naga
northern alliance for greenhouse action

Exploring Vulnerabilities

in Port Phillip Region

Desktop review

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VICTORIA State Government | Environment, Land, Water and Planning

MELBOURNE'S CLIMATE JOURNEY

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Executive Summary

This review looks at communities and business sectors that are especially at risk of detrimental climate impacts: at-risk communities and at-risk business sectors. These are two distinct but overlapping areas with the health and social services sector at the intersection of the two. For each of these two areas we review the relevant:

- Impacts
- Vulnerabilities, resilience and preparedness
- Current interventions
- Gaps in preparedness and interventions

At-risk communities (reviewed in Part 1) are impacted “first and worst” by natural disasters, extreme weather events, and related disruptions, as well as by long term changes, including:

- Extreme heat and heatwaves
- Bushfires
- Smoke and decreased air quality
- Blackouts and brownouts
- Storms
- Floods
- Drought

Both shocks and stressors have flow-on effects which may be no less significant than the immediate direct impacts of disruptions and disasters, such as

- Physical and mental health impacts
- Increased violence
- Thermal discomfort
- Food insecurity
- Bill shock.

People with fewer financial resources, less access to services and information, and lower mobility have more limited ability to cope with sudden shocks or significant long-term stressors. While communities who often deal with crises of multiple kinds may also have developed elements of community resilience, this is likely to be tested by prolonged, multiple and/or repeated shocks or long-term changes.

People in at-risk communities are also often already dealing with multiple and compounding health and wellbeing issues, inadequate housing, lack of access to services or information, inequity and discrimination. Climate-related events interact with and exacerbate existing systemic barriers and issues.

Case studies drawn from recent experience in Greater Melbourne have particularly highlighted the extreme risks faced by people in social housing, people experiencing homelessness, and newly arrived asylum seekers and refugees, especially the older people in these communities and those with chronic health conditions. Amongst these particularly at-risk groups, people without adequate housing tend to be as prepared for climate impacts as they can be, but this personal preparedness can only go so far given the situations in

which they live. Newly arrived asylum seekers and refugees, on the other hand, tend to be especially unprepared due to a range of factors.

At-risk business sectors (reviewed in Part 2) are also more vulnerable than other sectors to climate impacts. As with at-risk communities, businesses that have less financial stability and security are less resilient to shocks and stressors of all kinds, such as many small businesses. Others are more exposed to climate impacts due to their dependency on or exposure to weather and climatic conditions. In this review the focus has been on Small-to-Medium Enterprises (SMEs), manufacturing, tourism, outdoor workers and the health and social services sector.

The direct impacts faced by businesses are the same as those faced by communities, but the flow-on effects are different. There are:

- Indirect impacts of climatic changes on workforce and operations such as
  - Economic shocks, volatility and downturns
  - Supply chain disruption
  - Decreased mobility of customers and workers
  - Mental and physical impacts on occupational health and safety
  - Decreased productivity and capacity of workforce
  - Changing seasonality and timing of work.

- Transitional impacts of the economic, technological and political adjustments made in response to the changing climate and decarbonisation such as
  - Economic shocks and volatility
  - Increased risk and flow-on effects on insurance
  - Technological changes
  - Disruption to corporate knowledge and business continuity
  - Increased energy costs (particularly for cooling)
  - Changed markets and supply chains
  - Cost and regulation of fuels and emissions
  - Changed business models.

Businesses in Greater Melbourne seem to be, in general, not very aware about the potential for climate impacts on their business, though there are exceptions in industries that are regularly exposed to climatic factors, such as the tourism industry. There are also examples of SMEs in manufacturing, construction and food businesses that are taking action - whether couched explicitly as adaptation or not – and this has both mitigation and adaptation benefits. Energy efficiency and renewable energy initiatives are the most obvious examples of this.

The health and social services sector is doubly vulnerable as both an at-risk business sector and as a support system for at-risk communities. Many organisations in the sector have low adaptive capacity due to being small and resource-poor and due to the increasing demand of at-risk communities who are struggling to cope with climate change impacts. There are some tailored capacity building programs that are helping to build organisational capacity in this sector.

There are numerous interventions implemented by a range of agencies to support the adaptive capacity of at-risk communities. These tend to focus on personal preparedness, and there is a need to put more attention and resourcing into community-level strategies as well as root issues at the state and regional levels.

There are few explicitly adaptation-focussed interventions in the business world, let alone tailored for at-risk business sectors, however, there is great potential to incorporate adaptation into existing programs.

Background

Context and goals of this project

Victoria's climate has already changed and will continue to change. According to the Greater Melbourne Climate Projections published in 2019 by DELWP and CSIRO (*Figure 1* over page), average temperatures in Victoria have already increased more than 1°C since 1910, and are set to continue to increase, with double the number of very hot days and an increase in the number of high fire danger days of 42% by the 2050s and 60% by 2090 (or as early as the 2050s under a high-emissions scenario).[1] The Fire Danger Period (FDP) in Victoria has become longer in recent years, with the most recent fire restriction period extending from late September to late March.[2]

In summary, Greater Melbourne is expected to be hotter and drier and to experience more storms, fires, floods and droughts as well as significant sea level rise. These changes will have significant impacts on people in Greater Melbourne, and the impacts will not be evenly distributed.[1, 14]

Under *Victoria's Climate Change Adaptation Plan 2017-2020*[3] the Victorian Government committed to helping Victoria's regional communities and organisations work together to adapt to the impacts of climate change. This includes preparing adaptation strategies for all of Victoria's regions, including a Regional Climate Change Adaptation Strategy for Greater Melbourne, as well as specific adaptation strategies for seven key sectors (natural environment, built environment, water, transport, health and human services, and primary production). As part of this work, the Northern Alliance for Greenhouse Action (NAGA) completed a gap analysis for the Port Philip region in 2017-2018. This analysis identified particular segments of the community, and particular business sectors, who were especially vulnerable to climate change impacts.[4]

This project will build on that analysis by looking at some of these vulnerable groups and business sectors and:

- Outline the specific impacts and vulnerabilities they are facing
- Assess their preparedness for and resilience to these impacts
- Identify current and potential interventions to address these vulnerabilities and increase preparedness and resilience
- Make recommendations for a strategy to take this forward.

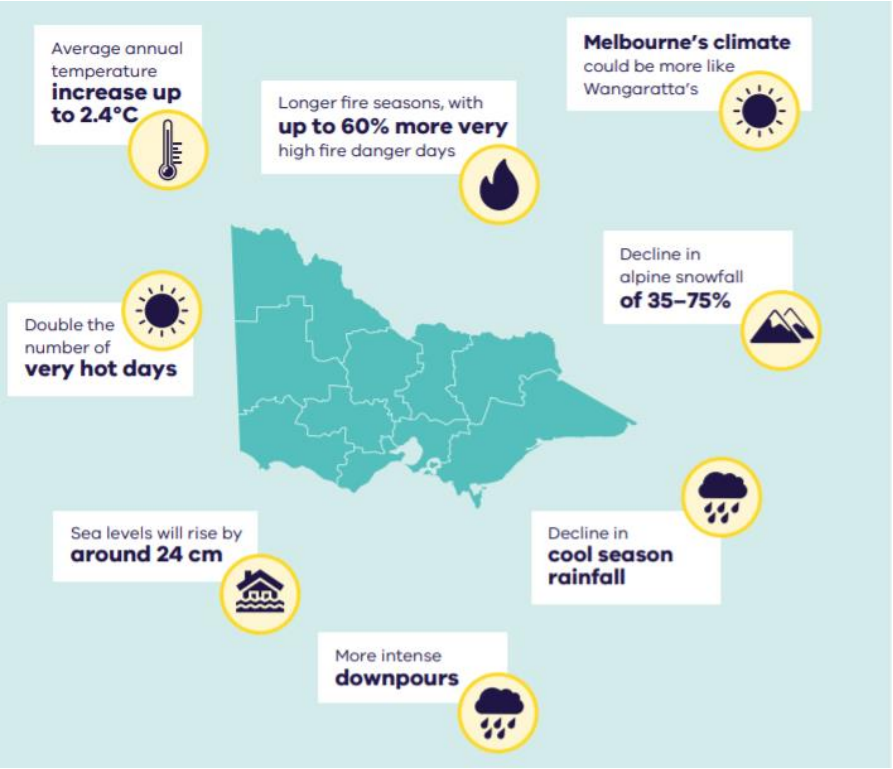


Figure 1. Predicted changes to Victoria's climate by the 2050s under a high-emissions scenario, compared with 1986-2005[1]

Building on the 2017-2018 gap analysis

The Climate Change Gap Analysis conducted by NAGA for DELWP in 2017-2018 identified particular vulnerabilities to the impacts of climate change amongst communities and businesses. Vulnerability is the degree to which a community, organisation or an individual is susceptible to, or unable to cope with, the adverse effects of climatic changes. This is a function of a community, organisation or individual's **exposure** to extreme heat and other climatic variables, their **sensitivity** to such changes and their **ability to adapt** (see also **Key concepts and definitions** below.)

This project seeks to gain a deeper understanding of how climate vulnerabilities play out in specific groups within the community and business sectors and to identify potential interventions to alleviate those vulnerabilities.
Since 2018 there have been some significant events that have added to the climate and general context in Greater Melbourne, such as:

- The bushfires of summer 2019-2020 – known as the Black Summer fires – and their unprecedented impacts on ecosystems in Victoria, and in particular on air-quality in Greater Melbourne (see *Box 1: Black Summer of 2019-2020*, page 8).
- The coronavirus pandemic of 2020. These impacts are also considered particularly where they interact with the communities and business sectors reviewed, and with climate risks and vulnerabilities and related interventions. It is also important to note that climate change is predicted to lead to higher rates of infectious diseases and more frequent outbreaks and pandemics.[5] The COVID-19 pandemic, and responses to it, help to illustrate many potential impacts of this trend, directly or indirectly related to climate change.

There have also been significant developments in the policy context in Victoria, with a raft of inter-related documents released by the Victorian Government, implementing directions initiated by the Victorian Climate Change Act (2017), and the Local Government Act (2020), across relevant departments and sectors.

These include:

- The Department of Health and Human Services:
  - Pilot health and human services climate change adaptation action plan 2019–21 (December 2019)[6] – one of the first sectoral adaptation plans
  - Tackling climate change and its impacts on health through municipal public health and wellbeing planning: Guidance for local government (October 2020)[7] which provides definitive advice to local government on their responsibilities for responding to climate risks and impacts on human health and wellbeing through Municipal Public Health and Wellbeing Plans – a major driver of local government action.
- The Department of Jobs, Precincts and Regions' *Integrated Strategic Planning and Reporting Framework for Local Government*, advises Local Government on the implementation of the new Victorian Local Government Act (2020).[8, 9] The overarching principles of this framework include giving priority to 'achieving the best outcomes for the municipal community including future generations' and taking 'economic, social, and environmental sustainability (including climate change risk)' into account.[8, 9]
- The Department of Environment, Land, Water and Planning:
  - Place-based climate change adaptation resources government, business and community (October 2020)[10]
  - Local Government Climate Change Adaptation Roles and Responsibilities under Victorian legislation[10]
  - Melbourne's Climate Journey discussion paper (community engagement on regional adaptation planning).[11]

A prominent feature of this policy work is the clarifying and highlighting of local government's opportunities, responsibilities and duty of care in preparing their communities for climate impacts and in factoring this thinking into decision making from the outset of their planning processes and at the highest level.

In addition, recent announcements about the Victorian budget for 2021-2022[12] indicate a range of relevant measures including:

- Funding for new public housing properties, a key measure in addressing homelessness and insecure housing, which are important factors in vulnerability to climate change (see *Heat, housing and homelessness*, page 25)
- Upgrades to existing public housing, much needed as people living in social housing are one of the most at-risk communities (see *People in social housing*, page 29)
- More stringent standards for rental housing properties, which is important as people in rental properties have less ability to make their homes resilient to extreme weather (see *Box 4: How aware and prepared are City of Melbourne residents?* on page 21)
- An expansion to the Solar Homes program that provides homes and businesses solar panel rebates, an important avenue for both climate mitigation and adaptation for both homes and businesses[114]
- Business grants for energy efficiency, which also has both mitigation and adaptation benefits.

Box 1: Black Summer of 2019-2020

The bushfires of summer 2019-2020 – known as the Black Summer fires – made the impacts of climate change tangible for many Melbournians.[18]

Bushfires in Victorian during this period killed five people, destroyed more than 300 homes and killed 6,632 stock animals. More than 1.5 million ha of public and private land burned, including 1.39 million ha of forests and parks, plantations and native timber assets, critical animal habitats and water catchments.[13]

The Insurance Council of Australia has estimated that 3,050 insurance claims were attributable to these fires with estimated insured losses of approximately $18.6 million.[13]

In January 2020, Greater Melbourne residents experienced some of the poorest air quality in the world as smoke from the bushfires drifted across Greater Melbourne for weeks, and residents were advised to stay indoors as much as possible, and to wear protective masks when going outside. The smoke and reduced air quality was estimated to cost the cities of Melbourne, Sydney and Canberra over $500 million.[14]

It has been estimated that the smoke caused 120 excess deaths, 331 hospitalisations for cardiovascular problems, 585 hospitalisations for respiratory problems and 401 emergency department presentations for asthma.[13]

Scope of this desktop review

This desktop review will look broadly at the adaptive capacity of communities and business sectors that are particularly vulnerable to climate change impacts, including both preparedness and resilience (see **Key concepts and definitions** below). It will also focus in greater depth on particular communities and sectors that are:

- particularly prevalent in the Port Phillip region and/or
- likely to experience the most significant impacts and/or
- located in areas/sectors identified by previous vulnerable mapping and assessments.

The communities covered in this review are summarised below.

- Socioeconomic and demographic communities (see also *Box 2: Which groups are most at risk in the community?* page 10)
  - Aboriginal and Torres Strait Islander communities
  - Drug and alcohol users and smokers
  - Newly arrived asylum seekers and refugees, newly arrived migrants, visitors and people with low proficiency or literacy in English
  - Older people
  - People who are homeless or in insecure housing
  - People living in inadequate housing (especially social housing)
  - People with disabilities and complex health conditions, including mental illness
  - Socioeconomically disadvantaged people and people experiencing financial hardship
  - Women, single parents and children

- Geographic communities
  - Heat-prone and highly vulnerable urban areas (such as Dandenong and Brimbank Local Government Areas)

- Business sectors
  - Construction and other outdoor workers
  - Health and social services sector
  - Manufacturing
  - Small-to-Medium Enterprises (SMEs)
  - Tourism
  - Transport/Logistics

Areas that are not covered in this desktop review (except where they intersect with the above) include geographic communities and business sectors that are likely to be covered in greater depth in other regional or sectoral adaptation strategies:

- Agricultural communities and primary producers
- Bushfire-prone communities
- Coastal communities
- Drought-prone communities
- Flood-prone communities.

Additional communities and business sectors not covered in great depth in the Gap Analysis that came up in the course of this review, such as women and single parents, and manufacturing and transport/logistics, have been included here as above.

The health and social services sector plays a dual role in this review. As the sector employing the most people in the region, it appears as a business sector in its own right in terms of its organisational capacity.[103] We also draw heavily on this sector for insights about at-risk communities and recognise its role in supporting these communities.

Both direct and indirect impacts of climate change are considered in this review, with a particular focus on increasingly hot weather and reduced air quality due to bushfires, and on energy supply, occupational health and safety, and supply chain issues, as these were repeatedly identified by stakeholders and participants as being particularly important.

Box 2. Which groups are most at risk in the community?

People of a certain age or life stage

- Over 65 years old, especially those living alone
- Pregnant women and breastfeeding mothers
- Babies and young children

People with disabilities and particular health conditions such as:

- Heart and lung disease, high blood pressure, diabetes, cancer or kidney disease, lymphoedema, fibromyalgia, poliomyelitis
- Certain neurological illnesses (e.g. Parkinson's disease, multiple sclerosis, motor neurone disease)
- Mental illness
- Illness or infection that causes dehydration or fever
- Conditions that impair sweating including dehydration, skin disorders (sunburn, prickly heat, burn scarring), congenital impairment of sweating, cystic fibrosis, quadriplegia, scleroderma
- Addiction to alcohol, cigarettes and other drugs
- Cognitive impairments
- Limited mobility
- Obesity
- Low cardiovascular fitness

People taking medications that may affect the way the body reacts to heat

- Allergy medicines (antihistamines)
- Some blood pressure and heart medicines (beta-blockers and vasoconstrictors)
- Seizure medicines (anticonvulsants)
- Thyroid medications (thyroxine)
- Water pills (diuretics)
- Antidepressants
- Antipsychotics

People in inequitable social and economic circumstances

- People who are homeless, especially those sleeping rough
- People living in rooming houses, transitional accommodation, cars, caravans, tents, or insecure housing
- People living in public or private social housing
- People with low socioeconomic status who have restricted means of coping with extreme weather
- People who are living alone and/or who are socially isolated
- People with low proficiency or literacy in English (and/or other languages)
- New arrivals and visitors unfamiliar with our climate and/or associated social practices to manage extreme weather
- People exposed to prejudice, discrimination and other systemic barriers such as racism, sexism, ageism and ableism
- People exposed to greater risk of violence such as women and children, drug and alcohol users, people in insecure accommodation or sleeping rough

People outdoors during extreme heat

- Working or being physically active outdoors (e.g. gardeners, athletes and labourers).

Box 2 is based on groups listed in the Victorian Heat Health Plan (2020)[22] with the addition of further groups identified through interviews and surveys.

Methodology

This review is based on:

- A literature review of relevant government, community, media and academic documents, particularly those published since the gap analysis in early 2018
- Semi-structured interviews with more than twenty representatives working in peak bodies, networks and organisations within the community, government and business sectors as well as researchers, advocates and academics
- Surveys of community organisations and businesses, distributed through peak bodies, local government, partner agencies and research participants
- Workshops and meetings with community organisations and businesses.

Methodological limitations

Due to the scope of the review, interviews were limited largely to relevant staff in the community, government, business and educational sectors rather than being conducted with individuals, households, communities and businesses directly facing climate risks. Secondary research in the way of survey data and public documents were used as a proxy for direct first-hand accounts of people's experiences. This choice comes with some trade-offs, explored further in the section on *The Importance of Community Service Organisations* (page 40). The surveys distributed as part of this research received only a small number of responses, so are not claimed to be representative of any populations, but rather provided an alternative means to interviews to draw on the expertise of individuals working in particular areas.

Key concepts and definitions

Adaptation and mitigation

This project focusses on climate adaptation, i.e. adapting to current and future impacts and risks relating to climate change. Climate mitigation approaches (i.e. attempts to reverse climate change) are included primarily in so far as they have adaptation co-benefits.[15]

Vulnerability and at-risk communities

As identified by DHHS and as used in the 2018 gap analysis, community vulnerability to climate change means: 'the degree to which a community or an individual is susceptible to, or unable to cope with, the adverse effects of climatic changes.' In this framework, vulnerability is understood to be 'a function of a community or individual's **exposure to** [climate impacts], their **sensitivity** to such [impacts] (i.e. how severely they are affected by them) and their **ability to adapt**.'[4]

People living in public housing, for example, are known to be vulnerable to extreme heat because:

- A significant proportion of public housing stock in Victoria is old and not well equipped to provide adequate shelter from extreme heat, therefore people living in public housing are more **exposed to** extreme heat than people living in housing that is better adapted for heat

- They are more likely than others to have chronic health conditions and disabilities, including mental health conditions, many are children or seniors, and therefore heat affects them severely – they are **sensitive** to heat
- They are on low, often fixed incomes, so their ability to pay for heat mitigation measures within their home, such as air-conditioning or electric fans, or to access commercial cooler spaces is low, and therefore their **ability to adapt** to or cope with extreme heat is low.[16, 17, 18]

Having said all this, the communities typically described as 'vulnerable' are often also resourceful and resilient. Describing them as 'vulnerable' can erase their agency and may not fit with their self-image.[16] It can also frame vulnerability as being more about individual or community capacity than systemic barriers. For these reasons, when referring to people and communities in this review we generally use the term 'at-risk' rather than 'vulnerable'.
It is also important to acknowledge that people who face systemic barriers that put them at greater risk from climate impacts often face multiple barriers.[16] As above, people living in public housing, for example, are likely to fall into multiple, intersecting categories of societal disadvantage, including:

- Disability and health issues
- Low socioeconomic status and low, fixed incomes
- Dependence on government and other services
- Discrimination of various kinds
- Low literacy (in English and/or other languages)
- Social isolation and mobility issues.[16, 17, 18]

These layers of risk can have a compounding and cascading effect (see also *Box 3: Examples of climate impacts interacting with existing vulnerabilities*).
Similarly, across Australia, 45% of people with disabilities live on or close to the poverty line.[19]

Box 2: Which groups are most at risk in the community? (page 10) provides a more comprehensive list of specific groups of people who are at greater risk from climate impacts.

Preparedness

Preparedness generally refers to having specific plans and means in place to deal with specific shocks and stressors (see below), and can be conceptualised at the individual/household level as well as at the community or system level.

Resilience

In contrast to preparedness, which is usually thought of as being quite specific, resilience is often seen as a more broad-based antidote to, or even as being the opposite of, vulnerability. Resilience is understood as the ability of a community, organisation or individual to cope with and recover from shocks and stressors, while maintaining a certain level of health, wellbeing and social functionality. It doesn't necessarily mean returning to the same, stable and unchanging state after a disruption. In fact a resilient social system may change and grow in unpredictable ways in response to shocks.[20, 21]

Other components of resilience include:

- How much change can be borne before things break down
- The extent to which a social system can self-organise
- The ability to learn and adapt.[20, 21]

Social-ecological understandings of resilience identify some key contributing elements that support this kind of resilience:

- Diversity and redundancy
- Modularity
- Tightness of feedback loops
- Strong networks and connectivity
- Innovation.[21]

While these terms are most typically applied to social and familial groups, they are also relevant to businesses and organisations of various kinds.
Using again the example of people living in public housing, we could assess the resilience of a given public housing community, and what might be some strategies to boost resilience, by considering all of these factors (see Tables 1 and 2 below). Because preparedness and resilience are both important capacities in climate adaptation, both will be considered here.

