bega valley shire council

Bega Valley Shire
Climate Resilience Strategy

2050

Acknowledgment

The Bega Valley Shire Council acknowledges the traditional custodians of the lands and waters of the Shire, the people of the Yuin nations, and shows our respect to elders past, present and emerging.

Executive summary

The climate of the Bega Valley Shire is expected to become hotter and rainfall more erratic. We can expect increases in the number of fire days and severe storms; reductions in the capacity of soil and vegetation to retain moisture: as well as increases in mean sea level and ocean acidity. Our towns, villages, key infrastructure, agricultural and tourism-based industries and our health and wellbeing all have varying degrees of vulnerability to these climate changes impacts. Our natural systems underpin all aspects of our lives and are important to our wellbeing. If well managed, they also have the capacity to support our community to mitigate and adapt to our changing climate.

Bega Valley Shire Council has formally recognised that we are facing a climate emergency and has resolved to increase its focus on mitigating and adapting to the impacts of climate change. This includes a net zero emissions target by 2050 and an interim 100% renewable electricity target by 2030. This Bega Valley Shire Climate Resilience Strategy 2050 aims to ensure that our community, environment and economy are robust and able to respond to the key challenges that climate change presents.

A resilience approach builds on the strong foundations for our Shire. A resilient Bega Valley Shire is prepared for shocks and stressors, be they financial, environmental, social or political. It enables us to come together to respond to adversity and to recover by building back an even better place to live, work and play.

Our resolve and resilience as a community have been tested over recent months, through the Black Summer bushfires, the fire-quenching floods that followed and a global pandemic that has fundamentally changed our way of life. Many of the vulnerabilities identified in this Strategy, such as the length of our bushland/ urban interface, our reliance on external food and commodities and the exposure of our aquaculture industry to water quality impacts, were exposed during these events. Also revealed was the strength of our spirit, our ingenuity, and our sheer determination to do what was needed to keep our community safe.

Bega Valley Shire Council recognises the need to continue to work together to reduce our vulnerability to these unforeseen and unprecedented events. The benefits of building resilience will far outweigh the benefits of inaction, both in reducing the impacts of disasters when they occur and the co-benefits of building economic, social and ecological capital.

This Strategy aligns with the policy direction of Australian and NSW governments, and is arranged into seven Key Response Areas:

1. Natural systems
2. Preparing for natural hazards
3. Liveable and connected places
4. Safe, health and inclusive community
5. Diverse and thriving economy
6. Energy security
7. Food security

For each of these areas, relevant vulnerabilities, challenges and benefits, existing programs, and mitigation and adaptation actions are described, as well as performance measures and targets (Table 1).

Enhancing resilience to the impacts of a changing climate is the responsibility of all of us, and we are not starting from scratch. There has been an extensive body of work already undertaken to respond to climate change across the Shire and we hold a powerful resource in the knowledge and skills of local people.

Bega Valley Shire Council recognises the strong commitment within the Bega Valley to take action on climate change and is thankful for the extensive input provided to develop this Strategy. Let's take the next steps together to a more resilient Bega Valley Shire.

Table 1: *Key Response Areas Performance Measures and Targets*

Key Response Areas	Performance Measures and Targets by 2050
Natural Systems	• Increase in area of wetland protected • Increase in estuarine health • Increase in area of endangered ecological communities protected • Increase in condition of riparian corridors • Increase in average annual stream flow volumes as measured at Morans Crossing, Kanoona and Angledale
Preparing for Natural Hazards	• Increase in area of rehabilitated dunes • Increase in number of dwellings designed to withstand natural disasters • Reduction in annual average insured losses
Liveable and Connected Places	• Increase in population living within 800 metres of the centres of our major towns • Increase in use of active transport • Reduction in waste to landfill
Safe, Healthy and Inclusive Community	• Reduction in heat related morbidity and mortality • Increase in volunteer hours • Improvement in average SEIFA relative socio-economic advantage and disadvantage index
Diverse and Thriving Economy	• Increase in area of existing rural land being actively farmed for food and fibre production • Increase in catchment storage capacity across the Bega, Brogo, Murrah, Bermagui, Towamba River and Narira Creek Basins • Increase in the value of visitor economy • Increase in electric vehicle registration • Reduction in per pallet freight relative cost • Increase in aquaculture production • Increase in value of timber production
Energy Security	• Reduction in cost of household energy • Net zero emissions (with interim target of 100% renewable electricity by 2030)
Food Security	• Increase in locally produced food • Increase in area of land zoned for small lot agriculture

Note: all targets measured from a 2020 baseline

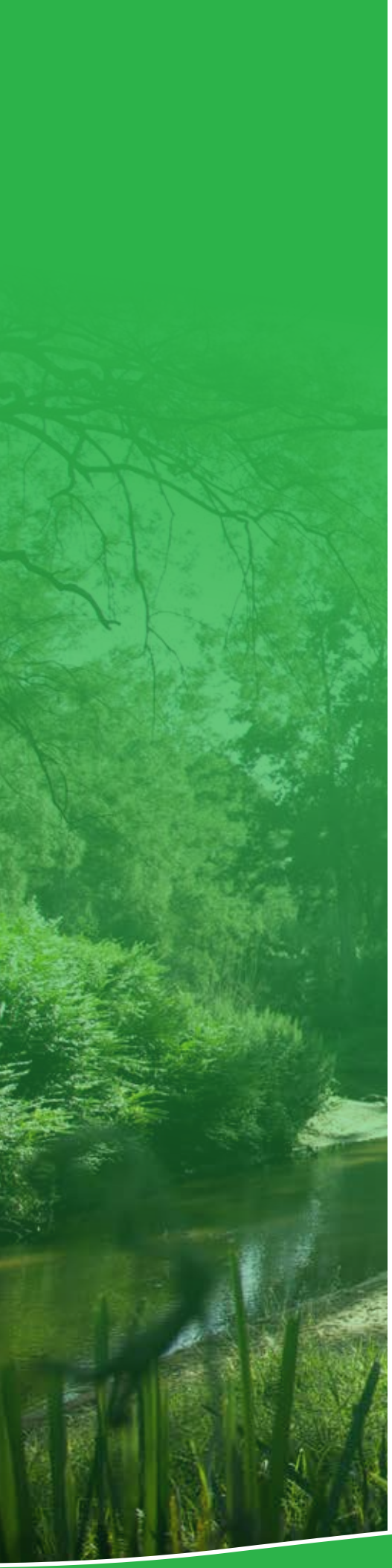

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Table fo Acronyms

Agency	Abbreviation
Bega Valley Shire Council	BVSC
Community	COM
Department of Planning, Industry & Environment	DPIE
Department of Primary Industries	DPI
Essential Energy	EE
Far South Coast Landcare	FSCLA
Forestry Corporation, NSW	FCORP
Industry	IND
Local Aboriginal Land Councils	LALCS
Local Land Services	LLS
Marine Estate Management Authority	MEMA
National Broadcasting Network	NBN
National Parks and Wildlife Service	NPWS
NSW Health	HEALTH
NSW Rural Fire Service	RFS
Resilience NSW	RES
Roads and Maritime Service	RMS
Sapphire Coast Producers Association	SCPA
State Emergency Service	SES
Telstra	TELSTRA
Universities	UNI
Water NSW	WATER

This Climate Resilience Strategy aims to highlight the activities, projects and programs already contributing to our Shire's resilience and identify the positive steps we as a community can take to create a climate resilient future.

Towards a Climate Resilient Bega Valley Shire

Background

The United Nations has identified climate change as a defining issue of our time:

The UN definition (under the Framework Convention on Climate Change) is: “A change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods of time”.

A changing climate provides challenges to people across the Bega Valley, potentially exacerbating existing vulnerabilities and creating new threats to our natural systems, communities, economy and built environment. Many of these vulnerabilities were exposed during the Black Summer bushfires and coronavirus pandemic, which have had unprecedented impacts on the Bega Valley community, environment and economy. It also provides great opportunities through early adaptation, efficient transition to a low-carbon economy, and development of new industry and technological opportunities that create jobs and benefit all residents.

In August 2019, Bega Valley Shire Council (BVSC) resolved to recognise the climate emergency, through the strength, scope and immediacy of initiatives for BVSC and the community to combat climate change ensuring the continued economic and social viability of agricultural and transport sectors in the Bega Valley. In order to meet these challenges, we need to ensure that the economy, environment and social fabric of our Shire are resilient to change. A resilient and robust Bega

Valley Shire will be prepared for shocks and stressors, now and in the future, be they financial, environmental, social or political. While this Bega Valley Shire Climate Resilience Strategy is intended to ensure that our Shire is prepared for the impacts of climate change, its success lies in being equitable for our community, strengthening our natural systems and enhancing quality of life for our residents.

While this Strategy is fundamentally intended to ensure that our Shire is prepared for the impacts of climate change, its success lies in being equitable for our community, strengthening our natural systems and enhancing quality of life for our residents.

This Strategy supersedes the Bega Valley Shire Climate Change Strategy (2014 -2017), which focused on the operations of Bega Valley Shire Council. This Strategy applies to the whole Shire.

Our first resilient peoples

The First Australians are arguably the most resilient culture on earth with over 80,000 years of continuous occupation of this land. Aboriginal people experienced periods of extreme climatic variability, varied sea levels and adapted to the full range of Australian landscapes.

People of the Yuin Nation have sustainably lived in what is now the Bega Valley Shire for many thousands of years. Their successful and resilient interaction with our local environment for countless generations, provides clear direction for current residents of the Bega Valley Shire to achieve a resilient community that is well prepared to deal with the impacts of a changing climate.

Input to this strategy

This Strategy has been developed with input from a wide range of stakeholders across the Bega Valley Shire. A Technical Advisory Group, comprised of local residents, contributed significantly to the form and content of the document. Important contributions were also made by business, government and not-for-profit representatives across the Shire.

The Strategy was publicly exhibited to seek broader community input. Sixty-six written submissions and 63 survey responses were received. In addition, feedback was provided through four climate engagement sessions with interested community groups, with approximately 100 people attending these events. Responses were also provided by six government agencies and non government bodies.

A summary of the issues raised during the public exhibition process is provided in Figure 1. Of the responses received, 94% were supportive of the draft Strategy. A range of changes have been made to the Strategy in response to suggestions put forward by our community.

