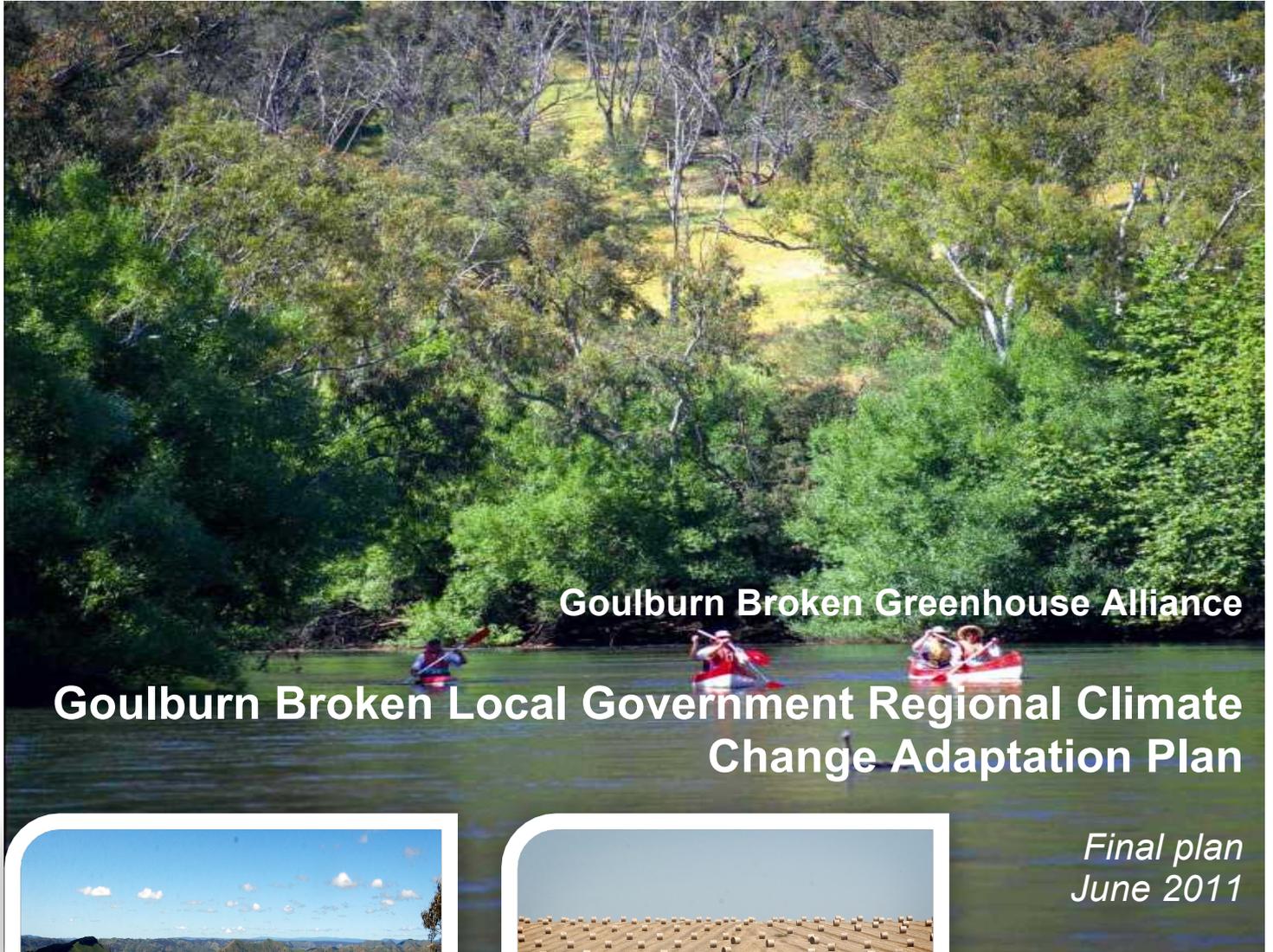


**Victorian Local
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Goulburn Broken Greenhouse Alliance

**Goulburn Broken Local Government Regional Climate
Change Adaptation Plan**

*Final plan
June 2011*



**goulburn broken
greenhouse alliance**



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Executive Summary

The *Goulburn Broken local government regional climate change adaptation plan* describes how the Goulburn Broken Greenhouse Alliance and its member councils can respond to the challenges of climate change across the Goulburn Broken region.

The Goulburn Broken region in northern Victoria is part of the Murray Darling Basin and comprises the shire councils of Mansfield, Mitchell, Moira, Murrindindi and Strathbogie, the Greater Shepparton City Council and the Benalla Rural City Council.

The Goulburn Broken region has a temperate climate, with average temperatures ranging between 7.7°C in winter and 20.1°C in summer and rainfall averaging 774 mm. The future climate in the region is expected to be drier and hotter than it is today. It is expected there will be more hot days and potentially more heatwaves, fewer frosts, a greater incidence of drought and higher intensity of rainfall, and less water available for irrigation.

These climatic changes will affect all aspects of community life and council asset and service delivery in the Goulburn Broken region. The infrastructure that delivers core services such as power, transport, water and communications may be disrupted more often. Community infrastructure (such as pools, sporting grounds, parks and gardens, halls, cemeteries and libraries) may cost more to build, maintain and operate. Habitats of the region's flora and fauna may be modified while developments in floodplains and bushfire prone areas may be at greater risk. The basis of the region's economic sectors and the provision of social services may be challenged.

However, there are many actions local governments can take to adapt their own operations and facilitate adaptation in their economies, communities and environment. As a priority, councils should focus on:

- developing heatwave strategies where they haven't already
- reviewing business continuity plans to ensure they address the risks associated with fire, flood, storm and heatwave events
- establishing priorities for public assets that will be maintained during periods of reduced water availability and high heat
- for those in the Murray-Darling Basin, seeking funding from the *Strengthening Basin Communities* program to investigate alternative water sources for pools and lakes.

The Goulburn Broken Greenhouse Alliance can assist councils in this by:

- advising member councils on the implications of climate change for their plans and strategies as they are developed and reviewed, particularly their environment strategies
- working with the Hume Regional Managers Forum secretariat to identify areas for collaboration and potential sources of funding
- conducting projects that have a regional focus or benefit from a regional approach, subject to availability of external funding.

1 The Goulburn Broken Local Government Regional Climate Change Adaptation Plan

The Goulburn Broken Greenhouse Alliance (the Alliance) was established in 2007, comprises the shire councils of Mansfield, Mitchell, Moira, Murrindindi and Strathbogie, the Greater Shepparton City Council, Benalla Rural City Council and the Goulburn Broken Catchment Management Authority (GBCMA) and is hosted by ResourceGV.

The *Goulburn Broken local government regional climate change adaptation plan* describes how the Alliance and its member councils can respond to the challenges of climate change across the Goulburn Broken region. Given its funding constraints, the primary focus of the Alliance over the next two years will be:

- advising member councils on the implications of climate change for their plans and strategies as they are developed and reviewed, particularly their environment strategies
- working with the Hume Regional Managers Forum secretariat to identify areas for collaboration and potential sources of funding
- conducting projects that have a regional focus or benefit from a regional approach subject to external funding being available.

The plan includes:

- a description of the Goulburn Broken region and the current and projected changes in climate for the region
- the significant risks and actions to adapt to or mitigate the impacts of climate change across the four operational areas of councils:
 - asset management
 - planning and development
 - economic development
 - community development.
- The implementation of the plan.¹

Importantly, due to budget constraints, the plan does not include consideration of:

- the impact of or opportunities created by climate change mitigation policies such as a carbon price
- activities communities or councils can undertake to reduce their greenhouse gas emissions.