Table 1: Are public housing communities currently resilient to heat stress?	
How long/hot a heatwave before things break down?	After 3 days of temperatures over 40 degrees people suffer serious health impacts or death, violence breaks out in cooler spaces etc
Can the system of residents, workers and support organisations organise a response before things break down	The system can respond to heatwaves up to 3 days as long as power supply is consistent and other emergencies are not present. After that, or if other factors (smoke, pandemic conditions) are present, help from state agencies is needed.
Does the system of residents, workers and support organisations learn and adapt?	There are high level reviews every summer but on the ground staff turnover is a challenge
Are residents strongly connected to each other and to other sources of support?	In some communities there is strong cohesion and connectedness whereas other communities are more fragmented. (Exactly this kind of disparity in social connectedness and cohesion has been linked to differing mortality rates in different neighbourhoods during a heatwave in Chicago in 1995.) [117]

Table 2: Strategies for building resilience in public housing communities	
Diversity and redundancy	Make sure residents have multiple cooler places to go, multiple strategies within their own homes, multiple sources of assistance
Modularity	Make sure each agency, and each building has a degree of self-reliance so that if one system collapses, the whole system doesn't automatically collapse (e.g. are there back-up generators in case the power goes out?)
Tightness of feedback loops	When residents report issues to agencies, these are remedied and information is fed back. When agencies fail, they are alerted and held accountable.
Strong networks and connectivity	Residents are strongly connected to other residents, to groups and to agencies and there are relationships of trust and information flow
Innovation	Residents, agencies and workers are able to try new approaches, to learn, to draw on different sources of knowledge

Shocks and stressors

When thinking about climate impacts, it can be helpful to consider that there are both:

- Shocks: short-lived, acute events – disasters and disruptions (e.g. fires, heatwaves, blackouts, floods, storms) and
- Stressors: long-term gradual changes and chronic issues such as warming, seasonal changes, droughts, sea level rise, declining biodiversity, the urban heat island effect; political, economic and social changes related to climate change.

These are both important kinds of impacts on businesses and communities.[23]

Small business

Different government and commercial bodies use different definitions of the term 'small business'. For the purposes of this review:

- Micro businesses have up to 5 employees
- Small businesses have 6-20 employees
- Medium businesses have 21-99 employees
- We will generally use 'small-to-medium enterprises' (SMEs) to refer to businesses with up to 99 employees.

Part 1: At-risk communities

Climate impacts on at-risk communities

In this section we review some of the most important climate-related impacts on at-risk communities. These are based on the 2017-2018 gap analysis, current research, interviews and surveys. It is acknowledged that many people will fall into more than one of these categories and therefore experience impacts across multiple categories. Existing issues and vulnerabilities also often interact with climate impacts in multiple ways.

Direct impacts: disruptions, disasters and long-term changes

At-risk communities are impacted more and sooner than other communities by natural disasters, extreme weather events, and acute disruptions such as:

- Extreme heat and heatwaves.
  - The Victorian Department of Health defines a day of extreme heat as being "when the forecast average temperature on any day exceeds the predetermined heat health temperature threshold in a Victorian weather forecast district" where the average means the average of the maximum and minimum temperatures forecast for that day. In Melbourne, for example, if this average exceeds 30 degrees, then this is deemed a day of extreme heat.22
  - Three or more days of extreme heat in a row constitute a heatwave.22
- Bushfires
- Smoke and decreased air quality due to bushfires
- Power disruptions
  - Outages, surges, and drops in voltage can be caused by the failure or damage of electricity infrastructure due to extreme weather and these can affect not only electricity supply but the performance and safety of electronic equipment. Extreme weather can also put pressure on electricity networks (e.g. increased demand for cooling during heatwaves) and cause the system to fail. [108]
- Severe storms
  - The Bureau of Meteorology defines 'severe thunderstorms' as those storms that produce damaging wind s, large hail, tornadoes or "heavy rainfall conducive to flooding." [115]
- Thunderstorm asthma
  - Thunderstorm asthma conditions can occur when certain types of thunderstorms interact with high levels of pollen in the air. These conditions are currently rare, and limited to grass pollen season (October to December). When thunderstorm asthma conditions do prevail, people who suffer from asthma or hayfever can experience severe respiratory symptoms, and when this affects a large number of people this is known as an instance of 'epidemic thunderstorm asthma,' such as on the 21 November 2016 when Melbourne saw "the world's largest epidemic thunderstorm asthma event" to date, with "thousands of people developing breathing difficulties in a very short period of time."[116]
- Floods
- Drought.

They are also disproportionately affected by long term trends and changes (such as warming, decreased rainfall and droughts, and sea level rise).[22, 24, 25, 28]

People with fewer financial resources, less access to services and information, and lower mobility have more limited ability to cope with sudden shocks or significant long-term stressors.25, 28 In addition, existing barriers and inequalities tend to be exposed and exacerbated by direct climate impacts (see *Box 3. Examples of climate impacts interacting with existing vulnerabilities* over page). On the other hand, communities who often deal with crises of multiple kinds may also have developed elements of community resilience. This resilience, however, is likely to be tested by prolonged, multiple and/or repeated shocks or long-term changes.[18, 28]

Indirect impacts on health and wellbeing

Both shocks and stressors also have flow-on effects on health and wellbeing. These secondary or indirect impacts may be no less significant than the immediate direct impacts of disruptions and disasters.[25] One example of this is that incidents of violence increase in hot weather and in the wake of disasters (see also see *Box 3. Examples of climate impacts interacting with existing vulnerabilities* over page).[18,34]

People in many of these communities are often already dealing with health and wellbeing issues, inadequate housing, lack of access to services or information, inequity and discrimination, or a combination of these. Climate-related events such as heat waves, storms and decreased air quality exacerbate these existing systemic barriers and issues.[16]

Other examples of indirect impacts include:

- Physical and mental health impacts
  - Thermal discomfort and flow-on effects on health and wellbeing, including mental health
  - Respiratory illnesses exacerbated by bushfire smoke, thunderstorm asthma, dust
  - Increased disease due to increased prevalence of disease-bearing species, changed climatic conditions
- Food insecurity due to increased cost or changing seasonality of foods, inability to keep food in safe conditions
- Bill shock (when households receive an unusually high energy bill following a period of extreme weather, and don't have the financial resources to cope with the spike in costs)
- Decreased or lost employment during changes in seasonal work.[24]

These less direct impacts – and access to mitigation against them - also interact with and can be compounded by existing issues, barriers and vulnerabilities just as direct impacts do (see *Box 3. Examples of climate impacts interacting with existing vulnerabilities* over page).[16]

Box 3. Examples of climate impacts interacting with existing vulnerabilities

Air quality, health and housing

When smoke from bushfires drifts into highly populated areas, as happened in the summer of 2019-2020, air quality decreases significantly. This has a disproportionate impact on people with respiratory illnesses and people who don't have access to adequate housing or other cooler spaces and therefore spend a lot of time outdoors, or in unsealed buildings, and may also not have access to masks.[18]

Extreme heat and older people

Older people are particularly vulnerable to heatwaves for a host of reasons, including that as people's bodies age, their ability to regulate their own temperature decreases.[27] The heatwave associated with Black Saturday in 2009, for example, saw a 34-fold increase in specifically heat-related ambulance call-outs, 61 percent of which were for people aged 75 years or older.[26] In addition to physiological vulnerability, older people are also more likely to:

- Have a disability (40% of Australians aged 65-69, for example, have a disability - compared with about 18.5% across the whole population)[19]
- Live alone and without a private means of transport.[18]
- Be on low, fixed incomes, even if they are asset-rich.[18]

International research into heatwave mortality indicates that older women in particular are at heightened risk of dying due to extreme heat.[67] In addition to the factors above, older women are even more likely than older men to be living in poverty, while living longer, and possibly having lower thermoregulatory capacity in their post-menopausal years.[67]

At the Brimbank Hotspots partnership event Fida Masri of Ambulance Victoria, told CroakeyGo: "Our elderly residents can't afford to run an air conditioner for two or three days, so by the third day the air conditioner is off and the inside of the house can actually be hotter than the outside of the house." At the same event local police commented that older people also tend to be afraid for their safety and unwilling to leave doors and windows open at night to cool down their houses.[26]

Local government officers working with older people commented that many older people have a strong need to ensure they will not be 'a burden' to their children and may live in self-imposed poverty in order to make sure that they are able to pay off their mortgage and leave money for their children when they die. They don't feel comfortable installing or using air-conditioning, or in some cases even a fan – let alone investing in home energy efficiency – because of the financial costs. Many older people are socially isolated, which is especially challenging when they have low proficiency in English or low literacy in English or their first language. Reaching isolated older people with public health information about extreme heat is something councils have struggled to achieve.[18]

These observations have also been echoed in multiple workshops and consultation sessions by community service organisation workers who visit older client's homes and frequently report unsafe living environments with poor insulation and no fans or air-conditioning (or again, an unwillingness to use air-conditioning which is seen as a costly extravagance).[18]

Older people also may not have a high degree of physical mobility, or any means of transport other than walking and public transport, making it difficult to access cooler places during extreme heat.[18]

Heat, disasters and violence

Incidences of violence are known to increase on hot days, particularly during protracted hot weather, and in the wake of disasters. This includes family violence (affecting partners, children and elders within a household or extended family, and including sexual violence, neglect and abuse) and community violence (violence that takes place between strangers in public places).[29, 34]

This has a disproportionate impact on people who are already vulnerable to violence, such as women, people with disabilities, children and elders, users of drugs and alcohol and people sleeping rough – particularly in urban heat zones and in bushfire-prone areas.[29, 30] The prevalence of violence against women in these circumstances also creates a vicious cycle, with violence being a leading causal factor in homelessness amongst women, and with homelessness further exacerbating exposure to climate risks.[34] Extreme weather and disasters can also impact on the ability to access telecommunications safely and privately, making it harder to contact help lines and other support services.[18]

Figure 2: Climate Change Related Violence poster (Enliven)[32]

These impacts can also be compounded by intersecting dimensions of vulnerability. Women and children with disabilities who don't have access to secure housing, and who may be sleeping rough or in environments where drugs and alcohol are prevalent, for example, are exposed to compounding layers of risk. [29, 30, 34]

Agriculture, food insecurity and unemployment

When long-term forces such as drying and warming – or a short-term shock such as a flood or very dry season – affects local primary producers, this also has flow-on affects for socio-economically disadvantaged people. As fresh local produce becomes less available and affordable, food security issues increase for those already least able to access good quality food. People employed in low-paid seasonal work are also likely to lose work.[18]

Inequitable access to cooler places

One way people cope with heatwaves is to access public 'cooler places' such as libraries, pools, cinemas, shopping centres, drop-in centres and community rooms. Many cooler places that are open to the public for free, however, tend to be open only during business hours. And those that are open later may not be safe (see *Box 8: Mallee Family Care report – Social housing in Mildura in 2016 – a glimpse of Melbourne 2090?* on page 31). People with pets who don't have a way to keep their homes cool may not be able to access indoor cooler places with their pets and are afraid to leave them outside or in their homes. People who are poor, young, who are mentally ill, affected by drugs or alcohol, or who are racially profiled by police or security guards, may also be turned away from cooler places.[18]

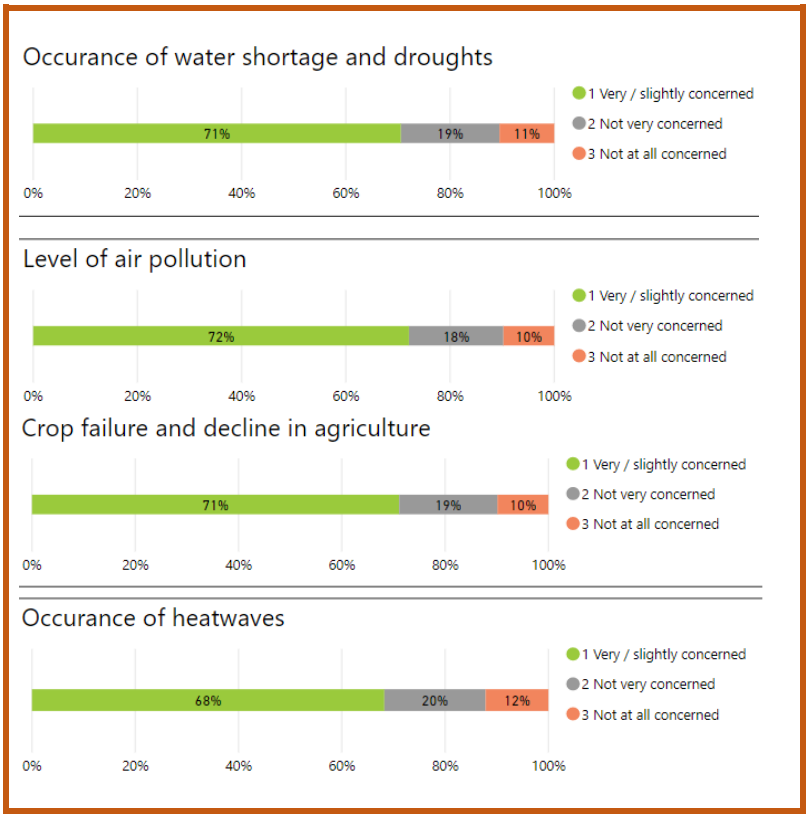
Assessing the vulnerability and preparedness of at-risk groups

A thorough and fine-grained assessment of the vulnerability, resilience and preparedness of all at-risk groups in Greater Melbourne in 2020 was beyond the scope of this project. Instead we offer some general insights about the level of preparedness and resilience of the general population and at-risk populations in Greater Melbourne, and focus in on some key groups identified as being particularly exposed.

General level of preparedness in Greater Melbourne

When assessing preparedness, it's helpful to know about people's level of awareness of and concern about climate impacts as well as concrete actions or plans they have in place to prepare for these impacts.

Sustainability Victoria surveyed Victorians in 2017 about their perceptions of climate change. Residents of Greater Melbourne showed a high level of concern about climate impacts, with around 60-70% of respondents registering that they were concerned across a range of impacts including heatwaves, fires, drought, storms and floods, agricultural decline and air pollution (Figure 3 below).[31]



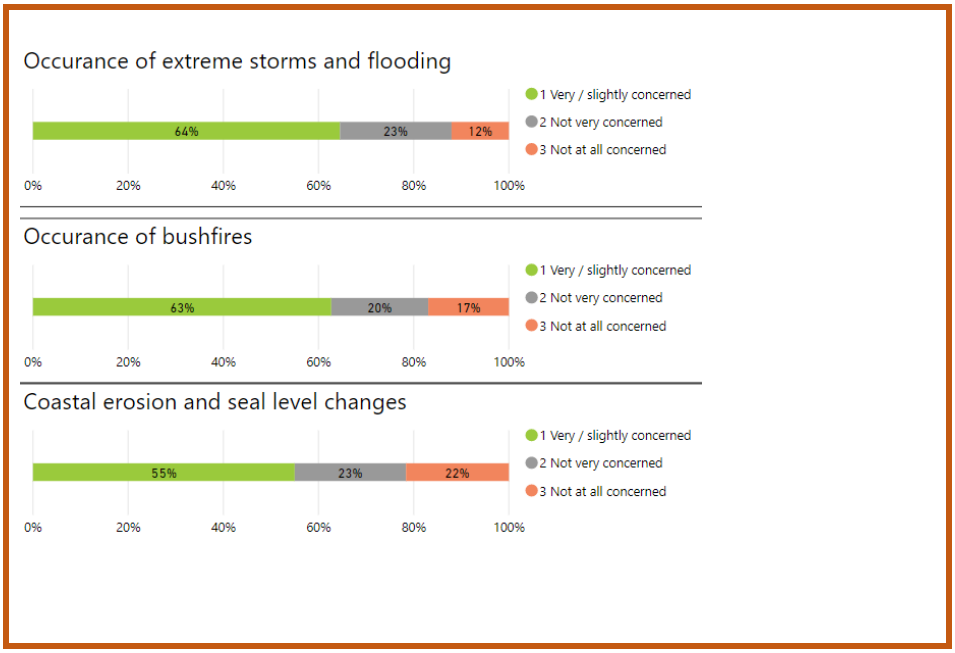


Figure 3. Victorians' Perceptions of Climate Change[31]

More recently (in 2020) the City of Melbourne surveyed their residents, as well as people who work or study in the City of Melbourne, to find out not only their level of awareness and concern about climate impacts but also how prepared they felt, and what specific steps they had taken to prepare.[32]

Key findings included:

- 75% of respondents perceived that extreme weather was becoming more common, or would become more common over the next ten years.
- 31% said they were 'not prepared' or only 'slightly prepared' for heatwaves, and only 20% felt 'very prepared' or 'extremely prepared'.
- 43% of respondents access public buildings to stay cool.
- People in rental properties or high-rise apartments were less prepared than others.[32]

(See ***Box 4****: How aware and prepared are City of Melbourne residents?* over page:)

A recent survey into people's experiences of extreme heat was carried out in Melbourne as part of the *Sweltering Cities* project, which is gathering community data to inform advocacy around cooling the hottest neighbourhoods in Australia's biggest cities.[70] Results from 110 respondents, over 40% of whom were over 50 years of age, included the following:

- 97.3% said they are concerned that summers are going to get hotter.
- 98.8% said they are concerned that **climate change** may cause hotter summers.
- 84.5% said they feel uncomfortable in the heat in summer in Melbourne.
- 44.6% said concerns about cost stop them from turning on the air conditioner.
- 84.5% said they have trouble sleeping on very hot nights or during heatwaves.
- 21.8% said they have a health condition that is made worse by extreme heat.
- 24.5% said they don't have access to information about how to be safe and well in heat waves.

Box 4: How aware and prepared are City of Melbourne residents?

The following are results from the 2020 City of Melbourne survey referred to above, and include the responses of residents, as well as those who work or study in the city.[32]

Awareness

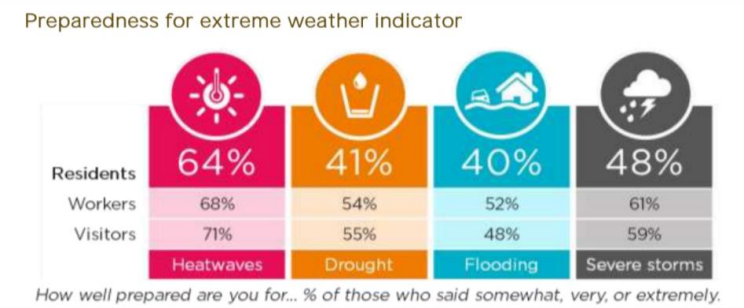
- Slightly more than 75% of respondents perceived that extreme weather was becoming more common, and more severe, or would become more common and more severe over the next ten years.
- Heatwaves were seen to be the most increasingly common and to have the greatest impact on City of Melbourne residents.
- The impacts and risks perceived included:
  - Threats to human health including death, injury, food insecurity and mental health impacts
  - Damage to buildings, roads and other infrastructure
  - Harm to wildlife and vegetation
  - Workplace impacts such as reduced productivity, job losses, work disruptions.

Significant impacts and risks that are recognised by the City of Melbourne, but that were not mentioned often by respondents included:

- Air pollution from bushfires
- Illnesses (especially respiratory)
- Evacuations and pressure on emergency services
- Degradation of the quality of open space and damage to waterways
- Damage to communications infrastructure
- Cancellation of events

Preparedness

- Over a third of respondents to the recent City of Melbourne said they had made some preparations around their home for extreme weather.
- In alignment with the perceptions of frequency and impact, respondents felt most prepared for heatwaves and least prepared for floods (the percentages below indicate respondents who said they were 'somewhat' to 'extremely' prepared).



- In addition to strategies within the home, 43% of people reported going to public buildings during hot weather.
- Nearly half of residents also said they had an emergency kit of some kind, and 24% had some kind of plan in place for extreme weather events.

Recent research released by Sustainability Victoria indicated that Victorians generally rank health as their top priority, yet 90% of people surveyed had not thought about the impact of climate change on human health. On the level of personal preparedness, more than half of respondents said that that their home gets too cold during winter and too hot during summer, and yet people's knowledge of healthy and safe indoor temperatures was concerningly low: around were half of respondents under-estimated or over-estimated the healthy range for indoor temperatures significantly.[71]

Preparedness of at-risk communities in Greater Melbourne

During 18 interviews and workshop sessions, only a handful of workers in this area felt able to assess the level of preparedness of the communities with which they work. In some cases this may be due to a reticence to speak on behalf of a community to which they do not belong; in many cases workers felt they were too far removed to understand the daily lives of the community. (See also *The Importance of Community Service Organisations* on page 40). The workers who did feel able to comment tended to be those who had been working in the area for a long time, and who were undoubtedly bringing a great deal of experience and insight to their participation in this project. Some of the comments from these professionals (not attributed to individuals)[18] included observations about personal resilience and its limits:

- They are resilient because of the nature of their lives.
- So far we haven't seen a really long heatwave to test all the systems… If we had a prolonged heatwave, people will exhaust their own personal resources. You can last a couple of days by going to libraries and so on but over a week they are going to need help.
- People can be very resourceful – with covid it's the people who have suddenly lost jobs who can't cope, not the ones who are already used to living on a low budget. Having said that the Mallee study is interesting [see Box 8: Mallee Family Care report – Social housing in Mildura in 2016 – a glimpse of Melbourne 2090? on page 31]– people in public housing were resourceful in adapting to heat –sleeping aside, community bonding, but there were flipsides as well (e.g. social discord, kids not going to school, AOD – need to be careful of perverse outcomes).

Others commented on a general lack of preparedness and capacity to prepare:

- It's impossible to say but broadly the Victorian community is not very prepared, and vulnerable people less so. They are less prepared because they have less capacity and less resources. There isn't a good understanding of what climate change means and what adaptation looks like. The best way to talk to them is through health impacts.
- There's a real gap in people's knowledge about what to do – and with rental properties, for example, your capacity is limited.

Others spoke of variability of preparedness amongst different groups and individuals:

- Community and council do a lot of work (around personal preparedness) so there are some groups that have better preparation because they've been engaged but people fall through the gaps – they might not know about grants or services they could access – but even in within those groups there are people who are engaged – and they do act as conduits – a great strategy is to target these influencers.
- Newly arrived refugees are very resilient but they are also highly vulnerable and their preparedness is very low.

Moreover, they pointed to the need to see individuals and communities as part of a larger system, in which personal preparedness plays only one part, and where there are larger issues that need to be addressed in order to provide protection for at-risk communities from climate impacts:

- It's not a good thing that people need to rely on external places for cool places or food....
- We need to invest more in getting people off the street during major [climate] events – let's not let them rely on their own resilience to survive.
- [We need to] have health systems that are better equipped to help people sleeping rough – especially around mental health. [We need] better funded multi-disciplinary health teams in each area … looking after highly vulnerable clients and who the system is not designed to support – you're going to a psych ward or a prison or you're staying on the street.