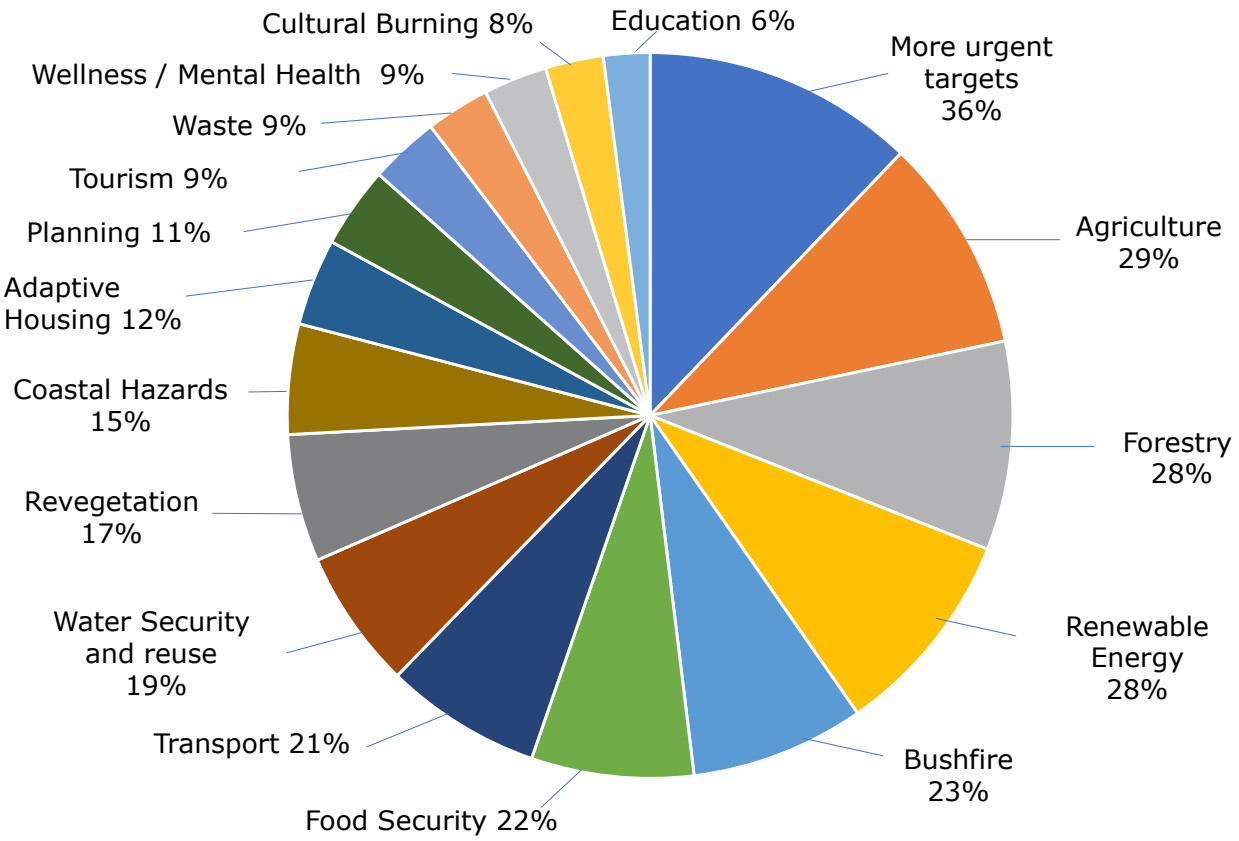


Figure 1: *Summary of priority issues raised in submissions*

Council's contribution to this strategy

Climate change is a global, national and local issue. Enhancing our community's resilience to the impacts of a changing climate is the responsibility of all levels of government as well as the business, government, not-for-profit sectors and individuals. Bega Valley Shire Council recognises that local government has an important role to play in increasing our Shire's resilience. The work Council has done to date provides a good foundation to implement both climate change mitigation and adaptation actions. However as discussed earlier it is also important to recognise that many strategies to increase our community's resilience across a range of sectors sit outside of the statutory responsibility or influence of local government (Figure 2).

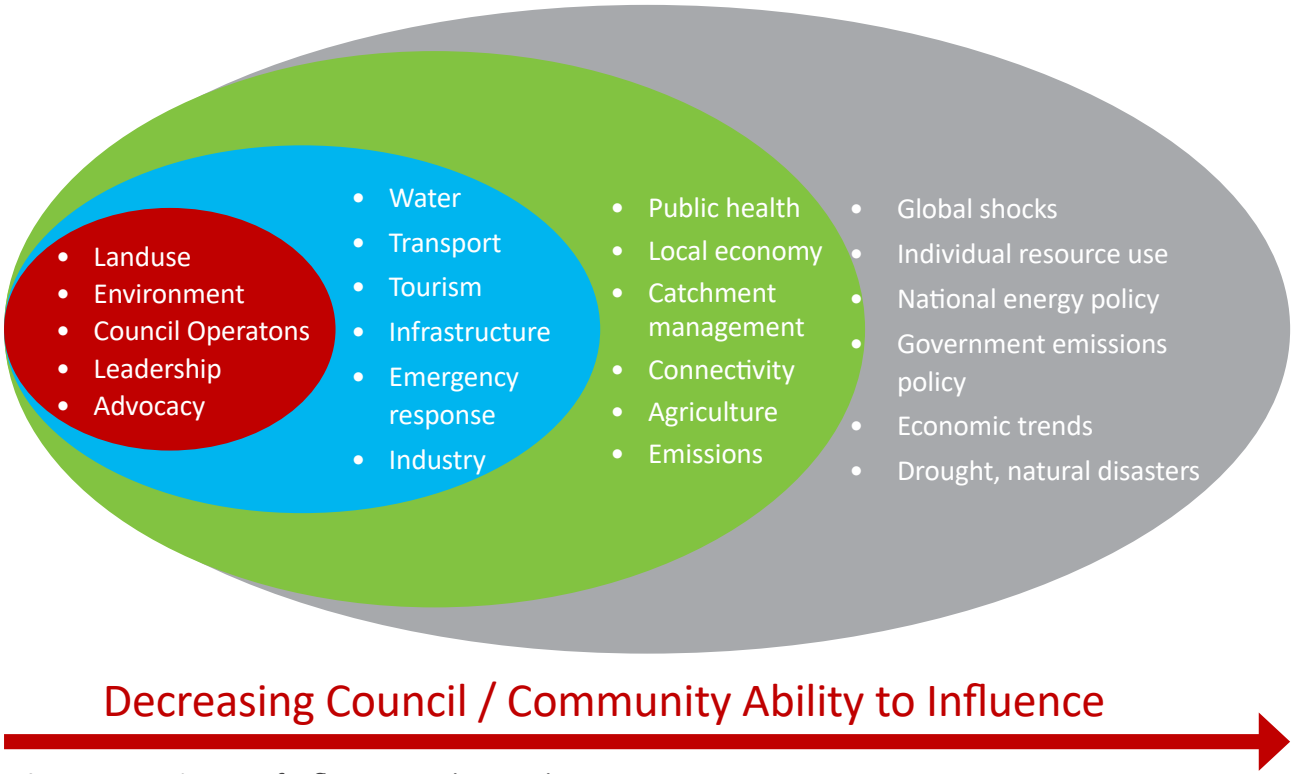


Figure 2: *Continuum of influence on climate change impacts*

The scope of this Strategy is limited to the geographic area of the Bega Valley Shire, including the operational responsibilities of BVSC. With regard to mitigation, BVSC's responsibilities relate to reducing its own emissions and encouraging and supporting the community to reduce their emissions through education, behaviour change programs and planning and development processes (Tables 2 and 3).

Table 2: *Climate resilience activity that is directly within Council's sphere of influence*

Within Scope (Direct Council Influence)	
Natural systems	BVSC's environmental management activities on BVSC managed natural areas will be based on resilience principles to ensure our approach is responsive to a changing climate.
BVSC owned infrastructure, assets and land	Identifying risks to Council owned infrastructure and assets as a result of climate change and planning for the protection and/or adaptation of these infrastructure and assets.
Energy efficiency and renewable energy	Reduction in energy consumption of BVSC operations and facilities and encouraging renewable energy development to support BVSC infrastructure.
Water supply	Implementing water use efficiency measures in preparation for predicted reductions in rainfall through effective water management, reduced consumption and use of alternative water sources.
Land use planning	Ensuring BVSC's strategic land use planning documents embed climate resilience actions.
Natural hazard planning	BVSC has an important role in understanding and preparing for natural hazards and the impact of climate change in exacerbating existing natural hazard threats to our resilience.
Local economy	BVSC's economic development initiatives and policy levers can assist our local economy strengthen its resilience to a changing climate.

Table 3: *Climate resilience activity that is indirectly within BVSC's sphere of influence*

Element	Area of indirect influence
Preparing communities for climate change impacts	The health (physical and mental) and wellbeing of individuals may be affected by climate change. BVSC in partnership with other levels of government can support and encourage residents to become more resilient to climate change impacts.
Adaptation of private property	BVSC and other levels of government provide advice and best practice guidance to our residents and communities about climate change resilience and adaptation for private property.
Emergency management	NSW government agencies retain the lead role in the delivery of emergency management services.
Natural systems	The natural environment (habitats, flora and fauna) will respond and adapt to a changing climate. BVSC will partner with land and natural resource management agencies to support the resilience of the natural environment.
Infrastructure, assets and land	Identifying climate change related risks to State owned infrastructure and assets as a result of climate change and planning for the protection and/or adaptation of these infrastructure and assets.
Energy efficiency and renewable energy	Supporting our residents and business in identifying opportunities to reduce their energy consumption and provide assistance in transitioning to renewable energy installation opportunities. Work with energy suppliers and distributers to ensure supply security and grid capacity.
Water supply	Advocating for greater water storage, catchment management and sustainable water access.
Land use	Collaborating with NSW government agencies to ensure land use policy embeds climate resilience.
Natural hazard planning	Working with Commonwealth and NSW government agencies, research bodies and universities to have the best available science to underpin our preparation and strategic planning for changes in our exposure to natural hazards.
Local economy	Supporting individual businesses and industry sectors to make investment and strategic decisions that build their resilience.

Why a Resilience Approach?

What is resilience?

The capacity of individuals, communities, institutions, businesses, and natural systems within our Shire to recover, build back better and grow, no matter what kinds of stresses and shocks they experience.

This Strategy adopts a resilience approach in order to respond to the key challenges that climate change will present. A resilience approach allows our community to focus on enhancing the strong foundations that underpin our Shire, that in turn allow us to implement adaptation and mitigation measures to address these challenges.

To ensure the Bega Valley Shire, our natural systems, communities, infrastructure and economy are prepared for the impact of climate change it is imperative to embed a resilience approach. Actions to address climate change or increase resilience of our community can no longer be seen as individual separate actions or programs. Every decision about the future of the Shire, each new policy approach or new project should build the resilience of the places and individual communities touched by these decisions.

BVSC will expand resilience thinking throughout its operations and long-term planning to drive the successful implementation of this Strategy. This will require a systems approach, understanding cause and effect, feedbacks, and thresholds or points of system failure. It will require cross-organisational, cross-scale co-operation across levels of government, private sector and communities to increase the resilience to climate change and disasters.

Examples of how our community is already demonstrating its resilience are provided in Appendix 1.

Shocks and stressors

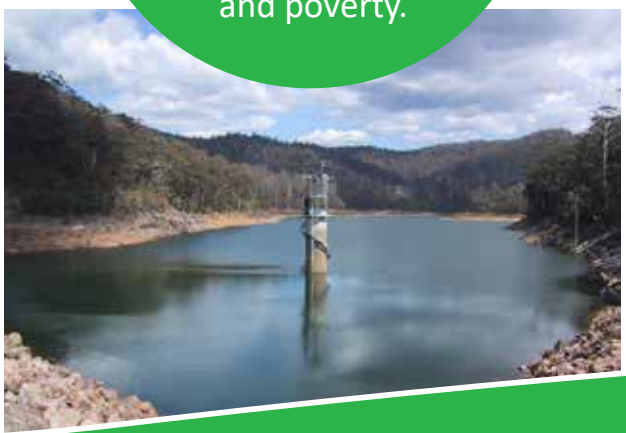
Bega Valley Shire residents engage with climate vulnerabilities and risk every day. Our resilience to our variable and changing climate is influenced by the physical geography of our Shire, natural environmental fluctuations, distance between our towns and villages, extensive infrastructure network, reliance on external economic and energy fluctuations, limited industry diversity and local socio-economic issues and housing availability.

These vulnerabilities have historically been impacted by long term stressors such as drought and water availability, unemployment, lack of public transport and low average household income across the Shire. Overlying these ongoing stressors are historic acute shocks such as the 1971 and 2011 floods; the 1952, 1980, 2018 and 2019/ 20 bushfires; 2016 East Coast Low, closure of the Heinz cannery in Eden, Commonwealth and State fishery buyouts, 2002 toxic algal event in Wonboyn Lake and 2020 coronavirus pandemic

Bega Valley Shire is among the most desirable places to live in Australia, but also poses unique challenges for resilience. For example, our 225km coastline has significant natural values that contribute to our quality of life, aquaculture and fishing industries and is the main attraction for the thousands of tourists who visit our Shire each year. However, it will face some of the greatest climate change driven impacts through increased sea levels, changes to ocean temperature and acidity, and increased severity of coastal storms.

Climate change will likely exacerbate many of our existing stressors and the impact and severity of future environmental, economic and social shocks. Taking a resilience approach means understanding the cumulative and compounding shocks and stressors and their thresholds or 'tipping points' which can create cascading impacts through our social, economic and natural systems. This Strategy must evolve and be forward-looking to identify and manage emerging challenges, especially during the recovery period. Restoring what was lost without reconfiguring some of the ways that we do things will re-establish or exacerbate existing vulnerabilities.

Stressors are conditions that weaken our Shire on a daily or reoccurring basis, such as drought, social isolation, unemployment, housing availability and poverty.



Shocks are sudden-onset events, such as floods, bushfires, extreme weather, industry closure and disease outbreaks.

Key Principles for Success

In order for this Strategy to be successful in enhancing the Shire's resilience and ability to withstand future climate driven shocks and stressors the following principles are critical.

