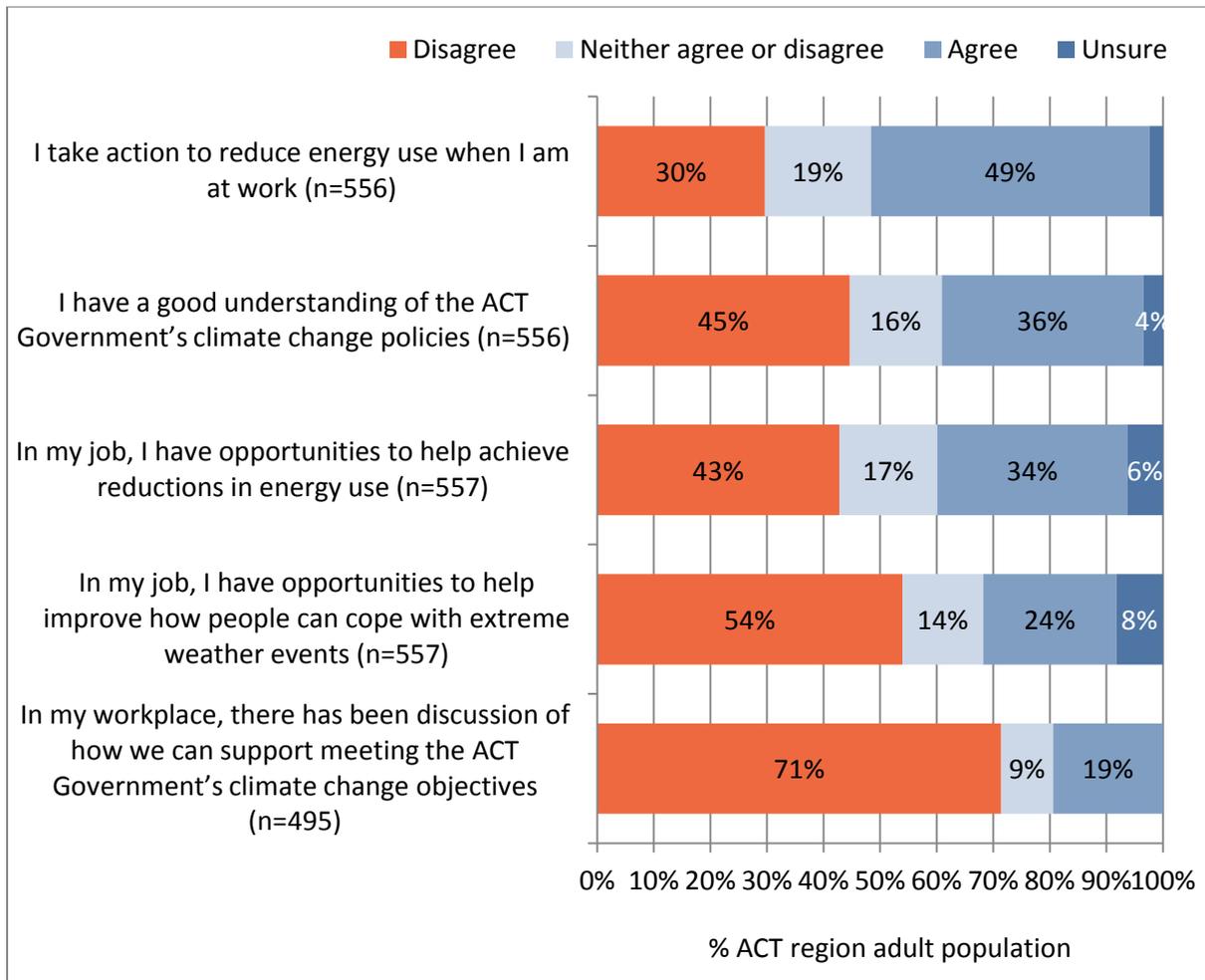


Figure 51 ACT Government employee engagement with climate change action in the workplace

- 24% felt they had opportunities in their job to help improve how people cope with extreme weather events, while 54% did not. This was highest for EPSD workers (30.5%), followed by Education (26.9%), Health (23.5%) and CMTEd was lowest (14.5%). Those involved in implementing policy/strategy were most likely to report having opportunities (34.8%) followed by those developing policy/strategy (31.1%), operational work (30.7%), those in technical/professional jobs (25.4%) and those in administrative positions (22.1%).
- 19% reported there had been discussion in their workplace of how they could support meeting the ACT government's climate change objectives, while 71% had not had any discussions. This was highest for EPSD workers (51.2%), and much lower for CMTEd (16.7%), Education (16.7%) and Health (11.5%) workers. Those involved in implementing policy/strategy were most likely to report having opportunities (31.8%) followed by those developing policy/strategy (29.8%), those in administrative roles (21.1%), technical/professional jobs (19.2%) and those in operational work (16.6%).

Table 20 ACT Government employee engagement with climate change in the workplace, by directorate and job type

	I take action to reduce energy use when I am at work	I have a good understanding of the ACT Government's climate change policies	In my job, I have opportunities to help achieve reductions in energy use	In my job, I have opportunities to help improve how people can cope with extreme weather events	In my workplace, there has been discussion of how we can support meeting the ACT government's climate change objectives
Chief Minister, Treasury & Economic Development (n=109)	45.6%	42.2%	28.7%	14.5%	16.7%
Education (n=123)	60.7%	24.8%	43.6%	26.9%	16.7%
Environment, Planning & Sustainable Development (n=70)	66.8%	59.4%	59.2%	30.5%	51.2%
Health (n=146)	40.5%	30.0%	23.9%	23.5%	11.5%
<i>Community Services (n=47)¹</i>	<i>40.9%</i>	<i>44.8%</i>	<i>21.3%</i>	<i>35.5%</i>	<i>11.9%</i>
<i>Justice & Community Safety (n=22)¹</i>	<i>38.7%</i>	<i>37.0%</i>	<i>16.5%</i>	<i>30.7%</i>	<i>16.9%</i>
<i>Transport Canberra & City Services (n=34)¹</i>	<i>47.0%</i>	<i>27.7%</i>	<i>27.4%</i>	<i>19.9%</i>	<i>22.6%</i>
Technical/ professional work (n=268)	52.1%	32.8%	35.9%	25.4%	19.2%
Administrative work (n=204)	45.6%	39.9%	31.3%	22.1%	21.1%
Policy/strategy development (n=112)	61.3%	57.3%	44.5%	31.1%	29.8%
Policy/strategy implementation (n=102)	58.5%	56.4%	46.7%	34.8%	31.8%
Operational work (n=152)	55.2%	25.7%	33.8%	30.7%	16.6%

¹Due to low numbers of responses from people in this category, the findings have low reliability and should be treated with caution.

Overall, the findings suggest that there is opportunity to increase awareness and action across different parts of the ACT government to increase climate-change related action. In particular, low engagement in some directorates suggests a need to develop materials that help people in those directorates identify opportunities to assist in achieving climate change targets. For example, workers employed in health roles may have many opportunities to increase awareness of heat-related illnesses and how to reduce impact, but may require support and development of appropriate materials to be able to more actively engage in this type of work.

10.8 IMPLICATIONS FOR SUCCESSFUL CLIMATE CHANGE ADAPTATION

This section considers what our findings about awareness of and willingness to act on climate change mean for achieving resilience to climate change in the ACT. Overall, ACT region residents have very high awareness of climate change and high willingness to act; past studies have had similar results, and this suggests that, using a *reflective* lens, there is high capacity that can be leveraged to help achieve successful adaptation due to high levels of awareness and agreement about the importance of acting on climate change. However, the low confidence many have in their ability to adapt successfully to climate change suggests potential challenges for achieving successful adaptation, and a need to develop *inclusive* strategies that assist all residents in identifying sets of *resourceful, robust, viable* options that are *flexible* to different situations for adaptation action, which help increase confidence in ability to adapt and likelihood of implementing specific adaptation actions. A key part of having *contingency* capacity to cope with change is building confidence in ability to implement successful actions, and considering how best to build this confidence should form part of *integrated* approaches to successfully adapting to the expected effects of climate change.

This section considers what our findings about levels of support for government action mean for achieving resilience to climate change in the ACT. Overall, ACT region residents have high support for government action on climate change, and similar to other findings of this study, this suggests that, using a *reflective* lens, there is high capacity that can be leveraged to help achieve successful adaptation, albeit in this instance through government action rather than action at the individual or household scale.

However, the low engagement of many ACT government staff in active communication about and action on climate change targets suggests potential challenges for achieving successful adaptation and a need to develop *inclusive* strategies that are *integrated* across the ACT government, and all parts of government in identifying sets of *resourceful, robust, viable* options that are *flexible* to different work situations for adaptation action, which help increase confidence in ability to take action in the workplace to support adaptation and resilience. Building improved capacity across different parts of government in being able to implement actions to support climate change objectives can improve *contingency* capacity to cope with change.

11. OVERALL RESILIENCE TO CLIMATE CHANGE

To support building resilience through successful adaptation, it is important to identify which groups and places are more and less resilient, and which aspects of resilience are driving poor versus good outcomes for these different groups and places. This section examines which (i) socio-demographic groups and (ii) places have higher and lower resilience for each of the six dimensions of resilience examined, and overall. First, the methods used to bring together the six dimensions of resilience to identify overall resilience are described. This is followed by examining average resilience, and the proportion of people with low and high resilience.

11.1 MEASURING OVERALL RESILIENCE

Overall climate change resilience was examined in two ways:

- **Average scores:** Overall resilience was calculated as the average, from 0-10, of the scores of the six core dimensions of resilience examined in this report (individual resilience resources, community resilience resources, heatwave resilience, extreme weather resilience, drought resilience, and awareness and support for action)
- **Low and high resilience:** The proportion of people with low and high resilience was assessed using a different calculation method, as calculating averages across many scores can artificially reduce the number of people considered to have low and high resilience. Segmentation analysis is a way of identifying 'clusters' of people who have differing levels of a particular characteristic: in this case, resilience to the expected effects of climate change. Segmentation analysis was performed using k-means clustering to identify four groups with differing levels of vulnerability to climate change: very low, low, moderate and high levels of resilience.

11.2 OVERALL RESILIENCE – FINDINGS

The average resilience score for adults across the ACT region was 5.9 out of a possible 10. As shown in Figure 52, the average half of the population had an average score ranging from 5.3 to 6.6. One quarter had a score below 5.3 while another quarter had scores higher than 6.6. This suggests that overall the 'typical' resilience to climate change is moderate: most people are moderately resilient to most aspects of climate change, with the exception of extreme weather resilience for which resilience is often lower. This moderate resilience is driven by capacity for adaptation, in the form of high awareness of climate change and support for action on it, and good access to individual resilience resources. However, this high capacity for adaptation is not always translating into residents taking specific actions to adapt: when asked about specific preparedness for effects of climate change, despite their high awareness of climate change, many residents had low preparedness for extreme weather events, and many lived in homes with low resilience to heatwaves and drought. This suggests that rather than raising awareness of climate change and the need for action,

a key action for the ACT government is to work to translate existing high willingness to act into more specific and targeted preparedness actions by residents.

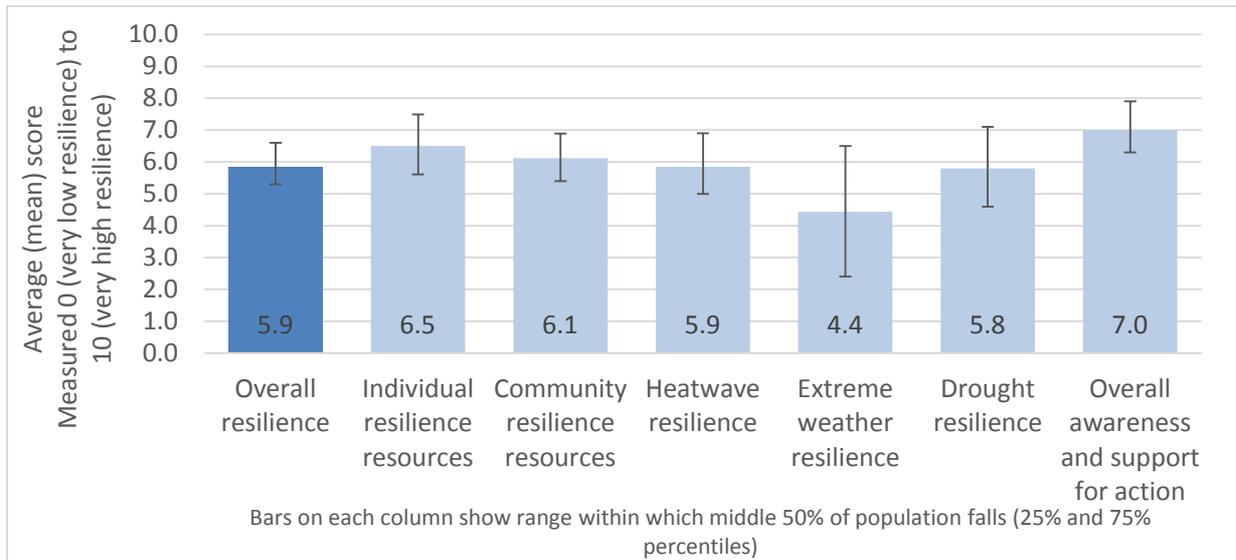


Figure 52 Overall resilience to climate change compared to six dimensions of resilience

Segmentation analysis was then used to identifying four ‘clusters’ of people with differing levels of resilience. This analysis uses statistical techniques to identify groups of people who ‘cluster’ together, and was used to identify the ‘break points’ that indicate differing levels of overall resilience. The analysis indicated there were four groups which had distinct levels of overall resilience. When these were examined, they could be characterised as very low, low, moderate and high resilience:

- Very low resilience:** This small group – 6.0% of the population – is highly vulnerable to the effects of climate change as they have very low resilience in multiple areas important to coping with the effects of climate change, with an average overall resilience score of 3.8 out of 10 (compared to an average of 5.9 across the adult population).
- Low resilience:** This group – 27.1% of the adult population – has relatively low resilience, usually having at least one or two areas in which they have lower than average resilience to climate change, and no areas of high resilience; on average they have an overall resilience score of 5.1, which is lower than the average of 5.9.
- Moderate resilience:** A large proportion of the adult population – 40.5% - falls into this group, who have moderate resilience (average overall score of 6.0, almost identical to the average resilience score. While overall this group have reasonable resilience, particularly through having good access to individual resilience resources and high climate change awareness and support for action, they do not always translate these resources into concrete action to prepare for events such as heatwaves, extreme weather events, or drought. Resilience in this group can be

improved through investing in translating their resilience resources into greater investment in preparedness for specific effects of climate change.