A number of community workers (24) answered a NAGA survey about the level of preparedness of the communities they work with. As with the workers interviewed, the modest response rate may have been due to a reticence to speak on behalf of a community, and lack of direct knowledge. The responses that were received, however, were informative in that they give insight into specific communities.

Table 3: Responses to survey – community preparedness

Communities covered	Organisation works with these communities		Individual worker works with these communities	
	Number of responses	Percentage of responses	Number of responses	Percentage of responses
Older people	21	88%	9	39%
Social housing tenants	19	79%	10	43%
People experiencing financial disadvantage	17	71%	8	35%
Children and single parents	16	67%	5	22%
People with disabilities	14	58%	6	26%
Aboriginal and Torres Strait Islander communities	13	54%	6	26%
People who are homeless or in insecure housing	13	54%	4	17%
People with drug and alcohol addictions	11	46%	3	13%
Newly arrived asylum seekers, refugees and migrants	3	13%	9	39%
Don't work directly with communities	2	8%	2	9%
Young people			1	4%
TOTAL	24	100%	23	100%

Because only a small number of responses were received in each category, and almost every respondent reported working with more than one community, it is not possible to attribute different responses to specific communities in most cases. Respondents were asked to identify if different communities experienced impacts differently, but did not do so.

The tables below give some indication of how aware and prepared these communities might be, and how capable they might be of coping with the impacts of climate change.

ANSWER CHOICES	RESPONSES	
Not aware	31.82%	7
Aware but not prepared	54.55%	12
Prepared	0.00%	0
Other / comments	13.64%	3

Table 4: Awareness and preparedness of at-risk communities (subjective assessment by community sector workers)

While recognising that whether or not a community can 'cope' is a subjective assessment, it is worth noting that respondents reported that a significant proportion (20-44%) of communities would not be able to cope at all with a number of climate impacts, while a small proportion are fairly resilient, and the majority will struggle but will cope with some impacts. Food insecurity was one of the impacts that communities are more resilient to, according to these results, while they are least resilient to exacerbated mental health conditions.

	NOT ABLE TO COPE AT ALL	WILL STRUGGLE BUT WILL COPE	FAIRLY RESILIENT TO THIS KIND OF CHANGE	TOTAL
Increased heat stress	8.70% 2	86.96% 20	4.35% 1	23
Exacerbated physical health conditions	22.73% 5	72.73% 16	4.55% 1	22
Exacerbated mental health conditions	36.36% 8	63.64% 14	0.00% 0	22
Increased family violence	40.00% 8	50.00% 10	10.00% 2	20
More need for crisis accommodation and services	44.44% 8	44.44% 8	11.11% 2	18
Increased drug and alcohol use	31.58% 6	52.63% 10	15.79% 3	19
Increased food insecurity	5.26% 1	68.42% 13	26.32% 5	19

Table 5: Ability of at-risk communities to cope with climate change (subjective assessment by community sector workers)

Workers also assessed the impact of COVID-19 on these communities' ability to cope, and reported that the majority of communities would be affected by difficulties in accessing cooler places or leaving home, and by decreased support networks and services.

ANSWER CHOICES	RESPONSES	
Difficulty accessing or social distancing in cooler places	72.73%	16
Less ability to leave the house to get cool	77.27%	17
Decreased support networks	81.82%	18
Impacted services	63.64%	14
Other (please specify)	9.09%	2

Table 6: Impact of COVID-19 on ability of at-risk communities to cope with climate change (subjective assessment by community sector workers)

In the following sections we will take a closer look at the level of vulnerability and preparedness of particular priority at-risk communities by reviewing relevant research and case studies.

Heat, housing and homelessness

People without adequate housing are especially exposed to extreme weather, and there is recent local research available to illustrate this, particularly in relation to extreme heat.[17, 33] This population of people without adequate housing includes:

- People who are homeless[35, 36]
  - People who are sleeping rough (outside and/or without shelter that is intended as accommodation but may include cars, tents, train cars, abandoned buildings etc)
  - People in insecure accommodation, such as people living in
    - Rooming/boarding houses
    - Refuges, crisis or temporary/transitional accommodation
    - Caravan parks
- People living in social housing[36]
  - Public housing (managed by the Department of Health and Human Services)
  - Community housing (managed by non-government not-for-profit organisations)
    - People living in inadequate private rental properties.

This covers a large and heterogenous population of Victorians, in which Aboriginal people and Torres Strait Islanders, culturally and linguistically diverse communities, and people with disabilities are all disproportionately represented.[37]

Statistics on homelessness are notoriously difficult to establish, since the definitions of homelessness are not consistent across all levels of government and non-government organisations, people's circumstances are often fluid, and homeless people tend to 'fall through the cracks', including those of systems such as census data collection.

Nevertheless a research report prepared for the parliamentary inquiry into homelessness in Victoria in January 2020 concluded that around 24,000-25,000 Victorians were homeless as of the 2016 census, and that of these, there were likely to be over 2,000 people sleeping rough each night. The City of Melbourne's 2018 survey of 5 inner metropolitan LGAs estimated there were 400 people sleeping rough in these inner metropolitan areas at the time of the survey.[35]

As of 2016, Victoria had a total of between 82,000 and 83,000 social housing properties classified as long-term rental properties, of which 75 per cent were public housing, 22.7 per cent community housing and 2.3 per cent Aboriginal community housing.[37]

For the purposes of assessing preparedness and resilience, it makes sense to consider people without adequate housing in the following categories:

- People sleeping rough
- People in insecure accommodation
- People in social housing
- People in inadequate private rental properties.

It is also important to remember that people may move between these categories and that the boundaries between them may be blurred at times,[41] and that many of these people may experience multiple barriers and risk factors, related to or exacerbated by their living situation.[38]

People who are sleeping rough

People who are sleeping rough are especially exposed to extreme weather and other climate impacts by definition as they don't have adequate shelter from the elements. They are also more likely to be:

- Socially isolated and isolated from services
- At risk of violence
- Fatigued and/or sleep deprived (and to fall asleep in the sun)
- Inadequately dressed for sun protection and thermal comfort
- Affected by drugs and/or alcohol
- At risk of dehydration
- Bitten by mosquitoes and other insects
- Perceived to be sleeping normally when in fact experiencing heat stress or illness
- Affected by mental and physical health conditions
- Turned away from commercial cooler places such as cinemas or shopping centres.[18, 38]

These multiple risk factors make rough sleepers some of the most exposed members of the community.[38]

Homeless support services have recognised these risks and regularly conduct vulnerability assessments to help prioritise support for those rough sleepers who are at greatest risk of death or severe health impacts. While it was beyond the scope of this project to attempt to collect and collate a comprehensive dataset of recent vulnerability assessments of rough sleepers in Melbourne, interviews with workers in this area indicate that rough sleepers are at greatest risk during extreme weather (see *Box 5: Launch housing: assessing acute needs of homeless people* over page).

While people sleeping rough have often built their self-reliance as a survival mechanism, their resources are limited, and their own personal resilience can only go so far. Unless they are able to get access to shelter and services, prolonged heatwaves can be deadly for people sleeping rough. With many people sheltering in bushland in State and National Parks, bushfires are also likely to have a largely unseen impact on rough sleepers. City of Melbourne staff and other homelessness workers have also commented that floods pose a significant drowning risk to people sleeping beside waterways.[18]

The Victorian government's recent initiative to provide emergency accommodation for rough sleepers during the coronavirus pandemic provides an illustrative example of how a lack of secure housing interacts with public health and shows promise for future climate-related emergency responses (see *Box 6: Homelessness and the COVID-19 response – a model for climate-related emergency responses?* on page 28). [18]

People in insecure housing

People in temporary or transitional housing such as crisis shelters, rooming houses or caravan parks typically have more adequate shelter than people sleeping rough do, however it may still be quite inadequate, and though 'transitional' (for example while waiting for social housing), people may live in these kinds of accommodation for months or years. [38] Compared with people in social housing, people in transitional accommodation are less likely to have access to private spaces and are likely to be reliant on common facilities. [38] This can affect health and wellbeing on hot days, especially given the correlation between heat and violence. [38] The difficulty of physical distancing and adequate cleaning for pandemic conditions, as seen with the COVID-19 pandemic, can also make communal spaces unsafe and anxiety-provoking.[18]

Box 5: Launch housing: assessing acute needs of homeless people

Launch housing is part of the Australian Alliance to End Homelessness (AAEH). Organisations who work with homeless people across Australia have adopted an approach developed in North America for triaging clients and prioritising services. This approach recognises that in order to make best use of limited resources, the people with the most acute vulnerability need to receive more services more quickly, and those with less need can be provided with 'light touch' assistance in a less urgent manner. In particular, those people who are at imminent risk of death need urgent and comprehensive assistance.[18]

The AAEH uses the Vulnerability Index Service Prioritisation Decision Assistance Tool (VI-SPDAT)[39] in this prioritisation process, and average scores are also tracked on a private dashboard accessed by AAEH partners. There has also been a concerted effort to bring all relevant parties together – from the various homelessness service providers to councils to Parks Victoria, to mental health and drug and alcohol services to police and emergency services – to better coordinate their work and provide more holistic, joined-up services. Sharing information collected using the VI-SPDAT has given all the parties a shared system of prioritisation and allowed them collectively to focus on the individuals in most need. The percentage of people transitioning out of homelessness has been improving in areas where this coordinated and prioritised approach is being used.[18]

The VI-SPDAT has been used in Australia for three years and partner agencies continue to refine how it is used, and the tool itself continues to be adjusted. The scoring is relatively comparable across different areas of Australia, with some exceptions, where for example a particular area may be focussed entirely on youth homelessness. [18]

As data continues to be collected around Australia, there could be an opportunity to track the seasonal variability of the acuteness of need amongst homeless people, especially those sleeping rough. This could be an important data source for understanding the level of vulnerability in this community, and potentially for helping to understand the human and financial cost of people remaining homeless. An action research project could compare the costs and outcomes of using temporary accommodation such as in *Box 6: Homelessness and the COVID-19 response – a model for climate-related emergency responses?* over page, doing nothing other than business as usual, or other approaches, and how this may differ at different times of the year. [18]

Box 6: Homelessness and the COVID-19 response – a model for climate-related emergency responses?

In the early months of the coronavirus pandemic the Victorian Government started offering free accommodation to rough sleepers in hotels and empty student accommodation. Approximately 7,000 people were accommodated in this way, and the program has been extended to April 2021. [18, 40]

Where in the past getting people off the streets and into accommodation has been a slow and laborious process, a huge and concerted effort of government and non-government agencies saw thousands of people accommodated in a matter of weeks. [18, 40]

This public health measure was taken to manage the risk of COVID-19 spreading amongst rough sleepers in Melbourne, primarily to protect the whole community rather than individual rough sleepers, but with the benefit that these people got access to secure, if temporary, private accommodation.[18] There were flow-on benefits from this as homelessness workers were able to provide access to a range of services that can be difficult to coordinate when people are not in a secure living situation.[40]

This effectively allowed homelessness services to approximate a 'housing first' approach, whereby homeless people are provided with secure, long-term accommodation as the first priority, and independent of meeting any kind of participation requirements (e.g. counselling, attending group sessions, job seeking etc).[41] This is an approach many homelessness services advocate for as the most effective way to end homelessness.[41] To follow through on this approach would include transitioning those currently accommodated through the COVID-19 response into longer-term housing. The Victorian Government's announcement of a $150 million package to keep 2,000 homeless people accommodated until April 2021 and to lease rental properties intended to become permanent homes for people who leave emergency accommodation was thus welcomed, though further commitments have been sought[18, 42]. Homelessness support agencies are now working hard to transition as many of these people as possible into longer-term housing, which is made easier by the relative stability of their clients once they are in temporary accommodation. [18, 40]

Agencies and academics claim that the health impacts of homelessness cost more than giving people homes. Bevan Walker of Launch housing has said "It costs more in police call-outs, and having doctors and nurses treat people in emergency wards, than it does to provide people with a home. With the 1,000 clients that we have currently in emergency accommodation, we'd be saving $15 million a year." [40]

These claims may not have taken full account of the mortality and morbidity risks and costs associated with sleeping rough in the context of Melbourne's heat island effect, increasing temperatures, increasing incidence of heatwaves and bushfire smoke.

It is to be hoped that the recent budget announcements about increasing the number of social housing properties in Greater Melbourne will help to reduce the number of people in transitional housing and sleeping rough, however the 6000 additional homes promised in the recent announcements still leave nearly 20,000 people of the 24,000-25,000 Victorians identified as homeless by the 2016 census without a home.[35, 37]

Until the ideal outcome is achieved of nobody needing to sleep rough in Greater Melbourne, the COVID-19 response could provide a blueprint for an emergency response to extreme weather events such as heatwaves that includes providing at least temporary accommodation as a public health measure to protect rough sleepers from potentially deadly conditions.

People in social housing

A number of recent research projects have explored the experiences of people living in social housing in Victoria. Two of particular relevance to this project are:

- The 2018-2019 Hotspots Initiative, which collected first-hand accounts from social housing tenants via social services workers (see *Box 7: Hotspots Initiative – Social housing tenants in Melbourne 2019-2020* below)[16, 17]
- The 2019 Mallee Family Care report into extreme heat experienced in public housing in Mildura (See *Box 8: Mallee Family Care report – Social housing in Mildura in 2016 – a glimpse of Melbourne 2090?* on page 31.)[33]

The first of these illustrates the recent lived experience of current public housing tenants in Melbourne. The second is based on focus groups and interviews conducted in Mildura, which may provide an insight into what public housing in Melbourne could be like in the latter part of this century, if no major changes are made to public housing, and under a high emissions scenario. (Mildura's average maximum summer temperatures are 5-6 degrees hotter than in Melbourne, and the overnight lows are only 1 degree warmer.[43] The Victorian Government's 2019 climate projections range up to an increase over 4 degrees from the average during the 1986-2005 period by 2090, with around 1 degree of warming since the 1800s already having occurred, for a total increase of 5 degrees.)[2]

While social housing tenants may have access to common indoor spaces, and outdoor spaces, that are cooler, these may not be safe, especially given the tendency for stress, anxiety and violence to increase in the heat.[33, 18]

The Hotspots Literature Evaluation lists a number of reasons why people renting social housing in Victoria are disproportionately affected by extreme heat:

- Many properties don't have passive design features (such as orientation, thermal mass and insulation) to be comfortable without additional weather mitigation
- Many properties don't have these mitigation measures – air conditioning and fans are often not present, but neither are more basic measures such as, internal and external blinds, curtains, insect and security screens.[16]

Tenants are on low (and often fixed) incomes, so paying for these items themselves is often prohibitive, as is running air conditioners if they do have them.[16]

Box 7: Hotspots Initiative – Social housing tenants in Melbourne 2019-2020

In the summer of 2019-2020, community health provider cohealth worked with the City of Melbourne, the Salvation Army, Ambulance Victoria, Victoria Police, Unison Housing, the Carlton Office of Housing, and the Royal District Nurses Services' Homeless People's Program to explore the lived experience of older social housing residents, with a particular focus on culturally and linguistically diverse tenants.[17]

Project workers collected stories directly from residents and recorded them in structured diary entries. They sought to understand the residents' experience of extreme heat while living in high-rise social housing apartments and their strategies for coping with the heat. They also investigated how the DHHS heat alerts and other parts of the support system were functioning, and what makes for effective outreach and assistance.

One of the key strengths of this project is in providing direct accounts that illustrate the real-world experience of many of the impacts of extreme heat identified in the literature, such as these below:

- Sleeplessness and fatigue
  - She doesn't sleep well during the night because the walls get so hot. She is a healthy person but…during hot days it really slows her down and makes her feel weak.

- Mental health impacts
  - He gets anxiety thinking about it [heat] and works himself up about it. He is on medication for his anxiety also.
  - … feeling like he and his wife were trapped as they could not go anywhere during hot days and had to stay in the unit in front of the fan. He said it can sometimes send him crazy.
  - She now suffers from anxiety thinking about summer…
  - He does worry and think about future summers and if he will be ok in the heat…
  - …it causes him stress about future summers and hot days and he wonders constantly during summer when the next heat wave will be.

- Safety and security impacts – residents reported sleeping outdoors or in corridors or common areas to escape the heat of their apartments, and not feeling safe:
  - …it was so hot one year during a heatwave, he slept outside on the grass in the estate. He did mention he was worried for his safety. However, his unit was like an oven and he was going crazy not being able to sleep.
  - … people from the neighbourhood make their way into [cooler common spaces] … He gets worried when he knows there is a hot day approaching because he wonders if the cool room space will be available and safe for him.

- Financial impacts of trying to keep cool
  - … it would cost too much to run [a fan] as he just received an electricity bill for $100 … so he is now hesitant to use power.
  - He worries about the cost of running [air-conditioning] … as he finds it very expensive… he prepares for this by putting extra away for his bill leading up to summer.

As well as these impacts, the residents also clearly had a wide range of coping strategies and ways of preparing for extreme heat, including:

- Strategies within their own home such as taking cold showers, using wet towels, putting their feet in cold water, and makeshift coverings for windows
- Changing their daily schedule – avoiding cooking, going shopping early in the day
- Finding cooler places like libraries, pools, community rooms, homes of friends and families
- Having back-up plans for if the power goes out
- Putting money aside to deal with bill-shock.

The stories of these residents highlights the need to look beyond personal preparedness, as they had developed many ways to prepare themselves, yet were still vulnerable to impacts due to the systemic barriers of living in social housing as identified above, particularly:

- Poor quality housing
- Limited access to mitigation measures such as blinds, fans and air-conditioning

- The interaction of extreme heat with existing chronic physical and mental health issues:

- He suffers significantly during summer as he has several illnesses including diabetes, high blood pressure, partial blindness, polymyositis... He worries about his future living at the high-rise during summer ….

The stories also highlighted that in government-managed public housing, residents perceived that the system was unresponsive to their needs, as complaints and requests had gone unanswered:

- He has had numerous dealings with Housing … he has "given up and [doesn't] bother now."

People in inadequate private rental properties

Inadequate housing is not confined to social housing, and some low-income private renters face the similar barriers to those faced by people in social housing in terms of their financial and legal capacity to equip their homes for extreme weather, and may of course fall into one or more other high-risk categories.[18]

In Brimbank, for example, newly arrived migrants and pensioners have limited options when it comes to finding affordable rental properties, and their financial resources are low.[18] The consultative work IPC Health did in Brimbank with these groups indicated that if they had more money (e.g. if their Centrelink benefits were higher), they would not only feel more confident about using cooling in their houses, but they would also like to undertake retrofits to make their houses more comfortable.[18] As it is, they tend to have to rely on cost-free measures at home, such as using wet towels to cool themselves and taking cool baths, and leaving home to seek cooler places at shopping centres or the beach.[18] Older people in particular reported that the hardest thing was to get a good night's sleep during extreme heat.[18]

In Melbourne's northern suburbs, workers reported that some older people in the private rental market were trapped in predatory rental arrangements, sometimes in completely inadequate accommodation such as shipping containers, and in come cases paying more than 100% of their pension in rent.[18]

Even people who are not necessarily on low incomes, and whose accommodation might not generally be considered 'inadequate' still say that living in a rental property and/or financial constraints are a significant barrier to preparing for climate impacts (see *How aware and prepared are City of Melbourne residents*? on page 21).

Box 8: Mallee Family Care report – Social housing in Mildura in 2016 – a glimpse of Melbourne 2090?

Mallee Family Care conducted focus groups with social housing residents in Mildura as well as with service providers. First-person accounts were recorded, and like the cohealth branch of the Hotspots initiative described above in *Box 7: Hotspots Initiative – Social housing tenants in Melbourne 2019-2020*, illustrated many of the known impacts of extreme heat on people in social housing.[46]

In addition to replicating all of the impacts described above, they illustrated some other specific impacts:

- On babies and infants
  - Babies are constantly sick. You are constantly needing Nurofen, Panadol because they've got higher temperatures.

- On children at school
  - "They've gotta come into school the next morning… they're disengaging…they can't cope because they're tired from the heat."
  - Children are also sent home from school when certain temperature thresholds are reached, but the homes of children who live in social housing are even hotter.

- On pregnant women
  - "I thought I was going to die… the heat is like ten million times worse for you."
  - "I spent 90% of my third trimester down the river."

- On people with health issues
  - Many residents reported direct health impacts of extreme heat such as sunstroke, dehydration, headaches and difficulties with breathing.

- On people using medications (see also Heat and chronic health issues, page 39)
  - "One resident who has been taking strong pain relief medication said that the medication doesn't work effectively during extreme heat, and as a result had to be transferred to hospital by ambulance during [a heatwave]."

- On violence levels
  - Many residents spoke about increases in anti-social behaviour, irritability, disrupted family life, violence, people roaming the streets at night and increases in drug and alcohol use.
  - "That's when the violence comes in, the domestic fights… the husbands have been drinking… and they come home and take it out on the family."
  - "I've seen one kind smash another kid in the head with a scooter."

- On accessing services
  - Fatigue can stop people from attending appointments and accessing services, which can disrupt counselling and rehabilitation or lead people to be considered non-compliant where attendance is compulsory.