Focusing on our shared values

The successful transition to a climate resilient Bega Valley Shire will be best achieved through a focus on the attributes that are valued by residents across the Shire. In recent years BVSC has undertaken extensive community engagement to understand what our residents value about the Shire.

Our natural environment and the role it plays in our lifestyle has consistently been highly valued by the majority of our residents. The ability to access key services, improved connectivity between towns and within existing towns and neighbourhoods and the need for public transport are social based values that are consistently raised by people across the Shire. A thriving economy, safe and inclusive communities, access to housing and education, and an industry growth based on innovation are other community and economic values that are relevant to all sectors of our community. A focus on the protection and enhancement of these values will provide a positive driver to underpin the implementation of climate resilience actions.

These things that we value can be directly threatened or lost during disaster – this was experienced during the development of this Strategy. The Black Summer bushfires and COVID-19 have shown that things we value, such as clean air and reliable essential goods and services (food, water, power and communications) are highly vulnerable. These vulnerabilities are created during times of relative stability and prosperity, when factors such as efficiency and

cost-minimisation are prioritised over other factors such as secure supply of essential goods and services. Until recently, post-disaster recovery focussed on rapidly rebuilding to restore 'normality'. Re-establishing the same infrastructure, supply lines for power, fuel, water and food, and failing to learn from these disasters, essentially reinforces the root causes of our vulnerability.

Understanding through meaningful engagement

It is important to understand the current vulnerabilities and stressors that are impacting our community as part of developing practical and achievable actions.

Engagement needs to be ongoing throughout the implementation of this Strategy. The aspirations and vulnerabilities of our residents will differ from house to house and town to village and it is vital that resilience actions recognise and cater for these variabilities.

Equitable access to climate resilience

Climate change affects all members of the Bega Valley Shire community. Conversely our efforts to reduce our community's contribution to climate change and prepare for its predicted impacts should be equitably distributed. Our implementation approach must help share the opportunities and benefits of climate action equitably.

We must work together

Climate resilience cannot be achieved by any one group or individual in isolation. Businesses, residents, institutions and non-profit organisations all have essential roles to play. Our joint responsibility will ultimately determine our success in embedding resilience into all aspects of our lives in the Bega Valley Shire. We all make small daily choices, which, when viewed collectively, present a tremendous opportunity to make meaningful progress to achieving climate resilience. BVSC's partnership with Clean Energy for Eternity is an example of the value and power of BVSC and community working towards a mutually beneficial goal and achieving tangible benefits for our Shire.

A Changing Climate

The global climate is undergoing change. In 2017 atmospheric carbon dioxide levels reached 405ppm, a level not reached for some 2 million years. Australia is home to one of three Global astmopheric monitoring stations at Cape Grim in Tasmania, which has recorded substantial increases over the last 40 years (Figure 3).

The amount of greenhouse gas abatement the global community undertakes will affect future levels of carbon dioxide (Figure 4), with significant impacts for our climate (Figure 5). Representative concentration pathway (RCP) 2.6 is the modelled climate response to decreasing green house gas emissions reduction, whereas RCP 8.5 represents business as usual. Global emissions are currently tracking above RCP 8.5.

Australians contribute about 21.50 tonnes of carbon dioxide equivalents per capita[1] to global greenhouse gas emissions, which are among the highest in the world. The contribution of Bega Valley Shire is estimated to be 15.25 tonnes of carbon dioxide per capita.

1 *National Greenhouse Gas Inventory: December, Department of Industry, Science, Energy and Resources (2019)*

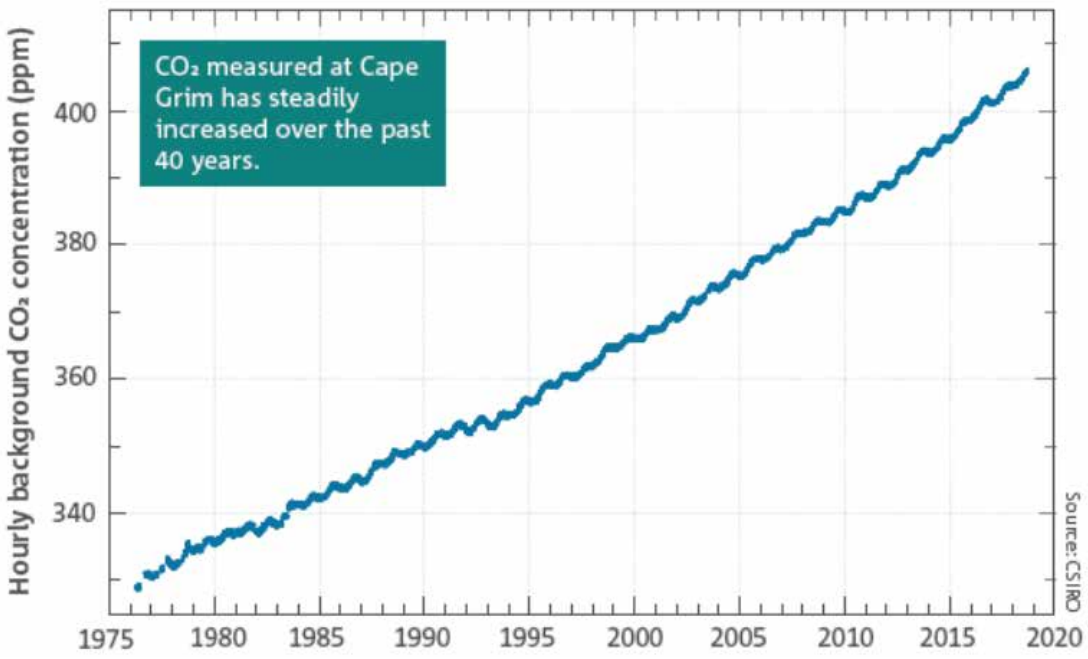


Figure 3: *Atmospheric carbon dioxide measurements Cape Grim, Tasmania (Source CSIRO 2018)*[2]

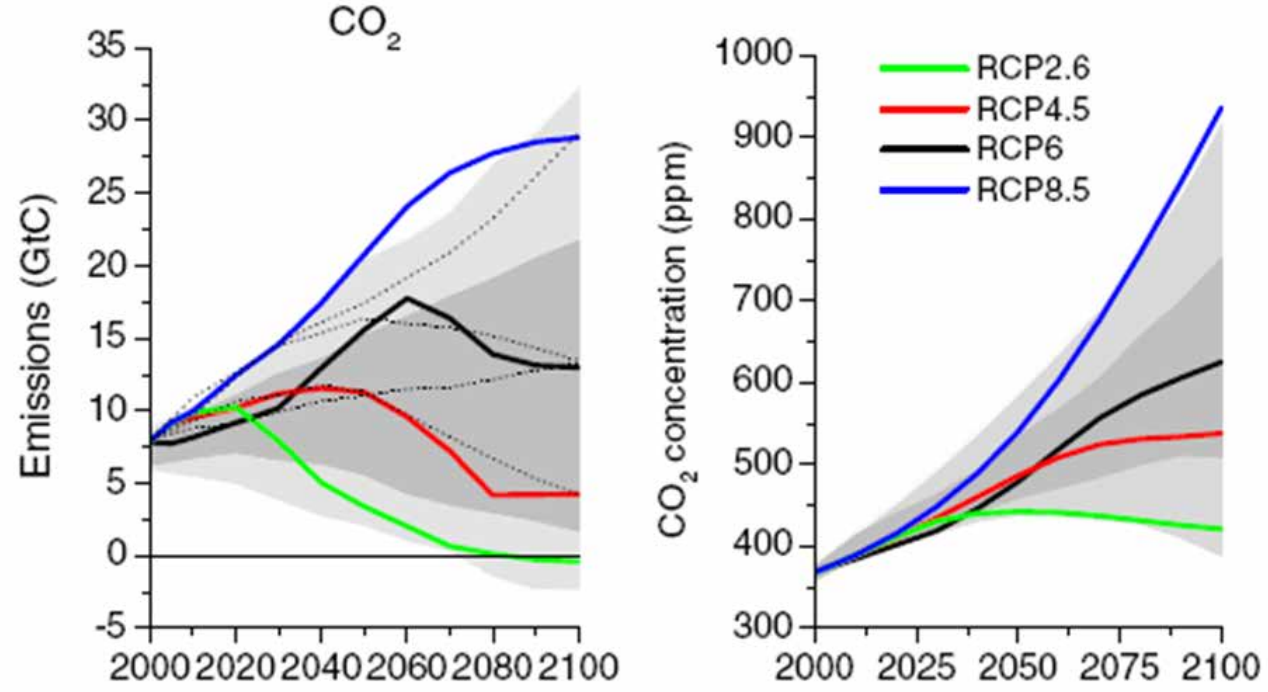


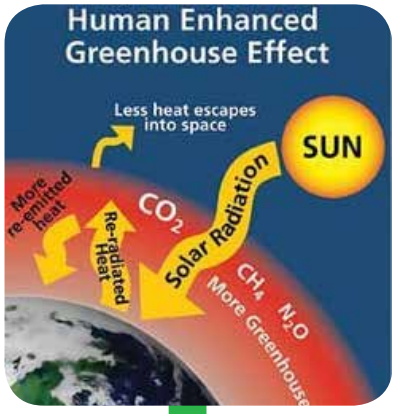
Figure 4: *Modelled global greenhouse gas emissions and atmospheric carbon dioxide concentrations (Source: van Vuuren et. al. 2011)*[3]

2 *State of the Climate Report, CSIRO 2018)*
3 *van Vuuren, et al. The representative concentration pathways: an overview. Climatic Change (2011)*

How a changing climate impacts our resilience

Primary climate driver

Increasing level of greenhouse gases drive global warming



Secondary climate drivers

- Increased average temperatures
- Increased precipitation variability
- Increased ocean temperature
- Changes to weather systems
- More intense storms

Global climate impacts

- Sea level rise
- Glacial and ice sheet melt
- Increase in ocean acidity
- Rainfall variability
- Increased transpiration
- Increase in hot days

Local climate change impacts exacerbate our vulnerabilities and reduce resilience

- Foreshore erosion – beaches and estuaries
- Reduction in catchment water flows
- Inundation of low lying areas
- Changes in species distribution
- Loss of calcium carbonate in shellfish

- Prolonged bushfire season
- Extended periods of drought
- More frequent heatwaves
- Reduction in soil moisture
- More extreme storms

Figure 5: *Impact of atmospheric carbon dioxide concentrations on our climate*

These changes have significant implications for the climate of Australia and that of South East NSW.

Australia

- Australia's climate has warmed by slightly over 1 °C since 1910, leading to an increase in the frequency of extreme heat events.
- Oceans around Australia have warmed by around 1 °C since 1910, contributing to longer and more frequent marine heatwaves.
- Sea levels are rising around Australia, increasing the risk of coastal inundation.
- The oceans around Australia are acidifying (the pH is decreasing).
- April to October rainfall has decreased in the southwest of Australia. Across the same region May–July rainfall has seen the largest decrease, by around 20 per cent since 1970.
- There has been a decline of around 11 per cent in April–October rainfall in the southeast of Australia since the late 1990s.
- Rainfall has increased across parts of northern Australia since the 1970s.
- Streamflow has decreased across southern Australia. Streamflow has increased in northern Australia where rainfall has increased.
- There has been a long term increase in extreme fire weather, and in the length of the fire season, across large parts of Australia[4].

The complexity and scale of global climate models make downscaling climate projections to a shire-scale difficult. There are ongoing improvements to the accuracy and the regional downscaling of climate modelling and forecasting by bodies such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Bureau of Meteorology (BoM), universities and government agencies.

The NSW Government's Adapt NSW program has produced a climate snapshot that encompasses the Bega Valley Shire. BoM and CSIRO have also produced projections for natural resource management regions, with our Shire falling into the 'Southern Slopes' region.

Due to the broad and different regions covered by the two forecast snapshots the climate projections presented in this Strategy are regional in nature and are the averaged result of 12 climate models.

4 State of the Climate Report, CSIRO 2018)

Current Bega Valley Shire climate variability

Bega Valley Shire has a temperate climate, strong seasonality and exposure to a range of climate factors (Figure 6).

