LODDON MALLEE CLIMATE CHANGE AND HEALTH FRAMEWORK

Building Climate Change Resilient Communities and Service System

BENDIGO HEALTH

Loddon Mallee Public Health Unit

Building Climate Change Resilient Communities and Service System

A framework for organisations in the Loddon Mallee Region

Produced by Bendigo Health
December 2022

Published June 2023

100 Barnard Street, Bendigo VIC 3550
lmphu@bendigohealth.org.au
1800 959 400
www.bendigohealth.org.au/LMPHU/

Acknowledgement of Country

We acknowledge the Traditional Custodians of the lands of the Loddon Mallee region, the Dja Dja Wurrung, Woiworong, Baraba Baraba, Taungurong, Yorta Yorta, Wemba Wemba, Wadi Wadi, Dadi Dadi, Latje Latje and Kureinji people, who have cared for this country, its mountains, trees, animals, waters and birds since the beginning.

We acknowledge that they never ceded sovereignty of this land. This land is, was and always will be Aboriginal and Torres Strait Islander peoples' land. We recognise that they met all their resource, energy, health and wellbeing needs from a deep sense of connection to Country and a strong sense of community. We pay our respects to their elders past, present and emerging.

We also acknowledge that Aboriginal and Torres Strait Islander peoples hold extensive wisdom and traditional and historical knowledge and connection to Country. It is essential that their knowledge and their self-determination is embedded across all climate change adaptation initiatives.

This framework was a collaboration with climate change experts and local cross-sector organisations

Contents

Foreword

Climate change poses significant risk to our society, environment, and public health. As a leading healthcare institution, Bendigo Health recognises the urgent need to address the impact of climate change and take proactive steps to mitigate its effects. By adopting the Climate Change and Health framework, Bendigo Health demonstrates its commitment to safeguarding the health and well-being of our community, while contributing to a sustainable future.

The healthcare and social sector, and all levels of government play a critical role in responding to climate change, as it directly intersects with public health. Rising temperatures, extreme weather events, and changing disease patterns are already affecting the health of individuals and communities. By integrating climate change adaptation and mitigation strategies into our operations, policies, and practices, we can effectively reduce our carbon footprint, enhance resilience, and promote health equity.

As Bendigo Health adopts the Climate Change and Health Framework, we recognise it is a long-term commitment requiring dedication, continuous improvement, and a willingness to adapt to emerging challenges. By embedding sustainability and resilience into our organisational operations and fostering a culture of environmental stewardship, we can make significant impact on both the health of our community and the environment.

By taking action now and embracing the challenge and opportunity for positive change, we can protect public health, reduce healthcare costs, and contribute to a sustainable and thriving community. Bendigo Health stands ready to be at the forefront of this effort, setting an example for others to follow.

I thank everyone who contributed to this plan and commend you. It forms a clear path for action and I encourage you to support its implementation.

Dr Ewa Piejko
Board Chair
Bendigo Health

About this framework

As evidence grows about the population health impacts and implications of climate change there is a rapidly growing demand for place-based work to guide local action to address the health and social impacts of climate change. The Loddon Mallee Public Health Unit (LMPHU), Bendigo Health has produced this framework to assist health and community organisations in the Loddon Mallee region to identify and reduce the impact of climate change on the health and wellbeing of our community, particularly for people experiencing systemic disadvantage.

This guide:

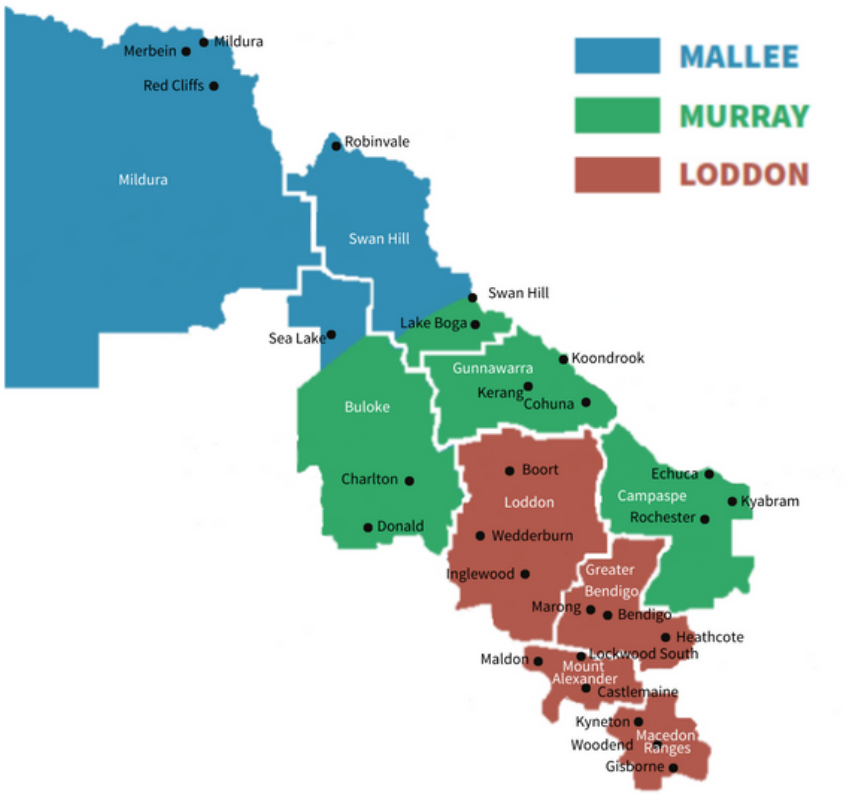
- demonstrates how climate change impacts people's health and wellbeing
- demonstrates the co-benefits of climate change action and health outcomes
- identifies opportunities for organisations to work in the climate change adaptation
- provides a framework for organisations to implement climate change adaptation and mitigation action
- supports evaluation of effort with the inclusion of suggested indicators and associated data sources
- provides recommendations for the implementation this framework.

Loddon Mallee Region

The Loddon Mallee Region (LMR) is in the northwest corner of Victoria and covers 58,986 square kilometres. The landscape is particularly diverse with Mallee deserts in the northwest, irrigation dairy farming in the northeast, the Great Dividing Range in the south and the riverine plains of the Murray River on the region's northern border. [1]

The LMPHU covers the LMR region with the exception of Central Goldfields. The LMPHU encompasses nine local government areas, 15 public health services and four stand-alone community health services with a widely distributed population. It includes large population centres in Mildura and Swan Hill in the northwest, and Bendigo and Macedon Ranges in the south.

Figure 1. Loddon Mallee Public Health Unit Catchment



Executive summary

The World Health Organization (WHO) has described climate change as the greatest threat to human health in the 21st century. [2] Increased heat waves, droughts, floods, storms, longer fire seasons, and reduced and more erratic rainfall all contribute directly and indirectly to increases in deaths, disease, mental health decline and poor nutrition.

Climate change impacts on the health and wellbeing of the local population disproportionately affect people experiencing systemic disadvantage - Aboriginal and Torres Strait Islander peoples, women, the elderly, the chronically ill, the socioeconomically disadvantaged, people with disability, culturally and linguistically diverse (CALD) people and LGBTQIA + people.

However, taking action on climate change also presents the biggest opportunity to improve health and reduce inequality. By reducing greenhouse gas emissions, through investment in affordable renewable energy, energy-efficient housing, and sustainable food and transport options, we make systemic improvements that will reduce the cost of living, avoid pollution and improve our health and wellbeing.

Along with the global community, Australian Governments are taking action on climate change at all levels; local, regional, state and national, to both reduce emissions (mitigation) and adapt to a changing climate (adaptation).

This framework has been developed by a diversity of state, regional and local cross-sector organisations and supports climate change action at a regional and local level. It includes a framework that illustrates how health outcomes associated with climate change are influenced by the:

- local incidence of climate change events or hazards
- exposure of the local population to those hazards
- vulnerability of the local population and environment to those hazards (including existing health, social and environmental vulnerabilities)

The framework also include responses, adaptation and mitigation action for health services, community organisations, local government and community groups and offers indicators and data sources to be used in monitoring and evaluation.

Climate change adaptation, including addressing systemic disadvantage, requires commitment, collaboration and collective responsibility between all levels of government, service providers and communities. It also requires a strengths and place-based approach and diverse community inclusion in decision making.

Aboriginal and Torres Strait Islander peoples' hold extensive and historical knowledge of caring for Country and their connection to and caring for Country, Culture and Community is integral to their health and wellbeing. Climate change is a threat to their connection to Country and is compounded by the impact of colonisation and its legacies. Therefore we also need to proactively embed Aboriginal and Torres Strait Islander peoples' self determination and knowledge in climate change adaptation initiatives as they are designed and implemented.

Climate change adaptation also includes effective planning, mitigation, response and recovery to environmental emergencies. This requires accountable leadership, effective inclusive communications, resilience of essential services and critical infrastructure, and diverse community inclusion and empowerment in emergency management.

A climate change resilient community understands the risks they face from climate change, addresses systemic disadvantage and adapts infrastructure, essential services and behaviours to mitigate the impacts of climate change. This framework is a step to enabling collective integrated cross sector action to build our climate resilience. This not only reduces the potentially devastating costs of future climate change impacts, but also creates a more equitable society and immediate and lasting benefits for our health, economy and environment.

Local, regional and state cross sector organisations have developed recommendations as next steps in the implementation of this *Loddon Mallee building climate change resilient communities and service system framework.*

Recommendations

These recommendations are not seen in isolation but as an interconnected and interdependent system of action to build climate change resilient communities and service systems. Underpinning these recommendations are principles of cross sector collaboration, equity, transparency, diversity, inclusion and courage and strengths and place based approaches. These recommendations are built on a foundation of addressing systemic disadvantage, including embedding Aboriginal and Torres Strait Islander Peoples' self determination in climate change adaptation.

1. Leadership and governance

a. Use the Primary Care & Population Health Advisory Committee of Bendigo Health as the key regional platform to guide and coordinate implementation of *The Framework*
b. Identify and secure funding and resourcing to implement *The Framework*
c. Develop and conduct health impact assessment to inform policy and leadership eg Health Impact Assessment (WHO)
d. Define cross sector roles, risks and legal responsibilities in adaption to the health effects of climate change.

2. Resilient and adaptive health service system

a. Encourage hospital membership to the Global Green and Healthy Hospitals initiative
b. Develop regional climate change and health policies and procedures that can be adapted at sub-regional and local levels
c. Support compliance to the *Health and Human Services Climate Change Adaptation Action Plan 2022-2026*

3. Resilient and adaptive community

a. Support the implementation of the Healthy Loddon Campaspe regional food systems strategy
b. Explore a cool spaces model for Loddon Mallee Region eg community cool spaces during heat waves
c. Co-design and implement community engagement and education in climate change and health adaptation
d. Support implementation of recommendations from the *VCOSS: A Climate of Fairness* to make climate change transition in the Loddon Mallee fair and equitable.

4. Public health climate change adaptation

a. Clarify and consolidate the role of the Loddon Mallee Public Health Unit as part of regional incident and emergency preparedness and response arrangements
b. Build the business case for investment in incident and emergency management preparedness and response capability to meet growing health impacts from climate change
c. Advocate for integrated planning provisions across State and Commonwealth Government mitigating the health impacts of climate change, for example through better floodplain planning provisions.

5. Monitoring and evaluation

a. Develop a monitoring and evaluation framework that includes a suite of indicators for the Loddon Mallee region
b. Invest in climate change and health impacts and resilience data and surveillance systems

Section 1

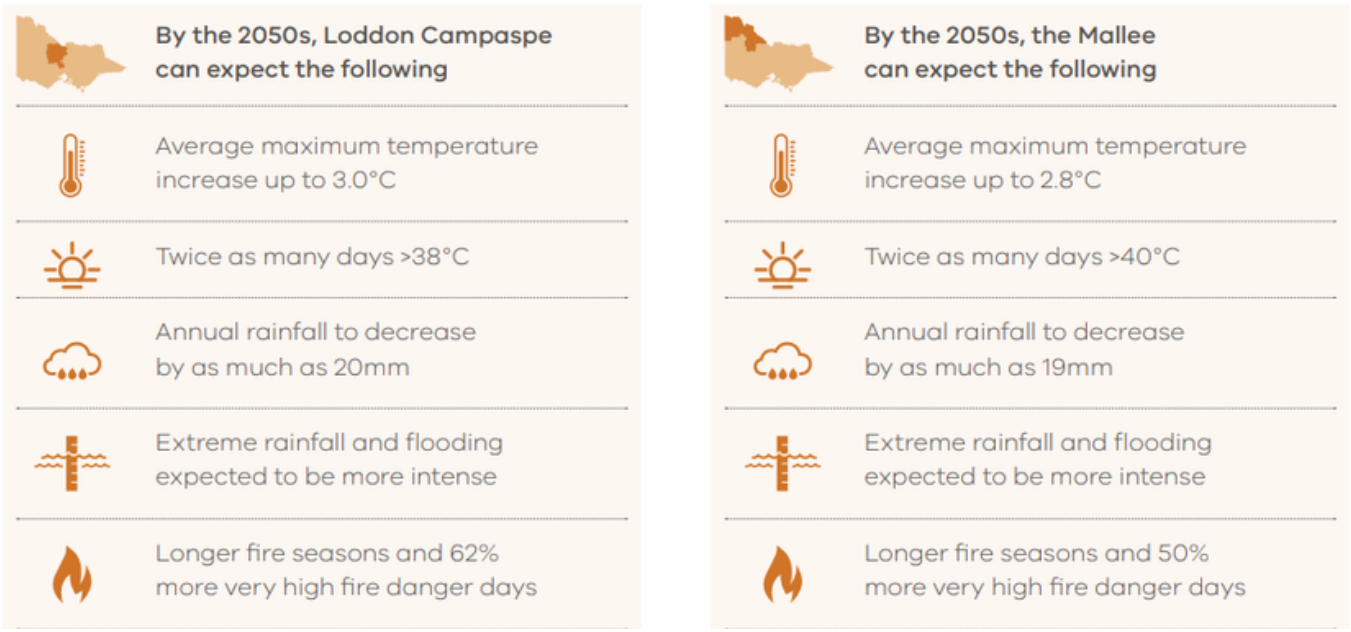
Climate change and health

The biggest risk to health is climate change

> *"Without urgent action on climate change, the conditions that underpin the health and well-being of the human population will be greatly diminished in coming decades and may only be available to a small number of people living in a few parts of the planet by the end of this century."*
> *Professor Peter Doherty, Nobel Laureate for Medicine*

The World Health Organization (WHO) has described climate change as the greatest threat to human health in the 21st century. [2] Increased heat waves, more frequent and extreme weather events, longer fire seasons, and reduced and more erratic rainfall all contribute directly and indirectly to increases in deaths, disease, mental health decline and poor nutrition. Victoria's climate has already changed with average temperature increases of 1.2° C since 1910, a decrease in average rainfall and a significant increase in fire danger. Figure 2 shows how the weather in Loddon Campaspe and Mallee is predicted to change by the 2050s.

Figure 2. Predicted weather change by the 2050s



Source: Loddon Mallee Climate Ready Plan, Loddon Mallee ADAPT

Environmental Scan: Loddon Mallee Region

Climate change action is good for health

"Victoria's response to climate change is an opportunity to reduce entrenched inequality by addressing the factors that heighten vulnerability." - VCOSS report

The good news is taking action on climate change also presents the biggest opportunity to improve health. By reducing greenhouse gas emissions, for example, through investment in affordable renewable energy, energy-efficient housing, sustainable food and transport options, we make systemic improvements that will reduce the cost of living, avoid pollution, improve what we eat and encourage exercise.

According to the WHO, the health co-benefits of climate change action often far outweigh the costs of implementation. [3] This points to significant opportunities for health and non-health sector partnerships to work together for the twin goals of improving environmental and human health outcomes.

Figure 3. Video of Lancet Countdown on health and climate change: 2020 report

Changing the conversation about climate change

In 2020, Sustainability Victoria published research indicating that 77% of surveyed Victorian community members would like to know more about the health impacts of climate change, and what behaviours will benefit health and mitigate against climate change.[4]

It is important to have conversations about climate change because it affects the health of our community.