- High resilience:** This group – 26.4% of the population – has an average overall resilience score of 7.1, well above the average. They typically have high resilience in two or more of the six dimensions of resilience examined. While sometimes having moderately poorly performing residential infrastructure, they typically have high access to resilience resources and are better prepared for extreme weather than others.

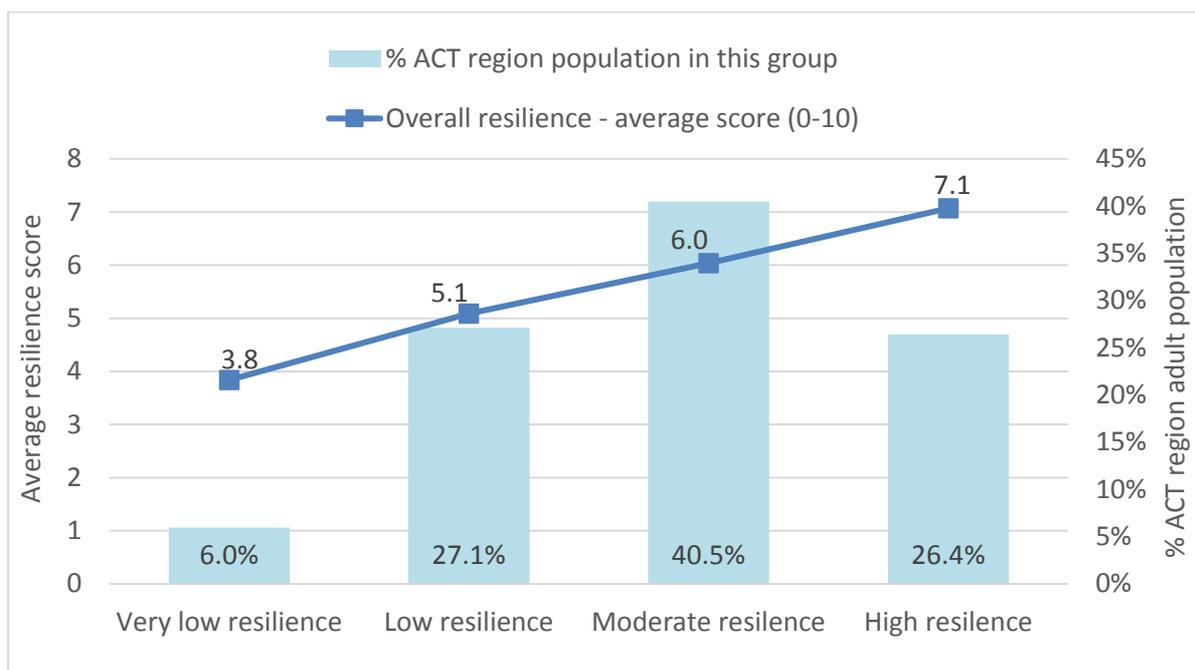


Figure 53 Proportion of population with very low, low, moderate and high resilience

11.3 VARIANCE IN OVERALL RESILIENCE

Average resilience scores were compared across groups, and the proportion of different groups and people living in different places with (i) low resilience and (ii) moderate or high resilience was examined. As noted earlier in this report, average scores are useful, but can mask large groups of people with low and high vulnerability: for this reason, it was important to examine both average resilience scores, and to also examine the proportion of people with low resilience and with high resilience to better understand how resilience varies across different groups and places.

As shown in Table 21, comparing average resilience scores highlights some differences between groups. A more comprehensive picture emerges when those with low and very low resilience are examined, with some clusters of people with low resilience identified in particular places and within specific groups, as shown in Table 22. Table 23 then shows the proportion with moderate to high resilience, and highlights that in some cases, there are

clusters of people with both low and high resilience living in particular places or amongst specific groups:

- **Gender:** While average scores for overall resilience only differed slightly between men and women, men were less likely to have a very low or low resilience score and more likely to have high resilience than women. Men on average had higher resilience than women to extreme weather events and heatwaves, while women reported high climate change awareness and support for action.
- **Age:** Overall, younger people were less resilient and older people more resilient. This finding held across most of the six dimensions of resilience, with one exception: younger people had higher climate change awareness and support action than older people. This suggests that despite higher awareness and support, many younger people experience difficulty translating this awareness and support into on-ground action in the form of preparedness for extreme weather, heatwaves and droughts. This difficulty is likely to result from factors such as living in rented accommodation that cannot be readily changed by the renter, and lower income amongst some younger groups.
- **Cultural background:** While those from differing cultural backgrounds had similar overall resilience, this masked some differences in specific dimensions of resilience. Those born overseas in non-English speaking countries overall reported poor resilience to extreme weather events and drought compared to others, despite being more likely to have high climate change awareness and support for action.
- **Formal education:** Those who did not have a university degree had slightly poorer overall resilience, driven by poorer access to individual resilience resources and poorer resilience to heatwaves in particular.
- **Household structure:** Those living with a partner or in a two parent family reported on average better resilience than those living in single person households or in a sharehouse or single parent household. Those living in single parent and sharehouse households had lower resilience overall, driven by poorer access to individual resilience resources and to extreme weather events in particular.
- **Home status:** Renters had lower resilience to climate change, and those who owned their homes outright higher resilience. Renters had lower resilience for all aspects of resilience examined, except climate change awareness and action.
- **Home type:** Those living in units/apartments reported lower resilience and those living in freestanding houses higher resilience. Low resilience amongst those living in units/apartments was driven by poorer access to individual resilience resources, and lower resilience to extreme weather events and drought.
- **Place:** While no place had lower overall resilience scores than average, this hid a range of outcomes in different places, with sometimes large differences in each of the six aspects of resilience examined. For example, higher resilience to extreme weather events was reported by those living in Belconnen East, Tuggeranong North

and South, Weston Creek and NSW areas. Poorer access to individual and community resilience resources was reported by Tuggeranong South residents and to a lesser extent those living in Outer Belconnen and Weston Creek. Those living in Gungahlin had lower than average drought resilience and had fewer people with high resilience than most other places.

Table 21 Overall resilience and six dimensions of resilience – average scores

		Overall resilience – average score (measured from 0-10)	Average score for each of the six dimensions of resilience (measured from 0-10)						
			Individual resilience resources	Community resilience resources	Heatwave resilience	Extreme weather resilience	Drought resilience	Climate change awareness and action	
	ACT region	5.9	6.5	6.1	5.9	4.4	5.8	7.0	
Gender	Male	6.0	6.5	6.1	6.0	4.8	5.7	6.7	
	Female	5.9	6.5	6.1	5.7	4.1	5.8	7.2	
Age	18-24	5.7	6.2	6.1	5.4	3.8	5.6	7.3	
	25-34	5.7	6.3	5.9	5.7	3.5	5.5	7.0	
	35-44	5.8	6.2	6.1	5.7	4.3	5.7	7.1	
	45-54	6.0	6.4	6.1	5.9	5.0	6.1	7.0	
	55-64	6.2	6.8	6.3	6.1	5.0	6.0	6.9	
	65-74	6.3	7.1	6.5	6.3	5.4	5.9	6.9	
	75 plus	6.2	6.9	6.2	6.2	5.3	5.7	6.5	
Cultural background	Australian born	5.9	6.5	6.1	5.9	4.5	5.8	7.0	
	Born o/s, English	5.9	6.6	6.1	5.8	4.5	5.8	6.9	
	Born o/s, other	5.8	6.5	6.2	5.8	3.7	5.4	6.9	
Formal education	No univ. degree	5.8	6.1	6.0	5.5	4.6	5.8	6.9	
	Univ. degree	6.0	6.7	6.2	6.0	4.4	5.8	7.1	
Household structure	Partner only	6.1	6.7	6.2	6.1	4.7	5.8	6.9	
	2 parent family	6.0	6.5	6.2	5.9	4.5	5.7	7.0	
	Single parent/ sharehouse	5.6	6.1	6.0	5.3	3.6	5.7	7.1	
	1 person h'hold	5.8	6.2	5.9	5.7	4.4	6.0	6.9	
Home status	Renting	5.5	5.9	5.9	5.2	3.3	5.5	7.2	
	Mortgage	6.0	6.5	6.2	6.1	4.7	5.7	7.0	
	Outright owner	6.3	7.1	6.3	6.3	5.2	6.1	6.8	
Home type	House	6.0	6.6	6.2	5.9	4.7	5.8	7.0	
	Townhouse	5.8	6.3	6.0	5.8	4.4	5.5	7.1	
	Unit/apartment	5.7	6.2	6.0	5.7	3.4	5.4	7.1	
Place	Belconnen E.	6.1	6.7	6.3	5.9	4.8	6.0	7.0	
	Gungahlin	5.8	6.4	6.0	5.8	4.3	5.3	6.9	
	Inner Belconnen	6.1	6.6	6.3	6.0	4.4	6.0	7.1	
	Inner North	5.9	6.7	6.1	6.0	3.8	5.8	7.1	
	Inner South	5.9	6.8	6.4	6.1	3.9	4.7	7.0	
	North	6.0	6.6	6.4	6.1	3.8	6.1	7.3	
	Out. Belconnen	5.8	6.3	5.9	5.7	4.4	6.2	6.9	
	Tuggeranong Nth	6.0	6.5	6.0	5.7	4.9	6.2	6.9	
	Tuggeranong Sth	5.9	6.1	5.9	5.8	4.9	5.7	6.9	
	Weston Creek	6.0	6.6	6.1	5.9	4.7	5.7	7.2	
	Woden Valley	6.1	6.8	6.4	6.0	4.5	5.7	7.1	
	NSW areas	5.8	6.3	6.1	5.6	4.7	5.8	6.8	

Table 22 Overall resilience and six dimensions of resilience - proportion of residents with low resilience

<i>Ochre shading indicates low resilience was more common than average amongst this group.</i>		Overall resilience – cluster analysis findings		% of residents with low scores for each of the six dimensions of resilience (defined as score of 4 or below)					
		% with very low resilience	% with low resilience	Individual resilience resources	Community resilience resources	Heatwave resilience	Extreme weather resilience	Drought resilience	Climate change awareness and action
	ACT region	6.0%	27.1%	5.0%	4.4%	11.4%	39.4%	17.2%	4.3%
Gender	Male	4.7%	25.2%	4.7%	4.2%	8.1%	32.2%	18.1%	6.5%
	Female	7.0%	28.8%	5.2%	4.4%	14.3%	45.5%	16.5%	2.1%
Age	18-24	6.0%	35.6%	6.4%	2.0%	15.3%	52.6%	19.9%	1.6%
	25-34	8.9%	34.3%	6.9%	7.3%	14.1%	56.1%	21.4%	2.8%
	35-44	7.1%	28.2%	5.6%	2.5%	11.3%	41.3%	15.9%	3.1%
	45-54	6.3%	22.0%	6.0%	4.8%	9.9%	30.2%	16.4%	4.7%
	55-64	4.6%	21.9%	3.8%	4.2%	9.8%	29.8%	13.1%	4.5%
	65-74	1.7%	13.5%	.4%	2.8%	8.5%	22.1%	12.4%	5.4%
	75 plus	.6%	22.7%	0.0%	6.0%	6.6%	19.3%	20.1%	11.6%
Cultural background	Australian born	5.8%	27.2%	5.1%	4.5%	11.4%	38.2%	16.2%	3.9%
	Born o/s, English	6.3%	25.2%	4.5%	5.1%	11.1%	37.5%	20.3%	3.5%
	Born o/s, other	7.1%	29.0%	4.2%	2.6%	12.2%	52.0%	22.2%	8.4%
Formal education	No univ. degree	8.9%	30.8%	8.8%	6.6%	17.4%	38.6%	17.1%	4.6%
	Univ. degree	4.4%	25.1%	3.0%	3.3%	8.3%	39.8%	17.3%	4.1%
Household structure	Partner only	3.7%	24.3%	3.5%	4.8%	9.6%	34.8%	17.0%	5.8%
	2 parent family	4.6%	26.5%	4.1%	3.9%	8.8%	36.0%	16.0%	3.8%
	Single parent/ sharehouse	10.6%	33.2%	8.8%	3.9%	18.9%	56.0%	18.8%	2.6%
	1 person h'hold	11.4%	29.7%	7.0%	6.8%	14.8%	39.9%	20.9%	3.3%
Home status	Renting	12.9%	36.3%	10.9%	5.5%	20.4%	62.0%	22.9%	2.2%
	Mortgage	3.3%	27.6%	3.1%	3.7%	7.2%	31.4%	18.6%	3.7%
	Outright owner	2.5%	16.7%	1.2%	5.0%	6.6%	27.3%	11.5%	7.5%
Home type	House	5.0%	24.9%	4.6%	3.7%	10.2%	34.9%	15.5%	4.9%
	Townhouse	4.7%	32.0%	7.0%	6.2%	11.9%	37.4%	22.9%	2.6%
	Unit/apartment	11.4%	31.9%	4.9%	6.4%	14.6%	60.7%	24.4%	3.5%
Place	Belconnen E.	5.4%	19.5%	3.8%	4.2%	8.1%	34.9%	11.0%	3.5%
	Gungahlin	8.3%	32.6%	6.4%	6.1%	12.2%	43.2%	24.9%	3.5%
	Inner Belconnen	3.4%	27.1%	2.6%	2.4%	10.7%	40.4%	12.9%	2.7%
	Inner North	4.5%	27.4%	3.5%	1.4%	8.8%	52.7%	17.4%	6.4%
	Inner South	7.4%	25.5%	5.8%	2.5%	10.9%	47.4%	40.3%	6.7%
	North	5.1%	23.2%	2.7%	2.3%	7.3%	49.6%	7.6%	.6%
	Out. Belconnen	6.8%	29.8%	8.2%	8.7%	17.3%	41.1%	7.2%	5.5%
	Tuggeranong Nth	6.2%	25.4%	4.1%	2.2%	14.2%	30.7%	8.6%	5.1%
	Tuggeranong Sth	4.3%	32.7%	7.5%	8.5%	11.3%	30.3%	17.4%	6.2%
	Weston Creek	6.2%	23.3%	7.0%	7.0%	10.0%	33.7%	18.9%	1.8%
	Woden Valley	5.1%	21.0%	2.5%	1.1%	10.1%	37.0%	21.8%	5.8%
	NSW areas	7.3%	25.2%	3.5%	4.3%	11.9%	33.5%	17.7%	2.8%