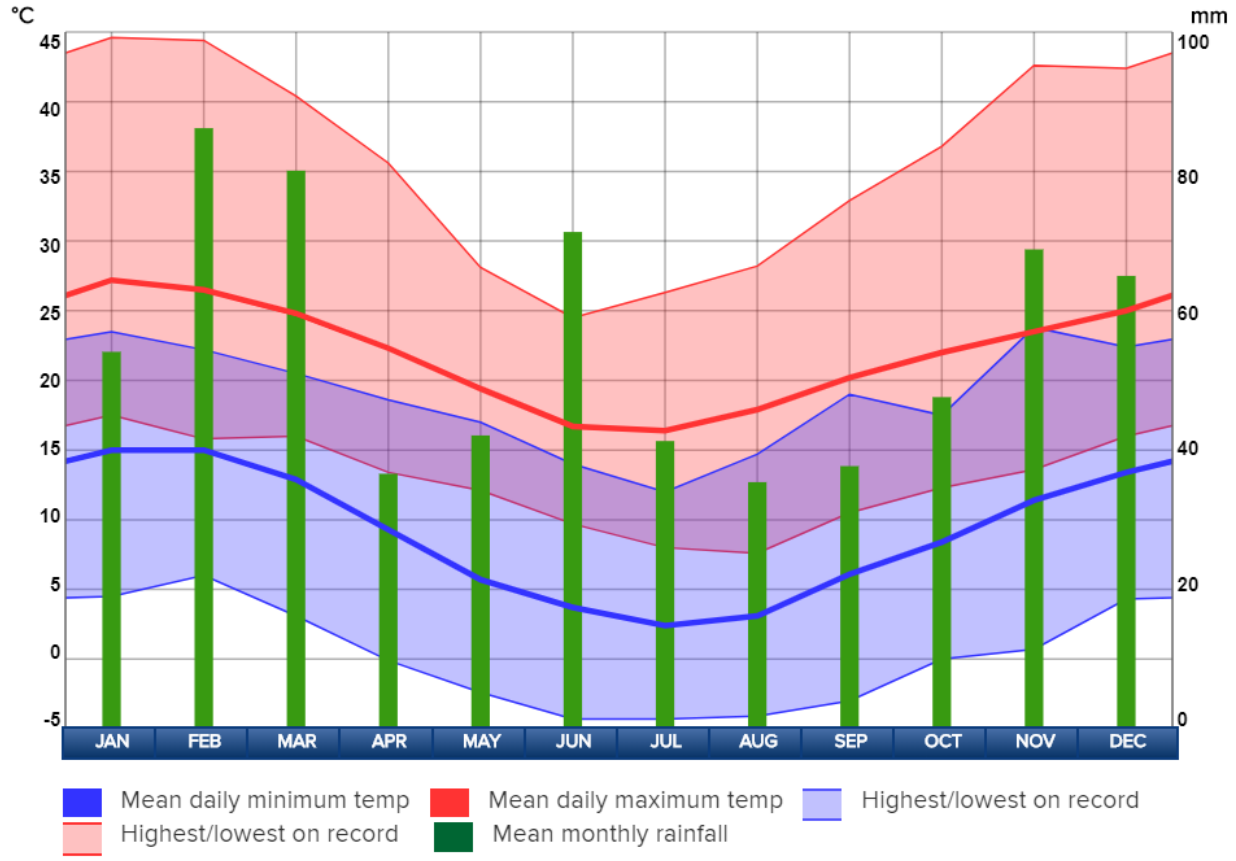


Figure 6: *Monthly distribution of Bega temperature (oC) and total rainfall (mm/month) for the 1992-Present period. Red/blue shading indicates the range of daily max/min temperatures within each month, and the solid red/blue curves indicate the average max/min temperatures in each month. Green bars indicate total rainfall in each month. (Source: Weatherzone 2019)*

Temperature

The annual mean temperature in south-eastern Australia is currently approximately 1°C warmer than the late 20th century average. Temperature trends over the past 50 years indicate an increase in annual mean temperature by 0.2-0.3°C, driven by increased warming in summer and spring.

The timeseries of south-eastern Australia (including Bega, but also extending south to Tasmania) indicates a clear warming trend over the past approximately 100 years of 1 to 1.5°C at present above the 1960-1990 average (Figure 7).

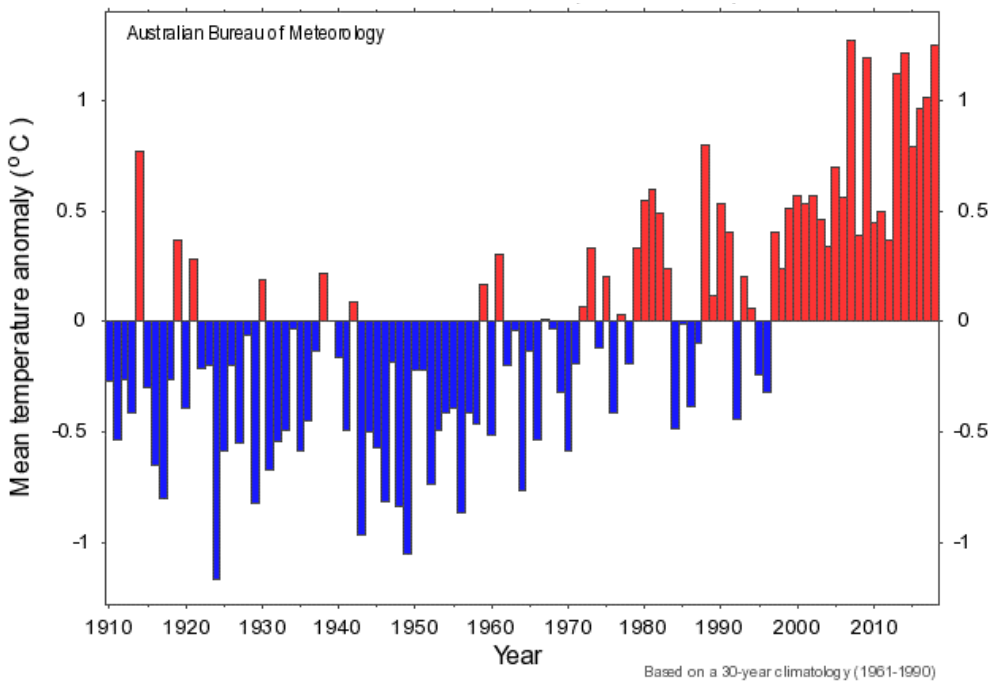


Figure 7: *The annual mean temperature anomaly (difference from the 1960-1990 average; oC) average over south-eastern Australia. The blue bars indicate that the annual mean temperature in that year was below the 1960-1990 average; the red bars indicate it was above. (Source: Bureau of Meteorology.)*[5]

5 *Climate Change - Trends and Extremes. Bureau of Meteorology (2020)http://www.bom.gov.au/climate/change/#tabs=Tracker&tracker=timeseries*

Rainfall

The median annual rainfall for the Bega weather station is approximately 800mm/year since the late 19th century, with wet and dry periods cycling on 5-10 year time scale (Figure 8). There is slightly higher rainfall in the northern and southern part of the Shire, and slightly lower values in between. The rainfall is distributed approximately evenly across the four seasons, with largest rainfall totals in the summer.

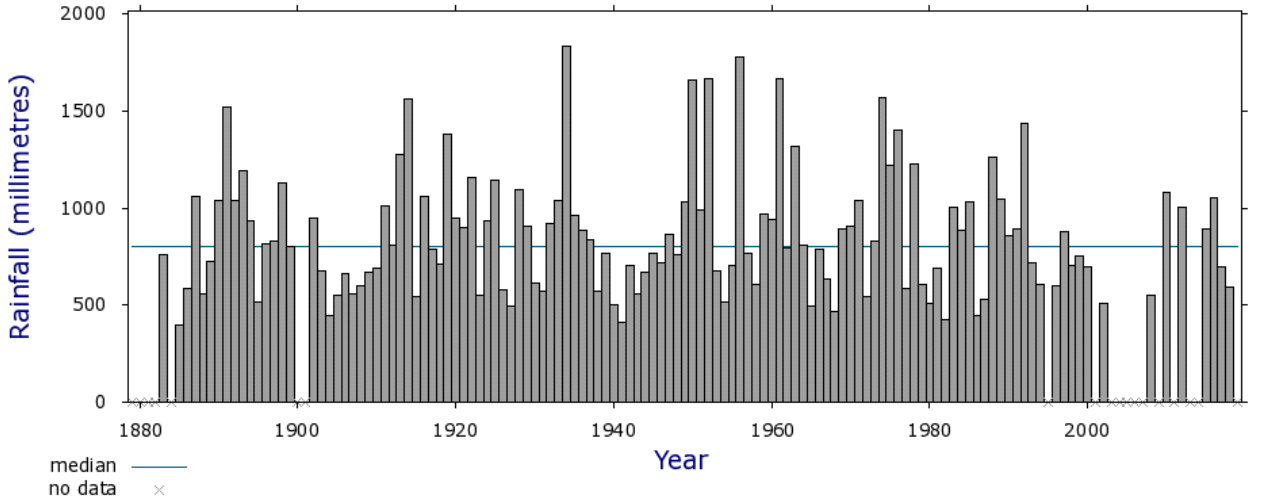


Figure 8: *Total annual rainfall (mm/year) at the Bega weather station (069002) from the late 19th century to 2018. Some years have incomplete data, indicated by a 'x'. The blue line represents the median over the timeseries. (Source: Bureau of Meteorology)*

NSW/ACT Regional Climate Modelling (NARCliM) projections

NARCliM is a set of 12 regional dynamically downscaled climate projections, developed by the NSW Government and the University of New South Wales, derived from 12 international global climate models. The NSW Department of Planning, Industry and Environment has provided NARCliM model projections for the South East and Tablelands region of NSW for the Present Day (1990-2009), and two future 20-year periods centred around 2030 (Near Future; 2020-2039) and 2070 (Far Future; 2060-2079) for a business-as-usual greenhouse gas emissions scenario, known as SRES A2. The NARCliM climate model data can be accessed via the NSW Government's Climate Data Portal. The information presented below has been reproduced from the 'South East and Tablelands Climate Snapshot'.

Forest Fire Danger Index

The Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather and develop community warnings. The FFDI combines observations of temperature, humidity and wind speed and ranges from zero to over 150 (Table 4). It is important to note that the FFDI does not measure localised fuel composition, structure or dryness and cannot account for the impact of localised topographical influence on fire weather or fire behaviour.

Table 4: *Forest Fire Danger Ratings (NSW RFS)*

Fire Danger Ratings		
Category	**Forest FDI**	**Equivalent Grass FDI**
Catastrophic	100+	150+
Extreme	75–100	100–150
Severe	50–75	50–100
Very High	25–50	25–50
High	12–25	12–25
Low-Moderate	0–12	0–12

Bega Valley Shire does not have a long-term FFDI record available. The closest station in NSW is Nowra (annual average), with a FFDI of 5.6, which is low. In the Gippsland region, the annual FFDI at Sale is on average 8.7 at present[6]. The lack of a locally based FFDI recording site, local topographic variation and exposures to Tasman Sea maritime, warm interior and Southern Ocean weather influences make the provision of an averaged FFDI problematic for the Shire.

Projections for Bega Valley are for a minor increase in the annual average FFDI to have a minor increase in the Far Future (2070), but still remain low to moderate. The changes in the expected number of days for extreme fire danger is at most 1 additional day over the next 50 years.

Precipitation

6 *Hennessy, K., Lucas, C., Nicholls, N., Bathols, J., Suppiah, R., and Ricketts, J. (2005). "Climate change impacts on fire-weather in south-east Australia." Climate Impacts Group, CSIRO Atmospheric Research and the Australian Government Bureau of Meteorology, Aspendale*

In the south-eastern NSW region, there is a projected future increase in summer and autumn precipitation and decrease in winter and spring precipitation (Table 5).

In the Far Future (2070), the summer becomes increasingly wet, however rainfall changes are projected to be less than Near Future (2030) projections for other seasons due to wet/dry periods and influences of temperature on water vapour.

Table 5: *The Present Day (1990-2009 average) annual total precipitation and the change in the annual total for the Near Future (2020-2039 average) and Far Future (2060-2079 average).(Source Adapt NSW)*

	Present Day: 2000	Near Future: 2030	Far Future: 2070
Precipitation total annual average	Approx. 800mm/yr	0 to 5% increase	0 - 10% increase

Temperature

The South East and Tablelands Region is expected to experience increases in all temperature variables (average, maximum and minimum) in both the Near Future (2030) and in the Far Future (2070) (Table 6). All models agree there are increases in all these variables, demonstrating high confidence in these projections.