However, talking about climate change can be tricky, particularly in a world where action on climate change has been politicised. A more participatory approach can be taken using *The Department of Environment, Land, Water and Planning's* ADAPT Loddon Mallee Climate Ready Conversation Toolkit to facilitate conversations in workplaces, neighbourhoods and community groups where everyone can participate by sharing their concerns and ideas.

Climate Ready Community Conversation Project

The Climate Ready Communities Conversations project in Mount Alexander Shire is holding up to 30 "climate-ready" conversations using ADAPT Loddon Mallee conversation tool kits with small groups of community members including those not often reached in formal consultation processes.

Information on what the community values about living in Mount Alexander Shire, what they identify as priority risks of climate change and possible action. This information will be shared with the council, ADAPT Loddon Mallee and build on other local climate change adaptation strategies. These conversations will offer an opportunity to share information and mobilise the community on climate change adaptation.

Policy context for climate change and health

Along with the global community, Australian Governments are taking action on climate change at all levels; local, state and national, to both reduce emissions (mitigation) and adapt to a changing climate (adaptation).

Adaptation or Mitigation?

Climate change action is typically divided into two categories: adaptation and mitigation.

ADAPTATION
Seeks to increase our ability to moderate, cope with and take advantage of the actual and expected consequences of climate change.

MITIGATION
Also known as emissions reduction, focuses on addressing the causes of climate change by reducing global greenhouse gas emissions present in the atmosphere.

National Level

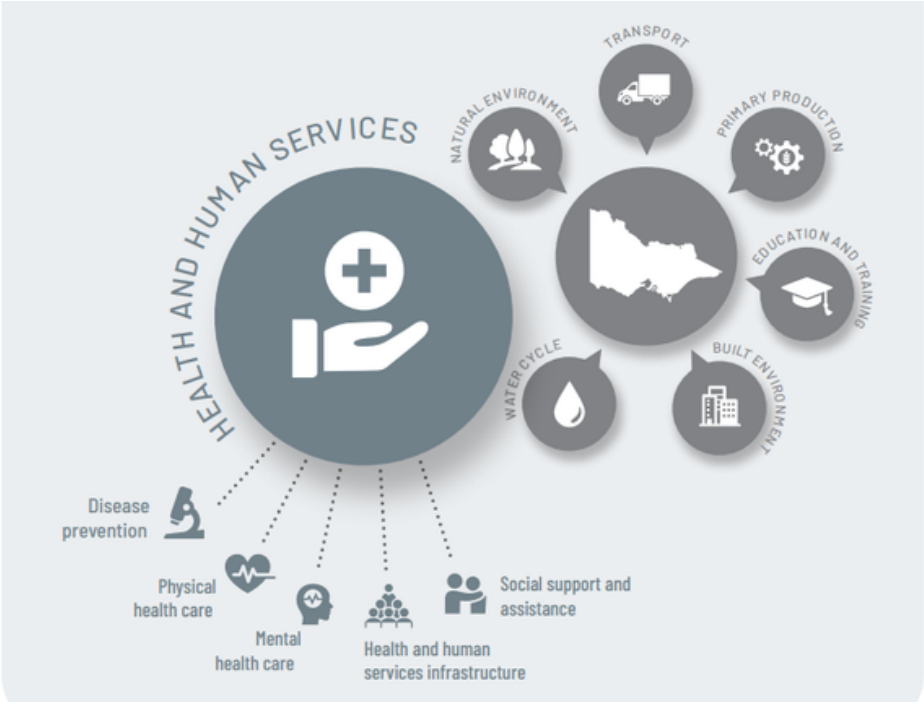
At a national level, there is a National Climate Resilience and Adaptation Strategy 2021-2025 - DCCEEW which operates across four domains — natural, built, social and economic. There is also a Climate change | Australian Government Department of Health and Aged Care strategy that develops a sustainable and responsive health system to address the direct and indirect health impacts of climate change.

State Level

ViThe Victorian State government has legislated a net-zero greenhouse emissions target by 2050 with the Climate Change Act 2017. Victoria's Climate Change Strategy provides a roadmap to net-zero emissions and a climate-resilient State . Arising from this strategy are:

- Net-zero emissions pathways for different sectors
- Seven systems-based climate change adaptation plans, including the Health and Human Services Climate Change Adaptation Action Plan 2022-2026. (Figure 4)

Figure 4. Seven systems-based climate change adaptation plans



Source: Health and Human Services Climate Change Adaptation Action Plan 2022-2026

In Victoria, the Public Health and Wellbeing Act 2008 gives state and local government specific responsibilities to plan for and contribute to protecting and improving health and wellbeing. The priorities for this work is guided by *The Victorian public health and wellbeing plan 2019–2023*, which includes a focus on tackling climate change and its impact on health.

The Victorian Aboriginal Community Controlled Health Organisation's policy forum has been identified as a key mechanism for the embedding of Aboriginal self-determination in climate change adaptation approaches. [5]

Regional Level

The ADAPT Loddon Mallee Climate Ready Plan is a place-based approach to adaptation that identifies impacts and provides a framework for action not captured by state-wide plans. ADAPT Loddon Mallee has also funded a range of community-led adaptation projects.

Local Level

Local governments in the Loddon Mallee region have strategies and action plans to address climate change mitigation and adaptation challenges in their operations, infrastructure and within the community as a whole. In addition, local governments have a responsibility to assess climate change risks to the natural environment, sports and recreation, urban development and housing and human health.

Local Governments have legislative and community emergency management responsibilities that include investigation of public health risks related to communicable diseases and environmental hazards Under the *Public Health and Wellbeing Act 2008.*

All nine councils in the LMPHU have environmental or climate change plans or strategies that have climate change mitigation and adaptation actions. Further to this some councils:

- have declared a climate emergency
- have committed to a community net-zero emissions target by 2030 and 2040
- are developing strategies or plans for net-zero emissions
- are participating in the Central Victorian Greenhouse Gas Alliance Cool It project - Cool It: Heat Vulnerability Mapping
- are members of the Victorian Energy Collaboration 100% Renewable Energy Power Purchase Agreements.

Loddon Shire

Healing Country

> *Knowledge, ways of being and doing connect us with Country. That connection helps Country heal. When Country is healed, Country is strong. When Country is strong, we are strong. [6]*

Aboriginal and Torres Strait Islander Peoples have protected and cared for Country since the Dreaming. They hold extensive knowledge and wisdom about caring for Country, Community and Culture. However, due to colonisation, they have experienced dislocation and dispossession from their rights and rites to Country. Climate change poses an additional threat to cultural values and sites, beyond the legacy of colonisation. It is a threat to Country and their spiritual connections to it and thus the cultural determinants of their health and wellbeing.

Self-determination and connection to Country, Community and Culture are integral to Aboriginal and Torres Strait Islander peoples' health and wellbeing. This also establishes a strength-based approach to climate change adaptation and addressing the health impacts of climate change. We need to proactively embed Aboriginal and Torres Strait Islander peoples' self-determination and knowledge in climate change adaptation initiatives as they are designed and implemented. [7]

The Korin Korin Balit-Djak: Aboriginal Health, Wellbeing and Safety Strategic Plan 2017–2027 aims to realise the vision for Aboriginal self-determination by achieving positive outcomes in a variety of domains, including system reform across the health and human services sector.

Treaty and the Yoorrook Justice Commission are key steps towards advancing self-determination, healing and supporting Traditional Owners' rights on Country. Victorian Traditional Owners have developed the Cultural Landscapes Strategy to provide direction to the Victorian Government about how it can enable and empower Traditional Owner self-determination in land management. Various initiatives of government working with Traditional Owners include facilitating the re-introduction of cultural burning, working with the Dja Dja Wurrung Nations to build knowledge about how climate change impacts cultural values associated with water and identifying opportunities to adapt.

At a regional level, the ADAPT Loddon Mallee Climate Ready Action Plan includes objectives and priority actions that support caring for and healing Country in a changing climate. Dja Dja Wurrung has developed a healing country plan (Dhelkunya Dja) that reaffirms goals and obligations to care for Country and describes their People's aspirations as the Traditional Owners of Djandak.

Dja Dja Wurrung partnering with government

The Victorian Government has partnered with the Dja Dja Wurrung Nations to build knowledge about how climate change impacts cultural values associated with water and identify opportunities to adapt.

Dja Dja Wurrung has developed a climate change cultural water values framework (renamed Bundjil's Law) as part of the Pilot Water Sector Climate Change Adaptation Action Plan 2018–2020, funded by the Victorian Government. The framework outlines Dja Dja Wurrung Cultural Water Values and highlights how Dja Dja Wurrung world views and connection to Country need to inform climate change adaptation.

The framework is a cross-cultural tool to support the Dja Dja Wurrung and government water managers to work in partnership on ensuring climate change adaptation initiatives align with Dja Dja Wurrung rights, obligations and Country objectives.

Source: Adaptation Action plans: A major step forward for climate resilience in Victoria, Victorian State Government

Section 2

A framework for climate change and health pathways

Loddon Mallee climate change and health framework

Climate change impacts health through a multitude of pathways and feedback loops that can be complex to grasp. The framework (see Table 1) is by necessity a simplification of these processes, designed to "step through" the causal journey and help organisations in the health sector understand where they fit in and how to respond. Local data will inform this work and measure improvement over time.

The framework illustrates how the magnitude and nature of local health outcomes associated with climate change are influenced by:

- The local incidence of climate change events or hazards
- The exposure of the local population to those hazards
- The vulnerability of the local population and environment to those hazards (including existing health, social and environmental vulnerabilities)

Health impacts (on the far right of the table) are either experienced directly as a result of climate change events (eg. floods) or indirectly as mediated through environmental and human systems (eg. increased incidence of water-borne disease).

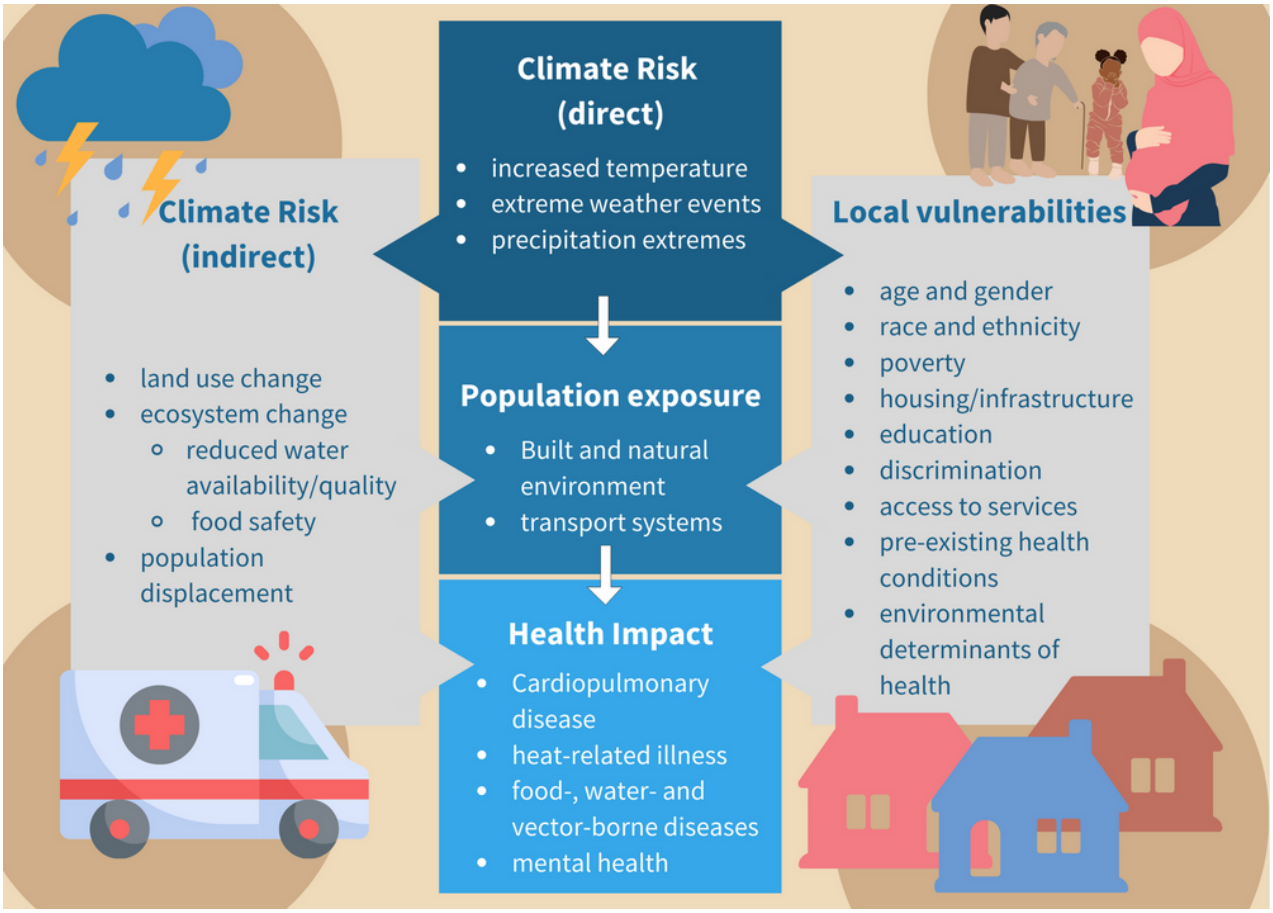
The framework also demonstrates how local responses (services, initiatives, interventions) can be directed towards different points along the causal pathway. For example, responses can reduce or avoid negative health impacts from climate change by reducing:

- a population's exposure to climate hazards (eg. by retrofitting homes to be more climate resilient to heatwaves)
- the vulnerability (sensitivity) of the population to those hazards (eg. by improving the social support systems ie. welfare checks for individuals with significant health issues and living in poor housing during heatwaves)

Responses can also be directed to the point of health impact to reduce its severity. For example, by increasing the health sector's capacity to offer care on heatwave days or tailoring mental health and family violence support to the particular trauma of environmental emergencies.

Figure 5 demonstrates the relationship between climate change and human health, for more detail see table 1.

Figure 5. Conceptual framework of the relationship of climate change and health



Source: adapted from National Institutes of Health, Climate Change and Health Initiative Strategic Framework

Table 1.Climate change and health impact pathways framework

	Climate change risk		Influencing risk factors				Health impacts	
			population exposure	local vulnerabilities				
	Direct: extreme climate/ weather hazards	**Indirect:** environmental change	Population exposed to hazards	Existing health conditions	Social determinants of health	Environmental determinants of health	**Direct:** direct health impact from extreme weather events	**Indirect:** mediated through environmental and human systems affected by climate change
Climate change and health pathways	Heatwaves Bushfires Drought Storms floods	Decrease in water, soil and air quality Ecological change: • changing rainfall patterns • reduced water availability • land use change • decreased food safety/security population displacement	Locations in which people live and work The built and natural environments that mediate exposure • housing quality • building on flood plains/fire prone areas Transport systems that enable them to alter their level of exposure Access to services eg. emergency services	Asthma Cardiovascular disease Respiratory allergies Mental health	Socio-economic status Ability Age Gender Ethnicity Migration Education Housing Transportation access Food security Social capital Access to services	Overall soil, water and air quality Access to greenspace biodiversity	Allergies Cardiovascular disease Respiratory disease Hypothermia Hyperthermia Heat stress Injury/trauma Mental health Death	Vector-borne diseases Waterborne diseases Foodborne diseases Other infectious diseases Exposure to contaminants such as mycotoxins in food Impacts on the micro and macro nutritional quality of food Mental health Family violence
Response	Mitigation		Adaptation				Responses	
	Responses that reduce CO2 to mitigate climate change eg. program solar conversion of municipal buildings		Responses that reduce the exposure of the local population and organiastions to the weather and climate hazards eg. creation of cool public spaces	Responses that improve the health of the population eg. healthy eating program to reduce health risks	Responses that improve social conditions that impact the health of the population eg. disability services to support access to employment and housing	Responses that improve the local environment to maximise the health amenity for the local population eg. planting trees that don't generate pollen	Responses that prepare local health and social services to treat those impacted by climate and weather hazards eg. increased staffing during extreme weather events build the capacity of staff to deliver mental health first aid	
	Risk management and legal liability—operational and strategic plans of all facilities and services acknowledge and reflect the short-, medium- and long-term risks of climate change to health and wellbeing services.							