Table 23 Overall resilience and six dimensions of resilience – proportion of residents with high resilience

<i>Purple shading indicates high resilience was more common than average amongst this group.</i>		Overall resilience – cluster analysis findings		% of residents with high scores for each of the six dimensions of resilience (defined as score >8)					
		% with moderate resilience	% with high resilience	Individual resilience resources	Community resilience resources	Heatwave resilience	Extreme weather resilience	Drought resilience	Climate change awareness and action
	ACT region	40.5%	26.4%	12.6%	4.0%	5.2%	6.0%	7.3%	24.9%
Gender	Male	41.9%	28.1%	11.8%	3.9%	5.3%	7.3%	7.2%	19.1%
	Female	39.1%	25.0%	13.3%	4.2%	5.3%	4.6%	6.8%	30.6%
Age	18-24	40.9%	17.5%	10.1%	2.7%	1.2%	5.5%	6.0%	32.6%
	25-34	39.4%	17.3%	10.9%	3.5%	3.7%	2.3%	4.1%	25.9%
	35-44	42.6%	22.1%	9.3%	4.2%	3.1%	4.7%	5.2%	24.7%
	45-54	40.8%	30.9%	9.0%	2.6%	4.9%	7.4%	12.6%	23.3%
	55-64	37.2%	36.3%	18.1%	4.8%	9.3%	7.3%	8.4%	22.8%
	65-74	43.4%	41.3%	23.0%	9.0%	9.4%	10.0%	8.3%	21.7%
	75 plus	40.5%	36.1%	14.6%	6.6%	11.6%	9.4%	7.7%	20.9%
Cultural background	Australian born	39.8%	27.2%	13.3%	3.5%	5.3%	6.6%	7.1%	24.0%
	Born o/s, English	40.9%	27.6%	10.0%	5.5%	6.7%	4.9%	8.9%	27.1%
	Born o/s, other	45.2%	18.7%	11.1%	6.7%	2.9%	1.6%	5.3%	28.1%
Formal education	No univ. degree	38.5%	21.7%	9.4%	4.1%	3.2%	7.5%	7.5%	22.6%
	Univ. degree	41.5%	29.0%	14.3%	4.0%	6.3%	5.1%	7.2%	26.1%
Household structure	Partner only	41.3%	30.7%	16.6%	3.4%	7.5%	7.7%	6.2%	21.9%
	2 parent family	42.4%	26.6%	11.8%	5.3%	4.5%	5.2%	5.9%	26.6%
	Single parent/ sharehouse	40.1%	16.1%	9.5%	3.5%	2.2%	4.3%	7.8%	28.6%
	1 person h'hold	29.9%	29.0%	6.3%	1.5%	4.9%	5.2%	18.3%	22.6%
Home status	Renting	36.6%	14.3%	8.1%	3.3%	1.6%	3.5%	5.2%	30.9%
	Mortgage	41.7%	27.5%	10.8%	5.4%	4.9%	5.7%	7.7%	23.1%
	Outright owner	40.2%	40.6%	21.6%	3.5%	10.4%	8.4%	9.7%	21.0%
Home type	House	40.3%	29.8%	13.9%	4.5%	5.7%	6.8%	7.7%	24.6%
	Townhouse	41.0%	22.3%	10.6%	2.7%	5.4%	4.7%	5.1%	24.8%
	Unit/apartment	40.2%	16.5%	8.6%	3.7%	3.0%	3.2%	6.6%	25.5%
Place	Belconnen E.	39.6%	35.5%	13.1%	4.5%	3.6%	8.2%	5.3%	22.0%
	Gungahlin	36.2%	22.9%	10.2%	2.1%	5.1%	3.7%	5.0%	21.5%
	Inner Belconnen	39.0%	30.5%	11.5%	4.0%	8.2%	8.6%	8.6%	28.4%
	Inner North	44.0%	24.0%	16.2%	3.6%	6.5%	3.7%	9.3%	28.2%
	Inner South	41.7%	25.4%	13.7%	7.1%	7.7%	2.7%	1.3%	22.4%
	North	39.2%	32.5%	15.0%	6.6%	5.7%	3.1%	11.0%	28.3%
	Out. Belconnen	38.0%	25.4%	10.9%	2.8%	7.4%	6.4%	8.3%	22.1%
	Tuggeranong Nth	39.4%	29.0%	14.8%	4.2%	1.6%	9.3%	8.8%	23.4%
	Tuggeranong Sth	39.4%	23.6%	8.6%	3.8%	4.1%	7.5%	9.3%	25.3%
	Weston Creek	40.5%	30.0%	15.9%	3.3%	3.2%	9.9%	4.5%	34.4%
	Woden Valley	45.5%	28.4%	17.9%	9.6%	6.4%	4.6%	6.4%	27.1%
	NSW areas	47.1%	20.4%	9.3%	0.0%	2.8%	5.1%	8.0%	20.8%

11.4 CHARACTERISTICS OF PEOPLE WITH LOW, MODERATE AND HIGH RESILIENCE

The previous section identified whether people living in particular places, or with particular socio-demographic characteristics, were more likely than average to have high or low resilience. This is useful, as it identifies overall risk of people with particular characteristics having low or high resilience. However, it is also important to understand if some groups are typically 'over-represented' in each of the four groups identified in the cluster analysis. Are some groups more represented amongst those with very low, low, moderate or high resilience? To further understand this, Table 24 and 25 compare the socio-demographic and residential characteristics of each of these four groups with differing levels of resilience:

- **Very low resilience** was more common amongst female renters aged 25-44, those living on their own or in single parent households, with lower levels of education, and often living in units/apartments. There was a stronger clustering of these households in Gungahlin than other regions, with higher representation in the Inner South, Outer Belconnen, Tuggeranong North and the NSW areas.
- **Low resilience** was most common amongst younger women aged 18-34, although there were more men in this group than in the very low resilience group; this group often had no university degree, and was slightly more likely to live in a townhouse and in Tuggeranong South than those with other levels of resilience.
- **Moderate resilience** was most common for two parent families with a mortgaged house, and represented a large proportion of the population.
- **High resilience** was most common amongst those aged 55 and older, who were born in Australia and had a university degree, owned their home outright (and usually lived in a house rather than a townhouse or a unit/apartment), who had no children living at home. Men were more common in this group than others, although only slightly.

Table 24 Groups and places over-represented or more often represented in each of four resilience clusters

<p>Very low resilience (6.0% adult population)</p> <p>Women, those aged 25-34 and 35-44, those born overseas, those with no university degree, single parent/sharehouse, single person household, renters, those living in unit/apartments, residents living in Gungahlin, Inner South, Outer Belconnen, Tuggeranong North, NSW areas.</p>	<p>Moderate resilience (40.5% adult population)</p> <p>Most groups represented in similar proportions to the general population in this group, due to its large size: groups most commonly in this group and not over-represented in others were those living in two parent families with a mortgage, slightly more likely to be living in the Inner North and Woden Valley although differences between districts were very small.</p>
<p>Low resilience (27.1% adult population)</p> <p>Women, those aged 18-24 and 25-34, those with no university degree, living in a townhouse, and living in Tuggeranong South.</p>	<p>High resilience (26.4% adult population)</p> <p>Men, those aged 45 and older (particularly those aged 55-74), those born in Australia, with a university degree, living with a partner but no children at home, in a house they own outright, slightly more common in Belconnen East, Inner Belconnen, North, Weston Creek and Woden Valley.</p>

Table 25 Proportion of each socio-demographic group and place in each of four resilience clusters

		Very low resilience	Low resilience	Moderate resilience	High resilience	ACT region adult population
Gender	Male	38%	44%	49%	50%	48%
	Female	62%	56%	51%	50%	52%
Age	18-24	14%	18%	14%	9%	13%
	25-34	32%	28%	21%	14%	22%
	35-44	23%	20%	20%	16%	19%
	45-54	18%	13%	16%	19%	16%
	55-64	10%	11%	12%	18%	13%
	65-74	3%	5%	10%	15%	10%
	75 plus	1%	6%	7%	10%	7%
Cultural background	Australian born	74%	77%	76%	79%	77%
	Born o/s, English	15%	13%	14%	14%	14%
	Born o/s, other	11%	10%	10%	7%	9%
Formal education	No univ. degree	52%	39%	33%	28%	35%
	Univ. degree	48%	61%	67%	72%	65%
Household structure	Partner only	23%	33%	37%	43%	37%
	2 parent family	28%	36%	38%	37%	36%
	Single parent/ sharehouse	31%	21%	17%	11%	17%
	1 person h'hold	18%	10%	7%	10%	9%
Home status	Renting	66%	41%	29%	16%	31%
	Mortgage	22%	42%	43%	42%	41%
	Outright owner	12%	17%	28%	42%	28%
Home type	House	59%	65%	70%	78%	70%
	Townhouse	11%	17%	15%	12%	14%
	Unit/apartment	30%	18%	16%	10%	16%
Place	Belconnen E.	4%	3%	4%	6%	4%
	Gungahlin	22%	19%	14%	14%	16%
	Inner Belconnen	5%	10%	9%	11%	10%
	Inner North	6%	8%	8%	7%	8%
	Inner South	8%	6%	7%	6%	7%
	North	5%	5%	6%	7%	6%
	Out. Belconnen	10%	9%	8%	8%	8%
	Tuggeranong Nth	9%	8%	9%	10%	9%
	Tuggeranong Sth	7%	12%	10%	9%	10%
	Weston Creek	6%	5%	6%	7%	6%
	Woden Valley	7%	6%	9%	9%	8%
NSW areas	11%	8%	10%	7%	9%	

11.5 IMPLICATIONS FOR SUCCESSFUL CLIMATE CHANGE ADAPTATION

This section shows that resilience to climate change is a function of life stage and circumstances, more than living in specific places. Vulnerability to climate change occurs amongst groups who are more vulnerable overall: those with fewer financial resources and higher commitments in particular, with renters, single parents, and younger people who have not yet built a large set of resilience resources either in terms of financial resources or resources related to building life experience and skills. However, the findings in this section also show that even amongst groups with relatively high resilience, it is common for people to live in homes that do not perform well in heatwaves, and to have low levels of preparedness for extreme weather events; the difference between the low and the high resilience groups is that the latter have adequate financial and other resources to cope in

other ways with heatwaves and to recover from damage caused by extreme weather, whereas the former often do not have these alternatives.

To succeed in reducing vulnerability of those with very low resilience, adaptation strategies need to include **resourceful, robust, viable** options that are **flexible** enough to apply to the range of situations of those with low resilience. In particular, they need to be of use for renters and those living in homes other than freestanding houses, and to provide options for improving resilience to heatwaves amongst those who have limited financial resources or ability (due to being a renter or living in a unit/apartment with limited options for changing characteristics of the home) to make changes to the home they live in. Adaptation strategies need to be **inclusive** of all housing types and occupant types, rather than focusing on just some types (such as those who live in houses they mortgage or own). For those who have low resilience, adaptation support needs to focus on increasing overall **contingency** capacity to cope with a range of events, rather than on just one aspect of climate change resilience, with a focus on **integrated** approaches that consider effects of adaptation action on all aspects of ability to cope with and adapt to the expected effects of climate change.

12. RECOMMENDATIONS FOR TRACKING CHANGE OVER TIME

This survey is intended to continue over time. This section makes recommendations for tracking change in resilience as an outcome of successful adaptation over time, including:

- Frequency of monitoring
- Recommended survey content
- Recommended survey methods
- Further development of adaptation and resilience indexes.

12.1 FREQUENCY OF MONITORING

Community surveys are a significant investment, and ask members of the public to invest time and effort. Worldwide, survey response rates are declining with many people increasingly unwilling to participate in the large numbers of surveys they are asked to participate in (Keeter et al. 2017). This means care is needed, with surveys only conducted as often as is necessary to track change over time.

This survey should ideally be repeated at intervals appropriate to monitoring change in adaptation and resilience. While it is difficult to make predictions about how rapidly overall resilience will change, and the timeframes in which successful (or unsuccessful) adaptation will occur, it is possible to consider typical timeframes of change or in which adoption of actions might occur.

We would recommend this survey be repeated every three to five years, unless specific events occur that justify conducting the survey more frequently. For example, a series of climate-related extreme weather events that place significant stress on resilience resources may mean it is appropriate to conduct the survey earlier to track how successfully residents are coping with and recovering from these events. In the absence of either large events affecting much of the population, or rapid and large-scale investment in encouraging specific adaptation actions, it is unlikely that time periods of less than three years will show significant changes, for several reasons:

- Access to resilience resources tends to change relatively slowly for most people over time: for example, over five years the Regional Wellbeing Survey, which monitors access to resilience resources in communities across Australia, has found relatively little change in resilience resources in most communities except those experiencing significant stresses such as drought or economic downturn (Schirmer et al. forthcoming).