Like the residents who participated in the Hot Spots initiative, the Mildura residents also employed many different strategies for keeping cool and were clearly aware of the dangers of heat and what they could do to prepare. They also faced systemic barriers to anything more than personal preparedness in the face of very difficult conditions, and offered some critiques of the system:

- Many residents had applied to have air-conditioning installed for health reasons, but these were very rarely successful – unless you were "practically dying".
- Residents were aware of and were receiving heatwave warnings but commented: "*Warnings don't' change anything, you're gonna be hot and … you're gonna cook*."[33]

A common theme of people living in adequate or insecure housing, or without formal accommodation, is that they are as prepared for extreme weather as they can be, given the

level of control they have over their living conditions. There is also a degree of community resilience in the actions of community clubs, friends and family in looking after each other, sharing their cooler spaces, and sharing their knowledge. In other words, they are limited to 'coping strategies' rather than 'adaptive strategies' as described by South East Healthy Communities Partnership - they are individual stop-gap measures (sometimes quite literally) rather than deeper or more institutional changes as their ability to influence these is low.[28]

Newly arrived refugees and asylum seekers

There is a diverse range of overlapping segments of the community who are:

- Not highly proficient in spoken English and/or
- Not highly proficient in written English and/or
- Not literate in any language.[18]

While all of these audiences may miss mainstream messaging, alerts and media about, for example, heatwaves, their circumstances vary widely. Some may be well connected to a community in which messages are passed on by family and friends. Others may have little contact with other people. Newly arrived migrants may have financial resources and be able to communicate in English, whereas asylum seekers and refugees often do not have these advantages and are most at risk.[18]

Partners in the Hotspots Initiatives in Brimbank and Dandenong noted that people new to Melbourne may be unfamiliar with the climate and weather patterns, or may not have access to the kinds of cooling strategies that were available in their home countries.[18,44] Where older people in Brimbank who had moved from Mediterranean countries decades ago were relatively well set up to cope with heat in their own homes, as they prize brick houses and often have a cool cellar room to retreat to - a key difference between these households and newly arrived households is that they had had the opportunity to buy their own houses.[44] Newer migrants from Samoa and Afghanistan noted that their housing in their home countries was better built to suit the local climate compared with social housing provided in Dandenong.[18] They also noted that in Samoa they had access to the beach, shade trees and sea breezes - none of which are available in Dandenong - and in Afghanistan, loose, light clothing was more typical than in Australia.[18]

Refugees and asylum seekers tend to face a range of particular and compounding barriers that are more extreme than those faced by other CALD communities and that limit their ability to be prepared for climate impacts.[18] These can include the following (see *Box 9: Impacts on refugees and the role of settlement services* over page for more detail):

- Very constrained financial resources
- Limited networks
- Limited access to digital communications, and/or low digital literacy
- Low proficiency in spoken or written English
- Coping with trauma and associated psychological, cognitive and learning impacts
- Coping with anxiety and/or depression related to settling in a new and foreign country with limited support systems
- Reliance on family members or service providers for access to social, technological, financial and institutional systems
- Having to act as an interpreter or de facto case worker for family members

- Little familiarity with Melbourne's climate and false expectations based on different climate and emergency management contexts from their home countries
- Not knowing how to swim
- Low public health literacy.[18]

Box 9: Impacts on refugees and the role of settlement services

Many asylum seekers and refugees who have settled in Greater Melbourne face additional and compounding barriers to coping with climate impacts. While there is a great deal of resilience present in these communities, preparedness for Australian climate impacts is very low and vulnerability is high. Some of the more severe barriers are detailed below with illustrative examples.

Being overwhelmed with new information and situations

Newly arrived asylum seekers and refugees are learning how to navigate many systems and situations, that are new, and potentially completely foreign to them, such as Australian English language and culture, complex bureaucratic systems, telecommunications and other technology, the Victorian climate, Australian traffic rules, cars, emergency systems and context, public health messaging and many others. An everyday action such as "crossing the road safely [can be] hard" because it requires not only an understanding of how traffic and traffic rules work in Australia, but enough familiarity with cars and drivers to be able to judge speed and predict driver behaviour.[18]

Unfamiliarity with Australian climate and emergency context

Refugees and asylum seekers may have no experience with, or knowledge of, the nature of Australian bushfires, flash floods, or heatwaves. They may have experienced heat, fire and floods in their home countries, but in completely different contexts, and they may bring assumptions from these different contexts that do not hold true in Australia. These kinds of knowledge gaps can prove deadly in Australia, for instance, they may not understand:

- The severity and speed of Australian bushfires or how to stay safe in a bushfire.
- The danger associated with leaving children, pets and elders in a car on a hot day.
- How flash floods work, or the risks of drowning in floodwaters.[18]

Unfamiliarity with public health messaging and being in survival mode

Some refugees come from areas of the world where public health messaging is uncommon or even unheard of. They are therefore not attuned to public health information, nor used to a prevention mindset. Newly arrived asylum seekers and refugees may still be in survival mode. They may be quick to respond when something happens - for example they may be used to fleeing disasters, and to looking after each other in dangerous situations. They may not, however, be used to planning or preparing for events that can be predicted, and are not used to the kinds of events common in Australia, and therefore how to respond in these circumstances. They may be used to dysfunctional and/or violent situations where social and institutional capacity is low, where human rights and freedoms are threatened or violated, and they consequently may bring a distrust of authorities. This can make interactions with the health system, emergency management, police and other authorities difficult. [18]

Stress and trauma impacts

While trying to take in all of this new information, and adapt to a new environment, refugees are often coping with the psychological, emotional and cognitive impacts of the experiences that led them to seek asylum. Learning is very hard in this context. One of the first things settlement services are required to help newly arrived refugees learn is how to dial '000' in an emergency - even though they may speak little or no English. It can take months for them to learn to say their name and address in English. [18]

Isolation and reliance on others

Some refugees and asylum seekers, especially mothers who are at home with children most of the time, are reliant the services of CSOs such as neighbourhood houses and community centres for

social connection and learning opportunities. These organisations often have to cancel school holiday programs, adult learning programs and social activities in extreme weather, leaving these people with fewer options to address their isolation.[18] They may also be reliant on family members who speak English to navigate daily life, especially in the first five years of settlement.[18]

Stresses on young people

Often the people who act as these de facto interpreters, case workers and facilitators for their family are children and young people, as they are able to learn English more quickly "They are the communicators, doers, connectors in the first five years." They are not necessarily supported or equipped: "they don't necessarily have all the knowledge and tools [but there are] a lot of expectations on them." This can add to the stress and overwhelm of these young people. Neighbourhood houses, for example, are able to provide some support and enabling for these young people through educational and emotional support and positive relationships.[18]

Settlement Services

Many refugees settling in Greater Melbourne rely on assistance from settlement services provided by not-for-profit agencies. Like other community service organisations (CSOs - see also *The Importance of Community Service Organisations,* page 40), settlement service providers have the potential to play an important role in helping refugees adjust to and deal with Melbourne's changing climate. This requires, however, long term investment in and support of these services. Explicit linking of settlement services to climate adaptation, for example by embedding climate adaptation into service provision performance indicators, would be a potential strategy to institutionalise a role for settlement services in climate adaptation that some organisations, such as Bendigo Community Health Services (below) are already playing.[18]

Case study: Bendigo Community Health Services

Bendigo Community Health Services, while outside of Greater Melbourne, have done award-winning work in the area of public health engagement around disaster preparedness with local refugee communities, and have learned lessons that are relevant for settlement services - and other agencies interacting with refugee communities - across Victoria and Australia. These lessons are especially relevant for areas where refugee communities are new rather than established, and/or are coming from areas and living situations of crisis such as refugee camps.

One of the things that drives workers in this organisation is the realisation that, had these communities been present in 2009 during the Black Saturday fires, they could have "lost hundreds of people" due to the unique barriers detailed above in combination with catastrophic fires. [18]

Their initiatives have included:

- Translating information on heat health, floods and fire safety into multiple languages, both in written form and in videos, including guides to Victoria's emergency apps and fact sheets. The keys to success in this area have been:
  - Making sure target audiences were identified, segmented and addressed specifically (e.g. different refugee communities)
  - Creating multiple avenues and media for communication (videos are important for individuals with low literacy; facts sheets attached to fridge magnets help to reinforce messages)
  - Making sure that materials are checked by content experts (e.g. public health and emergency management) and speakers of community languages to ensure correct translation and interpretation
  - Planning not just how the information/materials produced but how they will reach the intended audiences, e.g.:
    - Use of trusted local sources that are embedded in local communities to distribute information (including community leaders, bilingual/bicultural workers, local councils)
    - Involvement of these local sources in the development of the information
    - Visiting relevant community festivals and events.

- Helping to build the capacity of local agencies involved in emergency management through cross-cultural training, training in understanding the refugee experience
- Building the internal capacity of the organisation by focussing on recruiting bilingual/multilingual and bicultural/multicultural staff
- Building community capacity through training community champions within each refugee community in understanding emergency management and preparedness and communicating this to their peers
- Establishing a covid hotline with speakers of community languages
- Working with local refugee-owned businesses to build their awareness. [18]

Due to the hard work of their employees, Bendigo Community Health Services has a great deal of experience and knowledge in helping refugees adapt to climate impacts, however, their funding is ad hoc, and therefore their ability to provide specific adaptation support is ad hoc. They would be a valuable source of information in a state-wide forum for agencies that support refugee communities. [18]

Clearly there is a strong need for more support for refugee communities to help them overcome the barriers they face in coming to grips with Australia's changing climate.

People with disabilities

Disability can be defined in several ways. The Australian Bureau of Statistics' Survey of Disability, Aging and Carers Australia (SDAC) defines disability as 'any limitation, restriction or impairment which restricts everyday activities and has lasted or is likely to last for at least six months', and according to this definition and survey, 18.5% of Australians have a disability. About one third of this number need assistance with core activities in their day-to-day lives.[20] It's also important to bear in mind the social model of disability, which recognises societal limitations and aligns with the definition used by the World Health Organisation: Disability is the umbrella term for impairments, activity limitations and participation restrictions, referring to the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors)'.[19]

All of these definitions are relevant in terms of climate impacts, and the need for extensive assistance and the limitations of societal systems can both exacerbate barriers for people with disabilities in coping with climate impacts.

Climate impacts affect people with disabilities disproportionately and in a number of ways, including:

- Societal
  - People with disabilities are often not adequately included in community engagement or consultation efforts around preparing for disasters, extreme weather or other climate impacts
  - Emergency management and evacuation procedures may not adequately account for the needs of people with disabilities
  - Society depends on disability support providers, community service organisations and carers to be equipped to provide a safety net for people with disabilities when mainstream emergency management fails them; and they are typically under-resourced and have low capacity themselves to cope with emergencies or disasters.
- Physical
  - People with disabilities are at greater risk of harm during disasters
  - People with complex and chronic health conditions, including mental health conditions, are heavily impacted by extreme weather
  - People with health issues are more dependent on a regulated environment and reliable electricity supply
  - Disasters, power disruptions and extreme weather can all affect medications and the body's interaction with them.[18, 19, 67]

Some key impacts are expanded upon below.

Emergency management, evacuations and disaster relief

Emergency management planners and frameworks do not consistently acknowledge and address the needs of people with low physical mobility and other disabilities emergencies. For people with low mobility, especially those who live alone and do not have independent transport, evacuation and relocation needs to be planned ahead of time and individuals need specific plans in place as general procedures will often not accommodate their needs. Disaster relief services also may not be accessible for people with disabilities.[18, 19, 67]

Representatives of disability-led organisations have commented on several specific elements of emergency management that can exclude people with disabilities:

- During disasters a mentality of "the survival of the fittest" may be activated and people may think less about disability access.
- In emergency situations information is rarely fully accessible – close captioned videos, for example, come out days later, and Auslan interpreters may not be available in an emergency.
- People who are isolated in their homes may not be able to evacuate without assistance. There were instances of this as recently as the Black Summer fires, when people with disabilities were not able to evacuate during fire or smoke events. [18]

In a 2013 study of the impacts of disasters on people with disabilities, Enliven have suggested some key questions for consideration during evacuation and in emergency accommodation, including:

- Can people hear or understand warnings?
- Can they quickly exit a home or workplace?
- Can they move about the community after evacuating?
- Are there necessary daily items (medicines, power supplies, medical devices) that are not likely to be available in emergency shelters?
- Are basic services, like rest rooms and showers, available and accessible to people with disabilities? [19]

More recently, the Queensland Government released a Disability Inclusive Disaster Risk Reduction (DIDRR) Framework and Toolkit, that asks a set of questions to examine the systemic barriers within our emergency management system:

- How can we better equip people with disability so that they are self-reliant in emergencies?
- How can we be more proactive in preparing for recovery support for mental health and well-being after disaster?
- Who checks in on people with disability?
- What happens when your support people are also affected by the disaster?
- What happens if you have nobody to check on you?
- How can evacuation centres better support the needs of people with disability?
- How can people with disability evacuate if they cannot evacuate?
- How can we maintain our social connectedness after a disaster?
- How can emergency services be more inclusive of people with disability?[67]

Enliven has also noted that the literature on disability and climate impacts is heavily focussed on the area of emergencies while other areas - such as the effects of long-term warming, air pollution or changes in patterns of disease - have received far less attention.[19]

Power supply and extreme weather

People with a range of disabilities are highly dependent on a secure power supply, so blackouts, brownouts and other disruptions can have serious implications for them, especially during extreme weather:

- Disability support equipment may not work in extreme circumstances. If there is a prolonged period without electricity equipment that needs to be charged will stop working.

- For people depending on electricity for life support, dialysis or other essential health support systems, blackouts and brownouts can be life-threatening.
- Extreme heat and cold also take a heavy toll on those with chronic health conditions as the inability to maintain a healthy temperature can make people sicker, affect medications, and disturb precarious physiological balances (see also *Heat and chronic health issues* below.)
- Mobility and access to services can also be impeded in a number of ways:
  - VLine and other public transport services are often disrupted by extreme weather, and this is one of the main avenues for transportation for people with disabilities
  - Carers may not be able to work in extreme temperatures which can impact greatly on the range of activities and services a person can access.
  - Home visits from other outreach services may also be cancelled on hot days for the safety of the workers.[18]

Heat and chronic health issues

Heat can have a significant impact on people living with complex or chronic health issues, including mental health issues. Not only do hospital admissions, emergency call-outs and deaths rise during extreme heat, but psychological and behavioural admissions also increase and the suicide rate can spike.[6, 26]

The study in the Mallee described in *Box 8: Mallee Family Care report – Social housing in Mildura in 2016 – a glimpse of Melbourne 2090?* on page 31 collected several accounts of the impacts on people who are taking medication to manage physical or mental illnesses, which include:

- Exacerbated side effects (Speaking about increase side-effects in the heat, one resident said: “I was just so confused and I didn’t have a clue what day it was. It was just horrific.”)
- Reduced effectiveness
- Side effects that exacerbate thermal discomfort
- Antipsychotic and antidepressant drugs can also lessen the body’s ability to regulate its own temperature.[33]

Some of the chronic conditions that are affected by extreme heat include:

- Epilepsy: multiple Mildura residents said that both children and adults with epilepsy are more prone to seizures in the heat
- Kidney disease
- Diabetes[33]

At a public event as part of the Brimbank arm of the Hotspots initiative, Biripi woman and academic, Dr Tess Ryan, explained to health media agency CroakeyGo what it is like living with a chronic illness during extreme weather.[26]

During extreme heat, she explained, her type 1 diabetes is difficult to manage, as the body’s regulatory hormones are affected by the heat, as are the absorption and stability of insulin in her blood. Extreme heat also affects her kidneys which have been weakened by her diabetes. “On hot days” she said, “I just stay inside”. She noted that these days, she lives in a house where she can keep cool, but earlier in her life, “As a student I was on a part-disability payment, living in public housing. Going out on a [hot] day … was a difficult thing for me to do.” [26]

The Mildura residents also described their depression and ADHD being exacerbated by heat, culminating in a sense of hopelessness. Heat also tended to increase isolation, which in turn had its own impact on mental health.[33, 17]

Aboriginal and Torres Strait Islander communities

Aboriginal and Torres Strait Islander communities experience heightened risks of impacts from climate change as well as barriers to coping with those changes.[120, 121] They are disproportionately represented in terms of other risk factors in terms of their communities typically having:

- A younger population
- A higher than average rate of smoking
- Prevalent health issues
- Financial disadvantage
- Inadequate housing. [120, 121]

Many Indigenous communities also have a strong cultural connection to country and thus damage or significant change to the natural environment and to plants and animals can have a significant on their mental health and cultural and/or spiritual wellbeing.[120, 121] They may also experience racial profiling when trying to access public cooler places.[18]

The Importance of Community Service Organisations

Community Service Organisations (CSOs) are community-based health and social services which include:

- Large non-government and not-for-profit organisations such as the Brotherhood of Saint Laurence, Co-health, Jesuit Social Services (JSS), Launch, and the Salvation Army
- Grassroots organisations serving particular local or cultural communities such as the Victorian Aboriginal Health Service, Aboriginal Housing Victoria, the Vietnamese Women's Association
- Micro-organisations such as individual locality-based Neighbourhood Houses
- Networks and partnerships that link organisations working together across regions and sectors to provide holistic services to communities, especially those facing systemic barriers and disadvantage, such as Primary Care Partnerships and the Neighbourhood House Networks
- Peak bodies and associations that provide a coordinated voice across the whole of the sector or parts of the sector, such as the Victorian Council of Social Services (VCOSS), the Climate and Health Alliance (CAHA), the Greenheart Alliance.[18, 44]

These organisations are often funded by and/or strongly networked with multiple levels of government. They often provide an interface or connecting role between government services and at-risk community members.[44] The hotels initiative described in *Box 6: Homelessness and the COVID-19 response – a model for climate-related emergency responses?* on page 28, for example, relied heavily on homelessness service providers (such as Melbourne City Mission, Sacred Heart Mission, Mission Australia, Launch, Brotherhood of St Laurence and others) to contact rough sleepers and move them into hotels.[18, 40]

CSOs are beginning to be recognised in the literature of climate vulnerability as playing a critical role in the social-ecological systems surrounding at risk individuals and communities,

though in the past they have not been well covered by research or policy. They often hold relationships of trust with the communities they worth with, and have a wealth of knowledge, experience and insight into the challenges they face. The Australian Council of Social Services describes them as "the shock absorbers for everyday adversity as well as crises" in at-risk communities.[44]

Academics and government bodies often rely on these workers on the 'coal face' of impoverished and disadvantaged communities to gain information about these communities. This raises issues about the extent to which the voices of marginalised people are heard directly, rather than filtered through layers of bureaucracy. Disability rights groups, the refugee-led organisation RISE, and Aboriginal community leaders, amongst others have, for example, called for governments and other agencies to plan "nothing about us without us".[18, 45, 46] Some may view CSOs as playing an unhealthy role in maintaining the systems that create and embed disadvantage as they are. This dynamic may also have contributed to the hesitancy shown by workers to speak for the communities in which they work in both interviews and surveys.

Nevertheless, CSOs are often the most accessible voices to government, and researchers, and they provide valuable information and insight. Many take their advocacy role very seriously and also attempt to incorporate marginalised voices directly. Certainly any assessment of the vulnerability of at-risk communities must consider the role CSOs play in community support structures. [44]

Current interventions

Types of interventions

There are numerous interventions implemented by government agencies, CSOs, communities and households in the community adaptation space. One way to categorise these is by the audience or level of influence they are aiming for – at the level of an individual person or household, at a community (or a group within that community) or at a broader societal and institutional 'big picture' (regional, state or national) level. Almost all of these interventions are planned and carried out by government and non-government agencies, but often the audience or focus is on a much smaller scale.
Table 7 below summarises some of the interventions in or relevant to present-day Greater Melbourne, and more detail is provided below on some of the most prominent and important types of interventions.

Table 7: Current climate change adaptation interventions relating to at-risk communities		
Level	**Types of interventions**	**Local examples**
Individual / family/ household	• Information and resources to assist with personal seasonal preparedness • Registers of people at risk • Public health, education and behaviour change campaigns • Retrofitting homes • Equipping homes with renewable energy • Food security initiatives	• Beat the Heat/Keep Cool posters, social media campaigns by councils[18,55,66] • Provision of heat health packs by CSOs and councils to homeless people (e.g. containing movie tickets, McDonald's vouchers, hats, drink bottles, sun cream, neck coolers etc) [18] • Local vulnerability registers for 'checking in' during extreme weather or disasters administered by health and community care or aged and disability services in councils, or in local agencies[18] • Workshops on heat health (IPC Health)[18] • Power Changes program (Uniting) – home visits to educate households about power usage[48] • Healthy Homes retrofit program (Sustainability Victoria), focussing on low income households and people with health issues[49] • Darebin Fan Fair and Darebin Cool Shade – providing pedestal fans and external blinds to pensioners[47] • Solar Saver (Darebin); Solar Savers (Solar Savers Network); Solar Homes (Victorian Government) – providing pathways for household solar, including for low income households[47] • Food from Home project (Enliven) - a food security project specifically addressing climate change[18]
Community	• Municipal infrastructure and land management • Community connectedness initiatives • Coordination of community services • Provision of community spaces and services	• Local government investment in water sensitive design, urban greening, etc to reduce the urban heat island effect[63, 64, 65] • Emergency relief centres and 'cooler places' provided or facilitated by councils, CSOs, and community groups during extreme heat (e.g. Italian club referred to in Box 7) – see *Emergency centres and cooler places* below • 'Check on your neighbour' campaigns[17] • Local government Heatwave/Heat Health Plans (see *Heatwave and Heath Health plans* below)

Community (continued)	• Peer empowerment programs • Community empowerment and grants programs • Organisational capacity building of CSOs to better support community	• Hotspots Initiative – Enliven communications campaign where participants agreed to educate 5 friends;[17] Green Champions and Future Powered Families program whereby public housing tenants and parents, respectively, educated their peers about energy saving at home (Environment Victoria)[50, 51] • Talking My Language (Darebin, Yarra, Maribyrnong Councils) – engaging CALD and Aboriginal community groups to develop culturally appropriate or translated materials to help their members save energy[18] • In Your Patch (Yarra City Council) and council sustainability and community grants programs that fund community group's own ideas and projects for helping their communities adapt[18] • Community Climate Change Adaptation (3CA) Grants Program (DELWP) [52] • Jesuit Social Services (JSS) and VCOSS partnership project on Planning for Community Resilience[52] • CAHA webinars on climate risks for boards of health and community sector organisations[18]
Societal and institutional: 'Big Picture'	• Legislation and policies • Strategies and plans • Funding programs	• The Climate Change Action 2017 includes a commitment to "take strong action to build resilience to, and reduce the risks posed by, climate change and ***protect those most vulnerable***" [emphasis added].[122] • Victorian government regional and sectoral climate change adaptation plans[3] and Victorian Heat Health Plan[22] • Local government Heatwave/Heat Health Plans (see *Heatwave and Heath Health plans* below) • See also Policy directions from the Victorian Government below and Building on the 2018 Gap Analysis (page 6)

The big picture: Policy directions from the Victorian Government

As outlined earlier (see *Building on the 2018 Gap Analysis,* page 6), the Victorian Government has published major pieces of work in the area of climate impacts and adaptation relating to Victorian communities and their health and wellbeing. During the course of interviews and workshops, some views were expressed on the impact these have had so far.