Source: Adapted from Watts et al 2015, The Lancet , Health and climate change policy responses to protect public health

Climate change risk

Climate change affects health in many ways: directly through extreme events such as heatwaves, floods, bushfires, and indirectly via worsening air quality, changes in the patterns of infectious diseases, threats to food and water supplies, and effects on mental health. This section identifies common climate change risks throughout LMR. Consider which risks are most relevant to the community you are working with and use this information to begin populating the framework.

Direct: Local climate & weather hazards and health impacts

Bush fires, flooding, extreme wind, droughts and storm events can generate a number of direct health impacts, such as injuries, mental health impacts and in the worst cases result in death.

The Loddon Mallee Region has a history of bushfires, storms, record-breaking extreme heat waves, droughts and floods with recent data indicating the occurrence of some form of damage from natural hazards in every year between 2009 and 2016 except 2012. [8]

Drought

The LMR was significantly impacted by the millennium drought in 1996-2010 (believed to be the worst drought since European settlement) on agriculture and other commercial activity and resulted in restricted residential water access. Local catchments have not fully recovered in the decade since the end of the drought. [9]

Bushfires

The 2015 Macedon Ranges fire burnt over 3000ha, destroying dwellings, agricultural buildings and fencing. The fire had a serious impact on farming and other industries, causing considerable economic and social upheaval in the surrounding communities. [14]

Smoke from fires, including from planned burns, can also be a hazard within the LMR. Those most at risk from smoke exposure include young children, adults over 65 years of age, people with asthma or existing heart or lung conditions, pregnant women, outdoor workers and smokers. [15]

In January 2020, smoke from bushfires across Victoria (and from New South Wales) rendered Melbourne's air quality the worst in the world with the smoke haze impacting on health and estimated to cost the cities of Melbourne, Sydney and Canberra over $500 million. [16]

Storms

In 2021, a severe storm caused widespread destruction across the Macedon Ranges shire. Damaging winds of up to 143km/h were recorded, as well as more than 500,000 lightning strikes. Thousands of residents and hundreds of houses, fences, outbuildings and sheds were impacted. Extensive tree falls occurred, resulting in closures to roads and trapping people without power or mobile reception. Many were without power and heating in the middle of winter for several weeks. [10]

Abnormal and/or changing weather patterns can make air quality worse and contribute to the increased frequency and severity of extreme "weather health events", such as epidemic thunderstorm asthma and other respiratory allergies. The 2016 thunderstorm asthma event in Victoria caused a 3,000% increase in asthma-related admissions and nine asthma-related deaths. [11]

Floods

The LMR has experienced floods over the years causing infrastructure damage, isolation, displacement and financial stress. These include properties impacted by the flooding of the Murray, Campaspe, Loddon and Avoca rivers in 2016.[12] The floods in 2010-11, affecting the Loddon and Campaspe rivers were the largest on record [13]. However, the impact of the widespread 2022 floods is still being accessed at the time of the development of this document.

Increasing temperatures

A heatwave involves three or more consecutive days of extreme heat. Extreme heat is calculated by the Bureau of Meteorology for each weather forecast district. The threshold temperature for each forecast weather district in the LMR are:

- Mallee District (Mildura Rural City, Buloke, Swan Hill and Gannawarra Shires): 34°C
- Northern Country District (Campaspe, City of Greater Bendigo and Loddon Shires): 32°C
- North Central District (Mount Alexander Shire): 30°C
- Central District (Macedon Ranges Shire): 30°C

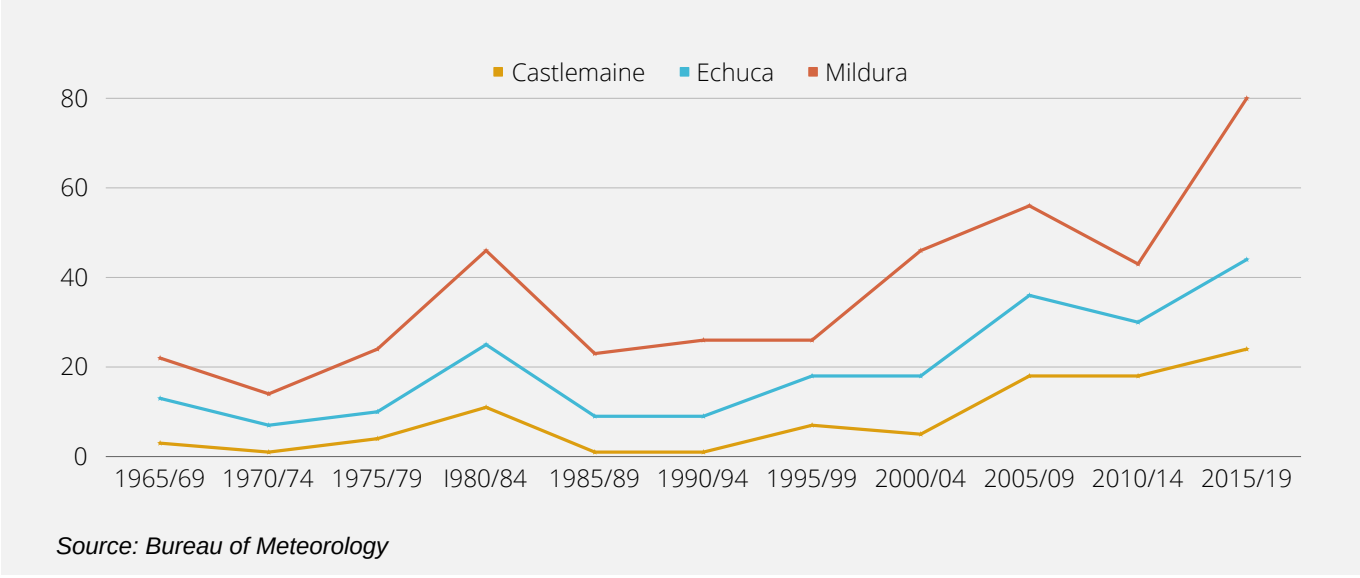
Heatwaves are the deadliest of extreme weather events experienced in Australia and a serious threat to health in Central Victoria. The generally identified health impacts of extreme heat and heatwaves include heat stroke, exhaustion, exacerbation of cardiac and respiratory illnesses, and falls due to dehydration.

Recent Australian studies have demonstrated that heat waves result in excess ambulance demand, hospital admissions and mortality. Indeed, the death toll from heat waves in Australia has exceeded that for any other environmental emergency. During the 2009 Victorian heatwave, there was a 46% increase in emergency cases at hospitals, including a 2.8-fold increase in cardiac arrests. This heatwave contributed to 374 excess deaths [17]. In the 2014 Victorian heatwave, 167 people died.

The risk of drowning can increase as people engage in water-based recreational activities. Heatwaves also increase demand and can compromise the operation of critical infrastructure, facilities and services. These can have health consequences. eg loss of electricity can lead to food spoilage and subsequent gastroenteritis.

Temperatures are increasing and expected to continue rising, with the number of days over 40°C increasing (see figure 6) Bendigo experienced more than four consecutive days of 40°C+ temperatures (this had not happened since 1908) in 2009 and 2014. In 2018 Bendigo experienced a record breaking 12 consecutive days over 35°C. [18]

Figure 6. Number of days above 40°C



Source: Bureau of Meteorology

A health impact of high rates of sun overexposure (ultraviolet rays) is the increased risk of skin cancer. Regional Victorians are 40% more likely to be diagnosed with melanoma than Victorians living in major cities. Within the LMR, the shires of Mount Alexander (45.19/100,000 ASR) and Buloke (37.8/100,000) have the highest melanoma rates (compared to the Victorian rate 27.7/100,000). [19]

Mental distress

In 2019-2020 many Australian communities experienced great loss and distress as a result of the extreme bushfire season in addition to the impacts of COVID-19, and subsequent flooding. There is evidence that the mental health impacts of adversity and trauma accumulate. While most may be able to bounce back from a single event, the fact that many communities and individuals have suffered from drought, then bushfires, then flooding, then COVID-related isolation and economic disadvantage makes us more concerned about the mental health impacts of current events. Repeated trauma exposure is also linked to the severity of adverse mental health impacts in emergency service workers.

A range of mental health conditions can be triggered by extreme weather events such as post-traumatic stress disorder, major depressive disorder, anxiety, depression, complicated grief, survivor guilt, vicarious trauma, recovery fatigue, substance use, and suicidal ideation. Between 2009 and 2018, there were 370 farmer suicides reported in Australia, with drought being a leading cause.[20]

Prevention of violence against women in emergencies

Violence against women increases during and after environmental emergencies. In response, the Macedon Ranges Shire Council develops an annual 'Prevention of violence against women in emergencies' action plan. The plans raise awareness of the risk of family violence after climate emergencies and supports volunteers and staff working in emergency response, relief and recovery to respond to family violence.

The materials include services information and the 'disaster is no excuse for family violence...' poster, flyer and wallet card, which are based on text from a postcard produced by the Gender and Disaster Pod and are designed to be used after an emergency in relief and recovery centres and other locations in affected areas.

Family Violence

Social and economic destabilisation caused by both extreme weather events and environmental degradation can lead to socially mediated health effects such as a higher incidence of family violence. Studies in the United States and New Zealand confirm that domestic violence increased in those countries in the aftermath of earthquakes, hurricanes and floods (50% - 300% increases). [21]

In Australia, the Black Saturday bushfires also saw an increase in the incidence and severity of family violence in affected shires.[22] The reasons for this are many and varied but may arise from the stress and trauma experienced by perpetrators or the pressure on people to conform to gender stereotypes [23]. These exacerbate existing gender inequalities, which are drivers of family violence [24].

We cannot achieve gender equality so long as violence against women persists. This is because when women experience violence they face significant barriers to functioning optimally in society, widening gender inequalities. e.g. they face housing instability, financial instability, difficulty sustaining employment and poor mental health.

As climate emergencies increase in frequency and severity we know that so too does the risk and prevalence of violence against women negatively impacting gender inequality.

Mount Alexander Shire

Indirect: environmental change and health impacts

Environmental degradation caused by climate change is also expected to cause and exacerbate a range of negative health outcomes in LMR. It is expected the region will experience an increase in waterborne, foodborne and vector-borne diseases (diseases that can be transmitted directly or indirectly between animals and humans), as well as exposure to contaminants in food, reduced nutrition, and exacerbation of existing chronic diseases.

Mosquito-borne diseases

Mosquito-borne diseases such as Ross River virus, Japanese encephalitis, Barmah Forest virus, Murray-Valley encephalitis and Dengue are expected to increase as a result of warmer weather, increased rainfall, flooding and even drought (which improve mosquito breeding conditions and reduce predation). Modelling suggests that changes in climatic conditions over the coming decades in Australia are likely to increase the burden of all of these diseases in endemic areas and lead to disease outbreaks in new areas. [25]

In 2017, following heavy Spring rains, Victoria witnessed the largest Ross River virus outbreak since 1993, with 1,974 human cases reported, often resulting in an inability to work for two to three months.

Foodborne diseases and malnutrition

Changes in rainfall, temperature, flooding and drought, can all contribute to reduced crop yields and reduced/poor water quality sources, leading to malnutrition and foodborne disease (such as salmonellosis). These impacts are exacerbated by unsustainable farming methods that deplete soils and mismanage water.

Vehicle of an emergency services worker who has been travelling around Robinvale post-floods and the vehicle is now covered in mosquitoes

Responses to mosquito-borne diseases

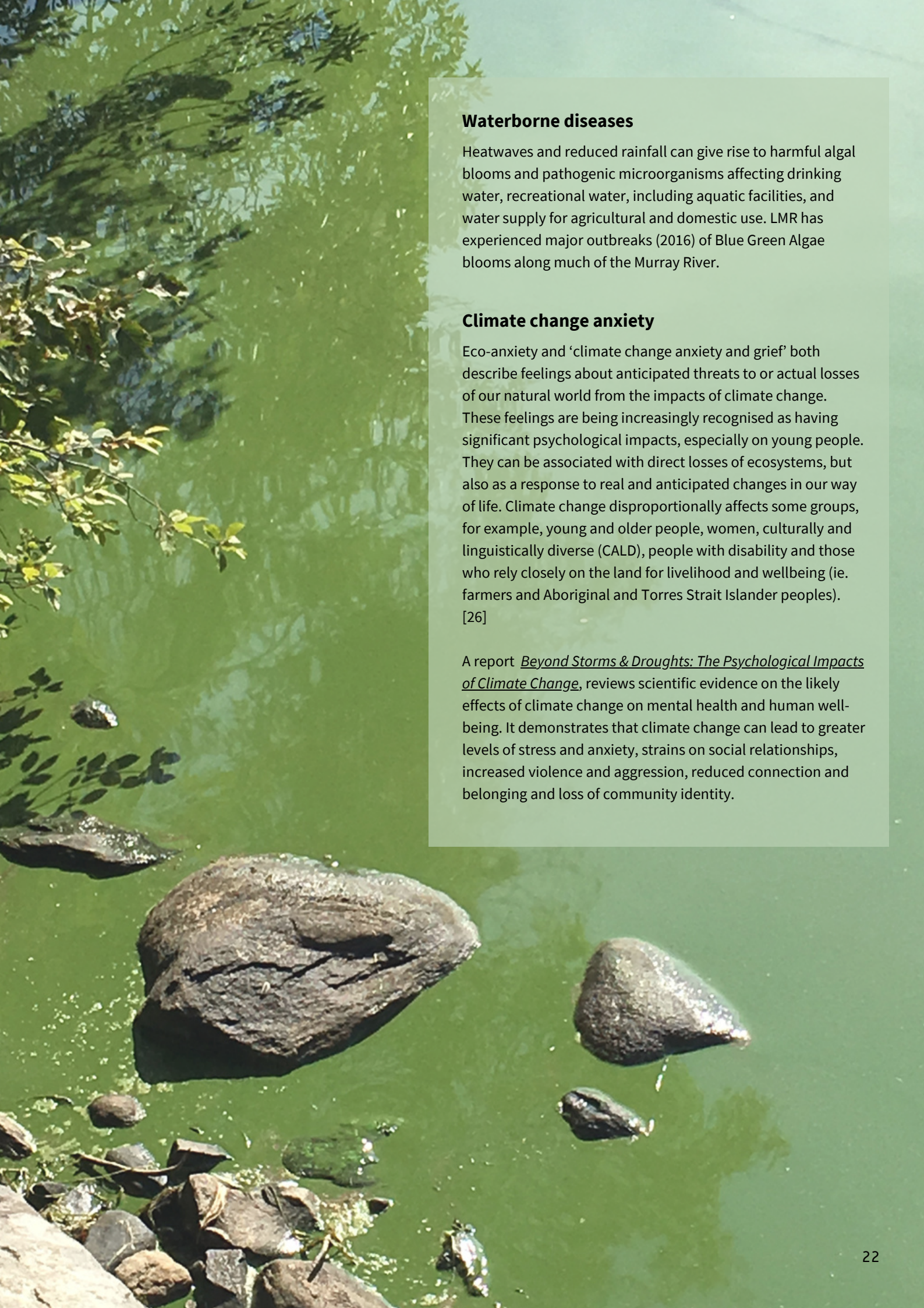
Prevention: engage local stakeholders* to raise awareness and education to reduce:

- mosquito breeding areas eg. stagnant water around the home
- mosquito bites eg. use of mosquito nets/screens, repellents, loose clothing

Monitoring/surveillance: Identify hot spots for targeted education, surveillance

- Arbovirus control program: trapping mosquitoes for testing) Human: notifiable diseases
- Arthropod: opportunistic samples

Response: to minimise transmission and impact - control program: larviciding and fogging (local government); notify local hospitals and GPs of outbreaks.



Waterborne diseases

Heatwaves and reduced rainfall can give rise to harmful algal blooms and pathogenic microorganisms affecting drinking water, recreational water, including aquatic facilities, and water supply for agricultural and domestic use. LMR has experienced major outbreaks (2016) of Blue Green Algae blooms along much of the Murray River.