- Adoption of many adaptation actions takes time: for example, modifying a residence to make it more fit for purpose in heatwaves often takes investment in several actions over a period of years.
- Behaviour change often takes time: studies on behaviour change show that achieving persistent changes in behaviour requires not only designing successful strategies to encourage change, but implementing them and addressing factors that act as barriers to adoption of those behaviours (e.g. Unsworth et al. 2013, Schirmer and Dyer 2018).

We therefore recommend repeating this survey every three to five years, except during periods when either (i) there is greater than usual exposure to climate-related stresses for a large proportion of the region's population, or (ii) when there has been investment in specific strategies to increase adoption of adaptation strategies, and a need to monitor success of these strategies.

12.2 RECOMMENDED SURVEY CONTENT

Longitudinal surveys should ideally repeat the same survey measures over time to enable tracking of change, and the measures used in this baseline survey were designed to be tracked over time. The survey instrument is provided in Appendix 1 to enable repetition of measures over time.

However, the international literature on resilience and adaptation to climate change is currently developing rapidly. Given this, it is likely that over time new understanding of the factors that are critical to successful adaptation will emerge, and will differ to some of the aspects measured in this initial baseline survey. Additionally, it is likely that, over time, some of the measures recommended in this baseline study will be identified as having lower utility than others for measuring adaptation over time.

Many of the measures in this survey were developed for this study, as there were few existing surveys from which measures could be taken. This means that most measures have not yet been fully validated and their sensitivity to change and overall robustness has not yet been fully assessed.

Ideally, a small study should be undertaken to further validate measures before repeating the survey. This would involve using standard validation techniques such as testing sensitivity of measures over short periods of time by measuring them more than once with the same survey subjects and identifying change, and applying other standard statistical validation techniques to better 'stress test' the measures. This work can then identify any measures that need to be improved or changed, and confirm that others are suitable for use over the longer-term to measure change.

When the survey is repeated, all or nearly all of the measures including in 2018 should be repeated, and change over time in each should be examined. After this has occurred, critical

analysis of the usefulness of different measures in identifying change should be undertaken, and recommendations made for a more parsimonious set of measures to continue using over time.

Finally, despite initial pilot testing of all measures, some measures used in this survey had noted challenges, and some gaps in measures were identified. We recommend the following changes be made when the survey is repeated in future:

- Including better measures of household characteristics that enable clearer identification of single parent households, something that was not possible in this survey. This requires more specific questions about household structure to be included.
- Separation of questions about insurance of (i) home and (ii) contents, to better understand types of insurance held and exposure to negative impacts. Additionally, those who rely on savings rather than insurance should be better identified, as savings can be an appropriate alternative strategy to use of insurance for some residents.
- Further develop measures of health-related exposure to heatwaves, to better understand health vulnerability amongst the elderly in particular, and ensure that self-report measures can be better interpreted. In particular, there is a need to better understand where self-reported results indicating high resilience may actually be a cause for concern as they indicate inappropriately low awareness of potential problems.

12.3 RECOMMENDED SURVEY METHODS

Longitudinal surveys should be undertaken using methods that are comparable over time, to reduce risk of introducing bias due to change in survey methodology. This means that future 'waves' (future delivery) of the survey should use a similar methodology to this survey.

Longitudinal surveys can use two approaches to tracking change over time: tracking the same people over time (a true longitudinal study), and tracking a representative population sample over time in which participants change but are representative of the broader population (a repeated cross-sectional sample).

In the first approach, the same individuals are surveyed over time, with survey results tracking how they change. This is the most robust way of identifying how resilience and adaptation is changing, as it enables tracking of change amongst a specific unchanged group of people. However, longitudinal surveys of the same sample over time also have challenges. The first challenge is that in any voluntary survey, there will be drop-out over time, and often that drop-out is not random, meaning that survey results may become biased over time due to bias in the nature of those who drop out of the study. Several health studies have identified that those who drop-out tend to be the most vulnerable: for

example, those with mental health disorders or low resilience are more likely to drop out of longitudinal studies, while those who have better health are more likely to continue participating (see for example Chatfield et al. 2005, Wolke et al. 2009). Maintaining participation of the same group of people also requires ongoing investment in maintaining contact databases and developing a relationship that increases likelihood of participants continuing to participate. Finally, it is important to continue recruiting younger people into a longitudinal study as otherwise findings will become biased over time due to younger cohorts being excluded as the sample being surveyed ages. Because of these issues, many longitudinal studies invest in continually adding new participants to their studies, to offset effects of drop-out, and in maintaining relationships with participants to minimize drop-out and associated bias.

Repeated cross-sectional studies are simpler and often require lower levels of investment, but care is needed to maintain the same methods of recruiting participants over time to avoid introducing bias due to sampling methods. These studies will not track how individual people are changing over time, but will provide a population-level picture of change that accounts not only for how individual people are changing, but also for demographic change in the overall population – for example, if the population of Canberra changes substantially in terms of age structure or education levels, cross-sectional surveys should reflect this and identify if this changing structure is associated with shifts in resilience and adaptation.

Ideally, both strategies should be pursued: participants who participated in the baseline study should be invited to continue participating over time, while a new cross-sectional sample should also be recruited each time the survey is conducted to ensure results can be representative of the adult population of the region.

12.4 FURTHER DEVELOPMENT OF ADAPTATION AND RESILIENCE INDEXES

This report includes several indexes intended to measure different aspects of resilience as an outcome of successful adaptation. The indexes reported here should be considered preliminary, and can be further developed and refined. We recommend investing in testing sensitivity of different approaches to calculating indexes, and where feasible in testing how these indexes perform in relation to other sources of data on resilience to climate change (for example, hospital admissions for different heat-related illnesses), to better identify the utility and appropriateness of different indexes, and improve interpretation of them. Findings of this type of analysis should then be used to inform re-development and improvement of the indexes presented in this report.

To facilitate ongoing development of metrics for measuring resilience and adaptation, we recommend depositing the de-identified dataset from this survey in an appropriate data archive, ensuring it is available in future to recalculate indexes as needed, as well as more generally to ensure it is possible to use the dataset over time to track change as further surveys are conducted.

13. DISCUSSION AND CONCLUSIONS

Successful climate change adaptation strategies will be reflective, inclusive, robust, flexible, resourceful, integrated, viable and create contingency capacity.

13.1 REFLECTIVE ADAPTATION

Successful adaptation will draw on past experience and learn from it to inform future decisions. The results of this study suggest that those who have most successfully engaged in proactive adaptation to date are those with high access to resilience resources, particularly those who are older, who own their home outright, and who have higher levels of formal education. This group is better able to adapt without support from government. Even amongst these groups, however, a high proportion of people still live in homes that are not highly fit for coping with extended heatwaves.

This suggests that strategies encouraging adaptation to date have often first reached those with the highest resilience resources, and for whom it is easier to implement proactive adaptation actions. Building higher resilience through the whole population requires developing approaches to reach those with lower access to resilience resources, particularly younger people, renters and those with low financial resources. It also requires designing adaptation options for those living in the increasing number of units/apartments in the region as well as for those living in freestanding houses.

13.2 INCLUSIVE ADAPTATION

Inclusive adaptation requires creating shared ownership in decision making, and social license for outcomes. Our findings suggest that residents of the ACT region largely feel strong support for government climate change objectives and support the government taking action to implement climate change adaptation strategies. This suggests high levels of social license for government action, although there is lower support for some actions, particularly requiring retrofitting of private buildings, which may impact on cost of living, a key area of pressure for many ACT region residents.

Fewer feel confident to implement action in their household to adapt, with younger people and renters in particular having low confidence in their ability to adapt to the effects of climate change expected in their lifetime. This suggests that inclusive adaptation strategies need to shift from building support for government action, to building confidence in implementing adaptation action at the individual and household scale. This requires assisting residents through identifying viable, robust and flexible adaptation options they can implement, better enabling shared action at all scales to adapt to the expected effects of climate change.

13.3 ROBUST ADAPTATION

Robust adaptation involves ensuring adaptation strengthens social, urban, rural and natural systems so they are fit-for-purpose for successful adaptation to climate change. Key areas

where there is low fitness for purpose are residential infrastructure, which often performs poorly in heatwaves, increasing risk of heat-related illness and negative impacts, and where there is high reliance on use of often expensive air conditioning to cope with heatwaves. This increases systemic vulnerability to heatwaves, with those most vulnerable to heatwaves often experiencing negative financial impacts from cooling their homes or risking exposure to heat-related illnesses, while also risking maladaptive responses of higher electricity demand in heatwaves that increases risk of blackouts and other negative system outcomes. Robust adaptation requires reducing exposure to these impacts through supporting better adaptation of existing residential infrastructure and design of new infrastructure to be not only energy efficient, but also better able to cool down after a hot day without use of air conditioning, particularly for units/apartments.

There is also clearly a divide between those with greater and lesser access to resilience resources that suggests systemic challenges for adaptation: robust adaptation requires supporting younger people, renters, those living in units/apartments, single parents and the financially vulnerable more generally, as well as those who currently are more likely to implement adaptation action.

13.4 FLEXIBLE ADAPTATION

Flexible adaptation requires being able to respond to changing circumstances. Achieving greater capacity for flexible adaptation requires better supporting those with low access to resilience resources, which are key to flexible adaptation as they provide resources that can be used in multiple ways to adapt to expected and unexpected effects of climate change. While many ACT residents have high access to resilience resources, the significant minority with low financial and social resources have lower ability to be flexible in their adaptation responses.

13.5 RESOURCEFUL ADAPTATION

Resourceful adaptation involves finding innovative and smart ways to use resources, develop the city and be productive. Currently, much of the government's adaptation action efforts appear to be largely enacted by people working in the EPSD directorate. More active development of a 'whole of government' approach in which people working in all parts of government are enabled to develop resourceful adaptation responses relevant to their area of work is likely to result in more successful adaptation. In particular, it will enable better use of the expertise, knowledge and skills of those working in different specialist areas to identify smart ways to address vulnerabilities and increase successful adaptation to climate change.

13.6 INTEGRATED ADAPTATION

Integrated adaptation involves coordinating systems and entities with shared objectives and a holistic approach. Similar to resourceful adaptation, better enabling all parts of the ACT government to participate in adaptation action can help achieve this type of integration.

This in turn is likely to result in development of strategies that better reach the groups most vulnerable to the effects of climate change, as it means they will be able to be reached through the areas of government with which they interact most often. For example, supporting those in the health sector to understand how people can act to reduce exposure to heat in their home can help them communicate with those who present to the health system with heat-related illnesses, and to achieve adaptation amongst this highly vulnerable group.

13.7 ADAPTATION THAT CREATES CONTINGENCY CAPACITY

Creating spare capacity to accommodate disruption and manage risks is important to successful adaptation. A key area of need is preparedness for extreme weather events, in particular improving proactive adoption of either insurance coverage or building sufficient savings to cope with damage from unexpected extreme events. Similarly, investment in increasing preparedness to respond to these events can reduce demand on emergency services during and after extreme weather events.

13.8 VIABLE ADAPTATION

Viable adaptation options are needed that are responsible, timely and efficient. Some residents currently lack access to viable adaptation options for their circumstances, particularly those living in rented residences, and those in younger age groups. There is a need to identify how to achieve improvements in fitness for purpose of properties that are rented, and how to better reduce risk of negative financial impacts of extreme weather events, heatwaves and drought for those who have few financial resources. Without this, there is a risk of an increasing gap between those who have high access to resilience resources and are able to successfully adapt and thus protect and grow those resources, and those who have low resilience resources, who are forced to cope with maladaptive strategies that over time further reduce the level of resilience resources they have to draw on. Viable adaptation strategies will reach the most vulnerable as a priority, and be specifically designed to meet their needs and be implementable without negatively impacting the often already low access to resilience resources amongst this group.

13.9 CONCLUSIONS

Successful climate change adaptation strategies will leverage existing strengths. This means considering how best to leverage current high levels of access to key resilience resources in the ACT population, particularly strong financial and human resources, to achieve proactive adaptation action, while supporting the significant minority who do not have good access to resilience resources and are more vulnerable to the effects of climate change. Ideally, adaptation strategies should leverage but not place pressure on existing resilience resources. This means ensuring that adaptation strategies are designed to reduce potential for additional pressure on living costs, particularly for renters and younger age groups.

The two key areas in which resilience to climate change is low for many groups is housing which has poor performance in heatwaves, and low levels of household preparedness for extreme weather events. There is a high risk of maladaptation in the form of rapidly increasing energy demands from increased use of air conditioning to cope with heatwaves in many poor performing residences, a coping strategy that can reduce resilience resources through increasing financial stress as well as placing higher demand on electricity supply. Strategies that support adaptation of residential infrastructure to perform better in heatwaves can significantly improve resilience to climate change, and are needed most for rented residences, and for units/apartments that often do not cool quickly after a hot day.

Our findings suggest high likelihood of underinsurance amongst a substantial proportion of the population. There is also relatively low investment in preparedness: while some key activities are undertaken relatively regularly by most households, such as clearing gutters, these are not linked to broader planning for how to protect the home or what to do in an emergency. Strategies to increase preparedness in the form of reducing risk of damage and insurance to cover damage can reduce risk of loss of resilience resources due to the impacts of storms, floods or bushfire.

Drought is not a significant challenge for many ACT region gardeners, particularly shorter periods of low rainfall, with social norms in the region supporting letting areas of the garden become dry and 'brown off'. However, lower rainfall is a challenge for those who wish to maintain a 'green and lush' garden, around one-third of gardeners, and many of these use both positive adaptation strategies such as mulching, but also often increase use of water to protect their garden, which can place pressure on scarce water resources. There is a need to encourage adaptation responses that reduce reliance on strategies such as increasing demand on mains water in dry times.