The development of the plan has been supported by the Victorian Local Sustainability Accord and overseen by a project steering group comprising representatives of the Alliance and the Department of Sustainability and Environment (DSE) (Appendix 1). There has been a range of input into the plan from across councils in the region via risk assessment and adaptation planning workshops.

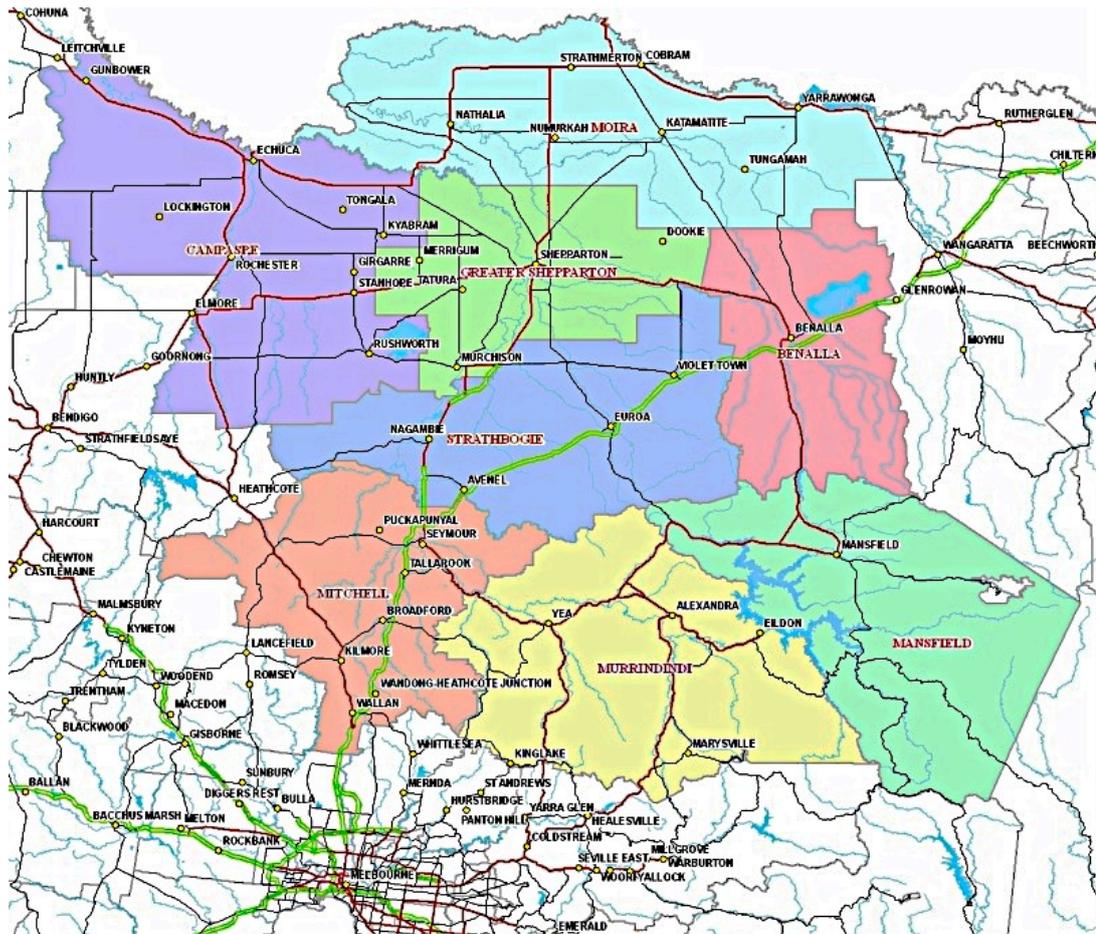
¹ Risks identified as affecting one area of council may require action by another area of council. The implementation section of the plan should be consulted for a complete list of suggested actions for all council areas.

2 Climate change in the Goulburn Broken region

2.1 The Goulburn Broken region

The Goulburn Broken region in northern Victoria is part of the Murray Darling Basin. It covers 10% of the state and is home to 181,000 people. The major cities and towns include Mooroopna, Shepparton, Numurkah, Cobram, Yarrawonga, Benalla, Euroa, Mansfield, Alexandra, Yea, Seymour, Broadford, Kilmore and Wallan (Figure 2-1).

Figure 2-1: Map of the Goulburn Broken region²



The region covers almost 2.5 million hectares and comprises the Yarra, Alpine and Strathbogies ranges in the south and east, the floodplains and wetlands of the Murray River in the north and the catchments of the Goulburn and Broken Rivers. Areas of particular environmental importance include: the Kinglake, Alpine, Lake Eildon and Barmah National Parks, the Ramsar-listed Barmah-Millewa forest, parts of the Mega Murray flagship area and the Upper Goulburn Biolink.

Many regard the region as the food bowl of the Murray Darling Basin. The main primary industries are horticulture, dairy, cropping, viticulture, wool, forestry and grazing of both sheep and cattle. The region also supports a large fruit and vegetable food processing industry centred around Shepparton and Cobram. Tourism, timber and recreation are also

² Campaspe Shire Council is not currently a member of the Goulburn Broken Greenhouse Alliance

vitaly important to the region's economy, particularly in the hills and ranges in the southeast and along the Murray River.

2.2 Climate change in the region

The Goulburn Broken region has a temperate climate, with average temperatures ranging between 7.7°C in winter and 20.1°C in summer and rainfall averaging 774 mm, most of which falls in winter and spring.³ These figures, however, hide significant variations, with summer temperatures known to exceed 45°C and rainfall to exceed 1000mm.

By 2030, average annual temperatures in the Goulburn Broken are projected to be around 0.8°C warmer, with the greatest increases expected in spring and summer. By 2070, average annual temperature is predicted to increase by a further 1.4°C in the Goulburn Broken under a lower emissions scenario. Under a higher emissions scenario, this increase nearly doubles to 2.7°C (DSE 2008).

Meanwhile, rainfall is expected to decline by, on average, 3%, with greatest reductions expected in spring and winter. Under lower and higher emissions scenarios, the greatest reductions in rainfall are likely to occur in spring (DSE 2008).

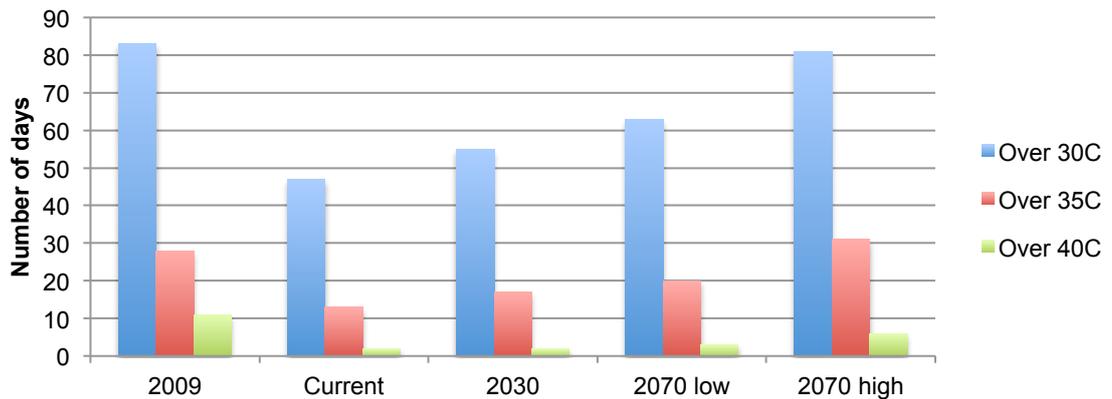
Although average temperature and rainfall can affect the regional distribution of some species and the agricultural crops suited to production in a region, the most significant impacts of climate change are more likely to be felt through changes in the frequency and intensity of extreme events, such as frosts and heatwaves, droughts and floods, and storms and bushfires.