Climate change anxiety

Eco-anxiety and 'climate change anxiety and grief' both describe feelings about anticipated threats to or actual losses of our natural world from the impacts of climate change. These feelings are being increasingly recognised as having significant psychological impacts, especially on young people. They can be associated with direct losses of ecosystems, but also as a response to real and anticipated changes in our way of life. Climate change disproportionally affects some groups, for example, young and older people, women, culturally and linguistically diverse (CALD), people with disability and those who rely closely on the land for livelihood and wellbeing (ie. farmers and Aboriginal and Torres Strait Islander peoples). [26]

A report *Beyond Storms & Droughts: The Psychological Impacts of Climate Change*, reviews scientific evidence on the likely effects of climate change on mental health and human well-being. It demonstrates that climate change can lead to greater levels of stress and anxiety, strains on social relationships, increased violence and aggression, reduced connection and belonging and loss of community identity.

Influencing risk factors

Population exposure to climate change risks

The local health outcomes of climate change are influenced by the extent to which people are exposed to places and settings that are adversely affected by climate and weather hazards.

Nearly all of the land in the Loddon Mallee region is a designated bushfire area

Indications that a population is vulnerable due to high-level exposure could include a high proportion of residential dwellings being located in bushfire or flood-prone areas, a high proportion of dwellings with insufficient heating and cooling options, and a lack of regular and reliable public transport accessible to residents seeking to move to safe spaces during extreme weather events. Homelessness is a significant risk to exposure to climate and weather hazards.

Nearly all of the land in the LMR is a designated bushfire area. There are many high bushfire hazard areas that intersect with settlements and areas that are experiencing rural residential and tourism expansion.

Some of the settlements identified for focused growth are also located in areas with bushfire hazards, including Bendigo, Castlemaine, Kyneton and Gisborne. [27]

In the LMR, despite an overall trend of declining rainfall, it is expected that more of the rain that does fall will be in increasingly extreme downpours, increasing the incidence of flood events. [28] The flood risk and area impacted by flooding vary around the region. Table 2 shows the percentage of each LGA which is impacted by flooding at the 1:100-year average recurrence interval (ARI) [29]. There is a one per cent chance (1% annual exceedance probability-AEP) of these areas experiencing flooding of this level in any given year based on flood modelling results from flood studies.

Table 2: percentage of each LGA which is impacted by flooding at the 1:100-year average recurrence interval (ARI)

LGA	% Included in 1:100 Ari Area	Main Localities with Affected Built Up Areas
Buloke	*11.2%*	Charlton, Donald
Campaspe	*31.7%*	Echuca, Kyabram, Moama (NSW), Rochester, Tongala, Wharparilla
Central Goldfields	*20.1%*	Carisbrook, Dunolly, Maryborough
Gannawarra	*40.4%*	Barham (NSW), Cohuna, Kerang, Koondrook, Quambatook
Greater Bendigo	*5.9%*	Ascot (Bendigo), Bendigo, Eaglehawk, East, Bendigo, Elmore, Epsom, Flora Hill, Golden Square, Heathcote, Huntly, Kangaroo Flat, Kennington, Long Gully, Maiden Gully, North Bendigo, Quarry Hill, Spring Gully, Strathdale, Strathfieldsaye, White Hills
Loddon	*29.1%*	Boort, Pyramid Hill
Macedon Ranges	*2.0%*	Gisborne, Kyneton, Riddells Creek, Romsey, Woodend
Mildura	*6.7%*	Mildura, Nichols Point
Mount Alexander	*2.4%*	Campbells Creek, Castlemaine, Moonlight Flat
Swan Hill	*10.2%*	Murray Downs (NSW), Nyah, Pental Island, Robinvale, Swan Hill

Source: Environmental Scan Report, Loddon Mallee Region, Victorian Government, Justice and Community Safety, 2020

Local vulnerabilities and sensitivities

The magnitude and nature of the impact of climate change hazards on the health and wellbeing of the local population disproportionately affects people experiencing systemic disadvantage. Three important forms of vulnerability are: the prevalence of existing health conditions, the prevalence of social conditions that are known to underpin health risks and disadvantage, and the current state of the local environment.

A population with higher rates of obesity, chronic disease, disability and high-risk health behaviours, means an increase in the number of people who may need assistance to manage extreme heat, bushfires and flooding, which will subsequently increase pressure on health and community services. [30]

Those most severely affected by climate change impacts are often those with the fewest resources to respond.

Rising temperatures, a serious health crisis, are more common in inland Australia, where Indigenous communities reside with poor quality housing that do not defend against the heat. Bush fire crisis hit mostly small towns, where those that are financially disadvantaged are not able to rebuild and businesses are less likely to bounce back, given the cascading economic effects. The risks posed by climate change threaten to exacerbate the health and economic inequalities already experienced by those in regional areas, widening the chasm further.

Addressing systemic disadvantage requires a strength based approach and inclusion in decision making

People experiencing systemic disadvantage in LMR are likely to include Aboriginal and Torres Strait Islander peoples, the elderly, the chronically ill, the socio-economically disadvantaged, people with disability, culturally and linguistically diverse people and LGBTQIA + people. Also people with poor access to energy-efficient housing and essential services such as adequate transport and fresh water, and those whose economic prosperity depends heavily on climatic conditions eg. farmers.

Climate change is also likely to have a disproportionate impact on women due to their traditional family roles as carers, their lower incomes as a result of pay discrimination, and reduced access to credit, education, technology and resources. Concernedly, the current approach to combating climate change could widen the gender equality gap. If current trends in areas such as education and employment continue, climate change mitigation and adaptation strategies as designed today could delay the attainment of gender equity by 15 to 20 years. This is largely because women are underrepresented in the fast-growth green economy and therefore are at a disadvantage in applying for new jobs, participating in reskilling, and gaining access to funding for green tech startups.[31]

The Health and Human Services Climate Change Adaptation Action plan 2022-2026 acknowledges that climate change disproportionately impacts people experiencing systemic disadvantage. It therefore advocates for a continued strong focus on reducing social disadvantage.

Designing an inclusive approach to emergency management planning

Research shows the disproportionate impact of emergencies on people with disability who are at higher risk of death, injury and loss of property. Recognising the importance of including people with disability in emergency management planning and decision making, the Department of Families, Fairness and Housing has engaged the University of Sydney to partner with Victorian disability advocacy organisations to design an inclusive approach to emergency management planning in Victoria.

Source: Health and Human Services Climate Change Adaptation Action Plan 2022–26

Intersectional climate justice: A conceptual pathway for bridging adaptation planning, transformative action, and social equity, 2022

Risk assessment and management

There is a significant opportunity to prioritise climate change adaptation across health and community services through evaluation of climate change risk.

Risk assessment and management aims to:

- identify and analyse climate change risks and opportunities
- develop strategies to reduce the impact on the organisation and the people they serve
- evaluate the strategy implementation.

Responding to risk is intended to help the organisation achieve its objectives, therefore risk management must be integral to strategic planning, decision-making, and resource allocation. [46]

The development of climate change risk management frameworks should involve consultation across all levels of service provision, suppliers, clients and the community. Peak bodies may have practical tools and information to support organisations to develop their risk assessment and management plans. An example of a simplified risk management template can be seen in appendix 1.

There are some general themes for organisations to consider in identifying risk and the relevant strategies (figure 7)

Climate Compass: A climate risk management framework for Commonwealth agencies, CSIRO

Leadership and Governance
Under the Public Administration Act 2004, governance boards and their directors are required to consider risks, including climate change-related risks. Climate change risk should be reported at the board level as it is an overarching issue affecting all organisation interests and activities.

Climate change risk assessment and management should be embedded in annual reporting, service accreditation standards and executive key performance indicators.

Infrastructure and asset management
Risk assessment needs to include infrastructure and asset assessment to determine if it can withstand weather hazards for business continuity and is energy efficient for climate change mitigation. Business cases for new or retrofitting infrastructure could explicitly consider the effects of climate change in their cost-benefit assessments.

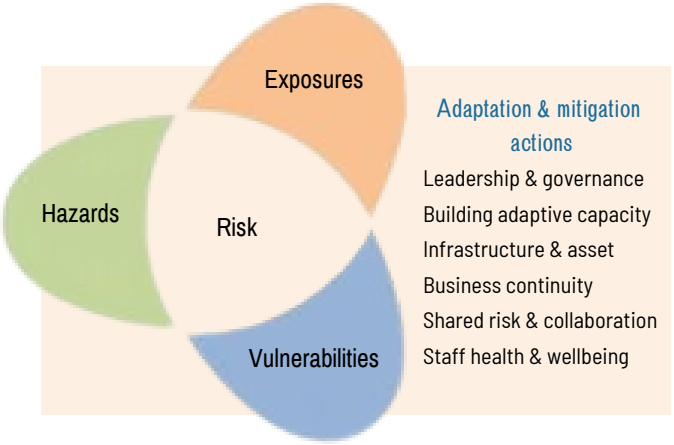
Building organisational adaptive capacity
Building the capacity of services to respond and adapt to climate change is vital to ongoing service continuity, safety and quality of care. Climate change places additional burdens on services and amplifies existing health burdens for individuals and the population. Wider community engagement and resilience building is required for long-term solutions to be effective. Supporting at-risk communities to increase their resilience to the effects of climate change can reduce demand on all health and community services.

Business continuity
Community organisations can be severely impacted by weather hazards with possible infrastructure damage, power outages and disrupted supply chains. Staff may also be personally impacted or may have difficulty accessing their workplace. Risk management ensures the continuity of services at a time when the community is most in need.

Staff health and wellbeing
The health and wellbeing of staff is essential for service continuity and quality. Risk assessment needs to consider how climate change impacts staff's wellbeing and ensure a safe work environment. Education about climate change impacts and clearly defined roles and responsibilities is an important component of risk management.

Shared risk management and collaboration
Shared commitment, planning, expertise and knowledge also shares risks management. This enables collaboration and coordination in building resilience for climate change and responding to environmental emergencies. Government agencies, regulators, peak bodies and professional associations all play a role in addressing climate change risk.

Figure 7. Concept of risk and vulnerabilities



Section 3

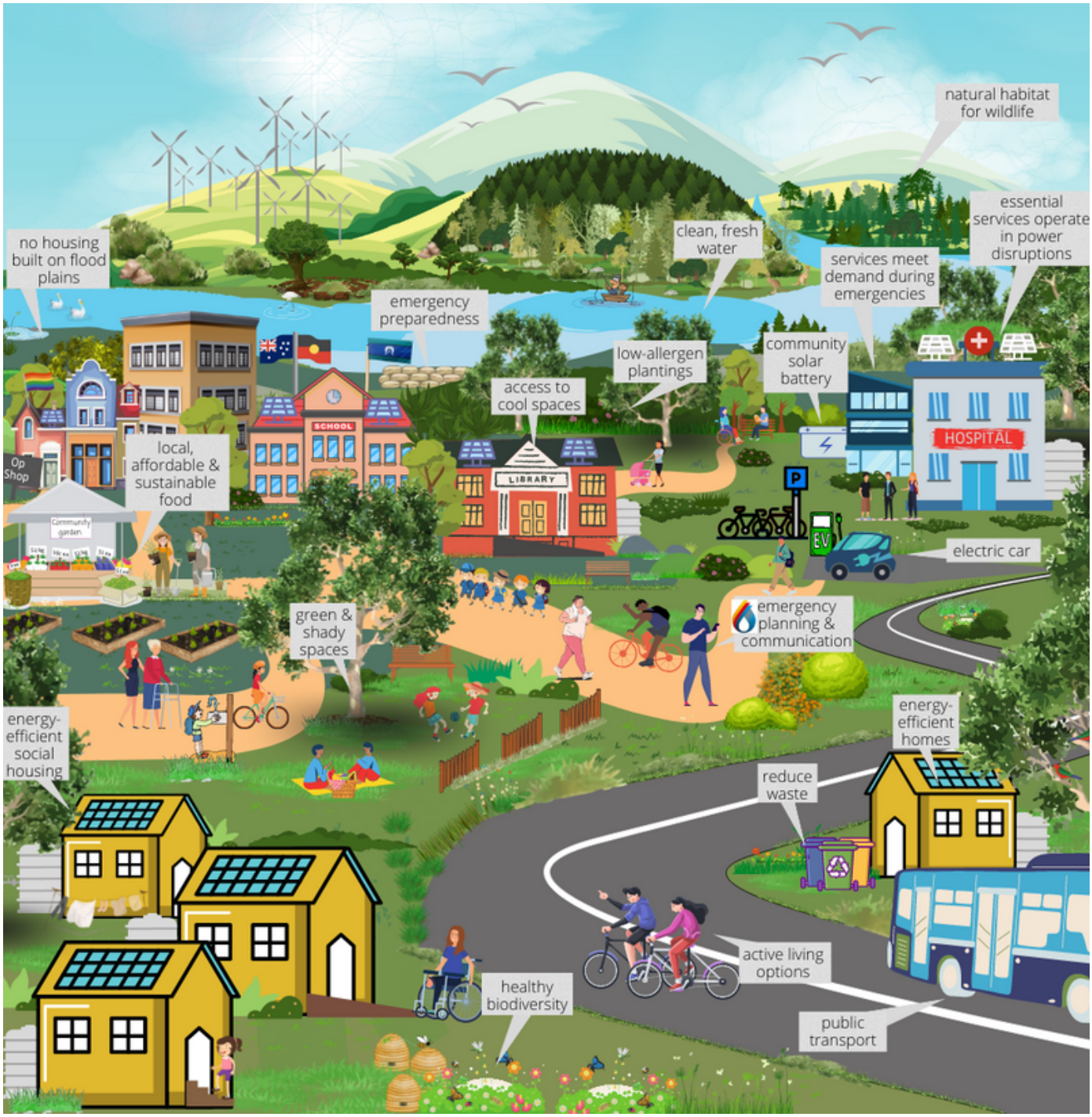
Organisational roles in climate change

Climate change resilient community

A climate change resilient community understands the risks they face from climate change, addresses systemic disadvantage and adapts infrastructure, essential services and behaviours to mitigate the impacts of climate change.

Acting now to build our climate change resilience not only reduces the potentially devastating costs of future climate change impacts, but also creates a more equitable society and immediate and lasting benefits for our health, economy and environment. This requires a place-based approach that engages and collaborates with individuals, communities and organisations from across the system.

Figure 8: visual representation of a climate change resilient community



Source: Loddon Mallee Public Health Unit

Working together to build community resilience for climate change

Real system change requires commitment, collaboration and collective responsibility between all levels of government, service providers and communities. This section demonstrates the co-benefits of climate change action and health and how local organisations can work together to maximise the benefits and improve public health.

Figure 9. Common Municipal Public Health and Well-being Plans' priorities

Councils play a leadership role in the health and well-being and climate change space, working together with other tiers of government, the health sector and related community organisations. Councils are legislated to provide Municipal Public Health and Wellbeing Plans (MPHWP)*, giving this work a strategic focus.

**Under the Public Health and Wellbeing Act 2008 and as outlined in the Climate Change Act 2017, councils are required to have regard to climate change when preparing an MPHWP (Municipal Public Health and Wellbeing Plan).*

These are all areas of action that address the health and climate change pathways 'upstream' by reducing exposure and vulnerabilities. They are also examples of how climate change action is good for health, as many of these initiatives are championed on the basis of their low-carbon outcomes but also have significant health co-benefits. There are many opportunities for organisations to participate in all of these initiatives, often working strategically with councils to support MPHWPs and climate change action.

Delivering health and climate change co-benefits

Climate change and health impact pathways are complex and interconnected, which demands better alignment and integration both within and between organisations. For example:

- If a street tree policy is being reviewed there may be an opportunity to influence the tree species used to maximise shade, reduce the urban heat island effect during heatwaves, minimise water usage and reduce pollen levels by selecting low or non-allergenic tree species
- Initiatives to address and reduce the impact of drought on public open space, such as using alternative water supplies like storm water for irrigation, could have co-benefits for the ecosystem and promote outdoor physical activity to improve physical and mental health and wellbeing.