Overall, ACT region residents have very high awareness of climate change and high willingness to act, suggesting high support that can be leveraged to help achieve successful adaptation. However, the low confidence many have in their ability to adapt successfully to climate change suggests potential challenges for achieving successful adaptation, and a need to develop strategies that assist all residents in identifying viable adaptation options they feel confident to implement.

Despite high support for ACT government action, many ACT government workers are not aware of how they can act to support achieving the government's climate change objectives, suggesting a need to invest in increasing awareness and action across all of government.

Overall, resilience to climate change often appears to be a function of life stage and circumstances, more than living in specific places. High vulnerability to climate change occurs more often for those with fewer financial resources, particularly renters, single parents, younger people, women, and those with lower levels of formal education.

However, even amongst groups with relatively high resilience it is common for people to live in homes that do not perform well in heatwaves, and to have low levels of preparedness for extreme weather events; the difference between the low and the high resilience groups is that the latter have adequate financial and other resources to cope in other ways with heatwaves and to recover from damage caused by extreme weather, whereas the former often do not have these alternatives.

Overall, the results suggest that those who have most successfully engaged in proactive adaptation are those with high access to resilience resources. This group is better able to adapt without support from government. However, some with good access to resilience resources have not drawn on these to engage in proactive adaptation actions to prepare for extreme weather events, heatwaves and drought. Building higher resilience through the whole population requires approaches to reach and provide options for (i) those with lower access to resilience resources who have less capacity to adapt, particularly to younger people, renters, apartment dwellers and those with low financial resources; and (ii) those with moderate to high resilience resources who are not currently drawing on these to invest in preparing for the expected effects of climate change.

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APPENDIX 1: SURVEY QUESTIONS

Living well with a changing climate

The ‘Capital region’ of the Australian Capital Territory (ACT) and surrounding parts of NSW experiences many weather extremes, having some of the coldest winters in the country, and heatwaves in summers. Climate projections predict that in the future the region will become warmer and drier, and events such as drought, bushfire, storms, floods and heatwaves will happen more often. Extreme weather events affect us all. To live well with a changing climate, better understanding is needed of who is most vulnerable to extreme weather events, and how we can support different people to cope with these events. This survey, conducted by University of Canberra researchers and supported by the ACT Government, will help build this understanding. For more information about the study, including how we ensure your privacy and confidentiality, see our survey information sheet.

The survey has six parts:

1. **How you find living in the region:** What are your views about the liveability of your local area?
2. **Your health and wellbeing:** This can affect how easily some people cope with extreme weather
3. **Liveability of your home:** How does your home and garden do during heatwaves and dry times?
4. **Coping with extreme weather events:** What do you do to prepare for extreme events such as storms and bushfires?
5. **Environment and climate change:** Your views about environmental issues and climate change
6. **About you:** This part asks for some more information about you e.g. age, including things like your age, gender

You can choose to do a shorter or longer version of the survey. What length would you like to do?

- Our short survey (around 15 minutes), 1 entry into the prize draw
- Our regular survey (around 20-25 minutes), 3 entries into the prize draw

Part 1: How you find living in the region

The first part of the survey asks for your views about living in the Capital region. Understanding how ‘liveable’ you find the part of the region you live is important, as living in a place that meets your needs and provides a high quality of life can support your ability to cope with extreme weather events.

How do you feel about the Capital region (Canberra and surrounding NSW areas) in general?	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
I would recommend this region to others as a good place to live	<input type="radio"/>							
There are plenty of jobs available in the region at the moment	<input type="radio"/>							
Living costs are affordable here e.g. food, petrol, housing	<input type="radio"/>							
The community copes pretty well when faced with challenges	<input type="radio"/>							
Most people get a fair go in this region	<input type="radio"/>							
I can get involved in local decision-making processes if I want to	<input type="radio"/>							

Thinking about the local area you live in (the suburban area, town or rural area you live in), to what extent do you agree or disagree with the following?	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
I feel part of the community here	<input type="radio"/>							
I feel like an outsider here	<input type="radio"/>							
Many people keep to themselves around here	<input type="radio"/>							
This is a safe place to live	<input type="radio"/>							
There is a high crime rate in this area	<input type="radio"/>							

Many people in this area drink too much alcohol or abuse drugs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
What are your views about how the area you live in and surrounding area is changing?	Getting WORSE ①	②	③	NOT changing ④	⑤	⑥	Getting BETTER ⑦	Don't know
The liveability of my local area is...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The friendliness of this area of my local area is...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The local economy in this area of my local area is...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The local landscape and surrounds of my local area are...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How do you find the outdoor areas near where you live?	Strongly DISAGREE ①	②	③	④	⑤	⑥	Strongly AGREE ⑦	Don't know
My suburb/neighbourhood has lots of vegetation (e.g. trees, shrubs)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like more trees in my local parks and streets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The streets near where I live have enough shade on hot days	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From my home, it is easy to go for a pleasant walk outside	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In hot weather, it is easy for me to go for a pleasant walk outside near my home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are parks, green spaces or nature reserves within easy walking distance of my home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I regularly spend time in parks, green spaces or nature reserves within walking distance of my home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I regularly spend time in parks or nature areas that are further than walking distance from my home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do any of the following make it difficult for you to spend time walking outdoors near where you live?	Not a PROBLEM ①	②	③	④	⑤	⑥	Big PROBLEM ⑦	Don't know
The risk of crime	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local paths are too busy e.g. with other walkers, cyclists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are few or no footpaths	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have other people to walk with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have enough time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My health often makes it difficult to go out for a walk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is often too bright or glary outside	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pollen allergy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor air quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How OFTEN do you do the following things (no matter where the activities occur)?	NEVER or almost never ①	②	③	④	⑤	⑥	ALL the time ⑦
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I spend time doing things with family members who don't live with me	<input type="radio"/>						
I make time to keep in touch with my friends	<input type="radio"/>						
I chat with my neighbours	<input type="radio"/>						
I take part in sports groups, activities or teams	<input type="radio"/>						
I am a member of one or more community or hobby groups	<input type="radio"/>						
I attend community events such as festivals, farmers markets	<input type="radio"/>						
I volunteer in my local community e.g. for groups like fire brigades, sports clubs, school canteen, meals on wheels, festivals	<input type="radio"/>						
I take part in groups that take care of the environment e.g. ParkCare, FrogWatch, Landcare	<input type="radio"/>						

Part 2: Your health and wellbeing

The next questions ask about your health and wellbeing. We ask about this because a person's overall health and wellbeing are important factors that often affect how easily they can cope in events such as heatwaves or storms. In addition, some specific health problems may be exacerbated in some types of weather.

How would you rate your general health? <i>Select one</i>				
<input type="radio"/> Excellent	<input type="radio"/> Very good	<input type="radio"/> Good	<input type="radio"/> Fair	<input type="radio"/> Poor
Does your health limit you in the following activities (for example due to disability, long term health condition or old age)? If so, how much?	Yes, limited a lot	Yes, limited a little	No, not limited at all	
<u>Vigorous activities</u> , such as running, lifting heavy objects, participating in strenuous sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Lifting or carrying groceries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Walking more than one kilometre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Walking half a kilometre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
General activities of self-care, mobility or communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Do you personally experience any of these health issues?					If yes, is this health issue typically worse during hot weather or other changes in weather such as storms?		
	Yes - major health issue for me	Yes - small to moderate health issue for me	No	Not sure	Yes	No	Not sure
Hay fever or pollen allergy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asthma	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respiratory disease (other than asthma)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heart/cardiovascular disorder or disease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allergic reaction to bites or stings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food or animal allergy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Depression or anxiety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being overweight or obese	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Migraine	<input type="radio"/>							
Heat-related illness such as heat exhaustion, heat stroke or heat rashes	<input type="radio"/>							

Think about all the vigorous and moderate activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

During the last 7 days, about how many hours of moderate physical activity did you do? Moderate activities take some effort but you can still talk while doing them, e.g. a brisk walk, household cleaning, raking leaves	Total hours in the last 7 days: (online survey to have drop down with options of None, ½ hour, 1 hour, 1 ½ hours, and so on, going up by the hour from 6 hours, and ending at '10 or more hours')
During the last 7 days, about how many hours of vigorous physical activity did you do? Vigorous activities requires more effort and make you breathe harder and faster ('huff and puff') e.g. jogging, aerobics, fast cycling, or activities such as digging	Total hours in the last 7 days: (online survey to have drop down with options of None, ½ hour, 1 hour, 1 ½ hours, and so on, going up by the hour from 6 hours, and ending at '10 or more hours')
On average, about how many hours do you spend sitting or lying down each day at the moment? <i>Do not include time spent sleeping</i>	Average hours per day on a weekday spent sitting: Do a dropdown menu starting from 1 hours and going up in hours to 16 hours or more

Thinking about your own life and personal circumstances, how satisfied are you with the following?	Completely DISSATISFIED										Completely SATISFIED	
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑨	⑩
Your life as a whole	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your standard of living	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
What you are currently achieving in life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your personal relationships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How safe you feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling part of your community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your future security	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the last four weeks, how often have you felt...	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Nervous?	<input type="radio"/>				
Hopeless?	<input type="radio"/>				
Restless or fidgety?	<input type="radio"/>				
Depressed?	<input type="radio"/>				

That everything was an effort?	<input type="radio"/>				
Worthless?	<input type="radio"/>				

If you are feeling distressed or need assistance, you can contact the following services for assistance, 24 hours a day: **Beyond Blue - 1300 22 4636 Lifeline - 13 11 14**

How much do you agree or disagree with the following statements?	Strongly DISAGREE					Strongly AGREE		N/A
	①	②	③	④	⑤	⑥	⑦	
I am confident I can achieve the things I want in life	<input type="radio"/>							
I am confident I can achieve the things I want in my work	<input type="radio"/>							

Part 3: Liveability of your home

This section asks how comfortable your home is during both hot and cold weather.

How easy do you find it to keep your home comfortable in different types of weather?	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
My home warms up very fast in hot weather	<input type="radio"/>							
When the temperature outside drops after a hot day, my home cools down quickly (without use of air conditioning)	<input type="radio"/>							
In summer, I use air conditioning/cooling in my home most days	<input type="radio"/>							
In winter, I use heaters in my home most of the time I am home	<input type="radio"/>							
I can easily afford to keep my home cool in summer	<input type="radio"/>							
I can easily afford to keep my home warm in winter	<input type="radio"/>							
Increases in costs of electricity or gas in recent years have been hard for my household to cope with	<input type="radio"/>							

In the last 12 months, about how much did your household spend on electricity and gas bills (in total, combining both types of expense)? <i>Select one.</i>	<input type="radio"/> Less than \$500	<input type="radio"/> \$2,000-2,499	<input type="radio"/> \$4,500-4,999
	<input type="radio"/> \$500-699	<input type="radio"/> \$2,500-2,999	<input type="radio"/> \$5,000-5,999
	<input type="radio"/> \$700-999	<input type="radio"/> \$2,500-2,999	<input type="radio"/> \$6,000 or more
	<input type="radio"/> \$1,000-1,299	<input type="radio"/> \$3,000-3,499	<input type="radio"/> Unsure
	<input type="radio"/> \$1,300-1,599	<input type="radio"/> \$3,500-3,999	<input type="radio"/> Prefer not to say
	<input type="radio"/> \$1,600-1,999	<input type="radio"/> \$4,000-4,499	

Have you done or are you planning to do any of the following actions? <i>We are asking as these actions can help reduce effects of some types of extreme weather, and/or can reduce energy use, however this does not need to be the reason you have done or are considering doing them.</i>	I already do this/ I have done this	I haven't done this and don't plan to	I would like to do this but am unable to	I'm considering doing this in the next year or two	I'm considering doing this, but not in the next year or two	Don't know
Invest in additional insulation at your home (e.g. in roof, walls)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Invest in double or triple glazed windows at your home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Invest in external awnings or shutters at your home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduce use of air conditioner on hot days, by setting it to a higher temperature or using it for less time (at home or work)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduce use of heater on cold days, for example by setting it to a lower temperature or using it for less time (at home or work)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Purchase more energy efficient heating or cooling system at your home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Purchase a car that is highly fuel efficient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Invest in solar panels on your residence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Invest in battery storage for solar energy at your residence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase use of public transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase use of cycling or walking instead of a car	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If they opted for the long version of the survey this was displayed if they selected "I would like to do this but am unable to" for any item above, and asked for each item that they were unable to do so.

You said you would like to do NAME but are unable to. To what extent are the following barriers that prevent you doing this?	Not a barrier	SMALL Barrier					BIG Barrier	
		①	②	③	④	⑤	⑥	⑦
I can't afford to do this	<input type="radio"/>							
I am not allowed to do this at my residence (e.g. you are renting, body corporate won't permit it)	<input type="radio"/>							
I can afford to do this but other things are higher priorities	<input type="radio"/>							
I don't have the information or advice I need to do this	<input type="radio"/>							
I don't have time to organise doing this	<input type="radio"/>							
I have health problems or a disability that prevent me doing this	<input type="radio"/>							
It's too complicated to do this	<input type="radio"/>							
There's no feasible options for me to do this (e.g. no buses at the right times, cycling is not practical due to a need to transport goods for work)	<input type="radio"/>							

Your garden

For people who have them, gardens are an important part of the liveability of their home. Gardens can also be impacted by extreme weather events such as heatwave, droughts, and storms. The next questions ask whether you have a garden area at your home or in a community garden, and a little about your gardening.