Table 6: *The Present Day (1990-2009 average) maximum and minimum temperature, and the temperature change for the Near Future (2030) and Far Future (2070). (Source Adapt NSW)*

	Present Day: 2000	Near Future: 2030	Far Future: 2070
Max temperature	18-20°C (southern half) to 20-22°C (northern half)	0 to 0.7°C increase	1.5 to 2.0°C increase
Min temperature	4°C (northwest inland) to 12°C (southeast coastal)	0 to 0.6°C increase	1.5 to 2.0°C increase

Hot days and cold nights

In the Present Day (1990-2009) period, the region has experienced on average less than 10 days where the temperature is above 35°C, however this increases by up to an additional 8 days over the next 50 years.

There are currently up to 120 cold nights in the Shire (temperatures below 2°C), with the coastal regions experiencing less than 10 cold nights a year, and this number increases north-westward through the Shire. In the future projections, there is a clear decrease in the number of cold nights.

Table 7: *The Present Day (1990-2009 average) total number of hot days above 35oC and cold nights below 2oC, and the change in these totals for the Near Future (2020-2039 average) and Far Future (2060-2079 average). (Source Adapt NSW)*

	Present Day	Near Future: 2030	Far Future: 2070
Average No. hot days per year (over 35°C)	Fewer than 10	3 additional hot days	8 additional hot days
Average No. cold nights per year	Coastal: about 10 Inland: up to 120	12 fewer cold nights	35 fewer colder nights

Wind

Table 8 presents results for two wind calculations averaged over the three NARCliM 20-year epochs (Present Day: 1990-2009), Near Future (2020-2039) and Far Future (2060-2079):

- The daily mean wind speed
- The daily maximum wind speed

Table 8: *Daily mean and daily maximum wind speed projections Bega Valley Shire (Source Adapt NSW)*

	Present Day: 2000	Near Future: 2030	Far Future: 2070
Daily mean wind speed	5 to 7m/s	2% increase	8% increase
Daily maximum wind speed	15m/s	5% increase	5% increase

The Near Future changes are very small due to a balance between increased mean wind speed of approximately 5% in autumn and spring, but a similar sized decrease projected for summer and winter. The Far Future, conversely, shows an increase in the mean wind speed that is persistent across the year and strongest in spring. .

In the Near Future, the daily maximum wind speed shows large variation in size and magnitude across seasons. The daily maximum wind speed in the northern half of the Shire is projected to increase (primarily in spring by up to 8%). In the southern half of the Shire, modelling projects minor decreases (less than 4%) for summer and autumn, and minor increases in winter and spring.

In the Far Future, the daily maximum wind speed increases across the Shire.

Sea Level Rise

Sea levels are rising globally and around the Australian coastline and will continue to rise through this century and beyond. Consistent with global increases, sea levels have risen in Australia at an average rate of 2.1 mm/ year over the past half century, with annual rises of 3.4mm observed from satellite altimetry data for the period 1993 – 2018) (see Figure 9).

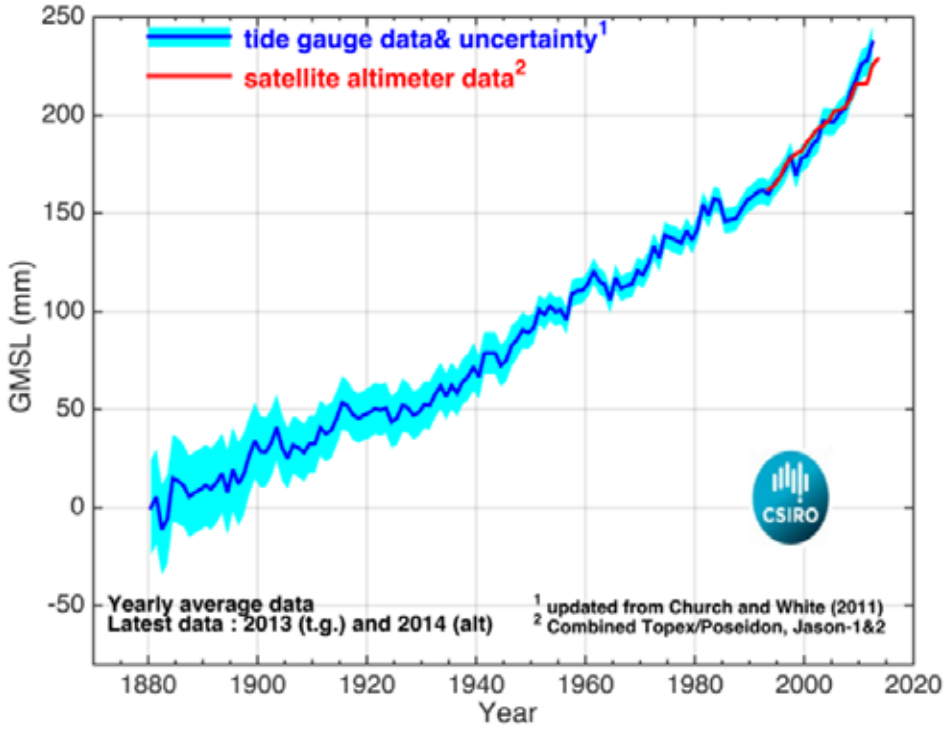


Figure 9: *Observed sea level rise from tidal gauges and satellite altimetry (1880 - 2018) (Source: CSIRO 2020)*[7]

Projections of sea-level rise for Australia show that the rate of rise during the 21st century will be greater than over the past four decades for all greenhouse gas concentration scenarios (Figure 10). The likely estimate of sea-level rise in Australia by 2100 is about 54-106 cm higher than 1986-2005 levels, depending on the extent of greenhouse gas abatement that is achieved in the near future.

The RCP 8.5 pathway or "business as usual" scenario models significant sea level rise for south east Australia (Figure 10). This projection is supported by observed rates of recent sea level rise as depicted in Figure 11, which highlights the ocean of south eastern Australia as having one of the largest increases in sea level rise across the globe. For Bega Valley Shire, this amount of sea level rise would lead to approximately 16km^2 of foreshore land being inundated by the year 2100 and the landward recession of our ocean beaches.

7 *Sea Level Rise Trend 1993 – 2019, CSIRO https://research.csiro.au/slrwavescoast/sea-level/sea-level-changes/*

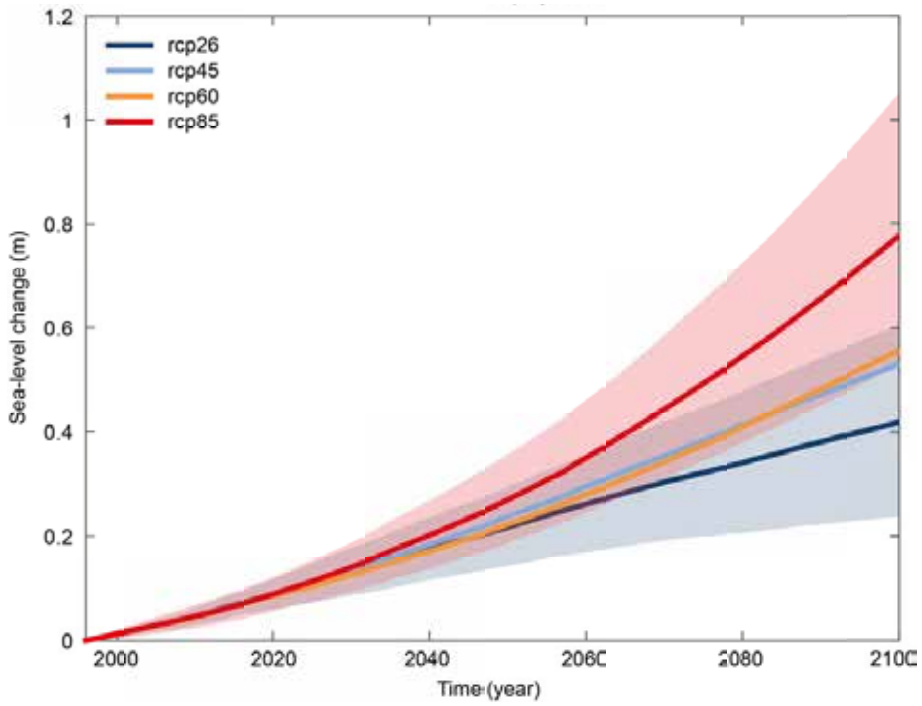


Figure 10: *NSW Coastline Sea Level Change Projections (Source: UNSW, 2016)*[8]

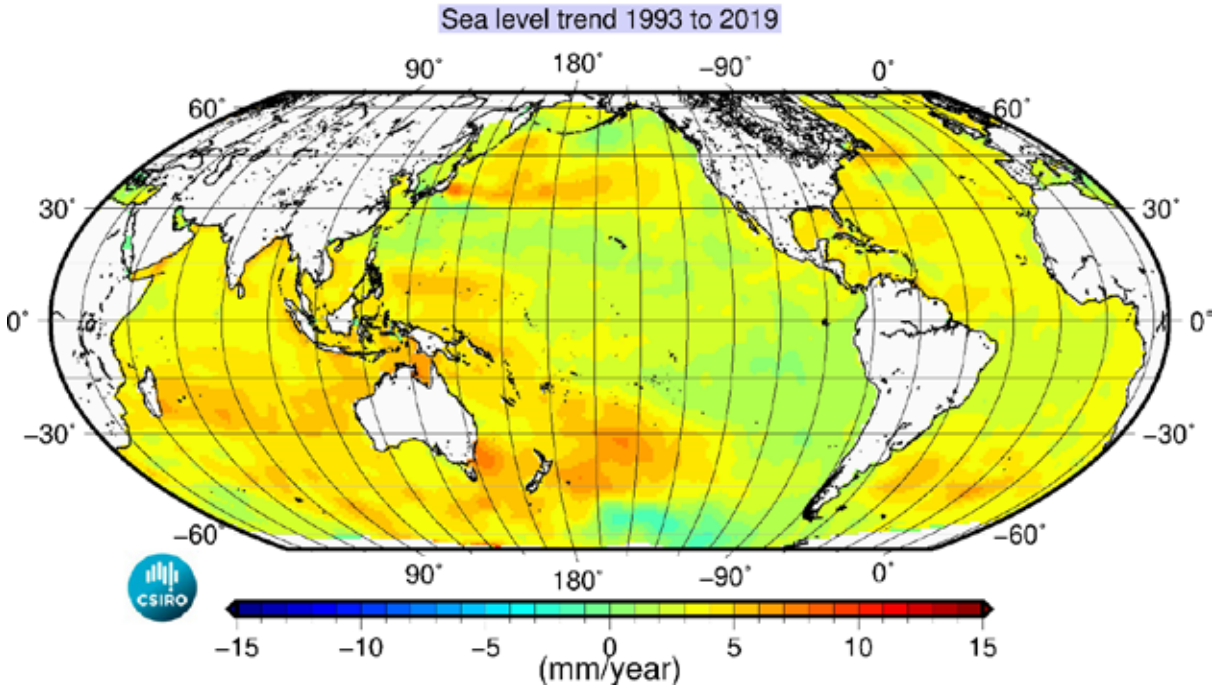


Figure 11: *Global Sea Level Rise 1993 – 2019 (Source: CSIRO, 2020)*[9]

8 *Sea Level Rise Science and Synthesis for NSW, University of NSW (2016)*
9 *Sea Level Rise Trend 1993 – 2019, CSIRO https://research.csiro.au/slrwavescoast/sea-level/sea-level-changes/*

Policy Context

This Strategy represents a local level policy response to broader global and national climate change initiatives and greenhouse gas emission reduction targets. Australia is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC). The latest UNFCCC agreement on climate change, the Paris Agreement, binds the Australian Government to achieving the emission reduction targets proposed in the Agreement.

Global policy initiatives

The Paris Agreement

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change and to pursue efforts to limit the temperature increase even further to 1.5°C. Additionally, the Agreement aims to strengthen the ability of countries to deal with the impacts of climate change.