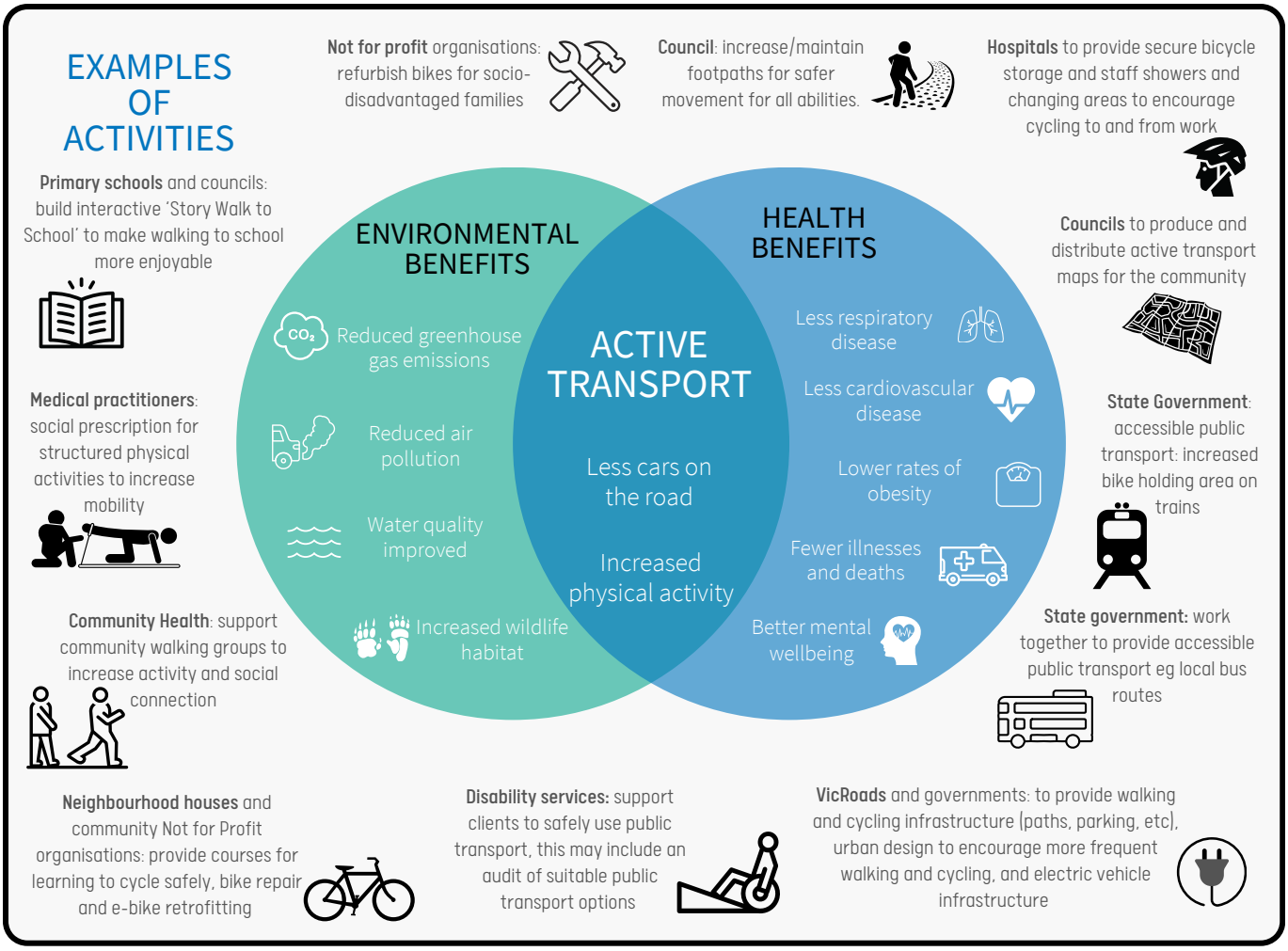
Macedon Ranges Shire

Active transport

Shifting to greater use of public and active forms of transport (walking, cycling) will have a positive impact on the environment and health (figure 10). There are also social benefits, which include:

- reducing household expenditure on car usage and maintenance and subsequently increasing economic resilience
- promoting social connection with group physical activities.

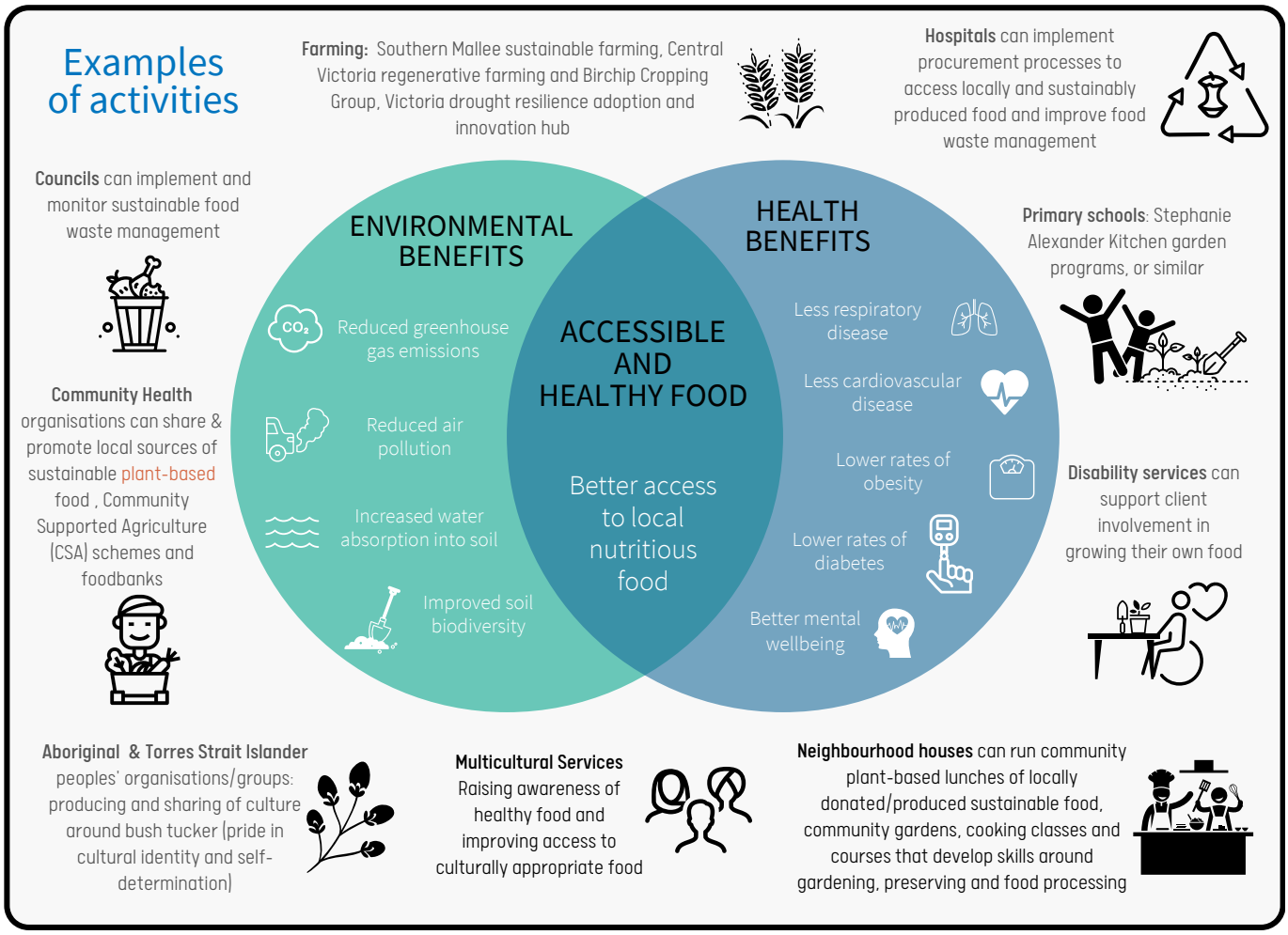
Figure 10: Co-benefits of Active Transport and a collaborative approach to activities



Accessible and healthy food

Supporting sustainable local food production, consumption and food waste management and increasing the proportion of plant-based products in diets will positively impact the environment and health. Sustainable local food production reduces food miles and includes building the quality of local soils through organic and regenerative agriculture. This in turn increases the absorption of water in the land (resilience to drought), soil biodiversity and nutrients in the food produced.

Figure 11: Co-benefits of accessible and healthy foods and a collaborative approach to activities



Food for all: Swan Hill Region

Food for All Swan Hill Region is a particular healthy eating initiative with multiple agency and community partners aiming to reduce vulnerability to food insecurity, improve local and community food access and improve environmental sustainability.

Some examples of partnership actions to date include; establishing the Swan Hill Food Hub at Swan Hill Neighbourhood House, Planting the Seed webinars with topics on learning how to grow your own food, and supporting the establishment of a seed library at the Swan Hill Library. More recent work has focused on needs identification on ways to reduce food stress for people facing systemic disadvantage and the dissemination of information on local food access and food budgeting and cooking tips.

Regional Food Systems Framework

Healthy Loddon Campaspe have developed a Regional Food Systems Framework, The Flourish, to guide the work of local government and key stakeholders in creating a healthy, equitable and sustainable regional food system.

This framework aims to increase:

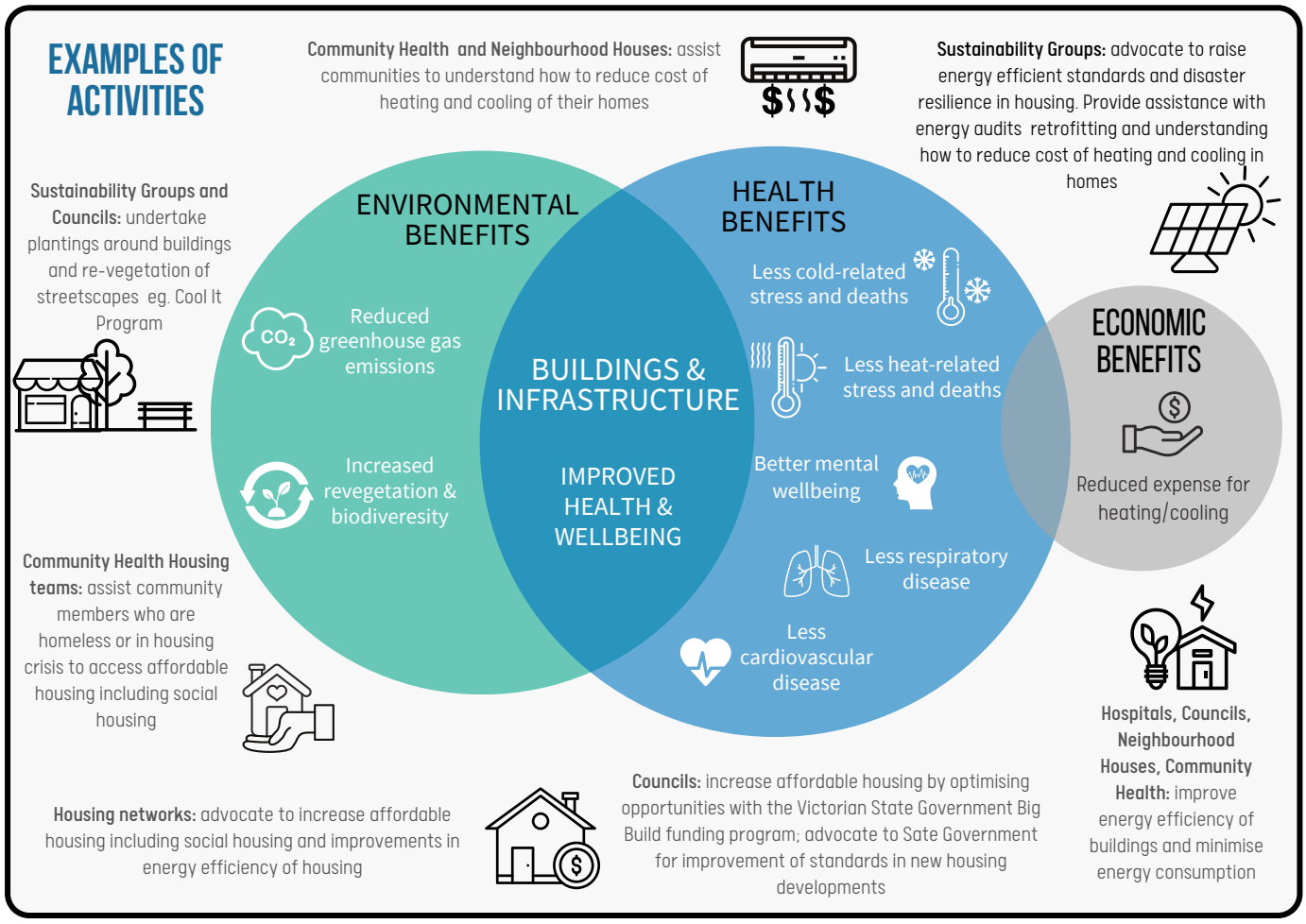
- food security
- access and consumption of healthy food through policy and environmental change in key settings
- access to culturally appropriate and local food
- community knowledge and skills related to healthy food
- climate change adaptation to reduce its impact on health

Climate change resilient buildings and infrastructure

When a community survey asked about thermal comfort at home during winter and summer, half of Victorians reported being colder than they would have liked last winter and slightly more (54%) said their home had been too hot last summer. These figures increase significantly for those living in public housing (61% and 65% respectively). [32]

Research has shown that lifting the energy star rating of existing homes to 5.4 stars could reduce heat-related deaths by 90%. [33] Upgrading buildings to be low carbon and climate change resilient through renewable energy generation and energy efficiency/thermal comfort improvements will positively impact on people's health and wellbeing.

Figure 12: Co-benefits of sustainable buildings and a collaborative approach to activities



Cool Community Spaces: Adapting to Climate Change

The Loddon Campaspe regional infrastructure strategy (2021-2051) commits, among other strategic actions, to:

- create climate change-adapted facilities for rural communities (cool spaces)
- rapidly renew old public housing
- make social housing suitable for changing local climates.

These commitments were informed in part by the submission Cool Community Spaces: Adapting to Climate Change resulting from consultation with CEOs of health and community services across the LMR. The Central Victorian local governments advocated for the enhancement of existing assets to become cool spaces, rather than building new ones. This includes a commitment to an asset audit and analysis to determine the best proposition for the Cool Community Space eg. fit for purpose and economically viable.

Section 4

Health services role in climate change

Health services responding to climate change

The Health and Human Services Climate Change Adaptation Action Plan 2022–26 includes 14 actions that address the gaps and opportunities for the sector to respond to climate change, under the headings of public and stakeholder engagement around climate change resilience and health, infrastructure resilience, and sector capability. This is a guide of the roles and responses required to address climate impacts directly. To summarise, the role of health services are to:

- embed Aboriginal and Torres Strait Islander Peoples' self-determination in climate change adaptation
- support the mental health of people affected by climate change
- increase support for health services and leverage trusted voices:
  - adequate surge staff recruitment and services preparation
  - the health, safety and well-being of the workforce will be a key focus of the adaptation response
  - health services professionals are also often trusted voices and anchor organisations within communities and thus play a significant role in supporting community adaptation to climate change impacts on community health and well being
- improve health sector capability
  - strengthen collaboration across health and human services systems. These systems can link into the Regional Emergency Management Plan and mitigate risks regarding food safety, drinking water quality, heat health and the spread of diseases affecting people
  - improve climate change and health impact data and surveillance systems
  - embed climate change risk responses in policies, plans, operational procedures and capital investment decision making
  - demonstrate organisational leadership in climate change adaptation and mitigation actions at all levels
  - develop or promote climate change training, tools, initiatives and resources for health services professionals to increase their capacity and resilience to respond to the impacts of climate change as they appear in their clients.
- health infrastructure: embedding climate change resilience into health infrastructure
  - ensure hospital energy supplies and communication infrastructure are secure
  - comply with the Victorian Health Building Authority guidelines that include new requirements for building climate change resilience into health infrastructure
  - improve the thermal performance of hospitals
  - reduce carbon emissions (eg reduce gas and electricity; reduce water consumption; invest in electric vehicle infrastructure)
  - improve waste management.