- Pilot health and human services climate change adaptation action plan 2019–21 (December 2019)[6]
  - When asked for their thoughts on this plan, most people in the health and human services sector had only a vague awareness of this document.
  - Those who were more familiar with it commented that, being a pilot, it was a starting point, and that it focussed primarily on the bigger players in the health sector such as hospitals and emergency services. In order to cover at-risk communities and the community-based organisations that work closely with them, it would need to delve further into the world of Community Service Organisations, where there is a wealth of knowledge and experience, as well as specific vulnerabilities as outlined above.
  - There was a sense that in order to bring home the necessity for strategic adaptation planning to the leadership level of CSOs, strong and specific policy directions were needed from the Victorian government, with accompanying resources to enact them.

- Tackling climate change and its impacts on health through municipal public health and wellbeing planning: Guidance for local government (October 2020)[7]
  - There was a strong sense that local governments are responding to this advice and that it is influencing the work of councils in the area of community development and health and wellbeing in particular. This is also beginning to influence – at least at the local level – some organisations working with local government on these areas, such as Primary Care Partnerships and CSOs. [18]

Heatwave and heat health plans

Heatwave and heat health plans have been created at both local and state government level and attempt to coordinate and embed responsibilities for heatwave responses among multiple agencies.[22,38] The state government have also provided a Heatwave Planning Guide for local councils in Victoria. [53] This is focussed on process and provides few practical examples. While a systematic review of all council planning documents in Greater Melbourne was beyond the scope of this review, a scan of relevant documents (such as Heat Health Plans, Emergency Response/Heatwave Response Plans, Climate Adaptation Plans) also seems to indicate that these documents tend to focus on providing governance frameworks rather than committing to specific actions, particularly at the level of detail of specific plans to protect at-risk communities. Nevertheless, some Councils have taken this a step further and developed heatwave response plans specifically for particular at-risk communities, such as the City of Melbourne's Heatwaves and Homelessness Plan.[22] Other councils have collaborated to create region-wide heat plans[54] (see *Box 10: Eastern Metropolitan Councils' Emergency Management Partnership: Local Government Extreme Heat Plan* below).

Heat health alerts

The Department of Health and Human Services provides alerts in the lead-up to heatwaves. Anyone can sign up for these alerts, but they are primarily targeted at local government, health agencies and support services to ensure they put their heath health/heatwave plans into action.[6]

Community level responses

Combatting the urban heat island effect

The urban heat island effect has a disproportionate effect on people living in suburbs with low levels of tree canopy cover and a lower proportion of green spaces to impermeable, heat storing surfaces such as roads and concrete. Multiple local councils in these areas are taking action to reduce the heat island effect and increase their communities' ability to cope with extreme heat, including the following examples.

- Greening the West is a regional partnership of local councils in the western suburbs of Melbourne, Victorian government departments and agencies and other bodies that has been successful in gaining state and federal funding for greening initiatives across Melbourne's west.[63] Greening the West has an explicit orientation to improving the health of communities in Melbourne's west, who experience a high rate of preventable illnesses and who are under-served in terms of green spaces, which has a range of health impacts including greater exposure to heat stress and air pollution.[118] The coalition has also expanded from directly increasing tree canopy into areas such as influencing new developments to incorporate more sustainable design and green space. [118]
- Moreland has developed a specific Urban Heat Island Effect Action Plan to address the impacts of heat on its highly urbanised community. The plan includes actions to increase tree canopy in Moreland, ensure that roads and active transport routes are cooled by adjacent trees, implement water sensitive urban design and encourage cool buildings.[64]
- Moonee Valley City Council implemented a Heat Wave Monitoring Project to address the health and wellbeing impacts of heat on Flemington Housing Estate residents. Evidence for the project was captured through in-home recording of temperature during summer months, with a focus on heat wave periods. This data has been used for advocacy for improved tenant rights and infrastructure and the development of a Heat Wave Action Plan.[59, 65]
- The City of Whittlesea's Urban Tree Canopy Project collected and analysed data on urban tree canopy cover to support changes to the Whittlesea Planning Scheme, ensuring that more canopy trees are delivered as part of new residential development in certain zones. [65]
- How Well Are We Adapting is both a web-based climate change adaptation monitoring, evaluation and reporting tool for Victorian local governments and a network of councils who have formed a community of practice around using this tool, and climate adaptation work more generally, including urban greening. This network is coordinated by the Western Alliance for Greenhouse Action (WAGA).[65]

Box 10: Eastern Metropolitan Councils' Emergency Management Partnership: Local Government Extreme Heat Plan (2018)

The Eastern Metropolitan Councils' Emergency Management Partnership covers nine Council's in Greater Melbourne's east: Boroondara, Knox, Manningham, Maroondah, Monash, Nillumbik, Whitehorse and Yarra Ranges. There are a handful of examples of community level action in their Extreme Heat Plan (2018). In particular libraries are encouraged to consider extending and publicising their opening hours, to provide water and extra seating and to display signage alerting community members to the hot weather and the availability of these services. There is also a Know your Neighbour campaign to promote greater connection between at-risk community members and the people around them.[54]

The Extreme Heat Plan is otherwise heavily focussed on supporting personal preparedness through communications campaigns and direct contact between Council workers and vulnerable clients:

All Councils within the EMR will work with the State Government, local agencies and carers to provide targeted community information in order to improve community resilience… the best defence to heat related illness is prevention… Resilience can be built through education… The most effective way to increase understanding about the health impacts of an extreme heat event is to actively educate people through the provision of the information. [54]

Emergency centres and cooler places

Local governments, community service organisations and grassroots community groups provide or facilitate access to buildings where people can take shelter during emergencies, extreme heat or other extreme weather.

The Shire of Nillumbik has renovated the Community Bank Stadium in Diamond Creek which also acts as an emergency relief centre. They have installed a solar and battery system and the centre is now able to keep operating off-grid during blackouts of up to eight hours. As a green wedge municipality Nillumbik is a bushfire-prone area and the community is vulnerable to power outages during heatwaves, flooding and bushfires. [68]

Providing shelter is not only a matter of emergency management, however, in Melbourne's increasingly hot summers. Providing cooler places for everyday use on hot days is an especially important strategy where people are unable, or cannot afford, to keep their own homes at a safe and comfortable temperature. Cooler places can be public buildings owned by councils such as libraries that are accessible for free, or pools which can be accessed with free passes provided by councils.

Some councils also work with community and private organisations in the area who are able to provide heat refuges by allowing people to access their air-conditioned spaces. City of Melbourne and Darebin City Council, for example, work with homelessness services and

charities and publicise their cooler spaces to the community, especially people experiencing homelessness.[18, 38, 66] Both councils also provide maps of green spaces, water fountains, pools, showers and cooler places in their municipalities.[18, 38, 66] Blacktown in Western Sydney is working with community organisations such as churches to promote them as cooler places. [107]

Some councils also provide vouchers for commercial services. City of Melbourne, for example, provides vouchers for cinemas and fast-food outlets to people experiencing homelessness.[18, 38]

Moreland City Council promotes its libraries, pools and customer service centres as "a place to stay out of the heat and a [have] cool drink of water." [55, 56] While some councils explicitly state in public documents that their facilities that act as cooler places may be open for extended hours in extreme heat[54] (see *Box 10: Eastern Metropolitan Councils' Emergency Management Partnership: Local Government Extreme Heat Plan* above), others are only beginning to consider such actions. As of the time of writing, this desktop review did not find any instances of councils in Greater Melbourne that had publicly committed to and publicised a consistent policy of making facilities available as public cooler places outside of regular opening hours, however these actions clearly are taking place on at least an ad hoc, occasional basis in Greater Melbourne – and further afield – as the examples below show.

- Moonee Valley City Council states on its website that several of its public buildings may have extended hours during heatwaves, including libraries, pools and customer service centres.[59]
- Moreland City Council has a hot and cold weather policy for its outdoor pools which has provisions for opening earlier and closing later when temperatures are over 31 degrees.[58]
- Glen Eira City Council has improved Carnegie Library's resilience to extreme weather by installing solar and increasing energy efficiency so as to reduce their reliance on the grid and vulnerability to rising energy costs.[125]
- Geelong City Council announced extended opening hours for Lara Pool including "stay[ing] open for longer on extremely hot days for some of its pools in response to community feedback.[57]
- Holdfast Bay in South Australia extended its library hours during a heatwave in 2019.[60]

Research is underway now at Monash University to examine whether the cooler places so often cited in public health messaging are actually appropriate and accessible for some of the most at-risk communities, especially older women who live alone.[67, 18,] While this research is in its initial stages, the associated literature review did not find any other assessment of this kind, and initial results gained before the COVID-19 pandemic halted interviews, suggested that there were barriers in terms of access, comfort and cultural appropriateness for at least some women interviewed.[67]

As already seen in *Box 3: Examples of climate impacts interacting with existing vulnerabilities* cooler places are also less accessible to young people, poor people, homeless people, and people at risk of being racially profiled.[18] Pet owners also usually cannot bring their pets into public indoor cooler places, and so many older people choose to stay at home rather than leave their pets alone in the heat.[67, 18]

Organisational capacity building to better support community

Another community-level strategy is to recognise the role of both Community Service Organisations and local councils in supporting at-risk communities during extreme weather and other climate impacts, and to build their capacity to play that role.

- DELWP's 3CA grants fall into this category and have funded several of the initiatives below.[52]
- Jesuit Social Services and the Victorian Council of Social Services were funded by DELWP in 2020 to roll out Planning for Community Resilience, a training and networking program to help CSOs and council officers build their own organisational capacity for dealing with extreme weather and other climate impacts, and to think through how they can support the at-risk communities they serve during extreme weather. In 2021 this training is intended to continue, with workshops already planned in Yarra and further funding being sought.[18]
- Similarly the Climate and Health Alliance has been working with law firm Minter Ellison to offer webinars for healthcare sustainability professionals and board directors of health and community service organisations so they are aware of their legal responsibilities regarding climate risks and impacts to their services, infrastructure, workforce, and communities.[18]
- As part of How Well Are We Adapting and also with DELWP funding, WAGA has recently run online training for maternal and child health staff at Moreland, Melton, Maribyrnong and Dandenong City Councils to increase their capacity to address climate impacts and risks in the delivery of services. Mothers and their children are an at-risk demographic, and some of the areas covered by this project are particularly prone to urban heat.[18, 65]
- Similarly as part of this project (Exploring Vulnerabilities) NAGA will also be running online training for CSOs and council workers in Melbourne's South-East, and at an upcoming conference in Melbourne's North-West, which will provide a range of workshops to help the community prepare for climate impacts, on both personal and community levels.
- Outer East Primary Care Partnership has created an online portal for resources on Climate Change and Health to enable its partners to learn about climate change and its impacts on health, and connect with each other to share learning and relevant projects.[72]
- DELWP has also funded training for local government in the roles and responsibilities of councils in addressing climate risks.[18]

These programs taken together target both officer-level knowledge and strategies as well as top-down planning and prioritisation, both of which are critical to building the capacity of CSOs and councils to support at-risk communities in coping with climate impacts.

Check-in services

Multiple local councils and agencies maintain registers of people at high risk during heatwaves, especially older people living alone.[18] They call people on these registers before and/or during heatwaves to check on their wellbeing, to offer advice on keeping cool, and to connect them with any services they may need to access, or adjust services they are already receiving. These services combine a personal preparedness approach (information provision on how to keep cool) with a community-level approach (in that they provide a safety net, and connector with community resources).[17, 18]

Personal preparedness through trusted sources, and peer and community empowerment

Alongside mass public health communications campaigns, more local approaches have recognised that these mass campaigns don't reach all at-risk communities and used trusted sources, peer empowerment and community empowerment to spread adaptation messages.

- The GreenTown project, funded by Sustainability Victorian and led by Environment Victoria, trained community leaders from 2008 to 2012 in:
  - the Arabic-speaking and Assyrian Chaldean communities in Moreland
  - The Turkish-speaking community in Hume
  - The East African community in Flemington
  - The Aboriginal community in Darebin
  - Newly-arrived Burmese refugees living in Ringwood
  - The multicultural community in the Collingwood public housing estate.

  These leaders learned how to conduct home energy audits and hosted workshops in their community to help their peers learn about saving energy and making their homes more comfortable in all seasons.[50]

- The Talking My Language project was a partnership between Darebin City Council, Yarra City Council and Maribyrnong City Council and worked with a CALD community organisation in each council area to engage community members in creating translated materials to disseminate to their own communities about energy saving. [18]

- Power Changers Community Connections uses trusted relationships to help people learn how to understand their bills, save energy, and makes their homes more comfortable *(see Box 11: Power Changers Community Connections* over page).[47]

- The Hotspots Initiatives funded so far:
  - Enliven in Dandenong (see *Box 12: Hotspots Dandenong* over page)
  - IPC Health in Brimbank (see *Box 13: IPC Health Case Study: addressing community concerns about heatwaves* on page 51).
  - Banksia Gardens Community Services' 'Climate Adaptation Requires Youth Action' youth leadership program (see Box 14: Banksia Gardens: Young People's Climate Leadership on page 52).

Retrofitting homes

Recognising the high level of risk faced by older people and people with chronic health issues and disabilities during extreme weather, both state and local government agencies have initiated a range of home retrofit programs, such as:

- The Healthy Homes retrofit program implemented by Sustainability Victoria), focussing on low income households and people with health issues[49]
- Darebin Fan Fair and Darebin Cool Shade – providing pedestal fans and external blinds to pensioners who couldn't afford air conditioning[47]
- Using the Home Maintenance budget through Home and Community Care services to install draught-proofing or other weather-proofing measures (e.g. Yarra City Council)[18]
- Solar Saver (Darebin); Solar Savers (Solar Savers Network); Solar Homes (Victorian Government) – providing pathways for household solar, including for low income households. Anecdotal evidence collected through the initial Darebin Solar Saver roll-out

which focussed exclusively on pensioners suggested that many participants would previously not use air-conditioning even if they had access to it, for fear of large energy bills. Installing solar allowed them to use their air-conditioning, knowing that they were generating their own energy. [18, 47]

Box 11: Power Changers Community Connections

Uniting Care has worked for several years on a project now called Power Changers that helps low income families increase their energy literacy and protect themselves from bill shock. This is particular important as we see more extreme weather in Greater Melbourne, particularly as low income families tend to live in houses that are not built to withstand extreme weather, and also may be worried about the cost of using electricity for cooling.[48]

The project illustrates well the approach of using trusted and engaged relationships to convey information and connect people with services:

- Participants are initially referred through financial counsellors who are engaged with low income families
- Uniting workers visit the families at their home on multiple occasions so they can engage with the context of the household, build trust and reinforce learning and understanding over time
- The program also includes retrofits and replacement of energy-hungry appliances
- Workers also make sure that households are aware of alternative ways to keep cool and available cooler spaces, including Uniting's own drop-in centre.[48]

The program is funded by energy distributors and power companies.[48]

Box 12: Hotspots Dandenong

Another of the Hotspots Initiatives focussed on the Dandenong area, one of the poorest, most diverse, and most urban-heat-affected areas of Greater Melbourne. The project was a partnership between Enliven (Primary Care Partnership) the City of Greater Dandenong, Southern Migrant and Refugee Resource Centre, Bolton Clarke aged care, and South East Councils Climate Change Association (SECCCA).[16, 17, 18]

The focus of the project was personal seasonal preparedness and took a co-design approach involving local agencies to reach at-risk cultural and linguistic groups in the area including newly arrived migrants.[17]

The Hotspots evaluation found that the project achieved a much greater level of coordination and collaboration between and within agencies than had previously been present and resulted in heatwave awareness and preparedness in the target communities.[17] The project has now been funded for implementation across another two local government areas.[17, 18]

Box 13: IPC Health: addressing community concerns about heatwaves

One of the Hotspots Initiatives, led by community health provider IPC Health in Brimbank, has been actively seeking out and listening to the concerns of local community members around climate impacts.[18] Brimbank has a large and diverse population, with half of all residents born overseas and 160 community languages being spoken in the area.[26] Like Dandenong, Brimbank is a relatively disadvantaged area, and tree canopy is low, making it a 'hotspot'.[17, 18]

Through the Keep Cool in Summer campaign in the summer of 2018-2019 summer IPC Health explored the needs of this diverse community, especially the older residents, in order to design a tailor-made series of workshops to address those needs.[17, 18] The third iteration of this series is being implemented currently in the summer of 2020-2021.[17] IPC Health has partnered with aged care service provider Bolton Clarke to develop workshops around eight topics that the community highlighted:

- Managing sleep and fatigue in hot weather
- Bladder health during summer
- Eating and nutrition in the heat
- Healthy skin in summer
- First aid (particularly knowing the signs of heat stress)
- Preventing falls (this came up particularly around baths when having a cool bath is a frequent personal cooling strategy)
- Energy literacy.[18]

IPC Health also interviewed the staff of service providers in the area and then worked with them on their communications and support services around extreme heat to make sure that the members of the community most at risk from extreme heat were identified and reached. As well as targeting older members of the community, IPC also partnered with Brimbank City Council Youth Services and the CroakeyGo media to reach young people and the general community.[17,18]

The iterative nature of IPC Health's work means they have learned some valuable lessons, especially on engaging the community around the health risks of heat:

- Timing of communications is crucial: it is difficult to engage people about summer heat outside of summer time (trying to engage in winter doesn't work at all), but you also need to engage early enough to get onto people's agendas (e.g. get into community groups' schedules)
- Understanding the specific demographics of a particular suburb or community is important as their needs and capacities vary widely. In Brimbank, for example, the CALD communities are diverse. A lot of older people who migrated to Australia from Europe when they were young are well prepared. They tend to own their own (brick) homes, have a cooler places in their homes and are very used to dealing with Melbourne's climate and keeping their homes cool. Conversely, migrants and refugees who have arrived recently and are renting (many in social housing) have low capacity to adapt their homes, and consequently have to focus more on strategies for keeping their own bodies cool. It's important to tailor messages to accordingly.
- In encouraging older people to register on a Council call-list, this IPC Health framed this as a service, a 'courtesy phonecall' and allowed them to choose the frequency of call that worked for them. This could potentially avoid feelings of embarrassment, vulnerability or even guilt.[17, 18]

Box 14: Banksia Gardens: Young People's Climate Leadership

Banksia Gardens Community Services (Banksia) is a neighbourhood house that serves the Banksia Gardens Public Housing estate in Broadmeadows. Banksia has a strong focus on children and young people, and their approach is based on participation and empowerment. They have a strong track record of running environmental community programs such as community gardening and citizen science, and have a vision of being able to provide a 'heat haven' for the local community.[61, 62]

In 2020 Banksia implemented the CARYA project - Climate Adaptation Requires Youth Action. This was designed as a ten-week training course for young people aged 18-29, leading into individual (or group) climate adaptation projects. [61, 62]

One of the drivers for this project was an understanding of feelings of urgency young people are experiencing in relation to climate change, gained from Banksia's long engagement and work with young people. The Black Summer bushfires of 2019-2020, particularly the smoke drifting across Greater Melbourne, both triggered and created a tangible representation of this feeling of urgency to act, according to CARYA coordinators Taryn D'Costa and Edgar Caballero Aspe. [61, 62]

This echoed similar observations around climate-related anxiety and grief from workers supporting the mental health of young people, and the 2019 Australian youth representative to the United Nations, Kareem El-Ansary. El-Ansary reported, after a nation-wide consultation process, that climate change was one of the top three concerns amongst young people all over Australia.

Taryn and Edgar knew that to be successful, their program would need to channel these feelings into learning, to create significant experiences and opportunities for discussion with peers, and empower them to take action. [61]

Originally intended to run face-to-face, like many activities in 2020, the majority of the program has been conducted online. This had an unexpected benefit of widening the audience beyond the local area of Hume, with sixteen participants joining not only from all over Melbourne - including the municipalities of Whittlesea, Moreland, Melbourne, Whitehorse - but even from overseas, with one of the participant joining from Vietnam. [61]

The participants were a diverse group reflective of the community, including the phenomenon referred to in *Box 9: Impacts on refugees and the role of settlement services* on page 34, whereby young people play a significant role in interpreting and navigating multiple systems for their family, and sometimes many extended family members. While participants were also diverse in their prior level of engagement with climate change, all were very 'switched on' and engaged with current issues generally. The participants were recruited through neighbourhood house networks, Council networks, TAFEs and universities. [61]

The training covered a variety of climate-related topics including impacts on First Nations, biodiversity and current impacts participants were observing. They also looked at connections with social justice, gender and agriculture. Participants specifically looked at climate adaptation and did a scenario planning exercise around heatwaves. [61, 62]

Some of the other success factors Banksia identified were:

- Gathering data prior to the program about what the group wanted to learn
- Choosing the right guest speakers for different topics, including speakers with different approaches, which participants found thought-provoking and engaging, not confusing
- Making it fun and engaging (even though some topics can be heavy)
- While not idea in all ways, the online format worked, and it was easy and accessible
- Providing opportunities for developing relationships.[61]

Gaps in preparedness and interventions

Prepared but vulnerable

Interviews with workers and advocates in this area, as well as the literature, emphasised that there is 'only so far' individual preparedness can go.[18] Some of the in-depth studies referred to in the last section show that people in at-risk communities are limiting their exposure as much as they can, and they are employing all the means of adaptation at their disposal, but it's not enough to ensure safety and health, especially when underlying sensitivity is high and multi-layered, and when extreme weather is prolonged.

It's also important to note that many of the personal preparedness strategies employed by individuals, households, and even communities, may become unworkable or less effective under pandemic conditions like the ones that have prevailed during 2020 (see below). This suggests that more focus is needed at the community level and the 'big picture' level to provide the maximum amount of support to communities to prepare for and be resilient to climate change. Thought and planning about is also needed to ensure that community and policy level responses take the into account the possibility of pandemic conditions, not only for the current coronavirus pandemic, but for future pandemics, which are made all the more likely by climate change.

Personal preparedness during a pandemic

Many of the strategies employed by individuals, households, and communities to keep cool during hot weather become problematic under pandemic conditions.

- Cooler places that are in public or community settings, or in common areas of private buildings, become less safe and more difficult to access when physical distancing is required, or may simply be closed all together.
- Public infrastructure like water taps and bubblers may not be safe to use, or even open for use.
- People with immune deficiencies, respiratory illnesses and other chronic conditions may not be able to leave their houses safely at all.
- Many people may feel very anxious about leaving their houses.
- Some people may not have access to good quality masks, again limiting their ability or willingness to leave their homes.[18]

Part 2: Vulnerable business sectors

Climate impacts on at-risk business sectors

Some business sectors are more vulnerable than others to climate impacts. As with at-risk communities, businesses that have less financial stability and security are less resilient to shocks and stressors of all kinds, such as many small businesses. Others are more exposed to climate impacts in particular, due to their dependency on or exposure to weather and climatic conditions.[73, 74]

In general we can break business impacts into the following three categories (although they are inter-related, and many events will have compounding impacts): direct, indirect and transitional, as below.