Frosts can cause fruit to be burnt and flowering to be reduced. Currently, Benalla experiences 46 days and Mangalore 39 days where minimum temperatures fall below 2°C. By 2030, this is expected to decline to 35 and 28 days, respectively, and by 2070, to 28 and 21 days for the low emissions scenario and to 17 and 14 days for the high emissions scenario.

Heatwaves (successive hot days) are one of the leading causes of mortality in the developed world. Additionally, hot days can stress livestock, cause lower bud and fruit development and sunburn of fruit. Days above 30°C, 35°C and 40°C are projected to increase (Figure 2-2) with averages for 2070 under the high emissions scenario projected to be similar to those experienced in 2009 in which the region experienced five days in February above 40°C and a hottest day of 44.3°C.

³ A summary of the current climate and projected changes is discussed below. Much of this information is sourced from DSE's 2008 Climate Change in Goulburn Broken report that provides data for two locations: Benalla and Mangalore. This has been supplemented with available Bureau of Meteorology data for Mangalore. References to 'current' and 'average' climate are based on records for the region between 1960 – 1990, determined by the Bureau of Meteorology as being the most appropriate comparator.

Figure 2-2: Number of hot days at Mangalore – current and projected



Source: RMCG analysis of BOM data

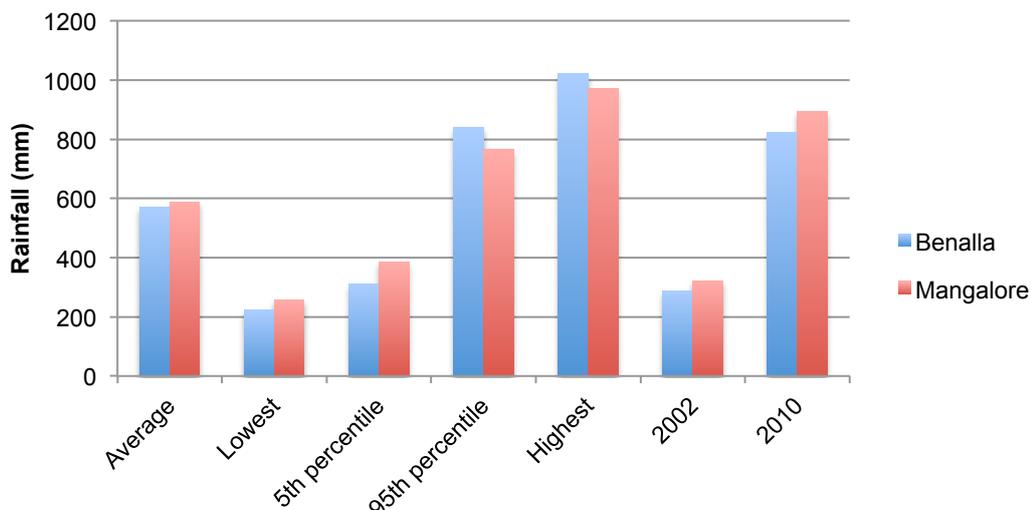
The Goulburn Broken region has, in the past 15 years, experienced the extremes of a prolonged drought and widespread flooding. Between 1997 and 2009, reductions in rainfall of up to 30% from the average were experienced in some parts of the region. Then, in 2010 and early 2011, the region experienced significant rainfall that caused flooding in many towns including Mansfield, Euroa, Benalla and Shepparton and across the northern floodplains.

While droughts reduce agricultural output, reduce flows in rivers and cause ground shrinkage and damage to buildings, intense rainfall causes flooding of houses and shops, livestock losses and crop damage, water logging and erosion of farm land, increased threat of pest and disease incursion and damage to fences.

Importantly, the particularly dry year of 2002 and the particularly wet year of 2010 were not the most extreme this region has experienced in recent times, but instead falling between the lowest and highest for the reference period 1961 – 1990 (Figure 2-3).

By 2030, increases in potential evaporation and reductions in relative humidity are expected to contribute to drier conditions, while fewer rain-days (>1 mm) are projected, increasing the incidence of drought (DSE 2008). By 2070, conditions will become increasingly drier as potential evaporation continues to increase and relative humidity decreases (DSE 2008). Although the intensity of rainfall is expected to rise in most seasons, lower soil moisture may reduce the incidence of flooding.

Figure 2-3: Historical (1961 – 1990) rainfall in the Goulburn Broken compared to 2002 and 2010



Hail and wind cause damage to buildings, including houses and schools, and affect commercial fruit crops by damaging the fruit prior to picking. High winds can also disrupt electricity supply and traffic due to fallen trees. Bushfires similarly damage and, in some cases, destroy buildings and disrupt the supply of most major services.

In February 2009, the southern part of the Goulburn Broken region experienced the worst bushfires on record as a result of high temperatures and wind speeds and extremely low soil moisture and humidity. The Kinglake fire complex killed 159 people and destroyed 1,800 houses and 330,000 hectares of land.

In March 2010, winds of up to 156km/hr and rainfall up to 3mm per minute damaged houses and crops, mainly in the northern part of the region.

With an expected decline in average annual and seasonal total rainfall and reduced soil moisture, the prevalence of bushfires is expected to increase. An increase in the intensity of rainfall indicates there may be more storms, however, changes in wind speeds are expected to be negligible (DSE 2008).

3 Asset Management

3.1 Introduction

The asset management component of the *Goulburn Broken local government regional climate change adaptation plan* focuses on the impact of climate variability and climate change on:

- utilities infrastructure (including sewers, roads, bridges and telecommunications)
- community infrastructure (including libraries, halls, parks, gardens and sporting grounds)
- natural assets.

In most cases, climate change may cause damage to assets, threaten continuity of service provision or result in a rise in maintenance requirements and operating costs.

3.2 Utilities infrastructure

3.2.1 Context

Utilities infrastructure includes major infrastructure used to deliver essential services to the region such as power, roads, transport, water and communications. These services are provided by a range of public and private organisations, including: councils, Goulburn Valley Water, North East Water, Yarra Valley Water, Goulburn-Murray Water, power distributors and retailers, VicRoads, VicTrack and telecommunications companies.

Immediate high priority risks to the region's utilities infrastructure are mostly caused by high and intense rainfall events and floods that:

- inundate assets on the floodplain and in towns where the stormwater capacity is exceeded
- increase the maintenance requirements of roads
- disrupt project delivery of contracted projects
- disrupt the management regime of channels and pipes, interrupting water delivery reliability and efficiency and in turn causing losses amongst enterprises requiring timely water delivery.

Additionally, intense rainfall following a dry period can undermine the structural integrity of bridges.

These risks are particularly concerning in the Cities of Greater Shepparton and Benalla, Seymour and the Shire of Strathbogie given their exposure to flooding and the location of valuable assets on the floodplain.

A range of additional risks are also important and will become increasingly so in a hotter, drier climate. These include the potential for water demand in areas of high population growth to outstrip water supply and, in other areas, conservation measures to reduce water usage to the point that low sewer flows cause treatment costs to rise.