Research shows most healthcare professionals believe the incidence of climate change-related health conditions will significantly increase during the next 10 years. However, only one-third of healthcare professionals currently feel well-informed and confident in talking about these issues with their patients. Coupled with a desire from the public to learn more, this suggests healthcare professionals could have a greater role in communicating the health effects of climate change and the actions community members can take to stay healthy in a changing climate. [34]

The Health and Human Services Climate Change Adaptation Action Plan 2022–26

Hospitals showing leadership

Global Green and Healthy Hospitals (GGHH) is a free global network for hospitals and health organisations who are committed to reducing their ecological footprint and promoting public and environmental health. The GGHH network is an initiative of the Climate and Health Alliance's (CAHA) international partner and affiliate, Health Care Without Harm. CAHA regularly hold sustainable healthcare events, including an annual Greening the Healthcare Sector Forum. Members work towards leadership in prioritising environmental health through a range of initiatives in energy use, waste management, chemical use and greener procurement. **See appendix 2 for practical examples of hospital action**.

Extreme heat and heatwaves

The Victorian Department of Health have provided an action plan to mitigate harm from extreme heat and heatwaves. The *Heat health plan for Victoria, 2021* includes an action plan for health services, which includes:

- providing relevant information for clinicians, patients , carers and the community
- keep waiting and outpatient rooms cool and provide water.
- consider cancelling or deferring outpatients or other non-essential hospital programs that are scheduled during extreme heat.
- review discharge plans for at-risk patients, keeping in mind their specific needs, during extreme heat
- check contingency planning for air-conditioning and power supply.
- plan for power outages, for example, what to do with vaccine fridges.
- plan for increased demand from patients with heat-related illness or exacerbated medical conditions
- plan for increased staff absenteeism. [35]

Hospitals taking action

The Victorian Government target is for all hospitals to be 100% powered by renewables by 2025 and an entirely electrified car fleet by 2032. [4] Hospitals in the LMR have committed to climate change mitigation and adaptation strategies, despite managing a pandemic and the associated increasing demand on clinical services.

A desktop analysis of the LMR hospitals' publicly available documents demonstrates their commitment. While most of the actions are climate change mitigation there are also adaptation actions in staff capacity building. Some of the hospitals' actions include:

- tracking their GHG emissions and electricity, gas, water consumption and waste production and recycling. This is reported in their annual reports
- sustainability or environmental plans, with mitigation targets
- environmental outcomes in their procurement policies
- comprehensive environmental/sustainability plans including the following components: Management and Communication, Energy Consumption, Water Consumption, Waste Generation, Bio diversity, Purchasing and Transport
- participating in the State Wide Zero Emission Vehicle project with installation of EV charging stations at the hospital and using hybrid vehicles
- sustainability training for staff
- working with key stakeholders on identifying and addressing the impact of climate change on people facing systemic disadvantage
- growing a vegetable garden for produce for the hospital kitchen

The most common reducing emissions actions includes: LED lighting, solar panels, dual screens (reduces printing), switching computers off and waste management.

Bendigo Health: recycling bed screens and curtains

Bed curtains need to be replaced every 12 months and Bendigo Health sought a way to re-use the bundles of curtains destined for landfill.

After using a sustainability in healthcare grant from the state government to buy a baler (machine to compress recyclables into bales) for the curtains, Bendigo Health Facilities Management engaged a Victorian recycling company – Replas – to transform the curtains into furniture and bollards, among others.

Bendigo Health Facilities Management is planning to purchase items made from the recycled curtains and alike products across its various campuses, including aged care facilities with tables and chairs and decking. Replacing items with recycled products made from their waste fully closes the loop with recycling.

Robinvale District Health Service: local and fresh vegetables

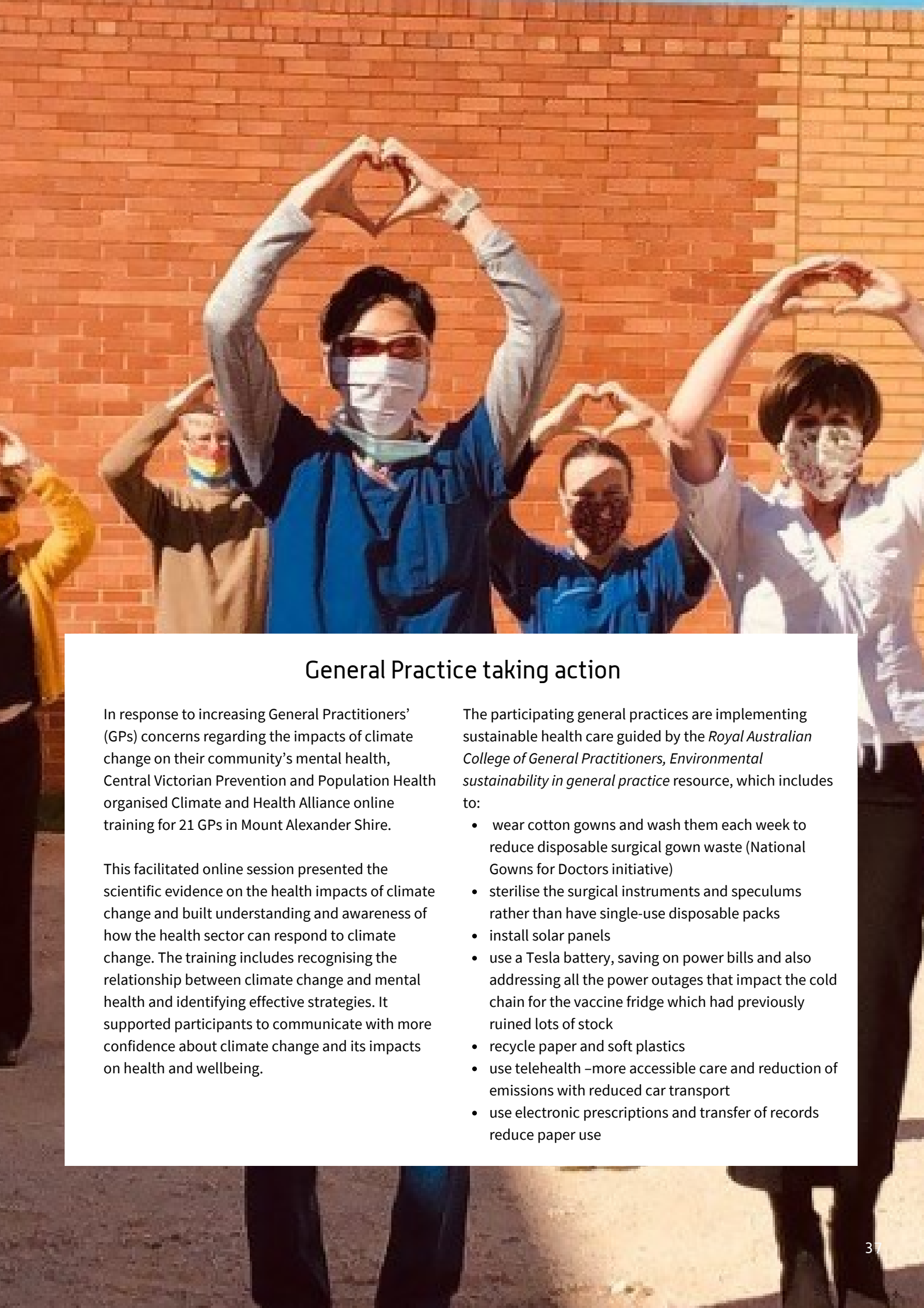
In 2021, Robinvale District Health Service Maintenance Team gardener, suggested establishing a vegetable garden within the health service grounds.
This idea received support, and as a result, a substantial vegetable garden was created. Now a couple of years on, the most local, seasonal produce supplies the majority of the vegetables, herbs and other freshly grown items the health service kitchen needs. This has resulted in significant financial benefits, as well as better quality and fresher produce being offered to the patients and aged care residents.

“The veggie garden has been very economical for us. Instead of buying seedlings, we are growing our own seedlings. It’s so cost-effective and beneficial for us as a health service! We have been saving on fruit and veggies right through winter and summer. Especially when the lettuce was $12 or so, it’s a huge bonus,” says Teresa, the hospitality supervisor and head chef.

Dhelkaya Health: Zero Emissions Vehicle

The Victorian Government released a Zero Emissions Vehicle (ZEV) roadmap as part of the Climate Change Strategy, committing to transition its fleet to 100% ZEVs by 2035. The Victorian government allocated $15m to replace 400 fleet vehicles with ZEVs by 2023.

Dhelkaya Health was accepted as one of the first state government agencies to be part of the Department of Treasury and Finance’s ZEV program. The Maldon Hospital (Dhelkaya Health) is a member of the Global Green and Healthy Hospitals network (see appendix 2 for summary agenda) and now has three ZEVs. They have obtained a permit exemption from Heritage Victoria to install electric charging stations on site.



General Practice taking action

In response to increasing General Practitioners' (GPs) concerns regarding the impacts of climate change on their community's mental health, Central Victorian Prevention and Population Health organised Climate and Health Alliance online training for 21 GPs in Mount Alexander Shire.

This facilitated online session presented the scientific evidence on the health impacts of climate change and built understanding and awareness of how the health sector can respond to climate change. The training includes recognising the relationship between climate change and mental health and identifying effective strategies. It supported participants to communicate with more confidence about climate change and its impacts on health and wellbeing.

The participating general practices are implementing sustainable health care guided by the *Royal Australian College of General Practitioners, Environmental sustainability in general practice* resource, which includes to:

- wear cotton gowns and wash them each week to reduce disposable surgical gown waste (National Gowns for Doctors initiative)
- sterilise the surgical instruments and speculums rather than have single-use disposable packs
- install solar panels
- use a Tesla battery, saving on power bills and also addressing all the power outages that impact the cold chain for the vaccine fridge which had previously ruined lots of stock
- recycle paper and soft plastics
- use telehealth –more accessible care and reduction of emissions with reduced car transport
- use electronic prescriptions and transfer of records reduce paper use

Section 5

Responding to environmental emergencies

Emergency response

Victorians are no strangers to the devastating impacts of fire, floods, droughts and severe storms. Increasingly, Australians are living in areas at risk of natural disasters. The Black Saturday fires in 2009 resulted in the death of 173 people, substantial loss of property and the infrastructure that supports communities, as well as the devastating environmental impact. The City of Greater Bendigo and Mount Alexander Shire were affected by these fires. Bushfires were again raging in Victoria (2019-20) with lives, infrastructure and natural habitat lost.

In early 2014, a fire in the Morwell open-cut coal mine adjacent to the Hazelwood power station in the Latrobe Valley, Victoria burned for approximately 45 days, shrouding surrounding communities in smoke. As authorities struggled to put out the fire, the nearby communities became increasingly concerned about the perceived health risks of exposure to the smoke, particulate matter and gas emissions from the burning coal.

Although local government plays a lead role in place-based emergency management, health services, community services and volunteers are essential actors in mitigating, responding to and supporting the recovery from climate emergencies.

The Northern Victoria Emergency Management Cluster

The Victorian Government identified that 'where municipal councils do not have the capacity to maintain appropriate emergency planning, planning could be undertaken at the sub-regional, rather than the municipal level'.

The Northern Victoria Emergency Management Cluster is a group of five councils within the Loddon Mallee region (City of Greater Bendigo, Central Goldfields, Mount Alexander, Loddon and Campaspe Shires), who have entered into a Memorandum of Understanding which formalises the governance model and ongoing relationship between partner councils to achieve agreed objectives.

Emergency response: what have we learnt?

There have been a number of Royal Commissions and Judicial inquiries into environmental emergencies so we can learn from the past and apply best practice for prevention and emergency response in the future. Recurring themes include:

Leadership

Governments should be accountable for their emergency management responsibilities. This requires clarity in responsibilities for decision-making authority, functions, advice and information sharing. Accountability is a core component of effective governance, made up of four key elements – transparency, answer-ability, enforcement and responsiveness. [36]

The Loddon Mallee Regional Emergency Plan documents the agreed emergency management arrangements for planning, mitigation, response and recovery and defines the roles and responsibilities of stakeholders at the regional level. This plan considers the municipal emergency management plans within the region and region-specific issues, including cross-border emergencies and consequences. [37]

Communication

There is a close relationship between information, trust and developing effective partnerships. [38] Evidence suggests that people trust those they know and that emergency and other emergency communication should be issued by as local a source as possible. [39] While communities expect emergency communications to come from the appropriate authorities (such as police, emergency services and government departments), the Hazelwood mining emergency demonstrated that the authority of the information is undermined, along with trust in the organisation, if the information received is contradictory. Trust in authorities is built over the long-term [40] and is easily damaged. Silence from authorities fuelled suspicion and lead the community to question the accuracy of information provided.

It is also important that emergency communications are timely and accessible to all community members especially those experiencing systemic disadvantage. Communications should be in oral, visual and written mediums, in plain English and translated in various languages. Online and hard copy and available through various channels including place based trusted organisations (eg local library, Council, community health, multicultural centres or neighbourhood houses) as some community groups may be wary of authorities due to past negative experiences.

Excess waste as a result from floods in Rochester, Campase Shire, 2022

Community Service resilience

A VCOSS survey in 2019, found that the demand for community and social services spikes after extreme weather events with 43% of organisations affected by extreme weather in the 12 months prior to the survey, with staff shortages, damage to infrastructure, and temporary closures resulting in detrimental flow on effects to the safety of staff members and the wellbeing of clients.

After an extreme weather event that severely damaged their service centres, 50% of organsiations would be unable to operate for at least a week. More seriously, 25% of organisations reported that damage caused by an extreme weather event could lead to their permanent closure.[41]

Essential services

Essential services are relied on by the community to meet basic, everyday needs. The provision of essential services is especially critical for the preparation, response and recovery efforts to emergencies, when people are at their most vulnerable. However, essential services are often disrupted in many regional communities in emergency-affected areas. These disruptions meant that people could not access information on the emerging threat, purchase essential goods due to either supply chain issues, lack or the inability to use EFTPOS, or contact friends or family. These difficulties add to the stress of an already stressful situation and place the lives and safety of the communities at risk. Emergency planning should include coordination with essential services providers especially food relief/support systems and sensitive incorporation of food and other vulnerability screening into everyday practices.

The Health Care System is a critical and essential service in times of emergency. *The State Health Emergency Response Arrangements* is an integrated plan, with health emergency management responsibilities shared between the Department of Health, the emergency management sector, the health system and the community.

Some responsibilities of the health care system include:

- continuity of health care service provision
- preparing for increased or diverse service demand during environmental emergencies eg. 'surge' workforce
- emergency triage system and distribution of patients
- maximise health outcomes by providing treatment in a safe, timely and coordinated manner
- provide timely, tailored and relevant information and warnings to the community eg. accessing essential services
- supporting people facing systemic disadvantage who may not understand emergency warnings and directions, or are unable to respond in an emergency situation (eg. Vulnerable persons Register).

World Health Organisation Hospital Safety Index

Critical infrastructure

Power and telecommunication are critical infrastructures that are often disrupted during environmental disasters. The state government has a role in mitigating these risks and facilitating coordination and information sharing between critical infrastructure operators.

If homes are more disaster resilient there is less demand on emergency responders

Community empowerment

The community also plays an essential role in preparing and responding to environmental emergencies. Community members are often the first respondents and they are connected to their environment and communities. In encouraging individual and community preparedness for environmental emergencies, governments have a critically important role in providing information on emergency risks via community education and engagement programs. These education and engagement programs are key to informing and empowering individuals and communities, and they should be fit for purpose – accounting for changing risk profiles and community demographics. [42]

Community organisations and groups are trusted within the community to elevate diverse community voices and include them in decision making in emergency management. In the Loddon Mallee region *Loddon Camapspe Multi Cultural Services* are working with the *Northern Victoria Emergency Management Cluster* to improve cross cultural safety required in emergency planning, prevention, responses and recovery.