The Agreement has a number of essential elements of direct relevance to this Strategy including:

- Long-term temperature goal - the Paris Agreement, in seeking to strengthen the global response to climate change, reaffirms the goal of limiting global temperature increase to well below 2oC, while pursuing efforts to limit the increase to 1.5oC (Figure 12).
- Mitigation – the Agreement establishes binding commitments by all Parties to prepare, communicate and maintain a nationally determined contribution to reducing greenhouse gas emissions and to pursue domestic measures to achieve them.
- Sinks and reservoirs –the Paris Agreement also encourages Parties to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gas emissions including forests.

- Adaptation – the Agreement establishes a global goal on adaptation – of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change.
- Climate change education, training, public awareness, public participation and public access to information is also to be enhanced under the Agreement.

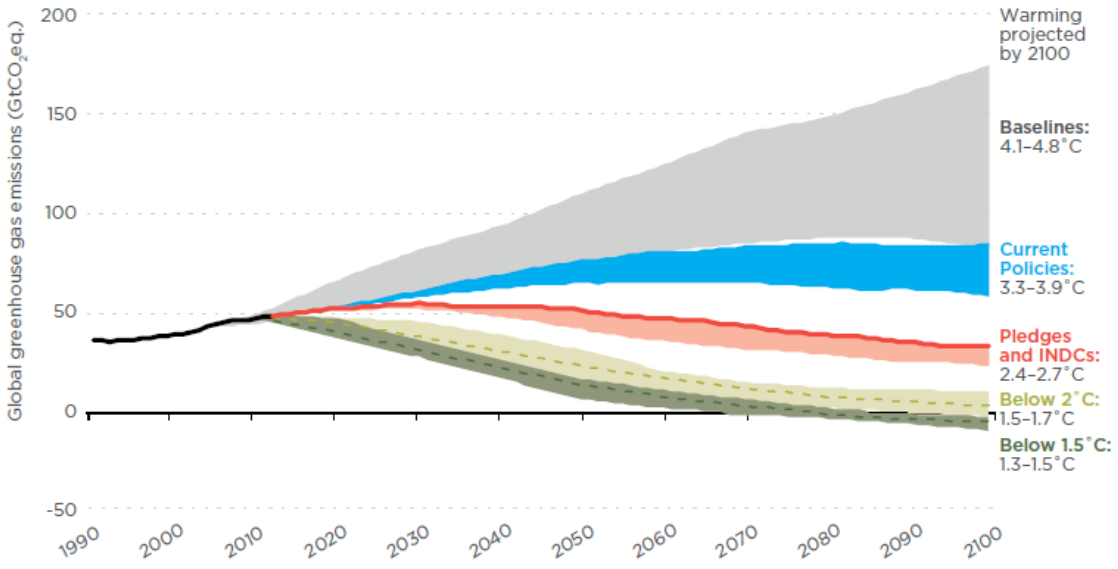


Figure 12: *Range of greenhouse gas emissions with and without climate mitigation measures*

Alignment with the UN Sustainable Development Goals

The Sustainable Development Goals (SDGs) (Figure 13), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. Australia is committed to the SDGs as a universal, global approach.

Our local efforts to build a climate resilient community aligns well with the UN SDGs and demonstrates how commitment to implementing global visions require community driven climate responses. The Key Response Areas of the Strategy demonstrate alignment with individual SDGs.

Figure 13: *The 17 UN Sustainable Development Goals*

The Australian Government policy response

The Australian Government has a 2030 target to reduce emissions by 26 to 28 per cent below 2005 levels. This target will see a reduction in the emissions intensity of Australia's economy by two thirds, and emissions per person halve by 2030. On 25 February 2019, the Australian Government announced the Climate Solutions Package, a $3.5 billion investment to deliver on Australia's 2030 Paris climate commitments. The major elements of the Climate Solutions Fund (Source: Australian Government, 2019) are;

- Providing a $2 billion Climate Solutions Fund to reduce greenhouse gases across the economy
- Investment in expansion of the Snowy Mountains Scheme and a second interconnector, Marinus Link, between Victoria and Tasmania
- Household and business energy efficiency improvements
- Developing a National Electric Vehicle Strategy

The NSW Government climate change policy framework

The NSW Government endorses the Paris Agreement and will take action that is consistent with the level of effort to achieve Australia's commitments to the Paris Agreement. The NSW Government's 'Climate Change Policy Framework' sets out its policy response to climate change through emission reduction and broader adaptation actions. The Framework has the stated aim to;

"Maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current and emerging international and national policy settings and actions to address climate change."

The NSW Government has two aspirational long-term objectives;

- Achieve net-zero emissions by 2050
- NSW is more resilient to a changing climate

In March 2020 the NSW Government released the "The Net Zero Plan Stage 1: 2020-2030" as the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050. It outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions over the next decade.

The plan aims to deliver a 35% cut in emissions by 2030 compared to 2005 levels. The plan will support a range of initiatives targeting electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing.

The implementation of the Net Zero Plan, together with the NSW Electricity Strategy, will result in more than $11.6 billion of new investment for NSW, including $7 billion in regional NSW. This will support the creation of almost 2400 new jobs, including 1700 jobs located in the regions.

Enabling adaptation in the South East (EASE)

Using the NSW South East region as a pilot, EASE builds on the findings from the South East Integrated Regional Vulnerability Assessment (SE IRVA) (OEH 2012), to provide a collective evidence base for NSW and local governments to incorporate climate change considerations into long-term planning.

The EASE project was initiated by the former NSW Office of Environment and Heritage (OEH) with the Institute for Sustainable Futures, UTS as a research partner. The project identifies potential transitions for key regional systems and puts them into the context of the vulnerabilities identified by the SE IRVA, projected population change, recent employment trends within industries for the region, and the influence of the neighbouring ACT.

EASE outlines current adaptation planning in our region and concludes by describing some possible first steps Enabling Adaptation in the South East (EASE) aims to "use tacit local knowledge to identify regional climate vulnerabilities and develop workable and agreed pathways and projects that minimise the impacts of climate change on local communities and build resilience to future extreme events and hazards."

Local policy and action

This Strategy draws together and builds upon current climate change initiatives across Bega Valley Shire to create a unified approach to climate change and broader sustainability objectives. BVSC has been undertaking climate change mitigation and adaptation action since 2007 and has embedded consideration of climate resilience throughout all parts the organization (Figure 14).

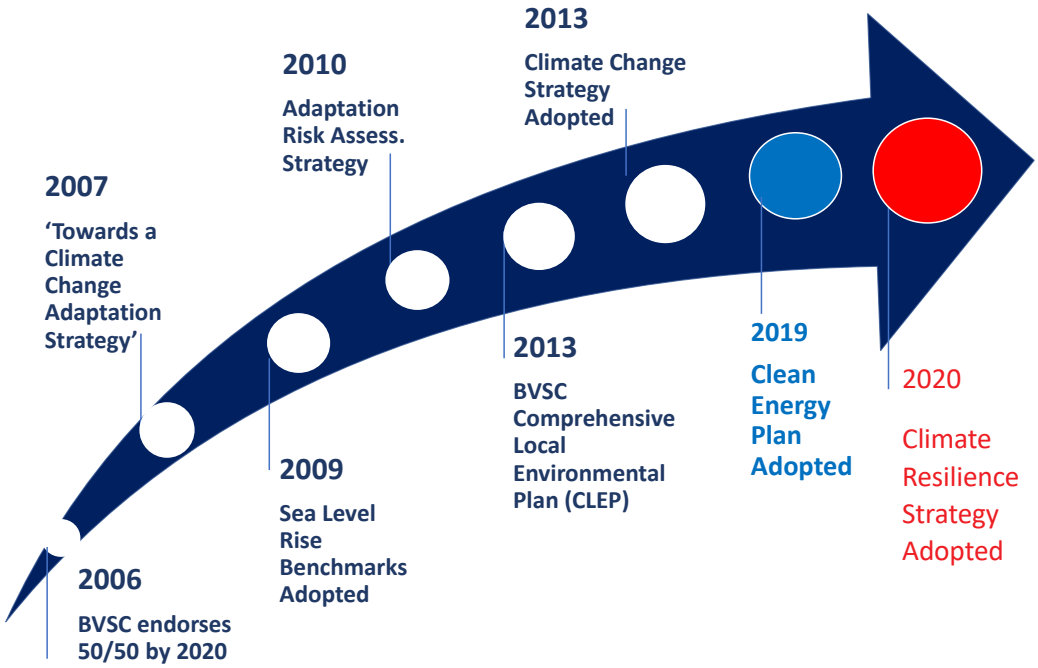


Figure 14: *BVSC climate change response timeline*

Bega Valley Shire currently uses the following sea level rise datums relative to 1990 sea levels – 40cm by 2050 and 90cm by 2100. These datums were adopted by Council as part of its endorsement of the previous NSW Government Seal Level Rise benchmarks. These datums have since be incorporated into Council's key land-use planning documents, coastal hazard study, flood studies and infrastructure development. These datums are proposed to reviewed following the release of the next IPCC report in 2021.

This Strategy recognises that there has been an extensive body of work already undertaken regarding climate change response in the Shire. The Strategy will support and evolve with interconnected strategies from all levels of government and industry and reinforce existing programs, as well as key community and industry networks.

Appendix 2 identifies a number of key programs and documents that have strategies and actions relating to adapting to the realities of a changing climate or suggest mitigation projects to limit our Shire's contribution to future climate change impacts.

Local climate change mitigation and renewable energy transition has been championed by Clean Energy for Eternity (CEFE), a local community-based group that has supported a wide range of mitigation, renewable energy, education and advocacy activities throughout the Bega Valley Shire, in neighbouring regions and at locations across Australia. Their activities have seen the installation of solar arrays on local community facilities, including their award winning 'Imagine Solar Farm' in partnership with BVSC.

Rooftop solar has been extremely popular with over 25% of local houses having solar installations. Numerous large and small scale commercial and industrial premises, farm buildings and Government buildings also have solar systems installed further increasing the Shire's renewable energy capacity.

Bega Valley Shire Council climate risk assessment

Council's latest organisational climate change risk assessment (Appendix 5), which applies to BVSC's operations, supersedes the previous document adopted by BVSC in 2010. The assessment assesses the impact of climate change on BVSC operations determines the subsequent risk profile and identifies gaps in BVSC's adaptation planning for these risks.

BVSC's functional areas (Infrastructure and Assets, Environment Management and Protection, Community Services, Land-use Planning and Development, Emergency Management & Natural Disaster Preparedness and Corporate Services) were assessed against six climate change impact scenarios (Hot Days, Temperature, Rainfall, Wind, Fire Weather and Sea Level Rise).

The assessment identified a total of 34 risks of which 22 were ranked high or very high (Table 9). This distribution of these risks is show in Figure 15.