- Direct and immediate impacts (e.g. on financial security, assets, occupational health and safety) from disruptions, disasters and long-term changes include:
  - Extreme heat
  - Bushfires
  - Smoke and decreased air quality
  - Blackouts and brown-outs (See also Box 15: Direct impacts on business – blackouts.)
  - Storms
  - Floods
  - Drought and drying
  - Sea level rise. [73, 74]

- Indirect impacts of climatic changes, and flow-on effects from direct impacts, on workforce and operations include:
  - Economic downturns and costs caused by climate events[101] (see also Box 17: The cost of heatwaves over page)
  - Supply chain disruption
  - Decreased mobility and access of customers and workers
  - Mental and physical impacts on occupational health and safety
  - Decreased productivity and capacity of workforce
  - Changing seasonality and timing of work.[18, 73, 74, 101, 109]

- Transition impacts: economic, technological, market and political adjustments made in response to the changing climate and decarbonisation include:
  - Economic shocks
  - Increased risk and flow-on effects on insurance
  - Technological changes
  - Disruption to corporate knowledge and business continuity
  - Increased energy costs (particularly for cooling)
  - Changed markets and supply chains
  - Increased legal liability
  - Cost and regulation of fuels and emissions
  - Changed business models. [18, 73, 74, 75, 101, 109]

See over page for a more detailed explanation of some important transitional impacts.

Box 15: Direct impacts on business - blackouts

Blackouts can be hugely disruptive to businesses, which are typically heavily reliant on mains power to operate.

A major blackout in South Australia in September 2016 left some customers without power for two weeks. The estimated economic cost of the blackout was $400M, of which $367M was borne by businesses.[85]

The Australian Industry Group, a national peak body for across arrange of industry sectors, reported on the business impacts of a series of significant blackouts experienced across Greater Melbourne and in parts of Victoria during a heatwave from 23-25 January 2019.[84]

According to their CEO:

"The cost to business in downtime, lost production and lost inventory [was] highly significant. Extreme heat events are increasingly common. Uncertainty over whether the electricity system will cope cannot be allowed to become a regular feature of the Australian economy."[84]

While much preparation in terms of energy supply and demand had been undertaken, "there are many possible points of failure across our interconnected electricity system when the weather is at its worst."[84]

It's important to note that this not a transition risk of moving to more renewable energy. As the Grattan Institute points out:

> Almost all outages are caused by problems in transporting electricity, and have nothing to do with whether the power was generated from new renewables or old coal or some other technology… Over the past 10 years, more than 97 per cent of outages across the National Electricity Market could be traced to the poles and wires that transport power to homes and businesses.[126]

The energy distribution network is vulnerable to extreme heat as well as flash floods and storms, which regularly cause blackouts across Victoria, especially in country areas (see also *Box 24: Tourism in the Yarra Ranges*).[18] With all of these events predicted to rise across Victoria, blackouts and brownouts (intentional or unintentional drops in voltage) could become more common, and businesses could be regularly disrupted.

As an industry with high energy needs, manufacturing is particularly vulnerable to power outages - see also *Manufacturing*.[18]

Changed supply chains, manufacturing and food businesses

Economic development officers across Melbourne recognise changing supply chains as one of the most prominent risks that climate change poses for businesses.[18]

McKinsey Global Institute reported last year on supply chains as a key climate risk, as climate-related disasters and conditions can disrupt the growing and harvesting of raw materials and agricultural products, the operation of processing plants, the workforce along the supply chain and transportation systems. They highlight the potential for climate events to disrupt the "complex system of interdependent supply chains" that make up our globalised trade system today. They note that disruptions to highly specialist supply chains are likely to have significant impacts to businesses downstream as they may not be able to source alternative suppliers. Conversely, when suppliers of widely available commodities are disrupted, the impact is lesser but widely distributed - for example the prices for particular products or materials may rise across the board.[75]

The Coronavirus outbreak in China in early 2020, for example, demonstrated the dependence of Australian solar providers on Chinese solar panels and components. When Chinese factories were largely shut down, Australia saw solar panel shortages and price rises.[76]

Manufacturers and food businesses are particularly exposed to climate-related supply chain risks, especially if they are reliant on products produced in only one or a handful of areas.[18] (See also *Box 16: Case Study: Melbourne Market* over page.)

McKinsey provides an example of a specialised supply chain - leading-edge computer chips required by many technologically-reliant industries. These are produced primarily in Korea, Japan, Taiwan, and other parts of the western Pacific. In this area, hurricanes significant enough to disrupt the supply of these products will be two to four times more likely to occur by 2040, and disruptions could last for several months.[75]

Economic shocks, insurance and small business

The Financial Review recently reported that 'the economic effects of climate change will be more severe than those of the [COVID-19] pandemic by 2070 and will continue indefinitely unless decisive action is taken'. In our globalised economy, these kind of macro-economic phenomena trickle down to and have a significant impact on small, local businesses.[80] Local economic downturns can also have an effect, with local markets shrinking when people have less disposable income due to local or broader climatic impacts.[109]

The Australian Industry Group surveyed its members in September 2020 after identifying insurance as an issue of growing concern for Australian businesses, and noting the profound influence of climate risks on the global insurance industry. The increasing frequency of disasters and other, more localised climate events is pushing up insurance rates around the world. The Insurance Council of Australia has reported that the 2019–2020 'Black Summer' bushfire season has been one of the most expensive ever experienced by the insurance industry.

The AIG survey revealed that:

- More than half of businesses who responded had had difficulty obtaining insurance in the previous year.

- High insurance premiums were the most common difficulty.
- Businesses reported that they had to choose between paying extremely high prices, or foregoing insurance.
- Many businesses did not feel they had many options for insurance.[78]

In addition the validity of insurance claims may be challenged, insurance payouts may decrease, excesses may increase, and the life of warranties may be reduced.[109]
Any issues that compromise financial sustainability tend to have a disproportionate impact on small businesses, as they are less likely to have contingency or emergency funds or access to resources from a parent company, and are more likely to operate with a much smaller cashflow buffer.[79, 80, 81]

Box 16: Case study: Melbourne Market

Melbourne Market is a wholesale market in Epping that provides an interface between primary producers and retail buyers. Fruit, vegetables and cut flowers are the primary products sold at the market. There are 330 stands, 154 refrigerated stores, warehouses and ancillary services such as fumigation rooms, ripening rooms and export facilities on site.[18]

There are approximately 11,000 workers, most of whom are either under cover, indoor or in warehouses.[18]

The market is relatively well prepared for extreme heat and blackouts as they have an embedded network to supply electricity including back-up generators to maintain the central cooling plant. During the last summer there were two electricity disruptions and they were able to continue operation. They are also exploring options for hydrogen power generation, including an off-grid power generator and hydrogen-fuelled equipment such as forklifts.[18]

They also have 5 megawatts of solar installed, including 2 megawatts installed as solar canopies that also provide shelter.[18]

A couple of areas in which they feel less prepared as yet:
- The market doesn't have enough under-cover parking, which means that workers and products may be exposed to extreme heat when unloading.
- The market is near a floodplain - though as yet this has not caused problems.[18]

Melbourne Market staff have also observed some impacts on their suppliers in the past year:
- Smoke caused a lot of damage to berries, table grapes and tomatoes, especially in Gippsland.
- Hailstorms caused a lot of damage to stone fruit.
- The COVID-19 pandemic has affected suppliers who are reliant on seasonal workers who are often overseas workers - they are struggling to get the picking workforce they need.[18]

As well as the economic cost of damaged produce, there is also a food waste impact, in that suppliers typically dig damaged produce back into the ground rather than attempt to sell it at a cut price.[18]

Increased legal liability

Businesses will need to come to grips with increased legal liability in the areas of occupational health and safety, customer safety and boards' obligations.

Heatwaves in particular, but also climate impacts more generally, have been identified as a key risk to the health and wellbeing of workers (see also *Construction and other outdoor workers*, page 66) and this can lead to workcover claims, legal actions and financial settlements for workers who have experienced illness or injury resulting from an employer's failure to provide safe working conditions.[109]
According to the Victorian Centre for Climate Change Adaptation Research (VCCCAR), for example, in the three-year period from 2008 to 2011, there were nearly 500 heat-related workplace claims resulting in $4.3M in payouts from the NSW Workers Compensation Scheme (the NSW equivalent of Workcover).[109]

Customer safety may also be impacted by climate change. Tourism operators, for example, have a duty of care for the safety of their customers, which may be put at risk by extreme weather, changed conditions and natural disasters. The Queensland Government advises tourist operators:

> Your duty of care may mean that you will need to shelter and feed visitors and staff during, and immediately after, a major emergency. You also may need to provide personal protective equipment … [and adhere to]… government rules and regulations brought on by the disaster.[112]

Businesses in general, and company directors and boards in particular, have a legal obligation to "act with care, skill and diligence in performance of their duties" and directors may be held liable breaching this duty if it was "reasonably foreseeable that his or her action or inaction might cause harm to the interests of the company".[110, 123, 124] Ignorance is not considered a valid defence against an allegation of breach of duty, and in fact directors are obliged to proactively identify and manage risks.

Even though the duty of care is to the company itself, this has not stopped activist shareholders from, for example, suing the Commonwealth Bank of Australia for their alleged failure to disclose their exposure to climate risk, and moreover, the Federal Court has made it clear that reputational risk must be considered, and "in context of a society that is becoming increasingly mindful of the effects of climate change" this includes managing climate risk.[110, 123, 124] While these duties are relatively well understood by the financial and insurance industries, whose core business is directly related to risk management, it's not clear that they have been grasped by other industries or smaller businesses.[111]

Customer mobility, changing business models, retail and transport/logistics

With first the decreased air quality resulting from bushfires during the summer and then the onset of the coronavirus pandemic from March, 2020 has seen a huge shift towards online shopping, delivery and recreational options and away from traditional in-person retail, dining and other activities. Many businesses have pivoted their operations to respond to this need.[18]

It has yet to be seen to what extent consumers and businesses will return to 'normal' ways of doing business after the pandemic, or to what extent there has been a permanent shift. At the very least, both businesses and consumers have found myriad ways to transact and interact remotely and it is likely that these will again become at least intermittently preferred options in any future pandemics, as well as in periods of extreme heat, poor air quality, or other events that make going outdoors difficult.[18]

The conditions of 2020 have had negative impacts on many businesses and retail, tourism and hospitality businesses - sectors in which SMEs are over-represented - have been some of the hardest hit.[83]
Other businesses and sectors have been able to grasp the opportunities created by shifting business models. Transport and logistics services have boomed with the increase in online shopping and deliveries. In the South East of Greater Melbourne this is a big part of the economy according to local government officers. There are districts filled with warehouses and delivery vehicles.[18]

It seems likely that as conditions outside become more hostile, and as 'digital natives' become the majority, this trend will continue, and this sector will then need to address the transition risk of their current reliance on fossil fuels for transportation.[18]

Box 17: The economic cost of heatwaves

Heatwaves have been identified by the Victorian Government as a particularly important climate impact for the economy and for industries. It is not just the risk of extreme heat events but rather the cumulative impact of increasingly hot summers that make heat so significant.

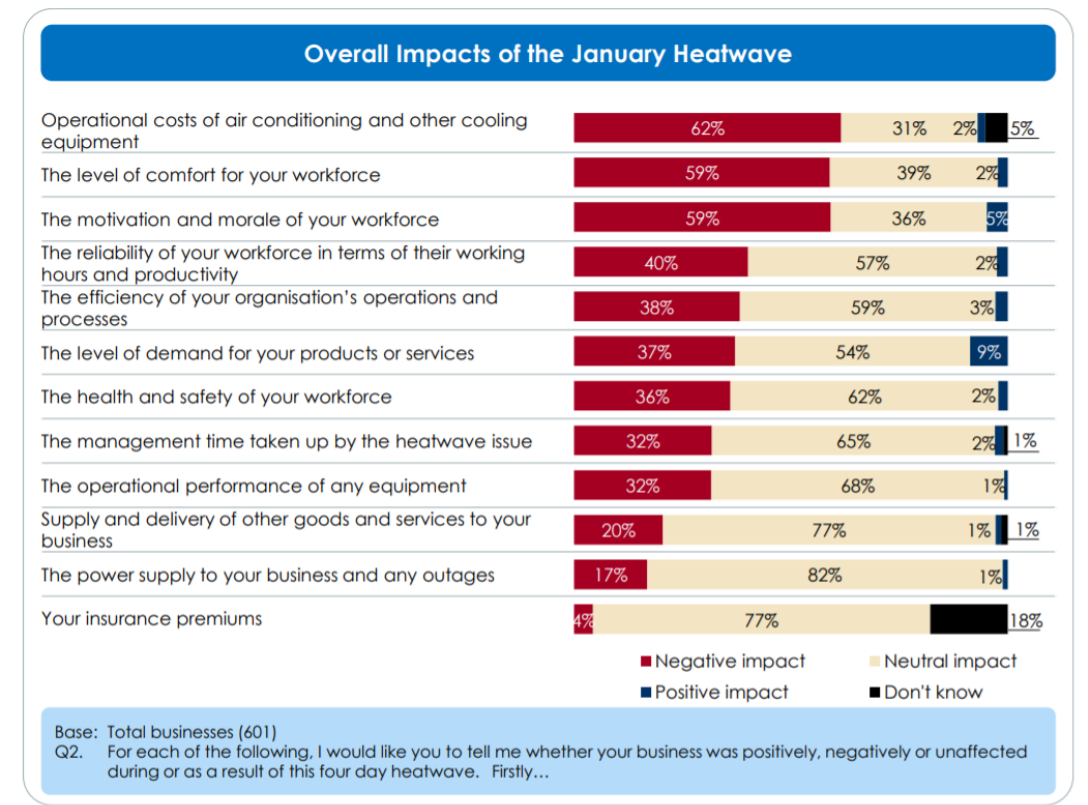
In a report commissioned by the Victorian Government in 2018, Natural Capital Economics report on the expected impacts of heatwaves based on the current climate and current levels of vulnerability (see table below).

	Likelihood for current period, Victoria average (return period)	Absolute Aggregate impact ($Millions)	Annual 'expected' impact ($Millions)
'Severe'	Once every 2 years	131	66
'Extreme'	Once every 25 years	291	12
'Very extreme'	Once every 110 years	1,000	9

This indicates that even 'severe' level heat events, which currently happen, on average, every second year, cost the Victorian economy $66M per year. The majority of this figure is the estimated revenue forgone due to heatwaves, but also reflects damages and losses caused by heatwaves.[73] These can include power disruptions, failure of communications infrastructure and transport disruptions, all of which can have significant impacts on business and industry.[109]

A ‘very extreme’ event has the potential to cost $1B and while currently this may only happen once every 110 years, we are currently seeing various heat records being set each year.[73]

A survey of 600 businesses in the City of Melbourne after the 2014 January heatwave indicated that on an individual level, many businesses experienced negative financial, operational and workforce impacts.[82]



Assessing the vulnerability, resilience and preparedness of at-risk business sectors in Greater Melbourne

General vulnerability, resilience and preparedness of businesses in Melbourne

The failure of the Australian business sector generally to grasp the urgency of addressing climate risks and impacts has been noted by researchers for some time, with a report prepared for the Victorian Centre for Climate Change Adaptation Research in 2013 observing that:

> The main perception of adaptation is that it can be addressed incrementally over time because climate change is gradual and significant impacts will only occur decades into the future. However, recent research indicates that rather than gradual incremental change, the climate changes in a step-like fashion, producing rapid shifts in rainfall regimes or changes in the incidence of extreme events… new 'thinking frameworks' are needed to deal with unprecedented and potentially rapid changes in future climate risks. The most exposed businesses will need to undertake both short and long-term planning... Failure to address long-term issues may create greater vulnerability for a business or sector as a whole.[109]

Conversations with Economic Development officers across multiple local government areas in Greater Melbourne indicate that climate change impacts have not yet registered as a priority for most businesses. They noted that climate adaptation tended to be further down on the list of things that businesses typically pay attention to in their engagement with sustainability issues. It's a conversation that is not brought up by businesses proactively, and on the part of councils, it tends to come after "the basics" such as energy efficiency and reducing waste. Nevertheless many of these "basics" may also have adaptation benefits, such as the installation of solar panels and batteries mitigating against rising energy costs due to increased need for cooling and heating and against power disruptions (see *Box 25: Solar Saver for business and Environmental Upgrade Finance*, page 77).[18]

Officers also predicted that direct climate impacts will only be noticed by businesses when they are directly affected - and even then they may be written off as once-off events. Retail business in Darebin, for example, have been affected by flash floods, but because flooding tends to be quite localised and discrete, that doesn't mean that it will be recognised as an on-going risk to be managed across the sector.[18] This was echoed in the City of Melbourne survey detailed in *Box 18: Awareness and preparedness of businesses in the City of Melbourne – results from 2020 survey* over page- people were least aware of and prepared for floods for the same reasons (localised, discrete floods can be perceived as once-off events).[32]

Officers predicted that more indirect impacts will be more visible than transition impacts and are being felt now (See *Manufacturing*, page 70), however insurance will become a significant risk, whether businesses link it to climate change or not.[18]
For all sectors, but particularly those employing workers on lower incomes, who are dependent on public transport, the impact of extreme heat on worker mobility is a key risk.

Public transport systems are often disrupted during extreme heat, and workers who need to walk or cycle to or from or in between public transport modes are particularly exposed to extreme heat.[18, 109]

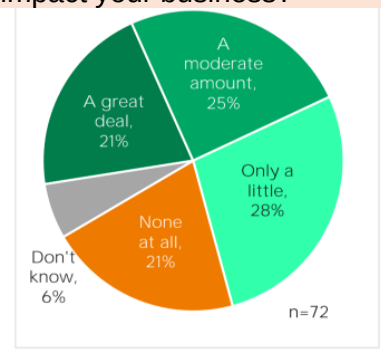
Many officers noted that in this time of economic shocks due to the COVID-19 pandemic and resulting lockdowns many businesses are focussed entirely on their own financial survival.[18] Nevertheless the City of Melbourne's survey into climate awareness and preparedness did receive responses from over 70 business owners (out of more than 500 responses from their community) - see *Box 18: Awareness and preparedness of businesses in the City of Melbourne – results from 2020 survey*.[32]

Box 18: Awareness and preparedness of businesses in the City of Melbourne – results from 2020 survey

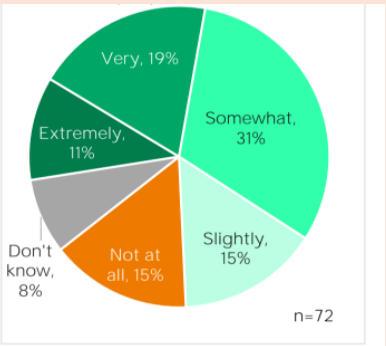
Results from the City of Melbourne's 2020 survey into climate awareness and preparedness did included the following responses from business respondents.[32]

- More than a third of business respondents (36%) reported having made some kind of preparations for extreme weather.
- Heatwaves
  - 46% of business respondents predicted that heatwaves would have a moderate or significant impact on their business, however office-based businesses (53%) said that heatwaves have no impacts on them.
  - The majority of businesses had made few or no preparations for heatwaves, however 42% did have policies in place for extreme heat.
  - During a heatwave, 31% of business owners said they would check on vulnerable staff and 21% said they would check on vulnerable customers.

How much do heatwaves impact your business?

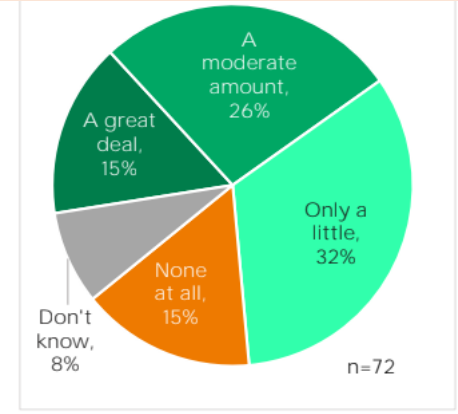


How prepared is your business for heatwaves?

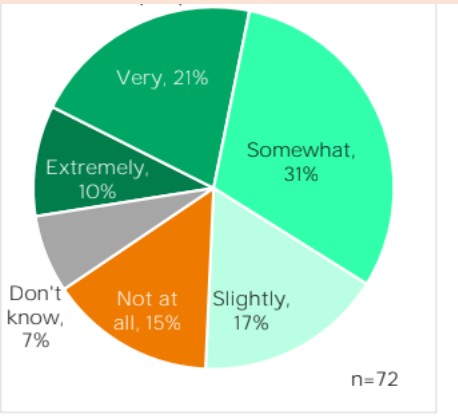


- Floods were of slightly less concern to businesses than heatwaves; but preparation levels were similar, with 32% having policies covering flooding, and 44% having insurance covering flooding.

How much do floods impact your business?

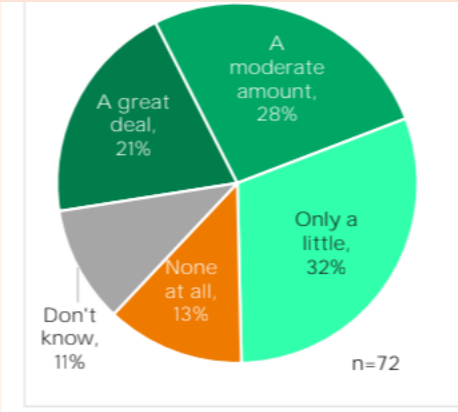


How prepared is your business for floods?

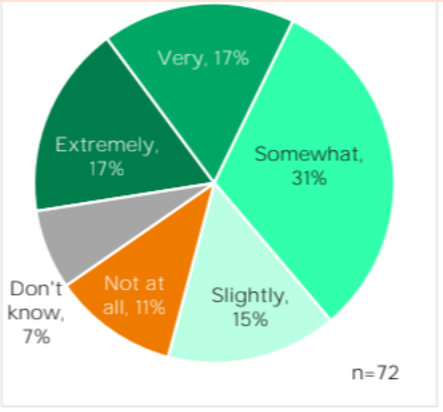


- Perceptions of risks from severe storms was slightly higher than for heatwaves, and preparedness was also slightly higher, with 42% saying they have insurance covering severe storms. Office-based business owners were both less concerned and less prepared.