Do you have a garden or courtyard with plants at your home, or access a community garden in your local area?	Yes	No	N/A
Back yard garden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Front yard garden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Courtyard with plants (including in pots) or lawn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plants grown on a balcony or other small area at your home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community garden plot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If they answered yes to any of the above, they were asked to answer the following:

How much of your garden area (including balcony areas/community gardens)	None	Small amount (< 10% of your garden area)	Moderate amount (11-40% of your garden area)	Large amount (>40% of your garden area)	Unsure
...needs watering most days in summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...needs watering once or twice a week in summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...needs watering less than once a week in summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How do you personally feel about gardening?	Strongly DISAGREE					Strongly AGREE		Don't know	N/A
	①	②	③	④	⑤	⑥	⑦		
I enjoy gardening	<input type="radio"/>								
I spend a lot of time gardening	<input type="radio"/>								
It's important to me to keep the garden looking green and lush all year round	<input type="radio"/>								
I don't mind if a few parts of the garden looks dry some times of	<input type="radio"/>								
I don't mind if a lot of the garden looks dry some times of year	<input type="radio"/>								
In my neighbourhood, most people expect you to keep your garden looking green all the time	<input type="radio"/>								

When there is an extended dry period with little rain, people often use a mix of strategies to manage their garden areas. To what extent do you (or others in your household) do the following during dry periods?	Never do this					Often do this		Don't know	N/A
	①	②	③	④	⑤	⑥	⑦		

Water the garden more often (e.g. every day or two instead of once a week)	<input type="radio"/>								
Water the garden for longer at a time (e.g. water for an hour instead of half an hour)	<input type="radio"/>								
Increase use of grey water (water from the washing machine, bath etc) on the garden	<input type="radio"/>								
Increase use of mulch around water sensitive plants	<input type="radio"/>								
Let the lawn area go brown	<input type="radio"/>								
Water the lawn more often to keep it green	<input type="radio"/>								
Let some plants other than lawn go brown or die	<input type="radio"/>								
Select particular plants to water and keep healthy while others are not watered	<input type="radio"/>								

Part 4: Coping with extreme weather events

This section asks about how you cope with one of the most common extreme weather events experienced in this region – heatwaves.

	When there are heatwaves, do you do this for yourself or others in your care?				How difficult or easy is it for you to do this on hot days? <i>Please answer even if you don't currently do this on hot days</i>					
	Never	Some-times	Often	N/A	Very DIFFICULT					Very EASY
					1	2	3	4	5	
Stay indoors more than usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Drink more water than usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduce strenuous activities e.g. exercise, housework, gardening	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Go to a swimming pool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Go to a cool indoor place e.g. shopping centre, cinema, café	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Go to an outdoor area with shade e.g. park, nature reserve, backyard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stay at work extra hours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visit a cooler location some distance away (e.g. driving to the coast)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change the type of exercise you do e.g. go for swim/to gym instead of outdoor exercise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change the time you undertake exercise e.g. walk earlier in the morning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Use air conditioning/ evaporative cooling to stay cool in your home	<input type="radio"/>								
Use fan/s to stay cool in your home	<input type="radio"/>								

The next questions ask about your past experiences of hot weather	No	Yes, a little	Yes, a lot	Not sure
Are you less social during times of very hot weather?				
Do you drink more alcohol during hot weather (i.e. beer, wine, spirits)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On very hot days, do you find yourself feeling more irritable?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you find it difficult to sleep on very hot nights?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In times of hot weather, have you experienced other people being more angry or aggressive?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hot weather and work

The way you cope with hot weather depends in part on what stage of life you are in – if you are retired, caring for others, employed or studying, you may have different ways of coping. This section asks a little more about what you do and, if you are working, what is in place at your workplace for hot periods of weather.

Which of the following describes your situation right now? <i>Select ALL that apply</i>	<input type="checkbox"/> Retired <input type="checkbox"/> Unpaid carer (part or full time) <input type="checkbox"/> Self-employed <input type="checkbox"/> I have full-time paid work <input type="checkbox"/> I have part-time paid work	<input type="checkbox"/> I have casual paid work <input type="checkbox"/> Unemployed & looking for paid work <input type="checkbox"/> Studying part-time or full-time <input type="checkbox"/> Other
Do you work in ... <i>Select all that apply</i>	<input type="checkbox"/> ACT Government <input type="checkbox"/> Commonwealth Government <input type="checkbox"/> NSW Government <input type="checkbox"/> Building / construction <input type="checkbox"/> Retail or hospitality <input type="checkbox"/> Education <input type="checkbox"/> Health, healthcare, social services	<input type="checkbox"/> Agriculture, forestry or fishing <input type="checkbox"/> Mining <input type="checkbox"/> Manufacturing <input type="checkbox"/> Tourism <input type="checkbox"/> Transport <input type="checkbox"/> Professional services e.g. legal, accounting <input type="checkbox"/> Other
How long does it take you to commute from home to work on an average work day?	<input type="radio"/> 10 minutes or less <input type="radio"/> 11 to 20 minutes <input type="radio"/> 21 to 30 minutes <input type="radio"/> 31 to 40 minutes <input type="radio"/> 41 to 50 minutes	<input type="radio"/> 51 to 60 minutes <input type="radio"/> 1 hour or more <input type="radio"/> Varies
How do you travel to work? Select all that apply	<input type="checkbox"/> By car, motorbike, scooter <input type="checkbox"/> Cycle <input type="checkbox"/> Walk	<input type="checkbox"/> Public transport <input type="checkbox"/> Other, please specify
Is your workplace environment ... <i>Select one</i>	<input type="radio"/> Completely indoors <input type="radio"/> Mainly indoors	<input type="radio"/> Mainly outdoors <input type="radio"/> Completely outdoors

Is your job physically demanding (e.g. involves lifting or moving heavy or awkward objects, or significant physical exertion)	<input type="radio"/> Not at all/never <input type="radio"/> A little/sometimes	<input type="radio"/> Moderately <input type="radio"/> Very much
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If you are currently working, we'd like to know a little more about planning for events such as heatwaves in your workplace.

How is hot weather managed in your workplace?	Yes	No	Not sure
I have attended a training course that covers the prevention of heat-related illnesses at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My workplace has guidelines for working during very hot weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'd like more training and guidance at my workplace about working in very hot weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with the measures currently used in my workplace for reducing risk of heat illness in very hot weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am able to adjust my working conditions as needed to cope during very hot weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

This was asked only if they selected "ACT Government employee"

Which part of the ACT government are you employed in?	<input type="checkbox"/> Chief Minister, Treasury and Economic Development Directorate <input type="checkbox"/> Community Services Directorate <input type="checkbox"/> Education Directorate <input type="checkbox"/> Environment, Planning and Sustainable Development Directorate	<input type="checkbox"/> Health Directorate <input type="checkbox"/> Justice and Community Safety Directorate <input type="checkbox"/> Transport Canberra and City Services <input type="checkbox"/> Other (please describe) <hr/>
Does your job involve any of the following?	<input type="checkbox"/> Technical/professional work <input type="checkbox"/> Administrative work <input type="checkbox"/> Policy/strategy development <input type="checkbox"/> Policy/strategy implementation	<input type="checkbox"/> Operational work e.g. day to day activities operating particular services or activities <input type="checkbox"/> Other (please describe) <hr/>

	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
I have a good understanding of the ACT Government's climate change policies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In my job, I have opportunities to help achieve reductions in energy use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I take action to reduce energy use when I am at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In my job, I have opportunities to help improve how people can cope with extreme weather events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In my workplace, there has been discussion of how we can support meeting the ACT Government's climate change objectives

Preparing for extreme weather events

The next questions ask about your preparation for extreme weather events. Preparedness is an important part of coping well when events such as storms or fire occur. Please answer the questions based on what you currently do, even if you think this means you are under-prepared for these events.

Is your home in a bushfire risk zone or flood zone?	Yes	No	Not sure
My home is in a bushfire prone area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My home is in a flood prone area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much do you agree or disagree with the following statements?	Strongly DISAGREE			Strongly AGREE				Don't know
	①	②	③	④	⑤	⑥	⑦	
There is a high risk of bushfire where I live	<input type="radio"/>							
My home could be easily damaged by severe storms	<input type="radio"/>							
I have taken steps to prepare my home/garden for drought	<input type="radio"/>							
I can easily cope with heatwaves when they happen	<input type="radio"/>							
I am well prepared for bushfire if it happens near my home	<input type="radio"/>							
I am well prepared for a severe storm if it happens near my home	<input type="radio"/>							

Do you have insurance coverage for your home and/or contents for the following types of events?	No coverage	Partial coverage for damage (covered for some damage but not all)	Full coverage for damage (not replacement value)	Full coverage for replacement value	I have insurance, but am not sure what it covers	Unsure if I have insurance
Storm damage from heavy rain, wind, hail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flash flooding from storm run-off	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flooding due to rising water levels in rivers, lakes, dams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bushfire	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much do you disagree or agree with the following statements about planning and preparing for extreme weather events at your home? <i>If you live on a rural property, please answer for your whole property rather than just your residence</i>	No	Sort of (a little, but with some limitations)	Yes	N/A	Don't know
If a bushfire threatens my home, I know what to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My household has a written bushfire plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've discussed bushfire planning with others in my household in the last 12 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If a severe storm or flooding causes damage to my home, I know what to do	<input type="radio"/>				
My household has a written plan for emergencies other than bushfire (e.g. storms, floods)	<input type="radio"/>				
I've discussed our emergency plan with others in my household in the last 12 months	<input type="radio"/>				
There is an emergency kit in my household with things such as a radio, flashlights and batteries	<input type="radio"/>				
Copies of my important documents are stored in a safe place in case of emergency	<input type="radio"/>				
The gutters at my home are cleaned at least once a year	<input type="radio"/>				
Vegetation that is near or overhanging my home is trimmed and cleared where it might present a danger in storm or fire	<input type="radio"/>				
There is little or no flammable material stored around my home e.g. mulch, grass piles, fuel containers, wood piles	<input type="radio"/>				

To what extent have you or your family been affected in the past by severe weather events? (<i>'Severely affected' means experiencing physical or mental health impacts, severe property damage, and/or significant financial impacts</i>)	NOT AT ALL affected						VERY SEVERELY affected
	①	②	③	④	⑤	⑥	⑦
Storms	<input type="radio"/>						
Floods	<input type="radio"/>						
Drought (severe rainfall deficiency lasting 12 months or longer)	<input type="radio"/>						
Bushfire	<input type="radio"/>						
Other natural/weather related disaster/s	<input type="radio"/>						

Part 5: Environment and climate change

This section asks for your views about environmental issues and climate change, and actions you think should be taken to prepare for or address effects of climate change.

Please rate the extent to which you agree or disagree with each statement. Please tick the box that indicates how you really feel, rather than how you think most people feel.	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
Too much time and attention is given to environmental issues	<input type="radio"/>							
I value protecting the environment, but it is not a priority for me personally	<input type="radio"/>							
I try to make environmentally conscious decisions when it is affordable and easy to do so	<input type="radio"/>							
I try to make environmentally conscious decisions even when they are expensive or inconvenient	<input type="radio"/>							
I shape all the decisions and actions I take based on their impacts on the health of the environment	<input type="radio"/>							

How strongly do you agree or disagree with the following statements?	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
Climate change is a genuine problem for the future	<input type="radio"/>							
My own actions contribute to climate change	<input type="radio"/>							
While climate change is important, there are other issues in this region that are more important to act on	<input type="radio"/>							
Climate change is the most important issue government should focus on	<input type="radio"/>							
The actions of any one person can't really help address climate change	<input type="radio"/>							
It's important to act now to reduce the effects of climate change	<input type="radio"/>							
I can easily adapt to any climate change that occurs in my lifetime	<input type="radio"/>							
More wild or extreme weather events will happen in the Canberra region	<input type="radio"/>							
I am worried about the effects of global warming	<input type="radio"/>							

How strongly do you agree or disagree with the following statements?	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
I support the ACT government's objective of zero net emissions (carbon neutrality) by 2050	<input type="radio"/>							
The ACT should slow down its actions to reduce greenhouse gas emissions	<input type="radio"/>							
The ACT government should introduce stricter regulations to make new buildings more energy efficient and comfortable in hot and cold weather	<input type="radio"/>							
The ACT government should invest in ensuring there are safe and cool places for residents to go during heatwaves	<input type="radio"/>							
The ACT government should require existing public buildings to be retrofitted to be more energy efficiency and comfortable	<input type="radio"/>							
The ACT government should require existing private homes to be retrofitted to improve energy efficiency and comfort in hot and cold weather	<input type="radio"/>							

This was only asked of those who selected the long version of the survey

Do you access information about climate change or environmental issues from the following sources?	Yes		No		How much do you trust information from this group on climate change?							
	Yes	No	Yes	No	LOW trust						HIGH trust	
	①	②	③	④	⑤	⑥	⑦					
ACT Government	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
University researchers or articles on The Conversation produced by researchers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
ABC radio or TV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
The Australian	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
The Canberra Times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				

Online news sites e.g. Huffington Post, news.com.au	<input type="radio"/>								
Social media news e.g. Facebook news feed, information shared online by friends	<input type="radio"/>								
Commercial radio e.g. Mix 106.3, 104.7	<input type="radio"/>								
Conservation Council ACT or member groups such as Landcare, Frogwatch, Friends of the Botanic Gardens	<input type="radio"/>								
Canberra Environment Centre	<input type="radio"/>								
Electricity and gas companies e.g. ACTEW AGL	<input type="radio"/>								
Commercial TV programs e.g. A Current Affair	<input type="radio"/>								