Table 9: *BVSC operational climate risks by climate impact scenario*

	Temperature	Hot Days	Rain	Fire Weather	Sea Level	Table 1 Ranking All Impacts Totals	
Low	0	0	0	0	0	Low	0
Medium	4	6	2	0	0	Medium	12
High	2	2	2	2	0	High	13
Very High	1	0	3	3	0	Very High	9
	7	8	7	5	0		34

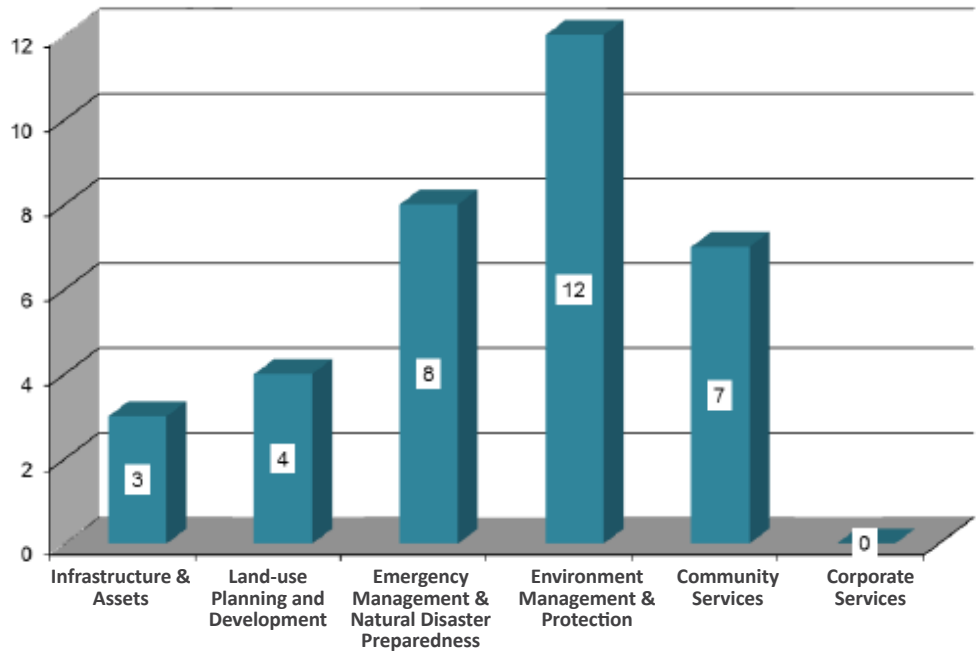


Figure 15: *Identified climate risks against responsible BVSC functional area*

The Sendai Agreement and the National Disaster Risk Reduction Framework

The changes in climate increase the likely frequency and intensity of disasters. The Sendai Agreement and the National Disaster Risk Reduction Framework (NDRR Framework) present disasters as an intersection between hazards, exposure and vulnerability. Disaster occurs where a hazard such as a bushfire or flood impacts on people, infrastructure, or natural environments, and the things that we value are lost or harmed. In the past, the effort has been focussed on characterising the hazard (for example climate change impacts on flooding or bushfire behaviour) and mitigating individual risks. While this is necessary, it is not sufficient because it does not deal with cumulative risk, cascading impacts and the need for new ways of making decisions to manage disasters. The NDRR Framework takes a systems approach with a proactive focus on understanding vulnerabilities and risks to the whole system. Importantly, this systemic approach lies well beyond the remit of the emergency services or climate change adaptation areas. It must involve a wide range of people and organisations and foster a greater sense of shared responsibility for action to bring about systemic change. This requires developing cross-organisational relationships and strategies to make co-ordinated decisions for collective impacts. These will strengthen the community whether disasters happen, or not.

Climate Vulnerability Assessment

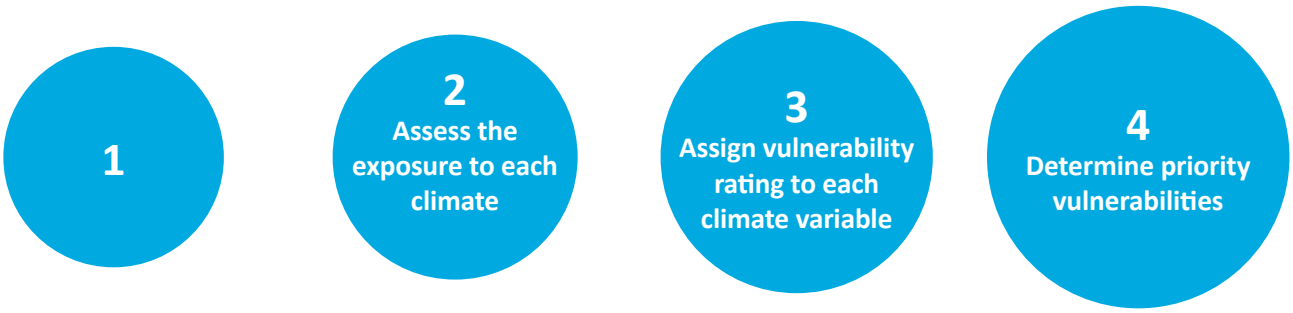
This following section examines the vulnerability to the resilience of the Bega Valley Shire, its environment, economy and community that may arise from the impact of climate change. Key vulnerabilities identified across the Shire are analysed against six key climate change related impacts predicted to affect the Bega Valley Shire (Appendix 3);

- Rainfall variability
- Increase in average temperatures
- Increased number hot days (35 +)
- More intense storms
- Change in ocean temperature and acidity

The vulnerabilities identified in Appendix 3 relate only to climate change impacts and do not consider other contemporary physical, environmental, socio-economic or political factors that may impact on the various vulnerabilities that have been identified. As such many important vulnerabilities and issues receive a low rating from a climate impact point of view. These issues are addressed by other strategic and policy initiatives by BVSC or other Government agencies.

Determining the exposure to individual climate factors for individual vulnerability factors is essentially being able to address the risk and increase the Shire's resilience to climate change. The higher the climate vulnerability to a particular vulnerability, the higher the priority for undertaking action to increase our resilience to a changing climate.

The process for assessing the impact of individual climate variables on individual vulnerability factors and determining a climate vulnerability rating is illustrated in Figure 16.



Vulnerability Factor	Climate Variable (6 x Variables)	Climate Variable Individual Resilience Vulnerability (Exposure / Sensitivity)	Vulnerability Rating
Example; Estuary Ecosystem Health	Example: Rainfall variability	5	Extreme
		4	High
		2-3	Moderate
		0-1	Low

Figure 16: *Climate resilience vulnerability assessment*

Our key existing vulnerabilities

The following section provides a brief overview of the Shire's existing vulnerabilities across a range of sectors (see full analysis in Appendix 4)

Bega Valley Shire's size, topography and landscape diversity bring with it a range of vulnerabilities to natural hazards and future climate variability. Encompassing 6,279km^2, the Shire spans a range of environments from the eastern Monaro, escarpment forests, river valleys, coastal catchments and a 225km long coastline (Figure 17). These physical characteristics in combination with our settlement distribution, infrastructure network, community and social characteristics and economy result in the Shire having a range of vulnerabilities to future shocks and ongoing stressors.

Natural systems

Our community highly values the quality of our local environment and consistently rates our environmental management activities as the most important function provided by BVSC. The high quality of our natural systems underpins our tourist, aquaculture, fishing and agricultural sectors. As such addressing vulnerabilities and threats to our natural systems are a key focus of BVSC and other natural resource management agencies.

The geographic and topographic distribution of our key natural systems from the forests of the escarpment and coastal ranges, floodplain wetlands of the Bega and Towamba Rivers, 28 estuaries and 225km long coastline, means that they have a range of vulnerabilities to ongoing pressures and shocks. These vulnerabilities result in all our natural systems having a high exposure to climate change.

The health and resilience of our natural systems is a key priority of this strategy as the universal factor essential to resilience across all sectors. The effective management of our natural systems will not only increase our communities' resilience, it will reinforce our "natural advantage" over other coastal destinations.

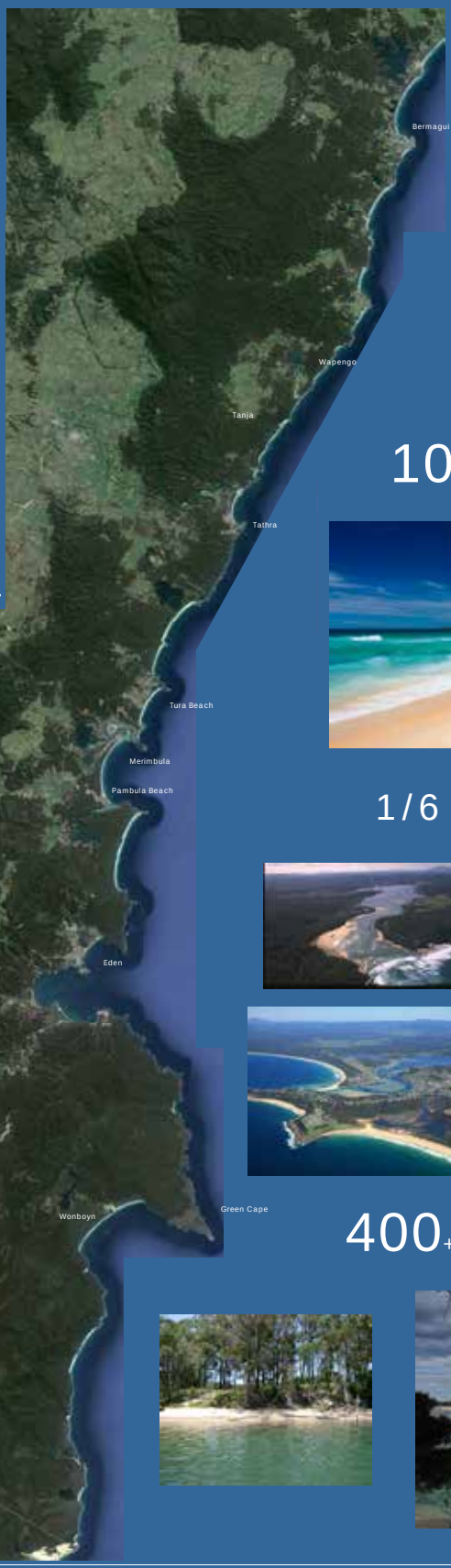
Key Vulnerabilities: Natural Systems
Decline in tree canopy cover
Fragmentation of wildlife corridors
Biodiversity – threatened species
Biodiversity – Invasive species (flora)
Biodiversity – Invasive species (fauna)
Length of coastline
Length of estuarine foreshore
Estuary ecosystem health
Lack of riparian vegetation
Extent of dune systems

The longest coastline.....of any Council in NSW

50% of our residents live within 1.5km of the coast

45% of our residents live along of our coastline

2750ha of protected wetlands



225km

101 ocean beaches

1/6 of NSW Estuaries - 29

400+km of estuarine foreshore

Figure 17: *Bega Valley Shire coastline features*

Land use and settlement

Approximately 70% of our Shire is owned and managed by the NSW Government (National Parks, State Forests, Crown Land are the major land owners) (Table 10). These areas have a range of vulnerabilities over which BVSC has limited influence or direct management responsibility. The majority of these areas are under forest cover of varying types, making them vulnerable to climate impacts as discussed in the previous section and later in this strategy.

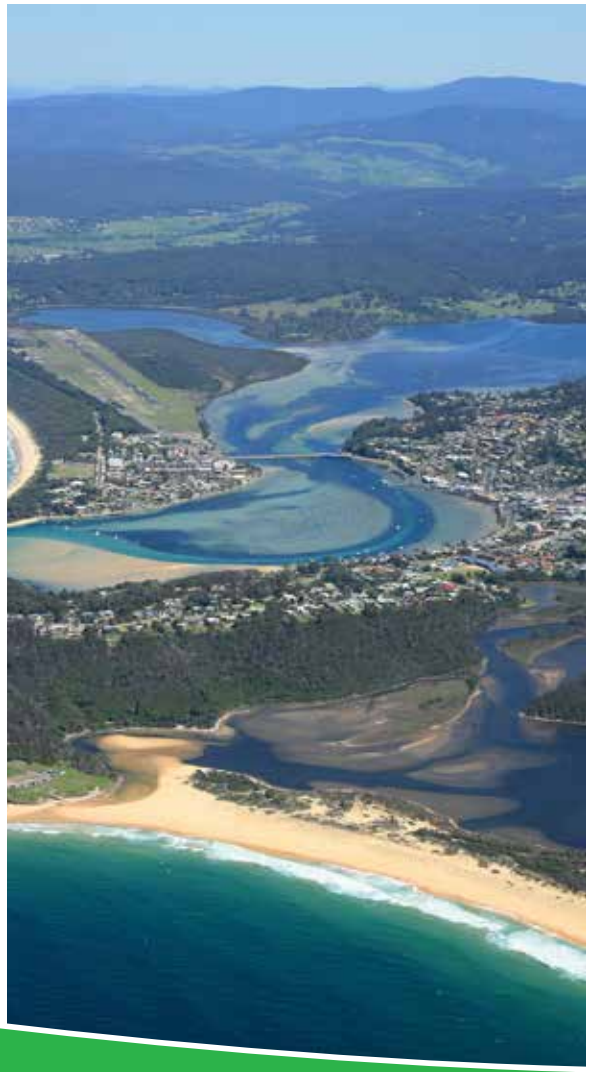
Our major land uses have a range of interconnected existing vulnerabilities that make them particularly susceptible to a changing climate. When combined, our forested areas (NPWS, State Forest and Private land) and agricultural areas represent 93% of land use in the Shire. These areas are acutely vulnerable to changing rainfall patterns, drought and the risk of bushfire.

The geographic distribution of our towns, villages and rural population, not only poses a significant infrastructure management challenge for BVSC, but results in various social and economic challenges for our residents and service providers. The distance between settlements and key services, facilities, combined with a lack of public transport, places a heavy reliance on private motorised transport.