Additionally, a number of impacts experienced in recent years will likely become more frequent. These include:

- storms and fires disturbing telecommunications infrastructure and provision in the region, which in turn affects business continuity
- hot days and heat waves increasing local electricity demand, causing black outs and load sharing
- extreme events disrupting normal council operation causing deferral of work or work out of normal hours.

Many risks to the region's utilities infrastructure are the responsibility of service providers other than councils and most have plans in place to manage these risks. Plans include:

- water supply-demand strategies in which urban water authorities forecast future water demand, accounting for population growth and climate change and plan demand management and system augmentation measures to ensure supply is adequate to meet demand
- electricity distribution system plans in which Powercor and SPAusnet identify infrastructure augmentations to meet predicted demand and improve reliability and load shedding plans in which they identify areas for disconnection in the event of a brown out to protect high risk priority customers such as hospitals
- maintenance schedules in which VicRoads plans roadway management including the removal of dead trees to reduce the risk of blockages following high winds.

Councils' utilities infrastructure responsibilities include stormwater management and the management of roads and their bridges for which they have a range of plans and management tools. These include:

- a common infrastructure design manual to ensure requirements and standards for the design and development of infrastructure are met
- their planning schemes and flood overlays to restrict building and infrastructure development in flood prone areas
- asset management strategies, road management plans (as required under the *Road Management Act 2004*) and maintenance schedules to prioritise areas for stormwater retrofits, road upgrades and strategic road maintenance.

The extent to which these plans and management tools incorporate projections of climate change is unknown.

3.2.2 Actions

No.	Proposed actions	Reason for action
3.1	<p>GBGA develop practical principles for including climate change in stormwater management plans, including:</p> <ul style="list-style-type: none"> ▪ use of the revised Australian Rainfall and Run-off guidelines ▪ use of water sensitive urban design to manage and slow runoff. 	<p>Most councils will need to review their stormwater management plans to incorporate findings from the revision of the Australian Rainfall and Run-Off guidelines. It is appropriate to also consider other climate change impacts on stormwater during these reviews.</p> <p>A process for incorporating these guidelines into existing plans needs to be developed. The GBGA can play a useful role in obtaining funding to develop this process on behalf of all councils, therefore making the revisions easier for councils to implement.</p>
3.2	Councils review their stormwater management plans to incorporate the impacts of climate change.	Using the process developed by the GBGA and the Australian Rainfall and Run-Off guidelines, councils review their stormwater management plans to ensure they account for the projected changes in climate.
3.3	GBGA assess the opportunities to include climate change impacts in the infrastructure design manual and work with relevant local governments when the manual is reviewed.	<p>The Cities of Greater Bendigo and Greater Shepparton and the Shire of Campaspe originally prepared the Infrastructure Design Manual. Since then, many councils have adopted its use. There are substantial benefits in a common infrastructure design manual.</p> <p>The manual aims to ensure minimum design criteria are met in regard to the design and construction of infrastructure for councils. It is unknown to what extent the manual includes consideration of a future climate that will be different to the current climate.</p>
3.4	GBGA investigate the impact of climate change on road maintenance schedules and develop practical principles for including climate change in road management plans and maintenance schedules.	<p>Councils have significant lengths of roads for which maintenance is a significant portion of many councils' budgets. Changes in climate will likely increase the frequency and cost of maintaining these roads, however the extent of this impact is unknown.</p> <p>The GBGA can play a useful role in determining the extent to which climate change will affect road maintenance and develop a straight-forward process for councils to follow to ensure climate change projections are reflected in road management plans and maintenance schedules.</p>
3.5	Councils review their road management plans and maintenance schedules to incorporate the impacts of climate change.	Using the process developed by the GBGA, councils review their road management plans and maintenance schedules to ensure they account for the projected changes in climate.

3.3 Community infrastructure

3.3.1 Context

Community infrastructure covers health and education infrastructure, as well as council owned infrastructure that provides a range of community services: pools, sporting grounds, parks and gardens, halls, cemeteries and libraries.

Climate variability and climate change pose immediate, high priority risks to the infrastructure itself and to the operation of the infrastructure. Buildings may be inundated,

inaccessible and costly to repair if they reside on the floodplain, while high rainfall, storms and heat events can increase the costs associated with the design and construction of community assets, the ongoing operation of these assets and the ongoing maintenance to ensure asset-readiness for extreme events. As with utilities infrastructure, the risks posed by flooding are particularly concerning in the Cities of Greater Shepparton and Benalla, Seymour and the Shire of Strathbogie given their exposure to flooding and the presence of valuable assets on the floodplain.

At the same time, climate variability and climate change can make it increasingly difficult to operate community infrastructure at current levels of service with:

- droughts and the resulting water restrictions making maintaining parks, gardens, sporting grounds and swimming pools at their usual standard of amenity difficult and costly
- heatwaves creating uncomfortable working conditions for pool and outdoor staff, who must continue to operate in hot conditions and usually with more visitors
- power outages, which can result from heatwaves, storms or intense rainfall, creating discomfort in childcare facilities, libraries and galleries and force reliance in backup power generation.

Closure of pools, public buildings and sporting grounds in all councils can affect recreation and leisure activities and events, sporting association competitions and amenity for residents and visitors. The continued operation of pools and libraries are critical given their role as community refuges.

Finally, increased dryness, storm events and floods can increase numbers of falling trees posing risks to the public.

The *Local Government Act 1989* states a function of Council being to

Provide and maintain community infrastructure in the municipal district.

Councils must also abide by other acts when providing and maintaining the community infrastructure include the *Occupational Health and Safety Act 1985*, the *Planning and Environment Act 1987* and the *Disability Discrimination Act 1982*.

Councils use a mixture of plans and strategies to manage risks to community infrastructure and its operation. These include:

- asset management strategies, individual activity plans and maintenance schedules that set out capital works and maintenance programs for all councils' assets
- business continuity plans that set out how service levels will be maintained in extreme events
- sustainable water use plans that analyse councils' water use and identify strategies to reduce it.

These plans respond to climate change to varying extents in different councils. Rather than councils conducting extensive reviews of all the above plans, councils could implement a number of key actions known to conserve water and reduce the impact of heat on community infrastructure where they have not already done so.

3.3.2 Actions

No.	Proposed actions	Reason for action
3.6	Councils renew sports grounds and green spaces with drought-tolerant species and water saving irrigation design.	Green spaces and sporting grounds are important for recreation and community events. During the prolonged drought, several councils found it difficult to maintain these spaces at the amenity level expected by the community. Replacement with drought-tolerant species and water efficient irrigation design will reduce water demand and will increase the number of grounds that can be maintained in times of reduced water availability.
3.7	Councils establish priorities for the public assets that will be maintained during periods of reduced water availability and high heat and engage the community to communicate the resulting different levels of service.	During a prolonged drought or dry period it may be necessary to dry-off some public assets such as pools, gardens, sporting grounds or green spaces. During heatwaves it may be necessary to reduce access to some services such as childcare centres. It is important that this planning be carried out early to ensure adequate community consultation can occur and decisions are taken in a timely manner.
3.8	Councils investigate alternative water sources for pools and lakes and alternative operating arrangements for pools, childcare centres and libraries during periods of high heat.	An alternative to drying off some green spaces or swimming pools could be to access alternative sources of water, while operating arrangements may be necessary to ensure swimming pools and other community refuges can continue to operate in periods of high heat.
3.9	Councils develop and implement a street tree policy that includes replacement with appropriate species over time.	Street trees provide amenity to local residents and visitors alike. However, during dry periods they can drop limbs, risking community safety and require additional council resources to water them. Replacement with appropriate species will reduce their water demand and danger to the community.
3.10	Councils establish shading for picnic areas, playgrounds, childcare centres, kindergartens, aged care facilities, streetscapes and civic spaces.	Out-door shading allows residents to be outdoors but remain cool on hot days. This is essential in places such as childcare centres where children must be allowed outside to play. Storm and wind events should be considered in determining appropriate structures and materials.