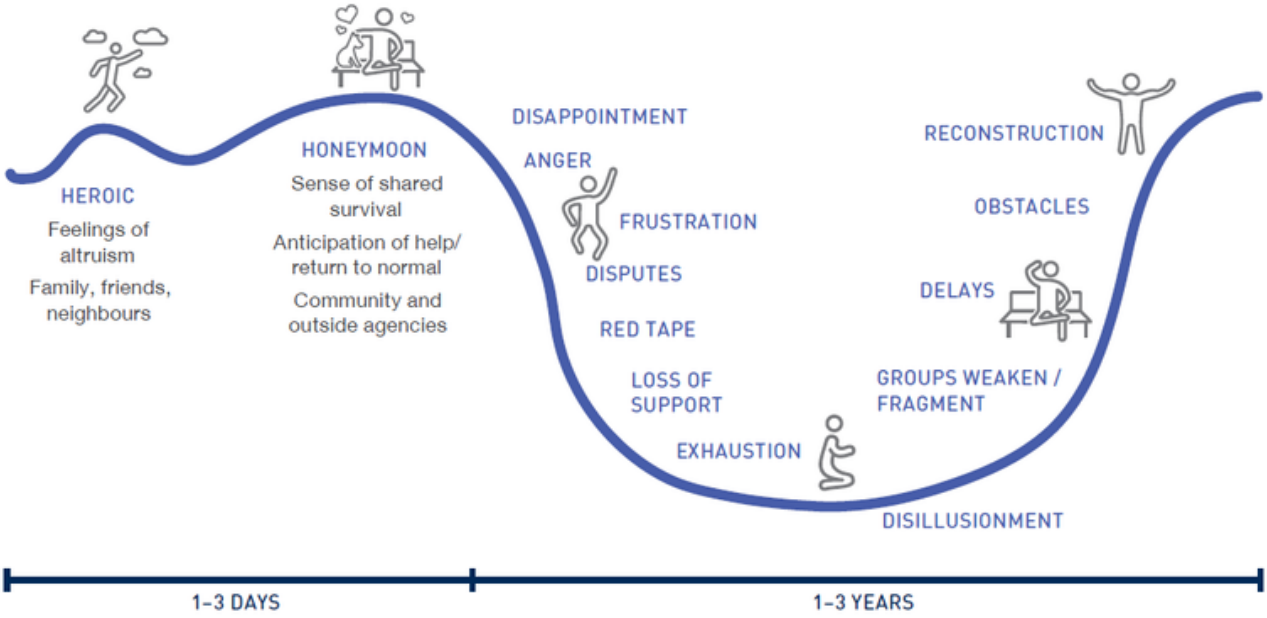
Campaspe Shire

Recovery

Recovery is a coordinated process of supporting emergency-affected communities to heal, recover, and find a new state of normal in their lives and functions. Recovery goals and timelines are different for each community and can run a full gamut of emotions across the journey (figure 13). The initial community focus is safety, security, shelter and health. Trauma-informed support for emotional distress, mental health, family violence, drug and alcohol use and financial counselling are shown to be critical for recovery. [43]

Community organisations may be engaged by the State Government to provide specific case support. A case support program aims to provide a single point of contact for impacted people, to link them directly with vital health and social support and information. It is also designed to help with practical needs such as fencing, stock water, emergency aid, filling out paperwork and navigating services available.

Figure 13: Different phases that the individual and communities might experience post climate emergency



Source: Australian Disaster Resilience Community Recovery Handbook, 2018 (Adapted from Cohen and Ahearn 1980 and DeWolfe 2000)

A partnership approach is required for the effective coordination of services and to mitigate duplication of effort. The time to build partnerships is before there is an environmental emergency as it takes time to build trust and relationships. It's also important to understand how your local area will manage an environmental emergency and what the processes are.

Involving communities in their own recovery is seen as critical and a key priority for the emergency management sector. Recovery must build on the infrastructure, networks and relationships that already exist in local communities. It's important to hear the voice of the community as they are the experts of their place, people, strengths and needs.

Mental health response to climate change impacts/disasters

The Black Dog Institute undertook a study, published in 2020, into the severe psychological distress experienced by Australians following climate emergencies. [44] The report presents the best available evidence in terms of what can be anticipated after large-scale emergencies and the specific mental health interventions that are needed in both the short and long term. These include avoiding psychological debriefing in the short term, strengthening social support networks, encouraging active participation in the community, investing in GP training for mental health care, providing support systems for emergency responders and integrating mental health care into emergency planning.

Gender and intersectional lens

Environmental emergencies place pressure on people to conform to gender stereotypes and exacerbate existing gender inequalities, which are drivers of family violence. Environment emergencies also compound other existing social inequalities and previous trauma experienced by refugees , LGBTIQA+ people, Aboriginal and Torres Strait Islander peoples and those community members with a disability. Many young people also feel under-prepared, uneducated and fearful at the prospect of environmental emergencies [45]. Therefore it is important to apply a gender and intersectional lens to emergency planning and involve those most impacted by the emergency in the planning, mitigation, response and recovery strategies.

Section 6
Monitoring and Evaluation

How to measure change

Monitoring and evaluation insight through the use of data on climate change risks, exposure and underlying vulnerability of local populations and health impacts will help us design better responses to reduce the health burden from climate change on our communities.

Similarly, data collation will also describe and quantify health co-benefits of climate change adaptation and mitigation initiatives (eg. food, transport, waste, energy, housing, reducing systemic disadvantage experienced).

A monitoring and evaluation framework will be developed identifying short, medium and longer term measures linked to broader population outcomes. This framework will be guided by a theory of change which defines the long term goal of climate change resilient communities and service systems and mapping backwards to identify necessary preconditions.

Identifying a common suite of indicators and collaborative data collation amongst organisations will help foster closer collaboration across health and non-health sector partners.
There may also be opportunities for organisations to consider:

- indicators associated with new relevant local data that can be easily collated eg number of community food gardens and
- qualitative methods of information collation to enhance the data collated eg community members' narratives of their experience of an environmental emergency, response and recovery.

This section takes a more detailed look at the type of indicators needed, and progress towards collecting relevant data. It also looks at how the data fits into an evaluation framework that an organisation or project might use, and makes recommendations for the next steps.

Planning and evaluation cycle: applying the framework

Evidence on the links between health and climate change can guide decision-making at different stages of project or program development. Broadly speaking, these stages are:

Baseline assessment: Gain a full picture of the health and well-being status of the community and local environment and the determinants that contribute to that status

- Include consideration of exposure, vulnerabilities, health impacts and adaptive capacity indicators to help frame the climate change related challenges and opportunities, and inform the areas of focus
- Include expected climate change risk

Planning: Identify strategies and actions that could be taken to tackle climate change and its impacts on health and wellbeing, using the Climate change and health pathways framework. At this stage work on alignment between organisations and integration within organisations to ensure that co-benefits of actions are addressed.

Implementation: Put strategies and actions into practice

Evaluation: The monitoring and evaluation framework will collect data along the way (including new data identified) that will help with evaluation and the next baseline assessment. This demonstrates accountability for investing resources in health and climate action and for learning more about what does and does not work.

Example indicators, existing data and gaps

Climate change, population health and the intersection of these processes, present as unwieldy and highly complex phenomena. There is a potentially endless array of individual indicators that could be drawn from the physical and social sciences and arranged in various configurations. For local evidence-informed climate change health responses to be possible, it is important to avoid becoming overwhelmed by this complexity. One way to do this is to carefully consider the nature of the response being designed, implemented or evaluated and select a small number of indicators that will effectively measure the health and/or climate change outcomes this action seeks to address.

The Framework for Understanding Climate Change and Health Pathways designed for this framework, provides a model for classifying climate health interventions and identifying the types of indicators that might inform the design, implementation or evaluation of those interventions. The Framework identifies four classification domains:
1. Climate change risks (direct and indirect climate and weather hazards)
2. Exposure (population exposed to hazards)
3. Local vulnerabilities (existing health conditions, social health determinants, environmental health determinants)
4. Health impacts

Appendix 3 maps out some local indicators associated with these four domains of intervention. See appendix 4 for associated data sources.

The Human Health and Wellbeing Climate Change Adaptation Plan for Queensland [46] recognises the following Priority Adaptation Measures:

1. Leadership and governance
2. Building capacity in the sector and the community
3. Specific public health measures
4. Risk management and legal liability
5. Research, data and evaluation
6. Economics and financing
7. Collaboration across agencies, sectors and stakeholder groups
8. Education and communication
9. Policy, regulation and legislation
10. Infrastructure, technology and service delivery

The plan also recommends the use of the Health Impact Assessment (WHO) to evaluate and inform policy and leadership.

New indicators

Adaptive capacity is the ability of a system to adjust to climate change to moderate potential damages, take advantage of opportunities and cope with consequences. Adaptive capacity can apply to an individual, organisation or community as a whole. Community resilience is another way of looking at the adaptive capacity of a community. Two indicators being developed by the government to inform a snapshot of resilience over time include:

- The Community Resilience Indicator: This has been flagged as a future indicator (at local government level) within the health and wellbeing outcomes framework data dictionary for Victoria. However, the measures and measure details for this indicator are to be developed.

- The Victorian Emergency Management Community Resilience Index (VEMCRI) is being developed by Emergency Management Victoria (EMV) to provide baseline information on community resilience that can be used by agencies and departments to inform recovery planning. The index is an online database of community resilience indicators and is required to be 'live' to incorporate updated indicator data over time. The VEMCRI has an interactive interface through which indicator data are arranged and visualised.

This is an important area for ongoing research, and efforts within the LMR to inform how these indicators are developed and applied will contribute much to the region's ability to adapt.

Appendix 1

Example of a simplified risk assessment and management template

Extreme Heat:	• increased energy and water demand across the site • increased stress on vital equipment and services (eg. elevators and plant) leading to greater maintenance demands • increased pressure across the energy network leading to an increase in energy network instability (eg. brownouts and blackouts) • greater failure of transport infrastructure • greater demand for community services and emergency services (eg. increased mental health impacts, heat stroke, dehydration)			
Likelihood rating	Likely (may arise about once per year)		**Consequence rating**	Major (Isolated instances of serious injuries or loss of lives)
Responsibility	Chief People & Capability Officer		**Monitoring & reporting**	Climate change (Heatwave) risk management reviewed pre & post summer period. Report to the organisation Board annually
Management	**Leadership and Governance** • Leadership groups to provide strong and visible direction for all levels of the organisation to prioritise and implement climate change: heatwave plan • Heatwave plan is integrated into service accreditation standards, annual reports, executive key performance indicators and service plans **Building organisational capacity** • Ensure proper process for government alert notifications • Increase staff capacity to support clients during a heatwave • expanding the reach of heatwave warnings to populations groups at risk • identifying publicly accessible facilities for respite during heatwaves • promoting reduced energy consumption during peak demand **Infrastructure and asset management** • Review asset management plans to identify vulnerable essential services (eg. transport, telecommunications and water infrastructure) and determine assets at risk from extreme heat • All new or retrofitted buildings comply to high energy efficiency eg. insulation against heat • Liaise with insurers to demonstrate proactive measures to reduce impact of extreme heat **Business continuity** • Generator maintenance on schedule to be functional during power outages • Increase staff capacity to manage increased demand on services **Staff health and wellbeing** • Staff that work outdoors comply to sun-smart principles and have access to shade and water • Staff have flexibility to travel in cooler times of the day and to work in a cooler environment • Education campaign on managing extreme heat is also targeted for staff **Shared risk management and collaboration** • Develop community adaptation and response plans to build household resilience • establish a collaborative communication network to share information and resources and align accurate public messaging from a trusted source and increase reach to people at risk • Continue to work with critical infrastructure and service providers to understand system inter-dependencies and develop an action plan to minimise the duration and frequency of disruptions.			

Appendix 2
Summary of the Global Green and Healthy Hospitals Agenda

Agenda area	Definition (from GGHH agenda)	Examples
Leadership	Demonstrate leadership support for green and healthy hospitals in order to: create long-term organizational culture change; realize widespread hospital worker and community engagement; and foster public policy that promotes environmental health.	• Hospital taskforce • Research • Community engagement • Advocacy for environmental health policy Strategic / policy leadership – eg. statements of intent, policy imperatives • Vulnerability assessments – resilience • Carbon accounting / auditing – mitigation • Life Cycle Analysis
Energy	Reduce fossil fuel energy use as a means to improve and protect public health; foster energy efficiency as well as alternative, renewable energy use with the long-term goal of 100% of energy needs to be supplied by on-site or community renewable energy sources.	• Reduce consumption in existing buildings • Energy audits, awareness and retrofitting • Purchase clean renewable energy
Chemicals	Improve the health and safety of patients, staff, communities and the environment by using safer chemicals, materials, products and processes, going beyond the requirements of environmental compliance.	• Chemicals and materials policy • Replace mercury-based thermometers • Seek alternatives to chemicals of concern eg. PVC, BPA, glutaraldehyde
Waste	Protect public health by reducing the volume and toxicity of waste produced by the health sector, while implementing the most environmentally sound waste management and disposal options.	• Environmentally preferable purchasing • Waste management committee • Waste reduction program • Waste segregation, recycling • Recycling anaesthetic gases
Water	Implement a series of conservation, recycling and treatment measures to reduce hospital water consumption and wastewater pollution. Establish the relationship between potable water availability and healthcare resilience to withstand physical, natural, economic and social disruption. Promote public environmental health by providing potable water for the community.	• Aspire to 'net zero water use' • Install efficient taps, toilets • Switch from film to digital imaging • Harvest rainwater
Transportation	Develop transportation and service delivery strategies that reduce hospitals' climate footprint and their contribution to local pollution.	• Provide care in accessible locations including primary and home care • Use telemedicine and email alternatives to face-to-face contact • Encourage walking, car pooling • Invest in hybrid, electric or biofuel hospital vehicles

Summary of the Global Green and Healthy Hospitals Agenda

	Definition (from GGHH Agenda)	Examples
Food	Reduce hospitals' environmental footprint while fostering healthy eating habits in patients and staff. Support access to locally and sustainably sourced food in the community.	• Buy local and organic food • Eliminate fast food eg. sugary drinks • Encourage vendors to supply sustainable food • Minimise and beneficially reuse food waste
Pharmaceuticals	Reduce pharmaceuticals pollution by reducing over-prescription practices, minimizing inappropriate pharmaceutical waste disposal, promoting manufacturer take-back, and ending the dumping of pharmaceuticals as part of disaster relief.	• Minimise prescription amount, don't provide sample medications • Educate about safe disposal of expired medicines • Work with pharmaceutical companies to develop more efficient medication delivery systems • Ensure that pharmaceutical waste is treated and disposed of using WHO guidelines
Buildings	Reduce health care's environmental footprint, and make hospitals healthier places to work and visit, by incorporating green building principles and practices into design and construction of health facilities.	• Aspire to carbon-neutral building operation • Minimise building and other hard surface footprint • Use passive design and protect natural habitat • Use local and safe building materials
Purchasing	Source sustainably produced supply chain materials from socially and environmentally responsible vendors.	• Review procurement practices and use local vendors • Co-ordinate between hospitals to optimise purchasing power • Use purchasing power to favour environmentally responsible, ethical suppliers

Appendix 3
Selected examples of climate change and health indicators

Climate Risk	Exposure	Vulnerabilities	Health Impact	Adaptive capacity
Projected number of extreme heat days (no of days above 40°C) Frequency, intensity and duration: • bushfires • floods • storms	Percentage of population living in: • designated bush fire prone areas • areas experiencing drought • flood-prone areas Percentage of people living in low energy efficient homes Number of people living rough	**Health related** Percentage of population with one or more long-term/chronic health conditions Persons reporting fair or poor health People with high/very high degree of psychological distress **Social health determinant related** Percentage of vulnerable age groups Percentage of older adults who live alone Proportion of people living in households below the poverty line Percentage of population experiencing homelessness or insecure housing Incidents of family violence Gender equality score Percentage of Aboriginal and Torres Strait Islander peoples Food insecurity **Environmental health related** Air quality (pm2.5 data) Groundwater quality Soil quality	Number of excess deaths from extreme heat and heatwaves Number of hospital contacts for injuries/ impacts during extreme weather emergencies Number of cases of mosquito-borne diseases (such as Ross River virus) Asthma rates Climate related mental health responses (during extreme weather events) Exacerbation of chronic diseases associated with extreme weather events	Percentage of areas covered by pervious (allowing water to pass through) surfaces Percentage of areas covered by tree canopies Percentage of population residing within a specified distance from public transport, amenities (such as supermarkets) and key health, medical and emergency services Proportion of households or businesses with private water supplies Number of refuge centres (eg. air-conditioned leisure centres, libraries and community centres) Number of GPs/100 per population

Source: adapted from Watts et al 2015, The Lancet, Health and climate change policy responses to protect public health