Part 6: About you

Do you identify as... <i>Select one</i>	<input type="radio"/> Female <input type="radio"/> Male <input type="radio"/> Other e.g. gender fluid, inter-gender, don't identify with a gender <input type="radio"/> Prefer not to answer
How old are you?	Years: _____
How would you describe yourself? <i>Select one</i>	<input type="radio"/> Australian-born <input type="radio"/> Born overseas in an English speaking country e.g. UK, New Zealand <input type="radio"/> Born overseas in a non-English speaking country e.g. China, France
Are you of Aboriginal or Torres Strait Islander origin? <i>Select all that apply</i>	<input type="radio"/> No <input type="checkbox"/> Yes, Aboriginal <input type="checkbox"/> Yes, Torres Strait Islander
Who lives in your household at the moment?	Total number of people, including yourself: _____ <i>Online version has drop down menu with choices to select</i>
Which best describes you at the moment? <i>Select one</i>	<input type="radio"/> Single <input type="radio"/> Married or de facto <input type="radio"/> Divorced or separated <input type="radio"/> Widowed
Have you completed any of the following formal qualifications? <i>Select ALL that apply</i>	<input type="checkbox"/> Year 12 of high school or equivalent <input type="checkbox"/> Certificate or diploma from TAFE <input type="checkbox"/> University degree (undergraduate or postgraduate) <input type="radio"/> None of these

Where do you live? <i>If you live in more than one place, please put in your primary residence</i>	Suburb, town, village or locality: _____ Postcode you live in: _____
What sort of dwelling do you live in?	<input type="radio"/> House <input type="radio"/> Townhouse <input type="radio"/> Unit/apartment <input type="radio"/> Student hall or residence <input type="radio"/> Aged care residence <input type="radio"/> Other (please describe) _____

<p>Do you live in an urban area, a rural town, or on a rural or semi-rural property?</p> <p>If you live in more than one place, e.g. one during the week and another on weekends, select all that apply</p>	<input type="checkbox"/> Suburban/urban area (e.g. Canberra or Queanbeyan suburbs) <input type="checkbox"/> Peri-urban area (on the fringe of a city) <input type="checkbox"/> Rural town (e.g. Cooma, Yass, Braidwood) <input type="checkbox"/> Rural residential or hobby farming property <input type="checkbox"/> Rural property used for farming (other than hobby farming) <input type="checkbox"/> Rural property used for other purposes
<p>How many years have you lived in your current local area? <i>Include the total time, even if you've shifted houses</i></p>	<p>Years: _____ <i>Online survey has drop down menu of options</i></p>

<p>In 2015-16, about how much was your <u>household</u> income before tax? <i>Select one</i></p> <p><i>This includes income earned by everyone in your household. Include income from government pensions, investments/dividends, and paid work. The categories below may look odd – they let us compare our survey results to those from the national census, so we can't change them.</i></p>	<input type="radio"/> <\$7,799 (\$7,800-\$15,599) (\$15,600-\$20,799) (\$20,800-\$25,999) (\$26,000-\$33,799) (\$33,800-\$41,599) (\$41,600-\$51,999) (\$52,000-\$64,999) (\$65,000-\$77,999)	<input type="radio"/> (\$78,000-\$90,999) (\$91,000-\$103,999) (\$104,000-\$129,999) (\$130,000-\$155,999) (\$156,000-\$181,999) (\$182,000-\$207,999) (\$208,000-\$233,999) (\$234,000-\$259,999) (\$260,000or more)
<p>Given your current needs and financial responsibilities, would you say that you and your family are...</p> <p><i>Select one</i></p>	<input type="radio"/> Very poor <input type="radio"/> Poor <input type="radio"/> Just getting along	<input type="radio"/> Reasonably comfortable <input type="radio"/> Very comfortable <input type="radio"/> Prosperous

<p>In the last year, did any of the following happen to you because you didn't have enough money?</p> <p><i>Select all that apply</i></p>	<input type="checkbox"/> Had to delay/cancel non-essential purchases e.g. holiday, going to a restaurant or movie, buying clothes <input type="checkbox"/> Could not pay bills on time e.g. electricity, rent, gas <input type="checkbox"/> Went without meals, or was unable to heat or cool home <input type="checkbox"/> Asked for financial help from friends or family <input type="radio"/> None of these
<p>If you were to face a \$2,000 unexpected expense in the next month, would you use any of the following methods to get the funds you need?</p> <p><i>Select all that apply</i></p>	<input type="checkbox"/> I would not be able to raise this amount of funds <input type="checkbox"/> I would use my savings <input type="checkbox"/> I would put it on my credit card or get a short-term loan from a financial institution <input type="checkbox"/> I would borrow from family or friends <input type="checkbox"/> I would pawn or sell some belongings e.g. car, computer, TV <input type="checkbox"/> I would delay paying for other items e.g. mortgage, bills <input type="checkbox"/> I would ask for help from a charity organisation <input type="checkbox"/> Other

If you

would like to enter the (prize draw), access results, or participate in future research, please complete the information below.

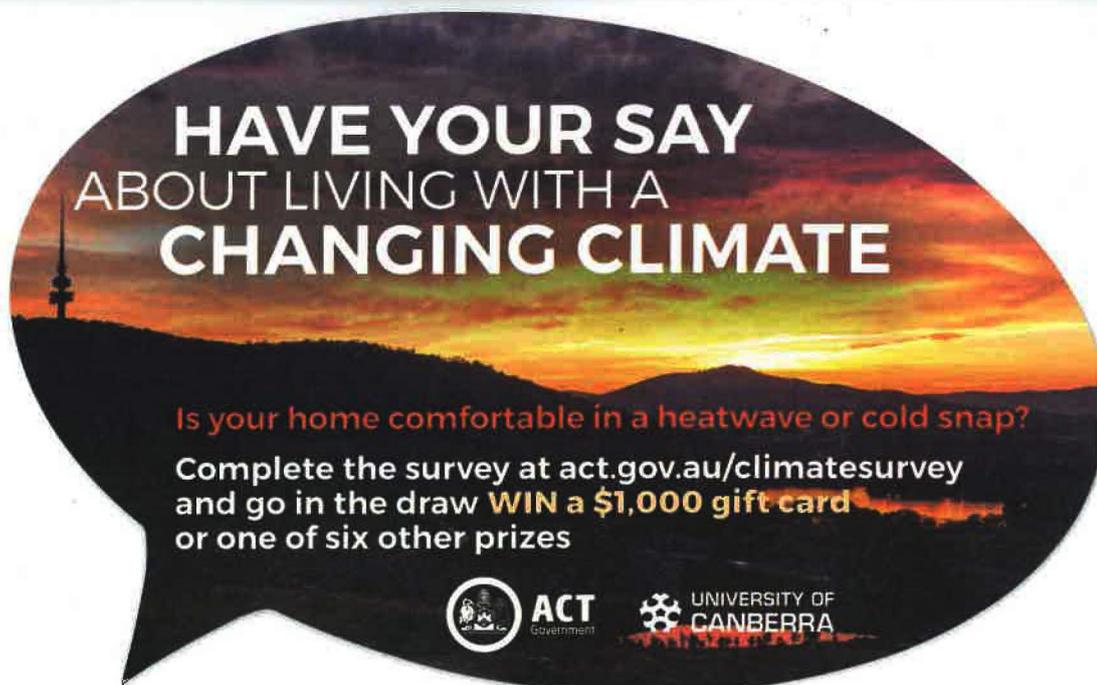
Do you want to participate in future research? <i>If you tick yes, we'll let you know when opportunities come up, but you're under no obligation to take part in them</i>	<input type="radio"/> Yes <input type="radio"/> No
Do you want to be entered in the prize draw? <i>Information about the prizes is available on the information sheet (hyperlinked) or available at www.TBC (which one we will be using)</i>	<input type="radio"/> Yes <input type="radio"/> No
Do you want to be notified when results of the study are available?	<input type="radio"/> Yes <input type="radio"/> No

As you indicated you either wish to be notified when results are available, enter the prize draw or be notified about future research, please complete the details below. These details will be securely stored separately to your survey response.

Name:	_____
Email address:	_____
Postal address:	_____

Thank you for taking the time to complete this survey.

APPENDIX 2: FLYER



**HAVE YOUR SAY
ABOUT LIVING WITH A
CHANGING CLIMATE**

Is your home comfortable in a heatwave or cold snap?

Complete the survey at act.gov.au/climatesurvey
and go in the draw **WIN a \$1,000 gift card**
or one of six other prizes

 **ACT**
Government

 **UNIVERSITY OF
CANBERRA**

**This University of Canberra
survey is supported by the ACT Government.
Your feedback will help the government
develop actions to adapt to climate change.**

Complete the survey by 9 March 2018 to enter the draw to win
one of seven prizes. Winners can choose a Flight Centre,
Coles-Myer, WISH or Bunnings gift card.

1st prize: \$1,000 gift card
2nd prize: \$500 gift card
5 runner-up prizes: \$100 gift card

FOR HELP WITH THE SURVEY

Call 1800 981 499 or email brigitta.yabsley@canberra.edu.au

FULL TERMS AND CONDITIONS of entry into the
prize draw are at act.gov.au/climatesurvey

Photo. CanberraDawn by Flickr user Matt Roberts,

APPENDIX 3: FLYER DISTRIBUTION

Suburb	Number of flyers	Suburb	Number of flyers
Amaroo	900	Gilmore	500
Bonner	2100	Harrison	1000
Bonython	1400	Lyons	400
Casey	1300	Macarthur	500
Charnwood	1200	McKellar	400
City	400	Melba	400
Duffy	1200	Nicholls	800
Fadden	300	O'Malley	300
Franklin	2400	Reid	600
Garran	300	Richardson	600

APPENDIX 4: PLACES AND SUBURBS

Place	Suburbs
Belconnen E.	Evatt, Giralang, Kaleen, Lawson, McKellar
Gungahlin	Amaroo, Bonner, Casey, Crace, Forde, Franklin, Gungahlin, Harrison & Mitchell, Jacka, Moncrieff, Ngunnawal, Nicholls, Palmerston
Inner Belconnen	Aranda, Belconnen, Bruce, Cook, Florey, Hawker, Macquarie, Page, Scullin, Weetangera
Inner North	Acton, Ainslie, Braddon, Campbell, Canberra City, Reid, Turner
Inner South	Barton & Parkes, Deakin, Forrest, Griffith, Kingston, Narrabundah, Red Hill, Yarralumla
North	Dickson, Downer, Hackett, Lyneham, O'Conner, Watson
Outer Belconnen	Charnwood, Dunlop, Flynn, Fraser, Higgins, Holt, Latham, Macgregor, Melba, Spence
Tuggeranong Nth	Fadden, Gowrie, Greenway, Kambah, Macarthur, Monash, Oxley, Wanniasa
Tuggeranong Sth	Banks, Bonython, Calwell, Chisholm, Conder, Gilmore, Gordon, Isabella Plains, Richardson, Theodore
Weston Creek	Stromlo, Chapman, Coombs, Duffy, Fisher, Holder, Molonglo, Rivett, Stirling, , Waramanga, Weston, Wright
Woden Valley	Chifley, Curtin, Farrer, Garran, Hughes, Isaacs, Lyons, Mawson, O'Malley, Pearce, Phillip, , Torrens
NSW areas	Queanbeyan, Googong, Jerrabomberra,
Others	Symonston, Hume, Fyshwick, Oaks Estate and Uriarra Village were excluded from analysis due to low numbers of residents.

APPENDIX 5: CALCULATION OF RESILIENCE INDEXES

This Appendix provides details of the calculation of each of the resilience indexes presented in the report.

Household financial resilience

Overall **household financial resilience** was calculated as an index for all survey participants, scored out of 10. It was calculated based on overall household prosperity, experience of financial stress, and ability to cover a \$2,000 expense without going into debt or losing possessions. The index is calculated so that a score of 0 = very low financial resilience, and a score of 10 = very high household financial resilience. Scores were calculated as follows:

- Household financial prosperity – (*Given your current needs and financial responsibilities, would you say that you and your family are: very poor, poor, just getting along, reasonably comfortable, very comfortable and prosperous*) (total of 5 points,) scored from 0 (person rated household as very poor) to 5 (person rated household as prosperous)
- Financial stress - *In the last year, did any of the following happen to you because you didn't have enough money? (i) Had to delay or cancel non-essential purchases e.g. holiday, going to a restaurant or movie, buying clothes, (ii) Could not pay bills on time e.g. electricity, rent, gas; (iii) Went without meals, or was unable to heat or cool home, (iv) Asked for financial help from friends or family, or none of the above* (total of 3 points): scored as 0 (experienced 3-4 financial stress events), 1 (experienced 2 financial stress events), 2 (experienced 1 financial stress events) or 3 (experienced no financial stress events)
- Ability to cover \$2,000 expenses - *If you were to face a \$2,000 unexpected expense in the next month, would you use any of the following methods to get the funds you need* (total of 2 points): scored as
 - A score of 0 was given to those who indicated the highest difficulty accessing finance, defined as those who selected *only* one or more of the following three options and did not select any others 'I would not be able to raise this amount of funds', 'I would ask for help from a charity organisation' or 'I would pawn or sell some belongings'
 - A score of 1 was given to those who could borrow funds but did not have savings immediately available, meaning they selected at least one of 'I would delay paying for other items', 'I would borrow from family or friends', or 'I would put it on my credit card or get a short-term loan' but did not select 'I would use my savings'

- A score of 2 was given to those who selected 'I would use my savings' (even if they also selected other options).

The financial resilience index score was only calculated for those people who answered all the questions that formed part of the index.

Individual social resilience index

The individual social resilience index was calculated based on the extent to which a person engaged in different types of social activity, using the following index (with a total score from 0 to 10 in which 0 indicates little to no social interaction of any type, while 10 indicates a person engaged in multiple types of social interactions relatively frequently):

- Spending time socialising with family and friends (score out of 6, with high emphasis given to this as close social support typically comes from these groups): Average score of time spent with (i) *I spend time doing things with family members who don't live with me*, and (ii) *I make time to keep in touch with my friends*, each scored from 0 (never or almost never) to 6 (all the time)
- Spending time engaging in social interaction beyond friends and family (score of 4) with an average score for the following (i) *I chat with my neighbours*, (ii) *I take part in sports groups, activities or teams*, (iii) *I am a member of one or more community or hobby groups*, (iv) *I volunteer e.g. for groups like fire brigades, sports clubs, school canteen, meals on wheels, festivals* and (v) *I take part in groups that take care of the environment e.g. ParkCare, FrogWatch, Landcare*, was taken and then divided by 1.5 to give a score out of 4. This approach was used as a person does not need to engage in *all* these types of social interaction to have social resilience and having high social engagement in any of these areas was considered sufficient to indicate high levels of social resilience.