3.4 Natural assets

3.4.1 Context

Natural assets include land, waterways, wetlands, native vegetation, habitats and species and can be recreational parkland, waterway frontages, wetlands, areas of agricultural land, a popular fishing area, a park with high cultural or historical significance or a stand of intact native vegetation. The GBCMA, Parks Victoria and DSE manage most of these assets, especially on public land. However, local governments, other organisations (such as VicTrack, VicRoads and Goulburn-Murray Water) and private landholders also manage the region's natural assets.

The immediate, high priority risks to the region's natural assets arise from the effect of changes in the climate on the assets themselves and councils' management of native vegetation and from the community's response to extreme events.

Average changes in temperature and rainfall are likely to modify the habitats in the Goulburn Broken region, increasing the opportunity for weed invasion, decreasing connectivity and contributing to decline in ecological quality, in turn leading to loss of biodiversity, soil erosion, runoff and reduced regional ecosystem services (e.g. carbon cycling, land productivity, air and water quality). At the same time, low, high and unseasonal flooding and flow regimes may reduce the water quality and hence biodiversity of the region's wetlands and waterways.

Changes in rainfall can affect councils' ability to improve native vegetation with unseasonal rain events increasing environmental and noxious weed invasion and abundance and therefore management, and dry conditions and heatwaves requiring more staff resources to establish and maintain environmental plantings.

Finally, fire and flood recovery efforts have in some cases included removal of native vegetation, which results in greater damage and fragmentation of habitat reducing biodiversity and its associated ecological functions.

Parties involved in the protection of natural assets in the Goulburn Broken region include:

- GBCMA – is a statutory authority established by the Victorian Government and has a lead role in working with community and Government to enhance land, water and biodiversity across all land tenure.
- DSE⁴ – holds this responsibility on state-owned land and is Victoria's lead government department for sustainable management of land, water and biodiversity resources.
- Department of Primary Industries (DPI) – has responsibility for biosecurity including pest plant and animal planning and control.

Of particular importance to the impact of climate change on natural assets, the Federal Government's *Caring for Our Country* program and the Victorian Government's *Victorian Investment Framework* allocate significant funds to the protection and restoration of the State's flagship areas and biolinks.

Under the *Planning and Environment Act 1987*, councils must undertake strategic and land use planning that includes planning for sustainability in nature conservation and monitoring and enforcement of all vegetation clearance. Additionally, a recent review of the *Catchment and Land Protection Act 1994* suggests local governments also have responsibility for invasive plants and animal control on local roadsides. This interpretation is currently being reviewed by DPI to ensure that consistent and appropriate roadside management occurs across the state.

Where they want to, councils can further assist in protecting the region's natural assets (particularly on roadsides) by:

- conducting sensitive rural road drainage design and maintenance practice
- educating the community about ways to minimise degradation and enhance asset value

⁴ The White Paper for Land and Biodiversity, *Securing our Natural Future*, is the most recent Victorian Government policy on natural resource management (State of Victoria 2009).
<http://www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/9DB1809566C926A1CA25767E001128C7A87712F40FADECFFCA25767300162346>

- encouraging community-based programs undertaking land protection works e.g. through Landcare
- providing incentives for private landholders to conserve native vegetation, e.g. through rate rebate schemes.

3.4.2 Actions

No.	Proposed actions	Reason for action
3.11	<p>GBGA source information on the likely spread of weeds into the Goulburn Broken region as the climate changes and develop training programs for weed-spotters for potential incursions.</p>	<p>Weed management responsibilities have long been an issue for the many organisations involved in natural resource management in the region. Clarifying this would be difficult and time-consuming. A more practical approach would be to use existing DSE and DPI information to identify the likely spread of new weeds and use existing community weed management to identify, remove and report weed incursions as they occur.</p> <p>The GBGA can work with the GBCMA to conduct this research and training on behalf of councils.</p>
3.12	<p>Councils actively support private land conservation through:</p> <ul style="list-style-type: none"> ▪ provision of incentives and rebates for conservation covenants ▪ participation in cross tenure landscape programs ▪ investment in identified conservation priority areas ▪ ensuring compliance with native vegetation retention controls. 	<p>The GBCMA and others encourage landholders to conserve native vegetation and habitats through a range of mechanisms that can be complemented by council programs.</p>
3.13	<p>GBGA identify ways in which councils or the Alliance can foster conservation of the region's biolinks, including potentially through:</p> <ul style="list-style-type: none"> ▪ advocacy ▪ encouraging local action based on broader, established strategies and priorities e.g. Goulburn Broken Biodiversity Strategy. ▪ inclusion in council policy, plans and strategies (in particular, roadside management plans) ▪ seeking investment for biolinks programs. 	<p>Biolinks present an opportunity to build natural resilience and resistance, address loss of ecological function and for species to adapt to threatening processes associated with climate change.</p> <p>Investment in biolinks increases natural carbon sequestration. Biolink conservation improves landscape attractiveness and liveability.</p> <p>The GBGA can play a useful role in identifying ways that councils can foster biolinks conservation and where regional coordination would be valuable.</p>
3.14	<p>GBGA investigate and communicate to councils the benefits of providing rate rebates on covenanted land.</p>	<p>Some councils in the Goulburn Broken region currently provide, or are considering providing, rate rebates to landholders with covenants on their land. Evidence of the efficacy of rebates in conserving natural assets on private land would support a case for councils to continue or implement such a program.</p>

4 Planning & Development

4.1 Context

The planning and development component of the *Goulburn Broken local government regional climate change adaptation plan* focuses on the impact of climate variability and climate change on private assets.

The immediate, high priority risks to private buildings (including shops and houses) and other assets (including fences and farm infrastructure) are primarily as a result of development on the floodplain, in areas of insufficient stormwater drainage capacity and in bushfire zones. As demonstrated during the 2009 bushfires and 2010/11 floods, such development can pose risks to community safety and cause damage to private assets.

These risks require prevention in the form of restricting development in these areas. However, such an approach has caused political discontent in some communities, particularly those that face development pressure due to their proximity to Melbourne.

Under Section 6(e) of the *Planning and Environment Act 1987*, councils have responsibility for 'regulat[ing] or prohibit[ing] any use or development in hazardous areas, or areas likely to become hazardous'. Councils control development through a range of planning instruments including planning schemes, Local Planning Policy Frameworks and Municipal Strategic Statements.

The 2009 *Victorian Bushfire Royal Commission* investigated the causes and responses to the bushfires in Victoria in January and February 2009 and proposed changes to the Victorian Planning Provisions 'to ensure development does not occur in areas in which the bushfire risk or environmental cost of making people safe is too high' (VBRC 2010). The Royal Commission made a number of detailed recommendations to achieve this, of which the Victorian Government has accepted all those relating to councils' areas of responsibilities. The implementation of these recommendations by council should significantly reduce development in bushfire prone areas and reduce the risks to existing development.

No similar, in-depth understanding exists regarding preparedness for floods, although the two inquiries announced following the 2010/11 floods (reviewing the flood mitigation, infrastructure management, warnings and response) may examine these issues.

Given the high priority risks to private assets are being addressed through existing processes, the most useful role for councils would be to communicate to the community about the need for changes in response to climate change projections.