Appendix 4
Indicators and data sources

Theme	Indicator	Data source
Climate risk	projected number of extreme heat days (no. of days of 40°C)	Bureau of Meteorology
	frequency, intensity and duration of bushfires	
	frequency, intensity and duration of floods	
	frequency, intensity and duration of storms	
Exposure	percentage of population living in designated bushfire-prone areas	https://discover.data.vic.gov.au/dataset/designated-bushfire-prone-area-bpa
	percentage of population living in areas experiencing drought	
	percentage of population living in flood-prone areas	https://discover.data.vic.gov.au/dataset/1-in-100-year-flood-extent
	heat vulnerability index	Australian urban Observatory (commissioned data)
Vulnerabilities: health related	percentage of population with one or more long-term/chronic health conditions (ABS classifies 10 condition groups, including asthma, chronic obstructive pulmonary disease, cardiovascular disease, mental health condition)	ABS Census of Population and Housing, ABS National Health Survey
	persons reporting fair or poor health	Victorian Population Health Survey
	people with high/very high degree of psychological distress	
Vulnerabilities: social health determinant related	percentage of population aged 14 years or younger	Australian Bureau of Statistics (ABS) , Census of Population and Housing
	percentage of population aged 65 years or older	
	people aged 75+ who live alone	
	percentage of Aboriginal and/or Torres Strait Islander peoples	
	proportion of adults who ran out of food and could not afford to buy more	Victorian Population Health Survey,

Theme	Indicator	Data source
Vulnerabilities: social health determinant related (cont)	percentage of population experiencing insecure housing	Social Health Atlas of Victorian Local Government Areas PHIDU
	rate of population experiencing homelessness	Australian Bureau of Statistics, Census of Population and Housing, 2016
	rate of incidents of family violence recorded by police	Family incidents: Victorian Crime Statistics Agency
	percentage of new migrants	Social Statistics - Asylum Seekers and Refugees and Immigration and Settlement
	population born in non-english speaking country	Australian Bureau of Statistics, Census of Population and Housing
	feels valued by society	Victorian Population Health Survey
	percentage of people that ran out of food in the previous 12 months and could not afford to buy more	Victorian Population Health Survey
Vulnerabilities environmental health determinant related	air quality (PM2.5 data)	Environment Protection Authority, AirWatch measures
	groundwater quality	https://www.epa.vic.gov.au/for-community/monitoring-your-environment/monitoring-victorias-water-quality/data-and-resources
	soil quality	https://www.soilquality.org.au/
Health impact	number of excess deaths from extreme heat and heatwaves	
	number of hospital contacts for injuries/impacts during extreme weather emergencies	https://vahi.vic.gov.au/reports/victorian-health-services-performance/hospital-admission-and-discharge
	number of cases of mosquito-borne diseases (such as Ross River Fever)	https://www.health.vic.gov.au/infectious-diseases/local-government-areas-surveillance-report
	asthma rates	https://www.aihw.gov.au/reports/chronic-respiratory-conditions/asthma/contents/asthma
	climate-related mental health responses (during extreme weather events)	
	number of hospital contacts for cardio vascular and respiratory conditions	https://vahi.vic.gov.au/reports/victorian-health-services-performance/hospital-admission-and-discharge

Theme	Indicator	Data source
Adaptive capacity indicators	proportion of households or businesses with private water supplies	
	number of refuge centres (eg. air-conditioned leisure centres, libraries and community centres)	
	general medical practitioners rate per 100,000 people (no. of GP bulk billing)	PHN exchange: https://www.phnexchange.com.au/
	able to get help from neighbours, family, friends	Victorian Population Health Survey
	people who help out as volunteers	
	number of GP's trained in environmental disaster trauma relief	
	number of new street trees planted each year	
	number of low-income houses retrofit for energy efficiency	
	number of community food gardens	
	the community resilience indicator	
	the Victorian Emergency Management Community Resilience Index (VEMCRI)	
	disaster resilience indicators	Australian urban Observatory (commissioned data)
	percentage of areas covered by impervious surfaces	
	percentage of areas not covered by tree canopies	i-Tree Canopy (itreetools.org)
	percentage of population residing within a specified distance from public transport, amenities (such as supermarkets) and key health, medical and emergency services	
	green space indicators	Australian urban Observatory (commissioned data)
	health of community organisations?	
	uptake of renewable energy	
Livability indicator	composite indicator of social infrastructure (includes access to services), walkability, public transport, food, public open space, housing affordability, local employment and alcohol	Australian urban Observatory (commissioned data)

References

[1] Loddon Mallee Emergency Management Planning Committee, 2020, Loddon Mallee Regional emergency management plan, accessed 13 Sept 2022, <https://www.emv.vic.gov.au/responsibilities/emergency-management-planning/remps/loddon-mallee-remp>

[2] World Health Organisation,(n.d) WHO calls for urgent action to protect health from climate change – Sign the call, accessed 13 Sept 2022, <https://www.who.int/news/item/06-10-2015-who-calls-for-urgent-action-to-protect-health-from-climate-change-sign-the-call>.

[3] World Health Organisation, 2021, COP26 special report on climate change and health: the health argument for climate action., accessed 13 Sept 2022, <file:///C:/Users/svlavery/Downloads/9789240036727-eng.pdf>.

[4] The State of Victoria Department of Health and the Department of Families, Fairness and Housing, 2022, Health and Human Services climate change adaptation action plan 2022–2026, accessed 13 Sept. 2022, <https://www.health.vic.gov.au/sites/default/files/2022-02/health-human-services-climate-change-adaptation-action-plan-2022-2026_0.pdf>.

[5] State of Victoria, Australia, Department of Health and Human Services, 2017, Korin Korin Balit-Djak: Aboriginal health, wellbeing and safety strategic plan 2017–2027, accessed 13 Sept.2022, <https://www.health.vic.gov.au/health-strategies/korin-korin-balit-djak-aboriginal-health-wellbeing-and-safety-strategic-plan-2017>

[6] ADAPT Loddon Mallee, 2022, ADAPT Loddon Mallee climate ready action plan, accessed 13 Sept 2022, <https://climatereadyplan.adaptloddonmallee.com.au/our-climate-ready-plan/>

[7] The State of Victoria Department of Health and the Department of Families, Fairness and Housing, 2022, Health and Human Services climate change adaptation action plan 2022–2026, accessed 13 Sept. 2022, <https://www.health.vic.gov.au/sites/default/files/2022-02/health-human-services-climate-change-adaptation-action-plan-2022-2026_0.pdf>.

[8] Infrastructure Victoria, 2019, Loddon Campaspe Regional profile: An analysis of regional strengths and challenges, accessed 13 Sept 2022, <https://www.infrastructurevictoria.com.au/wp-content/uploads/2019/04/Aither-Loddon-Campaspe-Regional-Profile-March-2019.pdf>

[9] ABC News, 2021, Many of Victoria's river catchments did not recover for years after Millennium Drought, study finds, accessed 13 Sept 2022, <https://www.abc.net.au/news/science/2021-05-14/water-catchments-may-not-recover-from-droughts/100131400>

[10] Macedon Ranges Shire Council, 2022, Storm recovery, accessed 13 Sept 2022, <https://www.mrsc.vic.gov.au/Live-Work/Fire-flood-storms/Storm-Recovery>

[11] Dwan P et al, 2021, Epidemic thunderstorm asthma: lessons learned from the storm down-under, accessed 13 Sept. 2022, https://doi.org/10.1016/j.jaip.2020.10.022

[12] Victoria State Emergency Service, 2019, North West (Loddon Mallee) Region emergency response plan, Flood subplan, accessed 13 Sept 2022, <https://www.ses.vic.gov.au/documents/8655930/9002655/North+West+Lodden+Mallee+Region+-+Flood+Emergency+Response+Plan+-+FINAL+AUG+2019.pdf/9813e8dc-c759-f27e-10c8-6d4580afd242?t=1621730786970>.

[13] Infrastructure Victoria, 2019, Loddon Campaspe Regional profile: an analysis of regional strengths and challenges, accessed 13 Sept 2022, <https://www.infrastructurevictoria.com.au/wp-content/uploads/2019/04/Aither-Loddon-Campaspe-Regional-Profile-March-2019.pdf>

[14] Forest Fire Management Victoria, 2022, Past bushfires:a chronology of major bushfires in Victoria from 2013 back to 1851. accessed 13 Sept 2022, <https://www.ffm.vic.gov.au/history-and-incidents/past-bushfires>.

[15] Victorian Department of Health, (n.d), Smoke from fires and public health, accessed 13 Sept 2022, <https://www2.health.vic.gov.au/public-health/environmental-health/climate-weather-and-public-health/bushfires-and-public-health/smoke-from-fires-and-public-health>

[16] Victorian State Government Justice and Community Safety, 2020, Environmental scan report: Loddon Mallee Region, accessed 13 Sept 2022, <https://files.emv.vic.gov.au/2021-05/Environmental%20Scan%20Loddon%20Mallee%20V2.pdf>

[17] Environment Victoria, (n.d.), Victoria, heatwaves & climate change, accessed 13 Sept 2020, <https://environmentvictoria.org.au/our-campaigns/safe-climate/victoria-heatwaves-climate-change>

[18] Bureau of Meteorology, 2019, Regional weather and climate guide, accessed 13 Sept 2022, <http://www.bom.gov.au/climate/climate-guides/guides/012-North-Central-VIC-Climate-Guide.pdf >

[19] Cancer Council Victoria, 2021, Melanoma factsheet, accessed 13 Sept 2022, <https://www.cancervic.org.au/research/vcr/fact-sheets-and-annual-reports/melanoma-factsheet.html#:~:text=How%20common%20is%20melanoma%3F, (Figure%201%20%26%202)> and data requested from Cancer Council Victoria

[20] National Rural Health Alliance, 2021, First national study of farmer suicide rates using coronial data, accessed 13 Sept 2022, <https://www.ruralhealth.org.au/news/first-national-study-farmer-suicide-rates-using-coronial-data>

[21] Parkinson D, Zara C, 2013, The hidden disaster: domestic violence in the aftermath of natural disaster, *Australian Journal of Emergency Management*, vol 28 issue 2, accessed 13 Sept 2022, < https://ajem.infoservices.com.au/items/AJEM-28-02-09>

[22] Parkinson, D, 2015, Women's experience of violence in the aftermath of the Black Saturday bushfires, Thesis DO-10.13140/RG.2.1.4265.9047, accessed 13 Sept 2022, <file:///C:/Users/svlavery/Downloads/Parkinsonfinalthesiswithexaminerschanges642015%20(1).pdf>

[23] Tyler, M & Fairbrother, P, 2013, Gender, masculinity and bushfire: Australia in an international context, Australian Journal of Emergency Management, vol. 28, no. 2, pp. 20-25.

[24] South East Healthy Communities, 2012, The Relationship Between Climate Change and Violence: A Literature Review, accessed 13 Sept 2022, <https://enliven.org.au/wp-content/uploads/2018/06/SEHCP-Climate-Change-and-Violence-Report-2012.pdf>

[25] Doctors for the Environment Australia, 2021, How climate change affects your health: the facts, accessed 13 Sept 2022, <https://www.dea.org.au/wp-content/uploads/2021/08/How-Climate-Change-Affects-Your-Health-August-2021>

[26] Black Dog Institute, 2021, Mental Health Impacts of floods, accessed 13 Sept 2022, <https://www.blackdoginstitute.org.au/wp-content/uploads/2021/03/Mental-Health-Impact-of-Floods.pdf>

[27] Victorian State Government Justice and Community Safety, 2020, Environmental scan report: Loddon Mallee Region, accessed 13 Sept 2022, <https://files.emv.vic.gov.au/2021-05/Environmental%20Scan%20Loddon%20Mallee%20V2.pdf>

[28] Victorian State Government Justice and Community Safety, 2020, Environmental scan report: Loddon Mallee Region, accessed 13 Sept 2022, <https://files.emv.vic.gov.au/2021-05/Environmental%20Scan%20Loddon%20Mallee%20V2.pdf>

[29] Australian Government, Geoscience Australia, (n.d.), ARR Guidelines, accessed 13 Sept 2022, <https://arr.ga.gov.au/arr-guideline>

[30] Victorian State Government Justice and Community Safety, 2020, Environmental scan report: Loddon Mallee Region, accessed 13 Sept 2022, <https://files.emv.vic.gov.au/2021-05/Environmental%20Scan%20Loddon%20Mallee%20V2.pdf>

[31] Zineb Sqalli, Shalini Unnikrishnan, et al., 2021, Why Climate Action Needs a Gender Focus, BCG, accessed 05 Oct 2022, <https://www.bcg.com/publications/2021/climate-action-impact-on-gender-equality

[32] Sustainability Victoria, 2020, Linking climate change and health impacts :research snapshot, accessed 13 Sep2022, <Report-Climate-Change-Linking-climate-change-and-health-impacts-Research-Snapshot-2020.pdf (sustainability.vic.gov.au)>

[33] Alam, Morshed; Sanjayan, Jay; Zou, Patrick X. W.; Stewart, Mark G.; Wilson, John, Modelling the correlation between building energy ratings and heat-related mortality and morbidity, Sustainable Cities and Society, Vol. 22 (Apr 2016), pp. 29-39, 2016:

[34] Sustainability Victoria, 2020, Linking climate change and health impacts :research snapshot, accessed 13 Sept. 2022, <Report-Climate-Change-Linking-climate-change-and-health-impacts-Research-Snapshot-2020.pdf (sustainability.vic.gov.au)>

[35] Victorian Department of Health, 2021, Heat health plan for Victoria, accessed 13 Sept 2022, <https://www.health.vic.gov.au/environmental-health/planning-for-extreme-heat-and-heatwaves>.

[36]Royal Commissions, 2020, Royal Commission into natural disaster arrangements report, accessed 13 Sept 202, <National Natural Disaster Arrangements | Royal Commissions>

[37] Loddon Mallee Emergency Management Planning Committee, 2020, Loddon Mallee Regional emergency management plan, accessed 13 Sept 2022, <https://www.emv.vic.gov.au/responsibilities/emergency-management-planning/remps/loddon-mallee-remp>

[38] Yell S, Duffy M, 2018, Community empowerment and trust: social media use during the Hazelwood mine fire, *Australian Journal of Emergency Management*, April 2018 edition, accessed 13 Sept 2020, <Hazelwood mine fire: community and social media | AJEM Research (aidr.org.au)>

[39] Yell S; Duffy M, 2018, Community empowerment and trust: social media use during the Hazelwood mine fire, Australian Journal of Emergency Management, April 2018 edition, accessed 13 Sept 2020, <Hazelwood mine fire: community and social media | AJEM Research (aidr.org.au)>

[40] Hagan, P; Maguire; B; Bopping, D., 2008, Public behaviour during a pandemic, *Australian Journal of Emergency Management vol 23(3),* accessed 13 Sept 2022, <Hagan, Patrick; Maguire, Brigit; Bopping, Derek --- "Public behaviour during a pandemic" [2008] AUJlEmMgmt 34; (2008) 23(3) Australian Journal of Emergency Management 35 (austlii.edu.au)>

[41] VCOSS, 2021, Adapting the community sector VCOSS feedback on the Health and Human Services Climate Change Adaptation Action Plan, accessed 13 Sept 2022, <https://vcoss.org.au/wp-content/uploads/2021/08/SUB_210806_Adapting-the-community-sector.pdf>.

[42] Royal Commissions, 2020, Royal Commission into natural disaster arrangements report, accessed 13 Sept 2022, <National Natural Disaster Arrangements | Royal Commissions>

[43] VCOSS, 2022, Who's who and what they do? Recovering from emergencies and disasters, accessed 13 Sept 2022, <Whos-who-and-what-do-they-do-recovering-from-emergencies-and-disasters.pdf (vcoss.org.au)>

[44] Black Dog Institute, 2020, Mental Health Interventions Following Disasters , accessed 13 Sept 2022, <mental-health-interventions-following-disasters-black-dog-institute-february-2020.pdf (blackdoginstitute.org.au)>

[45] The Six C's Emergency Management Specialists, accessed 17 Nov 2022, <The Six C's – Emergency Management Specialists (thesixcs.com.au)>

[46] Armstrong F, Cooke S Rissik D, Tonmoy F, 2018, Human health and wellbeing climate change adaptation plan for Queensland, accessed 3 Nov 20222, <Human Health and Wellbeing Climate Change Adaptation Plan for Queensland (www.qld.gov.au)>, Queensland Government

BENDIGO HEALTH

Loddon Mallee Public Health Unit