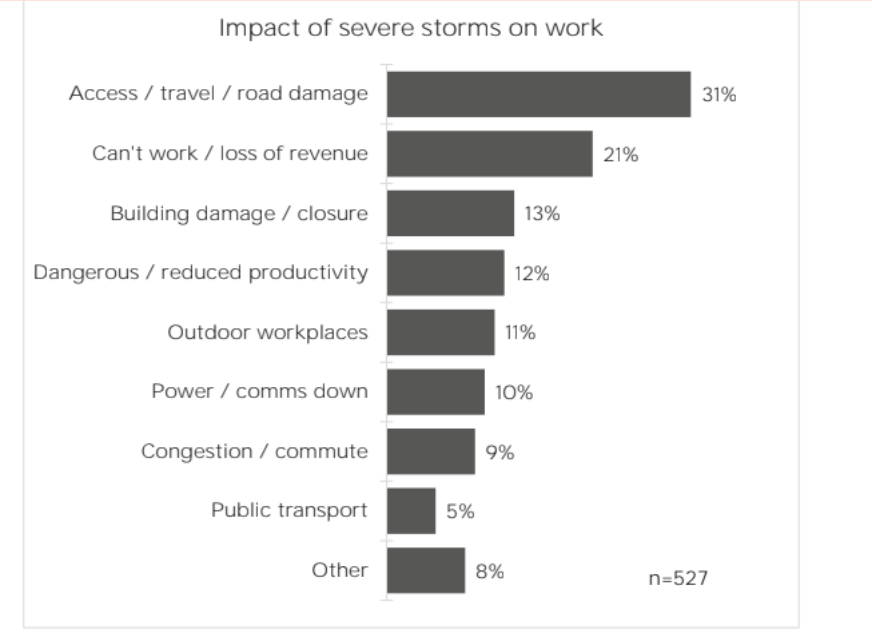
How much do severe storms impact your business?



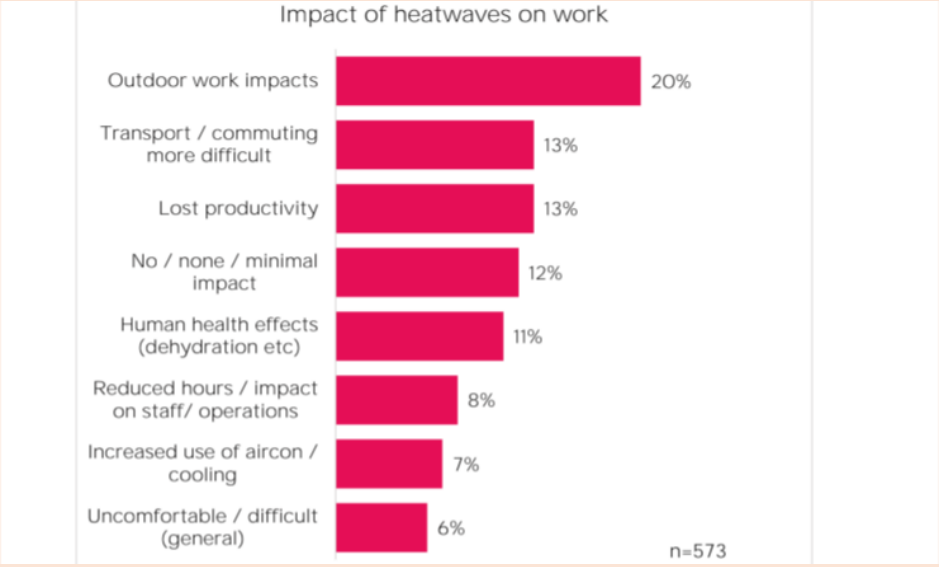
How prepared is your business for extreme storms?



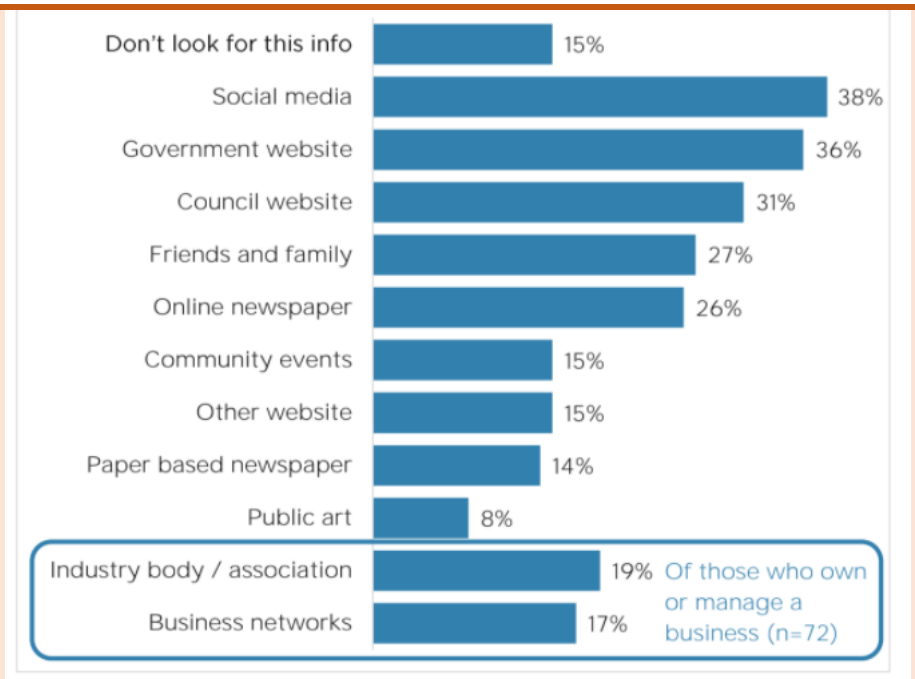
- Of the more than 500 respondents to the survey (which included people who live, work and study in the City of Melbourne), more than half said that extreme storms have an impact in the workplace, with access and commuting being the most commonly noted impact.



- Similarly more than 60% of general respondents said that extreme heat has an impact in the workplace, with the most commonly cited impacts being outdoor work and commuting as below.



- Unsurprisingly, respondents thought that the main impacts of drought on businesses were for farmers rather than city dwellers.
- When asked how they receive information about extreme weather, business respondents named industry associations and business networks amongst other sources.



NAGA's business survey specifically on climate impacts and preparedness amongst Greater Melbourne businesses collected only a handful of responses. While such a small sample is not representative, it is interesting to note that amongst this group (which included a manufacturer, a flower grower, two retailers, and an engineering services firm) the most commonly cited impacts were:

- Heatwaves
  - Reduced worker productivity (60%)
  - Have to change working hours (40%)
  - Power outages (40%)

- Bushfire smoke
  - Reduced worker productivity (60%)
  - Customers unable to access business (40%)
  - Workers have trouble getting to work (40%)
  - OHS risks increase (40%)

Preparedness was not consistent in this group, other than that no businesses said they were unaware of the impacts.[86]

There are also many examples of businesses in Melbourne that are already adapting to the changing climate (see Boxes 15, 19, 21-23).

Assessing the vulnerability and preparedness of at-risk business sectors

Construction and other outdoor workers

The construction industry is Victoria's fourth biggest employer with 8.3% of the State's workforce according to a report produced for the Victorian government in 2018 ('Heatwaves in Victoria: A Vulnerability Assessment'). Due to the outdoor nature of construction work, and its reliance on the transportation of goods and equipment, the health and productivity risks of heatwaves to the construction industry are high, and the vulnerability of the sector was assessed in this report as being 'currently very high'. A compounding factor is that a high proportion of construction companies are also SMEs.[73]

Other outdoor workers besides construction workers include gardeners, revegetation crews, tradespeople and workers in primary industries such as agriculture, forestry, fishing, extractive industries and horticulture.[87, 109] Australian research has found that young, male workers in these industries, especially trainees and apprentices, are at greater risk of injury during extreme heat, perhaps due to lack of experience as well as other factors, as are older workers, especially those with existing health issues. [87]

Box 19 below outlines a case study of solar installers (classified as construction workers).

Box 19: Case study on outdoor workers – EnviroGroup

EnviroGroup is a small business located in Coburg in the municipality of Moreland in Melbourne's northern suburbs. While it has a retail shop (EnviroShop) with five employees, its core business is selling, installing, and contracting the installation of solar systems, in which it employs up to about 20 people. Solar installers are classified as part of the construction industry, and they are also outdoor workers. EnviroGroup is therefore exposed to multiple categories of climate risk, but they assess themselves as being relatively well prepared, particularly in comparison to other businesses who, from EnviroGroup's observations, are not thinking or talking about preparing for climate change impacts. Industry bodies, who might be anticipated would be engaged with this area and providing support, don't appear to be doing so.[18]

With five to eight of its employees working primarily outdoors, and an additional three who are often on the road and travelling around Melbourne, perhaps the most obvious climate risks to EnviroGroup are in the area of occupational health and safety (OHS) and productivity. According to Mick Harris, Managing Director of EnviroGroup, one of the biggest risks is storms and winds. It is not safe to install solar systems under these conditions, so a windy or stormy day can often mean a day of productive work is lost.[18]

Like many solar companies, EnviroGroup also has guidelines around stopping work when it's too hot, but Harris recognises that "hard and fast rules" are sometimes unhelpful and supervisors need to be able to judge what is safe or unsafe. Setting a threshold of 36 degrees for example, doesn't account for the fact that a 35-degree can be unsafe depending on a range of conditions and factors. Starting work early and finishing work early is a standard practice for EnviroGroup's outdoor workers on very hot days.[18]

During the summer of 2019-2020 the unprecedented extended periods of smokiness also had an impact on outdoor workers. EnviroGroup provided masks to workers, but they still sometimes had to stop work when conditions became unmanageable.[18]

Increasingly, EnviroGroup is making contingency plans whereby workers who are not able to undertake their normal duties outside due to any kind of adverse weather can be productively employed inside on other tasks.[18]

As storms, wind, heat and smoke cause more jobs to be cancelled or rescheduled, this has a commercial impact on solar providers. Not only is productive time lost, and income delayed, causing cashflow issues, but customer satisfaction can decrease as people do not necessarily perceive or agree with the assessed level of OHS risks or understand the need for it be prioritised over their planned works. EnviroGroup is considering ways to make scheduling more flexible to address this issue.[18]

As an environmentally-focussed and future-focussed business, EnviroGroup has a high level of awareness about climate change and its impacts, and of their increasing significance into the future. No doubt this has played a role in their recognition and management of climate-related risks in their business. Some of these risk-mitigation and preparedness strategies include:

- OHS policies and practices
  - Emailing alerts to staff ahead of predicted extreme weather
  - Adjusting working hours to avoid extreme heat
  - Stopping work in unsafe conditions such as extreme heat or extremely poor air quality
- Contingency planning
  - Planning ahead for alternative indoor duties on days when outdoor work has to be abandoned
  - Moving to laptop computers means that short-term blackouts and brownouts don't affect the productivity of desk-based staff
  - Managing customers' expectations around installation timeframes that may be impacted by weather
- Investing in technology
  - Having installed a 12kw solar system on their own roof as well as a small battery system on their warehouse means they are able to increase the level of heating or cooling when needed without a big financial impact, especially as most power is consumed during business hours when the solar system is operating.
  - Having purchased an electric forklift which can be charged from solar system means that rising fuel costs, blackouts and brownouts do not affect the cost or running of the forklift.[18]

Health and social services sector

The health and social services sector is the biggest employer in Greater Melbourne with over 12% of the workforce.[88] This sector includes public and private organisations and services, including hospitals, community health organisations, community service organisations, disability support services, emergency health services, allied health services, drug and alcohol services, rehabilitation services, mental health services, pharmacies and other

organisations.[73] It is also a fast-growing sector, predicted to account for 16% of all jobs by 2022, and to continue to increase in importance as the population ages.[89]
Community service organisations not only play a critical role in supporting at-risk communities (see *The Importance of Community Service Organisations*, page 40) but are also:

- Often SMEs (e.g. neighbourhood houses, small clinics, community health centres, small not-for-profit counselling and rehabilitation services)
- Less studied and understood than other parts of the health sector
- Less often explicitly addressed by public policies
- Serving a high proportion of at-risk individuals and communities
- Highly constrained in terms of funding and resources
- Subject to increasing demand.[16, 17, 18, 45, 91]

The 'Heatwaves in Victoria: A Vulnerability Assessment' report projected the annual average costs of heatwave impacts on the health and social services sector (below) - of which 80% are attributed to the community health sector. The authors project that while heatwave impacts were around $5M per year in 2018, that figure will rise to around $11M in 2020 and over $15M by 2050 under a high emissions scenario.[73]

Heatwave intensity	2018 Annual 'expected' impact ($M)	2030 (RCP 8.5) Annual 'expected' impact ($M)	2050 (RCP 4.5) Annual 'expected' impact ($M)	2050 (RCP 8.5) Annual 'expected' impact ($M)
'Severe'	3.55	7.13	7.93	9.40
'Extreme'	0.81	1.57	1.71	2.30
'Very extreme'	0.85	2.26	2.23	3.67

In 2019 the Victorian Council of Social Services - the peak body for community service organisations in Victoria - conducted a survey of its members about their resilience to climate impacts. Some of the key findings included the following:

- Over 40% of organisations surveyed reported having been affected by extreme weather or a disaster in the previous 12 months, with the most common impacts being:
  - Staff transport disrupted
  - Clients' access to services affected
  - Increased demand on services
  - Staff absent or experiencing health impacts

  and less common impacts including damage to property, having to move premises, having to suspend services, or needing additional staff.

- Only around a third of respondents had read the DHHS Emergency Preparedness Policy

- A large majority of respondents felt that the following impacts were likely to get worse over time:
  - Energy affordability for organisation and clients

- Comfort and safety of organisation's premises and clients' homes and over half of respondents predicted that the organisation's capacity to meet the needs of clients, and the ability for clients to access the organisation's services, would decline with climate change.

- Nearly two thirds of respondents reported that their organisation had not done any research, planning or risk assessment regarding climate impacts in the previous twelve months, while 30-40% had undertaken emergency planning or planning for higher service demand.[90]

This survey built on a survey conducted in 2013 by ACOSS, the national equivalent of VCOSS. This study revealed that:

- CSOs are highly vulnerable and not well prepared to respond to climate change or extreme weather events
- Many small CSOs are at risk of permanent closure as a result of major damage to physical infrastructure and disruptions to critical services.
- This sector has not been thoroughly addressed in government policies around climate adaptation or by academic research, (though this has perhaps begun to change in the past five years).
- CSOs have the willingness to prepare for and adapt to climate change and "if well prepared, they have inherent skills, assets and capabilities to contribute to community resilience to climate change and in response to disasters."[44]

Like boards of directors of private companies who have a duty of care to consider and manage climate risks (see also *Increased legal liability* above, page 58), boards of health and social services organisations also have a significant duty of care to consider in relation to climate change. In fact the Centre for Policy Development recently reported that public sector organisations such as those in the health and community services sector "have duties of care and diligence to consider climate risk which are ***at least as stringent*** as the duties of private corporation directors [emphasis added]."[113]

Public sector organisations may be considered to have an orientation towards the public good in their core objectives, and to be obliged to be responsive to the community and to seek to apply best practice.[113] When we consider the special role, the particular vulnerabilities of, and the increased demand for CSOs in this context, especially those supporting at-risk communities and those that are also SMEs, the task of adequately understanding, addressing and preparing for climate risks and impacts seems overwhelming.

Recent surveys conducted by JSS and NAGA as well as interviews with workers in the sector indicate that awareness is growing amongst CSOs but planning and preparation is still in the initial stages for many organisations.[18] Staff from a range of Primary Care Partnerships, for example, participated in an interview and responded to NAGA's survey about organisational capacity. Only one of the respondents said their organisation was actively planning for any climate impacts (heatwaves, storms, floods and other extreme weather events). All indicated that their organisation was 'aware but not actively planning for' smoke and drought impacts, while three out of four were 'aware but not actively planning for' climate change in general, heatwaves, storms, floods and other extreme weather events. Similarly the same staff indicated their organisations were 'aware of but not actively planning for' the indirect or flow-on impacts of climate events - except for one organisation that was

preparing for exacerbated physical and mental health conditions. No staff members felt their organisation was 'fully prepared' for any element of climate risk.[18]

One of the contributing factors to this lack of preparedness was identified as the funding uncertainty of Primary Care Partnerships, especially ongoing rolling 6 month extensions to staff contracts. This uncertainty has undermined the organisations' ability to plan effectively. They also identified a lack of dedicated funding as an inhibiting factor in embedding adaptation both in their own organisaitons and in partner organisations, especially smaller ones. Other factors include competing priorities, lack of resources for health promotion, and a lack of authorising environment within organisations.[18]

Another key gap is getting the leadership of CSOs on board. Without their support, it's difficult to get traction across the board in spite of the enthusiasm at officer level.[18]
The Climate and Health Alliance (CAHA) have tried to address this by offering webinars for boards and leaders of CSOs and other health organisation. These have been booked out, demonstrating there is both need and appetite in this area.[18]

In summary, community service organisations represent a sector that is under-prepared, under-resourced, and over-exposed to climate risks, and yet hold enormous potential to play a strong role in boosting the resilience and preparedness of at-risk communities in a changing climate.

Manufacturing

The manufacturing industry is Victoria's fifth biggest employer with 7.8% of the State's workforce.[73] Local government officers in the North and South-East regions of Greater Melbourne identified extreme heat as a key risk to for the manufacturing sector, particularly its impact on staff in terms of both Occupational Health and Safety and productivity.[18]
Australian studies have found that "warehouse workers" and "indoor industrial workers" are categories of workers that experiences a higher rate of injury and illness during extreme heat.[87] Manufacturing often takes place in large factory spaces which may not be air-conditioned and where machinery, furnaces, ovens and molten metal may be present.[73]

A report produced for the Victorian government in 2018 'Heatwaves in Victoria: A Vulnerability Assessment' quote industrial health studies that show that workers in steel plants can be exposed to temperatures from 35.5 to 46.5°C even in the middle of winter. High ambient temperatures can cause machinery and equipment to overheat, stop working or shut off automatically to protect workers or prevent equipment damage.[73] Manufacturers therefore often have to change working hours or send factory workers home early on very hot days, often reducing production for the day.[73, 18] Manufacturers in Greater Melbourne tend to be aware of the risks associated with heat because of these risks to occupational health and safety and productivity.[18]

Power outages and/or the failure of air conditioning or plant at high temperatures also have the potential to disrupt these businesses significantly and are more likely to occur on hot days when demand spikes and the energy distribution system is overtaxed. Being large energy users, there can also be demand-management incentives for manufacturers to decrease their energy use at peak times (and therefore another incentive to send workers home during extreme heat).[18] (See *Box 20: NORTH Link: Energy options for manufacturers* over page).

Box 20: NORTH Link: Energy options for manufacturers

NORTH Link is a regional body bringing together industry, education and government partners working on economic development across Greater Melbourne's north. Most of their members are in the manufacturing industry. They commissioned a study in 2019 to look into the energy needs and opportunities of its members. Some of the key findings included:

- Two thirds of survey respondents reported having installed a solar system, and many also had back-up generators.
- Most members spent less than 10% of all outgoings on energy - but for small businesses this figure was typically between 10% and 30%.
- Most members used the most energy in the late afternoon on weekdays, and had very low usage overnight.
- Two thirds of respondents had undertaken an energy audit in the previous five years.
- Most expected energy prices to continue to increase in coming years.

NORTH Link's small members especially are exposed to the risk of rising energy prices, especially during extreme weather and there are strong opportunities to increase energy efficiency and on-site generation as a climate cost mitigation strategy.[92]

One response to the Exploring Vulnerabilities survey was received from a SME in the manufacturing sector. While little can be extrapolated from one response, it is interesting to note that the respondent:

- Considered that the productivity of their workers suffered on hot days and on smoky days
- Indicated that for those impacts that they believed would affect them, they were 'aware but not actively planning'
- Had undertaken some adaptation actions such as changing working hours on hot days and talking to workers about OHS impacts of extreme weather.[86]

A different manufacturer responded to a second survey on indirect and transitional impacts and indicated that:

- They experienced multiple impacts as a result of blackouts such as:
  - Employees have trouble getting to work
  - Food safety risks increase, more food spoilage
  - Have to stop some kinds of work
  - IT and phone systems go down
- They are actively planning for supply chain impacts, such as major disruptions, declining raw materials, rising costs, and the loss of overseas competitors (in the event of climate-disrupted industries overseas); and for rising costs of energy and cooling.
- They are aware of but not actively planning for OHS impacts, customer access issues and the potential need for evacuation.
- They were unaware of any impacts on the capacity or mobility of workers or insurance issues.
- They had taken steps such as installing solar and improving energy efficiency.[86]

Some manufacturers in Greater Melbourne are taking action to mitigate these impacts by installing solar and undertaking energy efficiency measures.[18] A small number have also painted their roofs white in order to reflect as much heat as possible away from their buildings or even installed a 'cool roof' (see *Box 21: 3 Ravens: keeping cool* below).[18]

Box 21: 3 Ravens: Keeping cool

Thornbury beer brewery 3 Ravens has implemented a range of energy saving measures through an Environmental Upgrade Finance from the Sustainable Australia Fund facilitated by Darebin City Council (see also *Box 25: Light$mart, Solar Saver for business and Environmental Upgrade Finance*) .[18, 93]

After conducting an energy assessment the brewers took advantage of this funding mechanism to install a 73.5kW solar system and a 'cool roof'. The cool roof reflects heat from the sun, keeping the building cool, and reducing the need for air conditioning.[18, 93]

They have also taken the opportunity of Greater Melbourne's COVID-19 lockdowns to move more of their business online.[18, 93]

These measures, as well as reducing emissions and saving the business over $20,000 annually, make 3 Ravens more resilient to Melbourne's changing climate:

- As hot weather increases, and energy reliability falls, the cool roof will help keep stock and staff cool and leave more energy available for brewery operations.
- The financial and energy savings make the business more resilient to economic shocks and fluctuating energy prices.
- Building their online capacity means they can provide alternative access to customers during extreme weather, transport disruptions, pandemic conditions and other climate-related issues. [18, 93]

Water is an important input to manufacturing operations for cooling and other functions. Drought and/or rising water costs could have a significant impact on manufacturers, particularly as regulations make it difficult to recycle water. Industry is required to filter waste-water to a high level of quality, but they cannot give it or sell it to other users without a lengthy application process, so most waste-water is simply discharged into the drains, or at best used a second time within the same business. The current regulations don't allow, for example, for this water to be sold or given to primary producers or other businesses with high water needs.[18]

According to officers in the South East, an increase in the frequency of power outages may be the most significant looming impact for manufacturers. Some larger manufacturers do have small gas-fired generators as a back-up energy system, and these may be enough to keep one production line online. While this is a good risk mitigation strategy for short-term disruptions, it does not address the longer-term need to move away from fossil fuels, and some work with manufacturers in Dandenong indicates that just two or three days of serious power disruption could be enough to put companies out of business (See *Box 22: Hilton Manufacturing* below).[18]

Box 22: Hilton Manufacturing

Hilton Manufacturing is a precision engineering firm that is actively reducing their energy use and have conducted modelling to investigate how long their business could stay remain financially viable without power. This project suggested that three days without power could be enough to jeopardise their business.[18]

They have installed a large (98.6 kW) solar array with a solar tracking system and DC optimisers for increased efficiency - but don't yet have battery capacity. While they have links to third parties with large generators, in a significant power disruption event, they would not have guaranteed access to these. They have a small generator but this would only meet a fraction of their energy needs.[18]

Some manufacturers also use a lot of gas in their production processes (see Box 23 below).[18]

Box 23: Exquisine: reducing gas and energy use to prepare for the future

Exquisine, owned by the Rose family, is a medium-sized enterprise that has been making desserts in Melbourne's north since 1986. The business used to use a lot of natural gas and electricity, but have taken a range of measures to reduce both drastically:

- They installed an 80kw solar system
- They implemented a carbon-neutral CO_2 fridge system
- They had their equipment and processes reviewed by an energy auditor and made a range of upgrades that have helped them to reduce their gas use. CEO David Rose told Sustainability Victoria: "We're basically harnessing the free energy that we create as part of our everyday processes. This saves a lot of gas." Through this process, Exquisine:
  - Installed a heat exchanger, which uses waste heat created by the production process and uses it elsewhere, for example to preheat water in the boiler.
  - Use hot or chilled waste-water to heat or cool dessert products, and the hot water is also used for cleaning.
  - Added insulation to pipes and tanks to reduce the energy needed to heat or cool water.