4.2 Actions

No.	Proposed actions	Reason for action
4.1	Councils communicate with the community about the need for development and policy changes in response to climate change impacts.	Changes to council policies and development plans will be required to reduce the risks posed by floods, fires and storms. Communication of the need for the changes may avoid this creating community angst.

It is also worth noting that the planning and development areas of councils have an important role to play in addressing risks to the natural asset management and community development areas of council. These include:

- actively supporting private land conservation (action 3.12)
- assisting the GBGA to identify ways to foster conservation of the region's biolinks (action 3.13)
- assisting the GBGA to develop and implement an education campaign to encourage the incorporation of sustainable design principles into new and renovated building designs (action 6.8).

5 Economic development

5.1 Context

The economic development component of the *Goulburn Broken local government regional climate change adaptation plan* focuses on the impact of climate variability and climate change on the productivity and viability of the region's economic sectors, the attractiveness of the region to investors and the potential reduction in tourism.

A change to a hotter and drier climate – higher average temperatures, reduced average rainfall and increased evaporation – will likely result in lower agricultural output from the region's dryland areas. It will also likely result in lower inflows to rivers and water storages which, coupled with a number of government policies aimed at restoring environmental flows to the stressed rivers of the Murray Darling Basin, will almost certainly result in less water being available for consumptive uses and irrigation, thereby constraining growth in irrigated agricultural output.

Lower agricultural output has ramifications for employment and regional economic activity with modelling for the Shepparton region showing a 13% reduction in irrigated agricultural production resulting in a fall in regional output of \$287 million, in employment of approximately 1,700 and in population of approximately 4,000 compared to a without climate change scenario.

These risks are particularly important for the Shire of Moira given its reliance on agriculture as a major employer in the municipality.

Tourism also plays an important role in most Goulburn Broken councils' economies and particularly that of the Shire of Mansfield. Droughts have resulted in dry lakes and reduced snow cover and in the future have the potential to reduce biodiversity. This affects the region's tourism product offerings.

Additionally, extreme events have the potential to disrupt major tourism events and reduce the perceived accessibility of a region's tourism assets. The latter issue was particularly evident following the 2009 bushfires and the 2010/11 floods, with news reports creating the impression that the entire region was not accessible.

As with tourism visitation, droughts and extreme events may affect the attractiveness of the Goulburn Broken region to investors and skilled labour. This potentially reduces investment in the region and the productivity of the region. Additionally, there is a concern that regulatory requirements, introduced to reduce the impacts of extreme events, will decrease investment opportunities and discourage investment in the region.

These risks are less prevalent in the Shire of Murrindindi. Being closer to Melbourne, it is less reliant on tourism and agriculture and can attract skilled workers relatively easily.

Councils have municipal emergency management plans to better prepare and hasten their response to and recovery from extreme events and try to communicate to would-be tourists as early and clearly as possible about areas that can and can't be visited. Some also work with their businesses to diversify their tourism product offerings and to maintain their access to council and state-owned land.

To attract investment and skilled employees, councils employ incentives and grants through their economic development plans as well as conducting projects to encourage diversification within and beyond their agricultural industries.

Despite this, maintaining economic viability in the face of drought, bushfires and floods has been difficult in recent years. A regional approach to tourism and learning from each other's successes in assisting their businesses diversify should assist communities to adapt further.

5.2 Actions

No.	Proposed actions	Reason for action
5.1	GBGA assess to what extent communication of recovery from extreme events is included in local tourism strategies and, if necessary, develop a program to encourage tourism bodies do so.	Tourism is important to many of the shires in the region. Extreme events can discourage tourists from visiting a region, although the entirety of the region may not be affected. Several shires would benefit from clearer communication to tourists about areas that can be visited and not.
5.2	Councils support existing businesses to diversify, including identifying off-season or alternate climate tourism products and alternative agricultural products and facilitating access to the required areas or approvals.	Tourism businesses that have a diversity of product offerings across different seasons and different climate conditions (dry, wet, hot, cold) will be more resilient when climate conditions prevent access to areas or natural assets. Similarly, agricultural businesses that have diverse means of production or produce goods adapted to a hotter, drier climate will be more resilient in the face of varying climatic conditions and reductions in irrigation water availability. Councils can assist businesses to consider alternative offerings and means of production and facilitate the approvals required.
5.3	Councils reconsider timing of major events to reduce the potential for disruption and develop robust contingency plans.	Major events are a key tourism attraction in many regions, so their disruption can mean the loss of an important income stream for the year. Although many events have contingency plans, these are often not robust and are implemented at the last minute. Better timing of events, if possible, may reduce their likelihood of disruption while good contingency planning and communication of this to tourists will reduce the disruption caused should adverse weather be experienced.
5.4	Councils advocate for continued investment in research, development and extension of agricultural technologies.	Research, development and extension are key drivers to agricultural productivity success and will be critical to continued productivity gains as climate change affects agricultural production. The region should advocate for R, D&E of particular significance to the region, such as in the dairy and fruit sectors.

6 Community development

6.1 Context

The community development component of the *Goulburn Broken local government regional climate change adaptation plan* focuses on the impact of climate variability and climate change on the provision of social services and the wellbeing of the community as a whole.

Extreme weather events, including floods and fire, can interrupt the provision of outreach social services including meals on wheels, mental health case management and home nursing and healthcare services. In extreme cases, access may be interrupted for several days, resulting in an inability of those relying on the services to function. This has particularly been the case in the Shire of Murrindindi where the topography of the shire limits access to social services.

Extreme weather events can interrupt a community's access to public assets such as swimming pools. As these assets provide opportunities for social interaction and community gathering, disruptions in their provision can cause fragmentation and dislocation of the community.

Recent experience has shown how drought, alone and in combination with other extreme events, can cause mental health issues and suicide amongst the farming community. Over time, the cumulative affect of drought has also been found to weaken a community's resilience to stress, causing a manifestation of social issues.

Finally, should the frequency of extreme events increase in the future, demands on volunteers will become more common, reducing community members willingness to volunteer. This has already occurred in the Shire of Mitchell as a result of the bushfires in 2009.

Councils have a range of plans and measures to reduce the impact of extreme events on the community. These include:

- municipal health and wellbeing plans, as required under the *Public Health and Wellbeing Act 2008*, that identify strategies to enable the local community to achieve maximum health and wellbeing
- business continuity plans, risk registers and disaster recover plans, as required under the *Local Government Act 1989*, to ensure their services continue in the event of a major disruption
- municipal emergency management plans, as required under the *Emergency Management Act 1986*, that identify and document the multi-agency arrangements in place for the prevention of, response to and recovery from emergencies
- heatwave strategies, recently funded by the Department of Human Services (DHS), that set out a process for stakeholders to follow when a local heatwave alert is issued by the Bureau of Meteorology and DHS. These often include identifying vulnerable population groups and maintaining a vulnerable persons register.

In its 2010 audit *Business continuity management in local government*, the Victorian Auditor-General concluded that 'the business continuity plans examined are unlikely to prove

effective in the event of a significant disruption to council services [and] ... while events that can cause a major disruption are rare, should they occur, there is little assurance councils' responses will be timely and effective' (VAGO, 2010). Additionally, not all councils have heatwave strategies.

In addition to preparing for and responding to extreme events as they happen, councils can also play a role in pre-emptively reducing their impact through encouraging the incorporation of environmentally sustainable design principles into residences, thus improving their performance in a heatwave.