The social resilience index score was only calculated for those people who answered all the questions that formed part of the index.

Individual health-related human resilience index

Overall health-related resilience related to human resources was then measured out of 10, drawing on a subset of these measures. Self-efficacy was not included due to the relatively high proportion of people who felt confident in being able to achieve desired outcomes in life: given the overall high confidence in this, it was decided that the best measure of human resilience should focus on health and wellbeing. Personal Wellbeing Index was also not included in the calculation of the overall health-related resilience as this measure follows a same pattern as the Global life satisfaction index.

Human resilience related to health was measured as an index scored from 0 to 10, where 10 indicated high resilience, using the following process:

- General health - *How would you rate your general health?* (score out of 4): this was scored as follows: excellent = 4, very good = 3, good = 2, fair = 1, poor = 0.
- Global life satisfaction - *Thinking about your own life and personal circumstances, how satisfied are you with the following? – Your life as a whole* (score out of 3): this was scored based on multiplying the global life satisfaction score (originally measured from 0-10) by 0.3 to achieve a score from 0 to 3
- Psychological distress (score out of 3): this was calculated taking the K6 measures (i) *nervous*, (ii) *hopeless*, (iii) *restless or fidgety*, (iv) *depressed*, (v) *that everything was an effort*, and (vi) *worthless*), measured from 6 to 30, by first dividing the scores by 10, and then reversing the score so that lower scores indicated higher distress and higher scores indicated lower distress.

Overall individual resilience index

The individual resilience index was then calculated as the average of the three dimensions of individual resilience (financial, health-related human and social capital).

Community resilience index

Community resilience indexes were calculated as follows:

- **Financial resilience** (score from 0 to 10): The three financial resilience items (i) *The local economy in this area of my local area is...*; (ii) *There are plenty of jobs available in the region at the moment*; and (iii) *Living costs are affordable here e.g. food, petrol, housing* were scored from 0 (strongly disagree or 'getting worse 1') to 6 (strongly agree or 'getting better 7'), and the sum of the three was divided by 18 and then multiplied by 10 to give a score from 0 to 10. This meant a person who strongly disagreed that there were plenty of jobs available, that living costs were affordable, and who felt the local economy in their local area was getting worse, would have a score of 0.
- **Social resilience** (score from 0 to 10): The four social resilience items (i) *Feeling part of your community*; (ii) *Many people in this area drink too much alcohol or abuse drugs*; (iii) *Many people keep to themselves around here*; and (iv) *The friendliness of this area of my local area is...* were scored from 0 (strongly disagree or 'getting worse 1') to 6 (strongly agree or 'getting better 7'), and the sum of the four was divided by 24 and then multiplied by 10 to give a score from 0 to 10.
- **Institutional resilience** (score from 0 to 10): The three institutional resilience items (i) *Most people get a fair go in this region*; (ii) *The community copes pretty well when faced with challenges*; and (iii) *I can get involved in local decision-making processes if I want to* were scored from 0 (strongly disagree or 'getting worse 1') to 6 (strongly agree or 'getting better 7'), and the sum of the three was divided by 18 and then multiplied by 10 to give a score from 0 to 10.

- **Liveability** (score from 0 to 10): The seven social resilience items (i) *The liveability of my local area is...*; (ii) *I would recommend this region to others as a good place to live*; (iii) *This is a safe place to live*; (iv) *There is a high crime rate in this area*; (v) *My suburb/neighbourhood has lots of vegetation (e.g. trees, shrubs)*; (vi) *There are parks, green spaces or nature reserves within easy walking distance of my home*; and (vii) *The local landscape and surrounds of my local area are...* were scored from 0 (strongly disagree or 'getting worse 1') to 6 (strongly agree or 'getting better 7'), and the sum of the four was divided by 42 and then multiplied by 10 to give a score from 0 to 10.

Overall community resilience index

This index was calculated as the average of the four community resilience indexes (social, financial, institutional, and liveability) listed above.

Heatwave resilience

Heatwave coping strategies

This index was calculated from 0 to 10 using the following process:

- Coping with heatwaves – the item (i) *I can easily cope with heatwaves when they happen-* was recoded to 0 (from 1, strongly disagree) to 6 (7, strongly agree) to give a score from 0 to 6.
- Difficulty in accessing coping strategies – the question *How difficult or easy is it for you to do this on hot days?* had 12 items with a score from 1, very difficult to 5, very easy. These were recoded to give a score from 0 to 4 (i) *Stay indoors more than usual*, (ii) *Drink more water than usual*, (iii) *Reduce strenuous activities e.g. exercise, housework, gardening*, (iv) *Go to a swimming pool*, (v) *Go to a cool indoor place e.g. shopping centre, cinema, café*, (vi) *Go to an outdoor area with shade e.g. park, nature reserve, backyard*, (vii) *Stay at work extra hours*, (viii) *Visit a cooler location some distance away (e.g. driving to the coast)*, (ix) *Change the type of exercise you do e.g. go for swim/to gym instead of outdoor exercise*, (x) *Change the time you undertake exercise e.g. walk earlier in the morning*, (xi) *Use air conditioning/ evaporative cooling to stay cool in your home*, (xi) *Use fan/s to stay cool in your home*

The two scores above were added up to give a score from 0 to 10.

Heatwave resilience – health and social

This index was calculated from 0 to 10 using the following process:

- Heatwave resilience health - A score of 0 to 8 was given based on the extent to which a person experienced any of the eight potential health problems (i) *hay fever or pollen*

allergy; (ii) asthma; (iii) respiratory disease; (iv) heart/cardiovascular disorder; (v) depression or anxiety; (vi) being overweight or obese; (vii) migraine; and (viii) heat related illnesses known to worsen in hot weather (all health problems listed in the report except food and animal allergies, which may worsen due to issues other than heatwaves). People were given a score of 1 if they didn't have a health issue, 0.5 if they indicated 'small-moderate' and 0 if they indicated 'major' health issue, giving a total score from 0 to 8.

- Heatwave resilience social - A score of 0 to 5 for social issues was given based on the extent to which a person experienced each of the five social issues (i) *Are you less social during times of very hot weather?*; (ii) *Do you drink more alcohol during hot weather (i.e. beer, wine, spirits)?*; (iii) *On very hot days, do you find yourself feeling more irritable?*; (iv) *Do you find it difficult to sleep on very hot nights?*; and (v) *In times of hot weather, have you experienced other people being more angry or aggressive?*. This was scored 1 if the person indicated 'no', 0.5 if they indicated 'a little or unsure' and 0 if they indicated 'a lot'.
- Heatwave resilience health & social - The two scores were added to give a score from 0 to 13. This was then divided by 13 and multiplied by ten to get score from 0 to 10.

Heatwave resilience – Infrastructure

This index was calculated from 0 to 10 using the following process:

- A score of 0 to 6 was given based on the extent to which a person experienced their home to (i) *My home warms up very fast in hot weather* (ii) *When the temperature outside drops after a hot day, my home cools down quickly (without use of air conditioning) (reversed)*. People were given a score of 6 if their house didn't warm up too fast or cooled down quickly in the evening, 3 if they indicated 'moderate' levels of their house warming up or cooling down, and a score of 0 if they indicated the house warming up quickly and not cooling down quickly, giving a total score from 0 to 6.
- The two scores were added to give a score from 0 to 12. This was then divided by 12 and multiplied by ten to get score from 0 to 10.

Heatwave resilience – Financial

This index was calculated from 0 to 10 using the following process:

- Two scores of 0 to 6 were given based on the extent to which a person ability to (i) *I can easily afford to keep my home cool in summer* and (ii) *Increases in costs of electricity or gas in recent years have been hard for my household to cope with*. People were given a score of 6 if they could afford cooling their houses and were able to cope with increased

electricity prices, 3 if they indicated a moderate ability, and 0 if they indicated their inability to afford cooling and coping with price increases, giving a score from 0 to 6.

- The two scores were added to give a score from 0 to 12. This was then divided by 12 and multiplied by ten to get score from 0 to 10.

Heatwave resilience – Workplace

This index was calculated from 0 to 10 using the following process:

- Workplace exposure - Two scores of 0 to 6 were given based on the extent to which a person's (i) *Is your workplace environment ...completely indoors, mainly indoors, mainly outdoors, completely outdoors* and (ii) *Is your job physically demanding (e.g. involves lifting or moving heavy or awkward objects, or significant physical exertion...not at all/never; a little/sometimes; moderately; very much*. People were given a score of 6 if they worked completely indoors no physical exertion, 3 if they indicated moderate workplace exposure and physical exertion, and 0 if they indicated their occupation to be completely outdoors and physically demanding, giving a score from 0 to 6.
- Workplace adaptation - Four scores of 0 to 6 were given based on the extent to which a person (i) *I have attended a training course that covers the prevention of heat-related illnesses at work*, (ii) *My workplace has guidelines for working during very hot weather*, (iii) *I am satisfied with the measures currently used in my workplace for reducing risk of heat illness in very hot weather*, and (iv) *I am able to adjust my working conditions as needed to cope during very hot weather*. People were given a score of 6 if they indicated complete ability to adapt during heatwaves, 3 if they indicated moderate workplace adaptation, and 0 if they indicated no ability to adapt at their workplace, giving a score from 0 to 6.
- The scores for workplace adaptation and workplace exposure were added to give a score from 0 to 12. This was then divided by 12 and multiplied by ten to get score from 0 to 10.

Overall heatwave resilience index

This index was calculated as the average of the five heatwave resilience indexes listed above (coping strategies, health & social, infrastructure, financial, and workplace), using a score from 0 to 10.

Resilience – Extreme weather

This index was calculated from 0 to 10 using the following process:

- Two scores of 0 to 6 were given based on the extent to which a person levels of preparedness for extreme weather events. These included items (i) *I am well prepared for bushfire if it happens near my home*, and (ii) *I am well prepared for a severe storm if it happens near my home*
- Five measures with a score of 0-1 of whether people had insurance cover for (i) *Storm damage from heavy rain, wind, hail*, (ii) *bushfire*, and were prepared for extreme events by having (iii) *Copies of my important documents are stored in a safe place in case of emergency*, (iv) *There is an emergency kit in my household with things such as a radio, flashlights and batteries*, and (v) *My household has a written plan for emergencies other than bushfire (e.g. storms, floods)*. The higher the score of these variables the higher the resilience.
- The seven scores were added to give a score from 0 to 17. This was then divided by 17 and multiplied by ten to get score from 0 to 10.

Resilience –water scarcity index

This index was calculated from 0 to 10 using the following process:

- Two scores of 0 to 2 were given based on the extent to which a person's water use to keep gardens maintained during summer and included (i) *needs watering most days in summer*, and (ii) *needs watering less than once a week in summer*. People were given a score of 2 if they watered using none or small amounts of water, 1 if they used moderate amounts of water, and 0 if they used large amount of water, giving a score of 0 to 2.
- Four scores of 0 to 6 were given based on views about gardens (*How do you personally feel about gardening?*) These included items (i) *I don't mind if a lot of the garden looks dry some times of year*, (ii) *It's important to me to keep the garden looking green and lush all year round* (reversed), (iii) *In my neighbourhood, most people expect you to keep your garden looking green all the time*, and (iv) *I have taken steps to prepare my home/garden for drought*. People were given a score of 6 if they agreed with the statements, 3 if they moderately agreed with the statement, and a score of 0 if they didn't agree with the statement, giving a total score from 0 to 6.
- The six scores were added to give a score from 0 to 28. This was then divided by 28 and multiplied by ten to get score from 0 to 10.

Resilience – views and taking action

This index was calculated from 0 to 10 using the following process:

- Five scores of 0 to 6 were given based on views about climate change and taking action. These included items (i) *it's important to act now to reduce the effects of climate change*, (ii) *my own actions contribute to climate change*, (iii) *more wild or extreme weather events will happen in the Canberra region*, (iv) *I can easily adapt to any climate change that occurs in my lifetime*, and (v) *The actions of any one person can't really help address climate change* (reversed). The higher the score the more willingness to act or more awareness of climate change is demonstrated.
- The five scores were added to give a score from 0 to 30. This was then divided by 30 and multiplied by ten to get score from 0 to 10.

Resilience – Support for government action

This index was calculated from 0 to 10 using the following process:

- Six scores of 0 to 6 were given based on agreement levels about government taking action on climate change. These included items (i) *The ACT should slow down its actions to reduce greenhouse gas emissions*, (ii) *The ACT government should require existing private homes to be retrofitted to improve energy efficiency and comfort in hot and cold weather*, (iii) *The ACT government should invest in ensuring there are safe and cool places for residents to go during heatwaves*, (iv) *The ACT government should require existing public buildings to be retrofitted to be more energy efficiency and comfortable*, (v) *I support the ACT government's objective of zero net emissions (carbon neutrality) by 2050*, and (vi) *The ACT government should introduce stricter regulations to make new buildings more energy efficient and comfortable in hot and cold weather*. The higher the score the more people agreed with each statement.
- The six scores were added to give a score from 0 to 36. This was then divided by 36 and multiplied by ten to get score from 0 to 10.

Resilience – Support for action

This index was calculated as the average of the two indexes above (resilience – views and taking action and resilience – support for government action), using a score from 0 to 10.

Overall climate change resilience index

This index was calculated as the average of the six indexes above using a score from 0 to 10: (i) overall heatwave resilience index (coping strategies, health & social, infrastructure, financial, and workplace), (ii) climate change resilience indices (views & actions and government support), (iii) overall individual resilience index, (iv) overall community

resilience index, (v) extreme weather resilience index, and (vi) water scarcity resilience index. The higher the score the higher the level of overall resilience to climate change.