Upgraded an open burner to a closed burner for one of the heating processes used, which also improves OHS and makes the space more comfortable in summer.[95]

"Our warehouse uses very little energy - next to nothing" says Rebecca Rose.[96]

Exquisine also sees improving their environmental performance as a strategic way to position their business for both local and international clients who are seeking energy-efficient suppliers across the supply chain.[18]

"This is going to be increasingly important in the future. Our business needs to be ready to meet this requirement and ideally to be ahead."[95]

Small-to-Medium Enterprises (SMEs)

An Australian study conducted by the Institute for Sustainable Futures and published by the National Climate Change Adaptation Research Facility in 2013 found that SMEs in Australia both face higher risks related to climate change than bigger organisation and have less capacity to adapt.[79]

SMEs are highly vulnerable to indirect and transition impacts, according to VCCCAR, who point out that in the wake of the Black Saturday Fires, 60% of small businesses in Marysville had gone out of business after 6 months, and after a year this percentage had climbed to 80%.[109]

According to Maree Adshead, small business owner and Queensland Small Business Champion, quoted in Queensland's Government's Small and Medium Enterprise Sector Adaptation Plan:

> Climate change is already resulting in adverse business outcomes for Queensland's SMEs including business interruptions, increased investment and insurance costs, and declines in financial indicators such as measures of value, return and growth. After natural disasters, SMEs face greater short-term losses than larger enterprises, and may have less capacity to adapt and survive.[80]

Some of the impacts identified by the Institute for Sustainable Futures included:

- Direct impacts: damage to assets from fires, floods and storms
- Indirect impacts: OHS risks to workers in extreme heat, decreased productivity, decreased customer access, increased costs of energy, especially for heating and cooling (see *Box 20: NORTH Link: Energy options for manufacturers*)
- Transition impacts: Changes in government policies, regulations; insurance costs.[79]

Some of the factors contributing to their greater risks include:

- Less capacity to afford insurance
- More local focus
- Lack of diversity and redundancy in smaller businesses
- Less access to cashflow and greater financial precariousness.[79]

This was echoed by the Queensland's Government's Small and Medium Enterprise Sector Adaptation Plan:

> Small businesses, in particular, generally have a much lower survival rate than medium and large businesses. The rate of attrition of small businesses highlights the greater susceptibility of the sector to major economic downturns.[80]

Some factors contributing to their lower adaptive capacity include:

- More focus on short-term planning or even survival - less focus on long-term planning
- Less diversity of skills, knowledge, thinking and creativity with a small workforce
- Less formal culture and structures, which can lead to poor management
- Low level of awareness of resources and tools for climate adaptation.

Again this was echoed by the Queensland Government's sectoral plan, which was produced after consultation with the sector:

> The SME sector is largely unaware of what the latest science says about projected future climate for Queensland's regions, let alone the possible impacts of these changed climatic conditions on starting or operating their business. Some businesses consulted indicated feeling overwhelmed by climate science information, while others said they were put off by its complexity or lack of consistency. Overall, businesses felt ill-equipped to understand climate risk, and therefore, to take steps to effectively manage the climate risks facing their business.[80]

Tourism

Victorian tourism is highly nature-based, and even within the Greater Melbourne region, peri-urban areas such as the Mornington Peninsula, the Dandenong Ranges and the Yarra Valley are significant areas for tourism (see *Box 24: Tourism in the Yarra Ranges*).[1, 18] Tourism is also a huge employer with 27.4% of the Victorian workforce.[73]

The Victorian tourism industry is prone to:

- Direct impacts from fires, floods and storms on assets, power supply and transport systems
- Indirect impacts on the health and safety of workers during extreme weather, customer access and immediate perceptions of safety and desirability
- Transition impacts in a changed insurance market
- Long term impacts from gradual environmental deterioration or climatic changes that decrease the aesthetic or functional qualities of a region.[1, 18, 73]

Summer is a peak time for the tourist industry but this is also the time of year in Greater Melbourne and surrounding areas that is most affected by heatwaves, fires and smoke, so our tourism industry is exposed to significant impacts.[18] Fire experts have recently suggested that the increasing severity of bushfire seasons in Australia should prompt a complete rethinking of holidays seasons in Australia.[97] Victoria's winter snow-based tourism is likely to decline as snowfall is predicted to decrease substantially by the end of the century. [1, 18, 74]
David Bowman, Professor of Pyrogeography and Fire Science at the University of Tasmania, was widely quoted in major news media in January 2020, suggesting that we may need to "say goodbye to the typical summer Australian holiday" and that "it would be a lot easier for firefighters … if they didn't also have to manage mass evacuations, and deal with populations that are dispersed and far from home."[97]

It remains to be seen whether and when this suggestion might be acted upon but there is no doubt that bushfires and days of high fire danger have a huge impact on the tourist industry.

Box 24: Tourism in the Yarra Ranges

Yarra Ranges Tourism is the regional tourism board covering around 450 businesses in the Yarra Valley and Dandenong Ranges region in Greater Melbourne's outer east. The key focusses of the tourism industry in this area are nature, food and wine. Most businesses fall into one or more of the categories of hospitality, accommodation, private tours and transport, breweries and wineries, conference venues and retail.[18]

Businesses in this region who engage with sustainability tend to focus on sustainable business practices rather than climate change per se, or its impacts or risks. Outside of drought years, conversations about climate change don't tend to come up.[18]

Wineries have already begun adapting to a hotter climate in terms of species and management practices but water management has been a big issue. While plans for large recycled water projects in Lilydale and Coldstream have struggled to find funding, some wineries have invested in their own water recycling systems.[18]

Some farmers in the region have bought properties elsewhere in order to spread their risks across multiple areas and to ensure supply. Without this strategy they may fail to fulfill their contracts with supermarkets in climate-impacted years.[18]

Wineries also experience direct impacts from smoke, including from planned burns, in that the smoke can affect the taste and quality of their grapes. Some work has been done to ensure that the growing season is factored into decision making about burning regimes but it was noted that there are further opportunities to learn about more sustainable burning techniques from traditional Indigenous knowledge in the area.[18]

Another challenge for the region is that access to power is not reliable, and this is only likely to get worse with increasing heat, fires, floods and storms. It is not unusual for businesses to be without power for three days in the wake of a storm. Some businesses have installed back-up power generators, but they do not perform as well as mains power. There's a relatively untapped opportunity for businesses to install solar and battery systems.[18]

Indirect impacts are also being felt in lower visitation numbers. The bushfire smoke of last summer saw a significant decrease in patronage from both local and international visitors. Businesses also feel nervous about receiving visitors on days of high fire danger due to the safety risks, particularly regarding increasing the number of people on the road should evacuation be needed. Some of them choose to close on these days, but they lose revenue because of this. Similarly if customers cancel bookings it is difficult for them to recover any of the lost income.[18]

A potential strategy that Yarra Ranges Tourism is looking at is intensification of tourist sites rather than expansion of the industry to more numerous sites. Part of the thinking behind this strategy is that if a site has the potential for financial and environmental sustainability, and resilience to climate impacts, it makes sense to focus activity there.[18]

A transition impact already being felt in this region is that, due to the Royal Commission into Bushfires, many properties have been reclassified under a bushfire management overlay. Businesses in this area now often struggle to get insurance for more than half of the value of their business, even if they are in a locality that is not particularly fire-prone. Some are required to build a self-contained bunker and this cost makes them less competitive.[18]

Current interventions

Capacity building specifically for climate adaptation and targeting at-risk sectors appears to be relatively rare in the business sector. Small businesses in particular are well-supported by council economic development teams in most local government areas, but adaptation in and of itself is not high on the agenda. Where adaptation and mitigation overlap, however, there is good support, and high potential to do more with more funding.

Energy efficiency and renewable energy initiatives are a good example of this, where reduced energy use has both mitigation and adaptation benefits, allowing businesses to be more resilient to rising energy costs and to maintain thermal comfort in the workplace (see *Box 25: Light $mart, Solar Saver for Business and Environmental Upgrade Finance*).

Globally and nationally, it is recognised that there is a strong business case for undertaking climate adaptation measures, especially cost-efficient ones. The Australian Business Roundtable for Disaster Resilience and Safer Communities, for example, estimated that the annual costs of natural disasters to the Australian economy will reach $2.3 billion by 2050, but that adequate preparation and adaptation measures could reduce these costs by 50%. Preparing a business case specifically for adaptation actions, however, is still relatively new and rare in the business world and may be one of the missing pieces as many businesses are not used to thinking in terms of climate risks or impacts.[98]

SMEs cut across all the at-risk sectors covered in this review, as well as being considered as a sector in their own right. They are therefore perhaps the most likely to receive support, and yet the least likely to have capacity to engage and participate.[18]

The table below summarises a number of different programs that are available to businesses that are or could be supportive of climate adaptation, but few if any are promoted as or understood as directly addressing climate risks and impacts as their reason for being.

The Victorian Government, for example, created the Circular Economy Business Innovation Centre last year as part of a 10-year, over $300 million investment and action plan. While this centre is billed as *'Accelerating a circular and **climate-resilient** economy'* [emphasis added], there is so far no sign of any funding or programs specifically addressing the business sector's resilience to climate change.[99] Like many other Sustainability Victoria (SV) grants and programs, the focus is waste and the circular economy. In 2020 business support programs of all kinds have focussed almost entirely on adaptation to and recovery from the COVID-19 pandemic and related lockdowns. Nevertheless, some of these will deliver adaptation co-benefits with, for example, multiple kinds of support for moving business administration and customer interface online; improving outdoor dining environments with urban greening measures; and a recently released toolkit for small businesses designed to increase planning for and resilience to disasters.[119]

Table 8 (over page) outlines a number of programs that provide support to businesses for measures that are specifically relevant to climate adaptation, even if they are not promoted as climate adaptation initiatives. See Table 9 for existing programs that *could* incorporate and address climate adaptation.

Table 8: Current interventions in the business sector for adaptive capacity to climate change impacts				
Type	**Programs**	**Provider**	**Target audience**	**Connection to climate adaptation**
Market-based instruments	Victorian Energy Upgrades (Victorian Energy Efficiency Certificates)	Energy Victoria	Non-specific	Discounted energy efficiency products and services can reduce the bill shock of extreme weather for businesses
	Renewable Energy Target (RET) and Small-scale Technology Certificates (STCs)	Australian Government	Non-specific	Acts as a rebate on solar systems and while not explicitly linked to adaptation, does assist businesses to fund their own energy generation and thus protect themselves from rising energy costs.
Online tools and training	Webinars for small businesses	Small Business Victoria; Councils	SMEs	Promoted two online workshops in December 2020 on *Building resilience: How to prepare for business challenges* - hosted by regional councils; included emergency preparedness and disaster response.
	Online toolkit: planning for disasters	Business Victoria	Non-specific but aimed at SMEs	Covers risk management and planning specifically around disasters.
	Crisis Planning for Business Workshops			
	Online adaptation toolkit	Geelong		Toolkit relevant for a range of organisations and sectors.
	Online resources for business planning for climate adaptation	Australian Government, NCCARF	Non-specific	Includes business case development, risk management, emergency management and recovery for businesses.

Renewable energy	Solar Saver	Darebin Council	Non-specific but focussed on SMEs	Helps businesses gain a degree of energy independence and resilience to rising energy costs - see Box 25
	Solar Victoria - SME initiative	Solar Victoria	SMEs	This program will be launched in May 2021, and 15,000 rebates have been committed to help small businesses install solar.[114]
Energy efficiency programs and grants	Energy efficiency programs such as Light Smart and Energy Audits	Local Gov	Non-specific but focussed on SMEs	Helps businesses mitigate against rising energy costs.
	Small Business Energy Saver Program (Point-of-sale subsidy)	Sustainability Victoria	SMEs up to 19 employees	Helps small businesses install more energy efficient appliances and equipment, including reducing the cost of air conditioning, through providing bonus discounts on products already discounted through the VEU.
	Business Recovery Energy Efficiency Fund (BREEF)	Victorian Government	Large energy users	Grants to help businesses who use over 40MW of power or 1tJ of gas per year to improve energy efficiency through capital works or demand management technology.
	Environmental Upgrade Finance (EUF)	Councils	Non-specific	Allows businesses to borrow the up-front cost of sustainability and climate adaptation building upgrades and pay it back through their council rates over time out of savings on power bills.

Table 9: Current offerings in the business sector that could be expanded to incorporate climate adaptation				
Program type	**Program**	**Provider**	**Target audience**	**(Potential) connection with climate adaptation**
Grants	Various business grants including covid recovery grants	Victorian Government and Local Government	Mostly SMEs	Many of these programs are somewhat flexible and could be used to help businesses conduct climate risk assessment, mitigation and planning. They also include several streams that businesses could use to adapt not only to Covid Safe conditions but to climate impacts (e.g. the Melbourne City Recovery Fund and Outdoor Eating and Entertainment Package to help CBD hospitality businesses make physical improvements to the streetscape and outdoor dining areas, could be used to increase greenery and shade to mitigate against urban heat).
	Recycling Victoria Grants	SV and CEBIC	Non-specific but required matching contributions favour large businesses	Currently focussed on waste but could target climate adaptation. Includes: • Innovation stream • Implementation stream • Identification stream
Market-based instruments	Emissions Reduction Fund (ERF)	Australian Government	Non-specific	Participants earn Australian Carbon Credit Units (ACCUs) for emissions reduced or stored. Not explicitly linked to adaptation but could include this as a capacity building element.

Information provision and networking	Business breakfasts, networking events, seminars, forums etc	Local Government	Non-specific	These often cover a wide range of topics and could specifically address climate risks and adaptation
	Online resources	CEBIC	Non-specific	A range of online resources and information sharing on innovative projects - mostly focussed on waste but could target climate adaptation.
Mentoring	Small Business 'Bus' (now offered online but soon returning to face to face)	Business Victoria	SMEs	Offers tailored mentoring for small businesses - climate risk assessment, mitigation and planning could be incorporated explicitly into this program.
Online tools and training	Small Business Digital Adaptation Program	Business Victoria	SMEs	As pandemics and extreme weather encourage consumers and businesses to interact and transact online, this program could help small businesses adapt their business model.
	Various online training courses, workshops and webinars to upskill businesses	Business Victoria and VCCI	Non-specific; prompted by changed conditions of COVID-19.	While many courses support generic business skills such as marketing, there are some areas such as supporting working from home and fostering mental health that intersect with and could be explicitly linked to climate change.

Box 25: Light $mart, Solar Saver for Business and Energy Upgrade Finance

Darebin City Council facilitates a range of programs to support local businesses to reduce their carbon footprint and increase their resilience to the changing climate and associated costs.

Light $mart has been one of Darebin's most successful programs (see also We are Greening Our Business), connecting businesses with Victorian Government and council subsidies to switch to efficient lighting. Over 250 Darebin businesses and organisations have participated, saving a total of over 3,600 tonnes of CO^2 or 977 cars off the road.[18]

The Darebin Solar Saver program helps households and businesses install solar systems on their own roofs. This provides a pathway for businesses to mitigate against rising energy costs and gain a measure of energy independence. Currently businesses are limited to participating in the Bulk Buy stream of the program, requiring them to pay the up-front cost and with a system size limit of 10kW. Batteries are also available through this stream.[18, 47]

Previously Darebin offered a rates-based mechanism to businesses and other organisations that effectively provided a no-interest loan and allowed them to realise the cost savings of solar and to pay back the cost over time out of these savings. Under this scheme, 12 organisations in Darebin, including small businesses, larger businesses and community service organisations were able to install solar systems ranging up to 99kW. The total capacity installed was 333kW, with the largest system of 84kW installed at the Islamic Museum of Australia and the average size being 28kW. [18]

Because businesses and other organisations operate primarily during daylight hours this program was able to help businesses meet a lot of their energy needs on-site, making them much more resilient to energy price rises and shocks. Aside from up-font cost, this program also addressed the barriers of information overwhelm, not knowing who to trust, not knowing how to find a reliable supplier, and not knowing how to calculate the financial costs and benefits. [18, 47]

The program was scaled back and changed considerably with the onset of the COVID-19 pandemic, however it offers a model that could be employed by any funding body that can provide cash up-front and be paid back over time. Local government agencies are ideally placed if the funding is available, because of their unique ability to employ rates mechanisms under the Local Government Act, but regional bodies and state bodies could also adapt this model. [18]

Darebin, along with sixteen other councils across Greater Melbourne, also facilitates Environmental Upgrade Finance (EUF) (see Boxes 20 and 23 for examples).[100, 101] Under these agreements, businesses can take out a loan to finance building upgrades and make repayments through a rates-based mechanism with their local council. EUF can fund renewable energy generation, energy efficiency, water efficiency and other climate change adaptation measures, amongst other sustainability initiatives. [100, 101]

Gaps in preparedness and interventions

There are some clear gaps and opportunities in this area for:

- Specific capacity building and funding for climate adaptation - e.g. by regional and industry bodies, local and state government - particularly targeting at-risk sectors
- Awareness raising around climate risk, legal liability and duty of care
- Integrating of climate risk and adaptation into existing programs and leveraging existing work to create adaptation benefits (such as integrating the adaptation benefits of online business into the burgeoning offerings around moving more customer-facing and internal processes online)
- Adaptation planning for specific at-risk business sectors at the state level.

Conclusion

While it is difficult to provide a thorough and fine-grained assessment of the real level of preparedness of individuals, households, community groups and businesses across Greater Melbourne, it is clear that there are some consistent patterns of vulnerability and risk, and in the responses intended to build resilience and preparedness, including in the gaps in these responses.

Of the at-risk communities considered, the ones who are perhaps most threatened by climate impacts are those who either:

- Are *unprepared* for climate impacts due to not having been reached by, or not understanding, public health messaging about Australian climate impacts and/or holding beliefs or assumptions that are counter-productive for adapting to these impacts or make public health messaging difficult to absorb (e.g. newly arrived asylum seekers and refugees), or
- Have prepared as much as they can on an individual, family, household, or even community level, but are coming up against systemic barriers and limitations of the environments in which they live (e.g. people in inadequate housing, people experiencing homelessness, people with disabilities and chronic health issues).

These two sets of at-risk populations require different responses and interventions from state, regional and local government bodies and agencies:

- The first cohort need public health responses that take better account of their unique circumstances and that are tailored to reach them effectively (i.e. through better targeted, community-based communications).
- The second cohort need more focus on community-level strategies (e.g. empowering communities to address their local adaptation needs) and addressing ‘big picture’ issues on the state and regional level (e.g. providing adequate housing for all, ensuring disabilities are factored into all levels of emergency management).

Of the at-risk business sectors considered, awareness of climate change is less of an issue than awareness of specific business impacts and how to prepare for them, or limits on the capacity or ability to prepare or adapt.

Similarly to at-risk communities, while some business sectors are acutely aware of climate impacts due to their dependence on outdoor work or climatic factors in general (such as construction, tourism, primary production), there is only so far that they can prepare or adapt - in some cases businesses may simply no longer be viable in certain areas (such as businesses that become uninsurable in fire-prone areas, or snow-based tourism operations).

For SMEs, limits on capacity are significant in terms of knowledge, time and financial resources, and because SMEs cut across all sectors, SMEs in at-risk sectors can be doubly vulnerable.

Similarly, health and social services sector organisations - especially when they are also SMEs - are vulnerable on all fronts, because of their unique role in supporting at-risk communities in increasingly difficult circumstances, while also needing to prepare and adapt themselves.

Across the board, pandemic conditions now need to be considered and integrated into all levels of response, for both community groups and business sectors.

Despite these vulnerabilities, barriers and complicating and compounding risk factors, there are also stories of success in Greater Melbourne. Community-based and place-based approaches to adaptation being led by community groups and community service organisations are showing the strength and resilience of locally embedded initiatives (such as the Hotspots initiatives, and outreach led by settlement services). Likewise in the business sector, small but innovative businesses are grasping the opportunities offered by renewable energy, energy efficiency and adaptive business models to make themselves financially sustainable and successful in a context of change.

Learning from, supporting and amplifying these stories of success will be an important part of Greater Melbourne's adaptation journey. These themes will be explored further in the Exploring Vulnerabilities Final Report, which will provide detailed recommendations to address adaptation in both at-risk communities and at-risk business sectors.

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