6.2 Actions

No.	Proposed actions	Reason for action
6.1	Councils review business continuity plans to ensure they address the risks associated with flood, fire, storm and heatwave events.	Business Continuity Plans plan to ensure long-term survivability and reinstatement of services following a disruptive event such as severe climatic events. These plans are periodically reviewed and could take into account risks associated with climate change.
6.2	Councils engage social service providers in preparing clients for emergencies.	Many social services providers already prepare their clients for managing in the event of an emergency. Personalised management plans that can be drawn on during the emergency could be established.
6.3	Councils undertake a community education program to increase the understanding of, planning for and services available in the event of an emergency.	Many communities do not understand the services available to them in the event of an emergency until the emergency occurs. Increasing this understanding before the event will make for more timely responses.
6.4	Councils institute post-events reviews to improve preparation, response and recovery to emergencies.	Reviews of emergencies such as floods and fires can provide significant lessons to ensure future emergencies are dealt with more effectively.
6.5	Councils provide information to the farming community regarding assistance with mental health issues and establish peer-support groups.	Many members of the farming community do not interact on a regular basis with the social services provided by government and non-government organisations. To ensure this does not present a barrier to farmers seeking help, familiarising them with the services available and how to access these services.
6.6	GBGA investigate ways to enable and promote appropriate programs that address mental health issues and boost community resilience to climate change impacts.	Regions throughout Victoria have developed health service plans over the past year, while the Victorian Government has committed to developing a rural and regional health services plan soon. To ensure the region is well equipped to provide an evidence base for increased mental health provision, investigation of the current services, impacts of climate change and the gaps would be beneficial. Peer support has been proven to be effective in providing regional people (men, in particular) with a non-threatening environment in which health and wellbeing issues can be discussed. Successful examples should be investigated and funding sought to expand them.

No.	Proposed actions	Reason for action
6.7	<p>Councils develop heatwave strategies, where they haven't already, including:</p> <ul style="list-style-type: none"> ▪ establishing processes for checking on vulnerable residents during heatwaves. 	<p>Council heatwave strategies help reduce illness and death in the community as a result of heatwaves by providing information to the community, improving council and other agencies response in the event of a heatwave and reducing the factors that contribute to mortality from heatwaves.</p> <p>For those councils that do not have such a strategy, developing one is a first critical step in better preparation for current heatwaves and for their expected increase in the future.</p>
6.8	<p>GBGA develop and implement an education campaign to encourage the incorporation of sustainable design principles into new and renovated building designs.</p>	<p>The Building Code of Australia includes a number of measures that houses can achieve a certain level of energy efficiency. In addition to this, encouraging developers and home owners to build and renovate houses to a higher energy rating would greatly increase the comfort of dwellings during hot periods.</p>

7 Strategy implementation and renewal

7.1 Introduction

The *Goulburn Broken local government regional climate change adaptation plan* considered a broad scope of risks posed by climate variability and climate change to the Goulburn Broken region. The focus in developing adaptation actions to address these risks has been on areas for which councils are responsible. There are three further considerations in developing these actions:

- the organisation best placed to implement the proposed actions – whether that be the Alliance, its member councils or an individual council
- the timeframe for implementation
- integration with the Hume Regional Plan.

These are discussed below, followed by an implementation schedule and arrangements for plan renewal.

7.2 Responsibilities and timeframes

The objective of the *Goulburn Broken local government regional climate change adaptation plan* was to develop prioritised actions for the Alliance to consider in developing its strategic plan and for member councils to consider in the development of their environmental strategies.

The Alliance's strategic plan will identify how the Alliance will fulfil its role of:

- facilitating the development of partnerships to avoid duplication of effort and share resources and information
- identifying and coordinating regional programs and projects
- increasing the community's awareness of climate change impacts and adaptation, and greenhouse gas emissions and personal mitigation actions
- facilitating the sharing of information and resources amongst Alliance members and with other regions.

Therefore, the Alliance is considered best placed to implement those actions that benefit many councils or address risks many councils face. It is also considered most appropriate where there is benefit from a regional approach, such as in advocacy on a regional issue.

Councils in the region are either in the process of or about to begin developing or updating their environment strategies. These strategies are an important part of a council's planning for improved environmental management and sustainability. They identify how councils will deliver the commitments in their Council Plans, guide investment in areas of highest need and build on previous work by council and the community to protect and enhance the local environment.

Climate variability and climate change is an integral part of any environmental management strategy, with its links to waste management, resource use and natural environment management.

Councils are considered best placed to implement actions that rely on or utilise established relationships (such as the relationship between a council and its community or between councils and the service providers that operate in their municipality) and where risks are specific to their municipality.

However, it is important to note that the council actions proposed in this plan are suggestions for consideration. The priorities of the councils within the region will differ depending on their particular circumstances and actions will need to be assessed during the development of each council's environment strategy. As such, the Alliance will play an important role in advising councils, during the development of their environmental management strategies and other plans, of the impacts of climate change for their municipality and the potential actions they can take to address these impacts, either alone or in conjunction with other councils.

No.	Proposed actions	Reason for action
7.1	GBGA advise councils in the development of their plans and strategies, particularly the environmental management strategies, of the findings of this climate change impact analysis.	Councils in the Alliance are currently developing Environmental Management Strategies that this plan will feed into. The GBGA can play a useful role in advising councils of the impacts of climate change for their various plans and strategies and measures to address this as these are developed or reviewed.
7.2	GBGA identify potential areas for regional collaboration following the completion of each councils' environmental management strategy and facilitate coordination between councils.	Once environmental management strategies are complete, there may be further opportunities for the councils to collaborate on regional issues. GBGA should review the strategies to identify these areas for coordination.

The appropriate timeframe and priority for implementation of adaptation actions should take account of:

- the priority of the risk the action is addressing
- the availability of funding (whether through council business plans or external support from the State or Federal Governments)
- the level of difficulty in implementing the action, including whether it has community acceptance, the size and complexity of the task and the presence of barriers
- the ability of the action to address issues beyond climate change
- the timeframe required for implementation and efficacy
- the cost of the action relative to its forecast benefits.

As the Alliance has two years of funding from its members for staff resourcing only, it is important that it access appropriate external funding streams for projects and quickly demonstrate its value to members. Therefore, for the Alliance, actions that can successfully access external funding and are valuable to members should receive priority.

For councils, who are early in the process of incorporating climate change information into their operations, priority should be given to those actions that are either easy to implement,

are low cost and have benefits beyond climate change adaptation or those actions that address extreme risks. In both cases, such actions are classified as “immediate”.

Beyond these immediate actions, other actions can be incorporated into existing processes for reviewing council documents. These are classified “ongoing”. A final category are those that can be implemented progressively over the near to medium future (three to five years). This includes those actions where decisions made and taken now will affect outcomes in the long-term.

7.3 Integration with the Hume Regional Plan

Climate change, water resources and economic development are key directions in the Hume Regional Plan. The information gathered during the development of this plan may prove a useful input to actions identified in the Hume Regional Plan, including:

- developing a comprehensive and integrated Regional Climate Change Strategy, consistent with Victoria’s Climate Change White Paper, detailing reduction of greenhouse gas emissions, climate change adaptations and opportunities for green industry development (1.1.1).
- undertaking a social, environmental and economic impact assessment for the consequences of a changed Hume Region climate (action 1.1.2).
- investigating the transferability of climate change adaptation research projects occurring within the region (action 1.1.7).
- developing an assessment tool that actions potential impacts and risks to environmental and agricultural assets as a result of climate change (action 1.5.3).
- investigating the information required to improve integration of climate change considerations in regional and local planning (action 1.5.4).

Additionally, some actions in this strategy have a great deal of overlap with those identified in the Hume Regional Plan. These have been noted in the implementation schedule below.

Finally, at a regional level, the plan states a desire to:

- support local government to form partnerships with government, community groups and greenhouse alliances to deliver climate change mitigation and adaptation initiatives that are practical and community based
- promote innovative and collaborative approaches to environmental sustainability and climate change through support for local government programs and initiatives.

The Alliance should present this plan to the Hume Regional Managers Forum and seek their support in any funding applications for the regional projects.

No.	Proposed actions	Reason for action
7.3	GBGA present the <i>Goulburn Broken local government regional climate change adaptation plan</i> to the Hume Regional Managers Forum and identify areas of common projects.	There are a number of areas of overlap between the Hume Regional Plan and this plan. The GBGA should present this plan to the Hume Regional Managers Forum and work with the secretariat to identify areas for collaboration.

7.4 Implementation schedule

7.4.1 Alliance actions

No.	Proposed actions	Potential partners	Lead area within council (& potential collaborators)	Hume Regional Plan ref.
<i>Immediate (<2 years)</i>				
7.1	GBGA advise councils in the development of their plans and strategies, particularly the environmental management strategies, of the findings of this climate change impact analysis.			
7.2	GBGA identify potential areas for regional collaboration following the completion of each councils' environmental management strategy and facilitate coordination between councils.	GBCMA All councils	Environment	
7.3	GBGA present the <i>Goulburn Broken local government regional climate change adaptation plan</i> to the Hume Regional Managers Forum and identify areas of common projects.			1.1GV1
<i>Subject to external funding</i>				
3.1	GBGA develop practical principles for including climate change in stormwater management plans, including: <ul style="list-style-type: none"> ▪ use of the revised Australian Rainfall and Run-off guidelines ▪ use of water sensitive urban design to manage and slow runoff. 	DSE Urban water authorities All councils	Asset management	
3.3	GBGA assess the opportunities to include climate change impacts in the infrastructure design manual and work with relevant local governments when the manual is reviewed.	DSE Urban water authorities Greater Shepparton City Council	Asset management	
3.4	GBGA investigate the impact of climate change on road maintenance schedules and develop practical principles for including climate change in road management plans and maintenance schedules.	All councils	Asset management	
3.11	GBGA source information on the likely spread of weeds into the Goulburn Broken region as the climate changes and develop training programs for weed-spotters for potential incursions.	DPI GBCMA All councils	Asset management	3.3.4

No.	Proposed actions	Potential partners	Lead area within council (& potential collaborators)	Hume Regional Plan ref.
3.13	GBGA identify ways in which councils or the Alliance can foster conservation of the region's biolinks, including potentially through: <ul style="list-style-type: none"> ▪ advocacy ▪ encouraging local action based on broader, established strategies and priorities e.g. Goulburn Broken Biodiversity Strategy ▪ inclusion in Council policy, plans and strategies (in particular, roadside management plans) ▪ seeking investment for biolinks programs 	DSE GBCMA DPCD	Environment (Planning & development)	3.1.3 3.2.2 – 5 3.4.1 – 3
3.14	GBGA investigate and communicate to councils the benefits of providing rate rebates on covenanted land.	GBCMA	Environment	3.4.1
5.1	GBGA assess to what extent communication of recovery from extreme events is included in local tourism strategies and, if necessary, develop a program to encourage tourism bodies do so.	Tourism Victoria Parks Victoria Goulburn River Valley Tourism Board	Economic development	11.1.2 – 3
6.6	GBGA investigate ways to enable and promote appropriate programs that address mental health issues and boost community resilience to climate change impacts.	DHS DPCD Mental health service providers	Community services	7.1.4
6.8	GBGA develop and implement an education campaign to encourage the incorporation of sustainable design principles into new and renovated building designs.	DPCD	Planning & development	1.1.5 2.2.1

7.4.2 Individual council actions

No.	Proposed actions	Lead area within council (& potential collaborators)	Potential partners	Hume Regional Plan ref.
<i>Immediate (1 – 2 years)</i>				
3.7	Councils establish priorities for the public assets that will be maintained during periods of reduced water availability and high heat and engage the community to communicate the resulting different levels of service.	Asset management (Community development & Economic development)	Urban water authorities DPCD	2.1.4

No.	Proposed actions	Lead area within council (& potential collaborators)	Potential partners	Hume Regional Plan ref.
3.8	Councils investigate alternative water sources for pools and lakes and alternative operating arrangements for pools, childcare centres and libraries during periods of high heat.		Urban water authorities DHS	2.1.4
6.1	Councils review business continuity plans to ensure they address the risks associated with flood, fire, storm and heatwave events.	Corporate		
6.4	Councils institute post-events reviews to improve preparation, response and recovery to emergencies.	Emergency management	CFA SES DSE	
6.7	Councils develop heatwave strategies, where they haven't already, including: <ul style="list-style-type: none"> ▪ establishing processes for checking on vulnerable residents during extreme weather conditions. 	Community services (Emergency management)	CFA SES DHS	
<i>Ongoing</i>				
3.6	Councils renew sports grounds and green spaces with drought-tolerant species and water saving irrigation design.	Asset management	Urban water authorities	2.1.4
3.12	Councils actively support private land conservation through: <ul style="list-style-type: none"> ▪ provision of incentives and rebates for conservation covenants ▪ participation in cross tenure landscape programs ▪ investment in identified conservation priority areas. Ensuring compliance with native vegetation retention controls.	Planning & development	DSE GBCMA	3.2.2 – 5
5.2	Councils support existing businesses to diversify, including identifying off-season or alternate climate tourism products and alternative agricultural products and facilitating access to the required areas or approvals.	Economic development	Tourism Victoria Parks Victoria DPI RDV	10.1.6 – 7 11.1.4
5.4	Councils advocate for continued investment in research, development and extension of agricultural technologies.	Economic development	DPI RDV	
6.5	Councils provide information to the farming community regarding assistance with mental health issues and establish peer-support groups.	Community services (Economic development)	Mental health service providers DHS	
<i>Medium term (3 – 5 years)</i>				
3.2	Councils review their stormwater management plans to incorporate the impacts of climate change.	Asset management	GVW GBGA	

No.	Proposed actions	Lead area within council (& potential collaborators)	Potential partners	Hume Regional Plan ref.
3.5	Councils review their road management plans and maintenance schedules to incorporate the impacts of climate change.	Asset management	GBGA VicRoads	
3.9	Councils develop and implement a street tree policy that includes replacement with appropriate species over time.	Asset management		
3.10	Councils establish shading for picnic areas, playgrounds, childcare centres, kindergartens, aged care facilities, streetscapes and civic spaces.	Asset management (Community development)		
4.1	Councils communicate with the community about the need for development and policy changes in response to climate change impacts.	Communications (Planning & development)		
5.3	Councils reconsider timing of major events to reduce the potential for disruption and develop robust contingency plans.	Economic development	Tourism Victoria	
6.2	Councils engage social service providers in preparing clients for emergencies.	Community development	DHS CFA SES	
6.3	Councils undertake a community education program to increase the understanding of, planning for and services available in the event of an emergency.	Emergency management	CFA SES	

7.5 Renewal

Information on the projected impacts of climate change is regularly updated and new, more localised information is progressively being developed. To remain relevant and to ensure the categorisation of risks and actions is accurate, it will be important to regularly review the strategy and to undertake periodic renewal of the strategy. A period of three years would ensure new CSIRO and Bureau of Meteorology localised projections based on the 2013 IPCC update could be captured and sufficient implementation of this plan will have generated lessons to learn from.

References

DSE (2008). *Climate change in Goulburn Broken*. State of Victoria.

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Appendix 1: Project Steering Group

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