Table 10: *Bega Valley Shire Land Use Breakdown*

Land use	Percentage of Shire
National Park	40%
State Forest	26%
Rural	27%
Residential / Commercial / Industrial / Environmental / Recreation	6%
Estuaries and waterbodies	1%

Key Vulnerabilities: Land use and Settlement
Area of Shire within National Park or State Forests
Extent / location of agricultural land
Distribution / location of towns, villages and settlements
Location of rural residential development
Low lying development
Length of bushland / urban interface
Lack of connectivity between and within settlements
Vehicle dependence
Lack of public transport
Limited housing diversity
Reliance on major towns for essential services



Infrastructure

One of our community's greatest existing vulnerabilities is the extent of our infrastructure network, to service what is a relatively small population base. Due to the Shire's land use, topography and distribution of settlements, the road, water, sewage and electricity infrastructure network in particular is extensive and linear in nature (Table 11).

Apart from the financial implications for our community in being able to fund this infrastructure network, the extent and linear network make it susceptible to impact from operational breakdowns, natural hazards such as flood, bushfire or storms or climate extremes such as prolonged heatwaves.

Key Vulnerabilities: Infrastructure
Extent of bitumen road network
Extent of gravel road network
Low lying water and sewer infrastructure
Location of airport
Water supply system
Capacity of stormwater network
Linear power network
Council's asset portfolio
Telecommunication infrastructure
Distribution of recreational assets
Condition of major highways
Number of bridges and culverts
Management of waste products

Table 11: *Extent of key asset types across the Shire*

Asset Type	Length / number
Bitumen roads	745
Gravel roads	706
Bridges	227
Water pipeline major	235km
Water pump stations	37
Sewer rising mains	231
Reticulation sewerage mains	347
Sewage pump stations	1,051
Sub transmission powerlines	332km
Distribution powerlines	1954km
Low voltage powerlines	1155km
Zone Substations (major)	6
Numbers of substations/ transformers	3329 +

Economy

Our local economy has a low diversity of major industry sectors and is reliant on agricultural, manufacturing, freight transport, tourism and medical /health sectors (Figure 18). The majority of these sectors have a high vulnerability to ongoing socio-economic stressors and acute shocks such as natural disaster, industry restructure or political / policy changes.

The majority of these key vulnerabilities also have a reliance on our natural systems, natural resource consumption or climatic variables. This reliance increases these industry sector exposures to the impacts of a changing climate.

Key Vulnerabilities: Economy
Lack of industry diversity
Reliance on major employers including Government
Dairy – water access
Dairy – irrigation costs
Dairy – production costs /commodity prices
Beef – commodity prices
Tourism - seasonality
Tourism – market competition
Tourism - reliance on natural environment
Distance from markets
Reliance on external food and commodities
Reliance on external energy production
Aquaculture – ecosystem health
Internet access / quality
Online shopping / changing retail trends
Reliance on road transportation

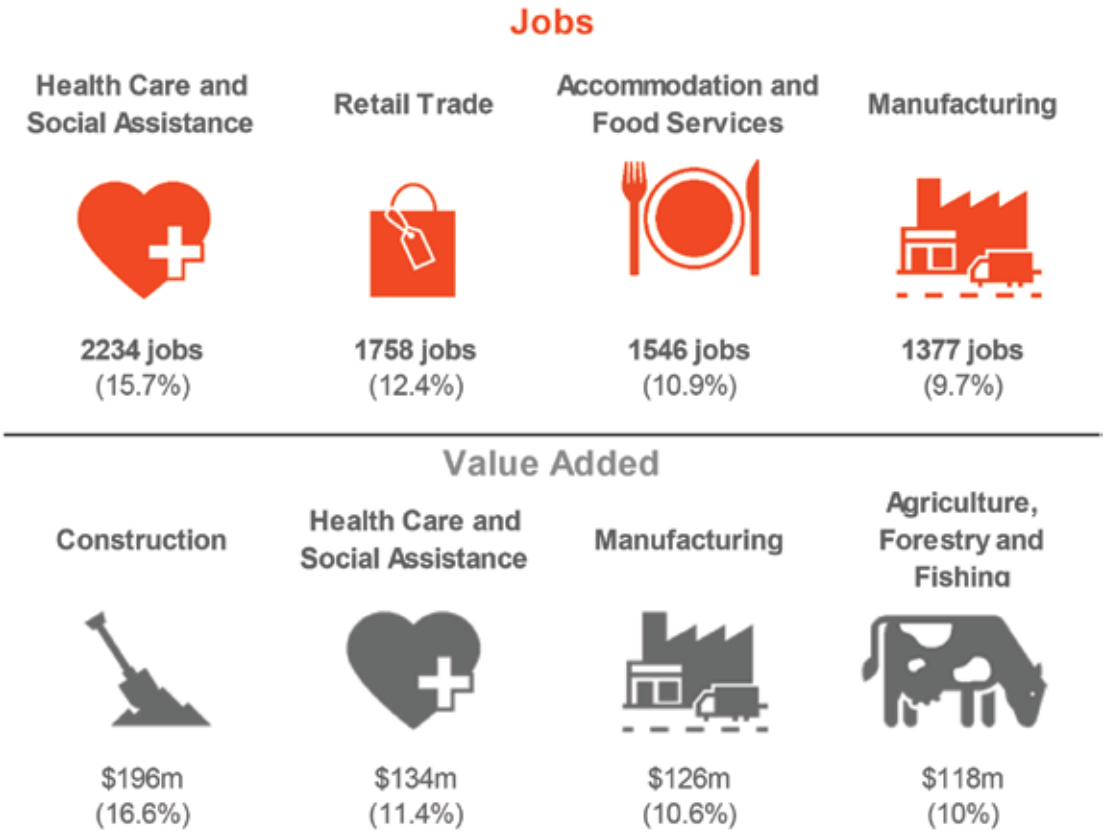


Figure 18: *Top four Bega Valley Shire Council industries for employment and value. (Source: NIEIR)*[10]

10 Shire of Bega Valley - Economic Health Check,, Id Consulting (2019)

Our community

The health and wellbeing of residents is an important indicator of the quality of life experienced by our community as a whole and can affect the ability of residents to participate in community life.

Factors that impact on our community's wellbeing and are key vulnerabilities are primarily socio-economic conditions (Figure 19) that residents experience, housing access / affordability, access to education, transport and sustainable employment opportunities.

Healthy built and natural environments are also key aspects in supporting individual and community wellbeing, living amenity, lifestyle and underpin resilience.

Key Vulnerabilities: Economy
Lack of industry diversity
Reliance on major employers including Government
Dairy – water access
Dairy – irrigation costs
Dairy – production costs /commodity prices
Beef – commodity prices
Tourism - seasonality
Tourism – market competition
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Reliance on external energy production
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Internet access / quality
Online shopping / changing retail trends
Reliance on road transportation

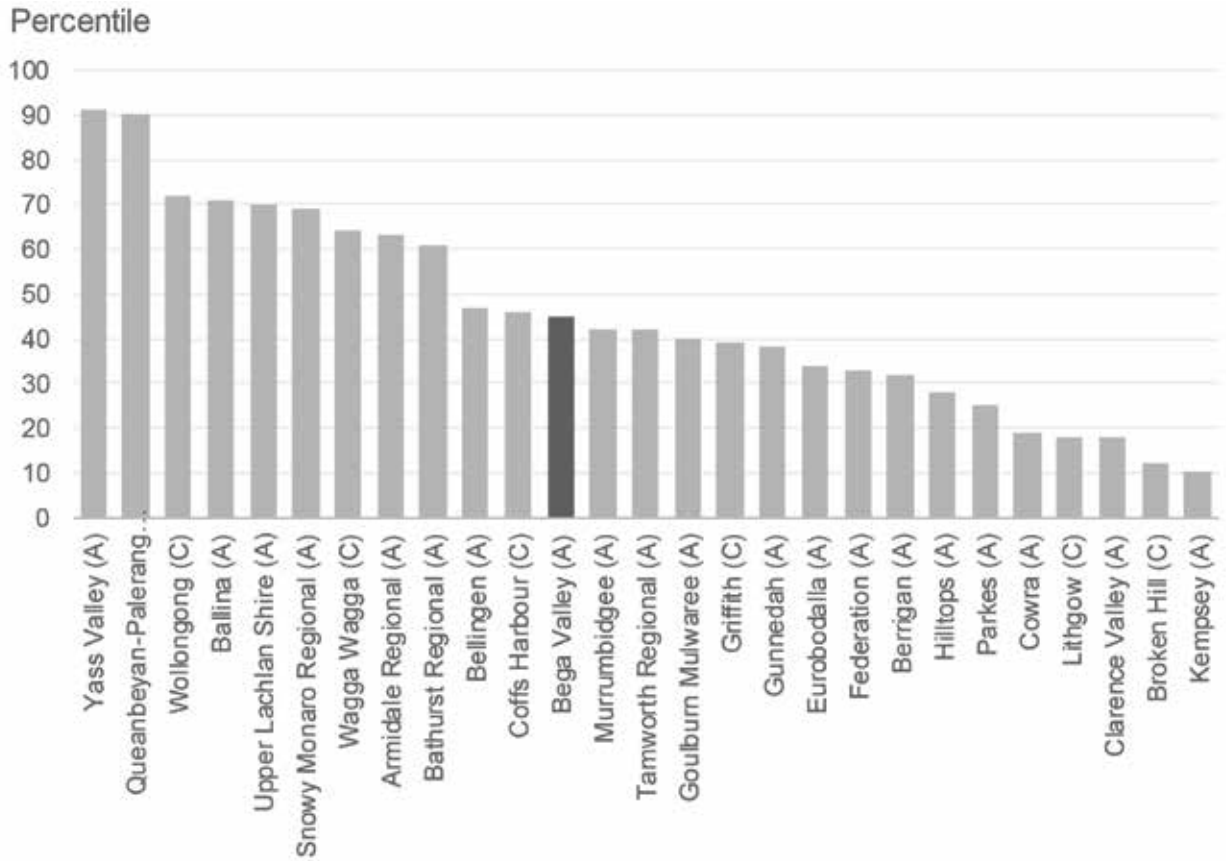


Figure 19: *SEIFA relative socio-economic advantage and disadvantage index. (Source: replace bvsc with ID Consulting, 2019)*[11]

11 *Shire of Bega Valley - Economic Health Check,, Id Consulting (2019)*

The whole system

Our society, economy and lifestyles depend on interconnected systems to deliver essential goods and services, from the food and energy we use, to our social services, transport, and communications. The rapid cascading impacts of bushfires (or other disruptions like COVID-19) through all of these systems cause sometimes irreversible impacts on people, infrastructure and ecosystems. Fires isolated populations, leaving them without essential services and systems that are not designed to deal with prolonged interruption. Taking a systems approach to the compounding vulnerabilities and risks, and the cascading impacts is important.

Key Vulnerabilities: The Whole System
Cumulative stresses and acute shocks, and amplifying feedbacks are increasing vulnerabilities.
Proximity of thresholds for catastrophic loss and non-linear, irreversible change.
Systems are configured for delivery in times of stability or prosperity – no 'buffer' for major disruption.
Interdependence of systems for essential goods and services and cascading impacts when shock occurs.
Each sector attempting to mitigate hazards, stresses and shocks independently.
Lack of broad understanding across society about systemic vulnerability and risk, and how to deal with them.
Governance (e.g. government and private sector planning processes) are not suited to the co-ordinated decision-making and collective action required.

Climate resilience – extreme vulnerability summary

Table 12 provides a summary of the vulnerabilities that were rated extreme through the vulnerability assessment undertaken as part of the development of this Strategy. The results of the vulnerability assessment are listed by vulnerability category in Appendix 3.

Table 12: *Extreme Climate Resilience Vulnerabilities*

Climate Vulnerability	Climate Factor	Vulnerability	Level of BVSC Influence
CV 1	Sea level rise	Length of coastline	Indirect
CV 2		Length of estuarine foreshore	Indirect
CV 3		Extent of dune systems	Direct
CV 4		Low lying development	Direct
CV 5		Low lying water and sewer infrastructre	Direct
CV 6		Location of airport	Direct
CV 7		Aquaculture - ecosystem health	Direct
CV 8	Rainfall variability	Decline in tree canopy cover	Direct
CV 9		Extent / location of agricultural land	Indirect
CV 10		Dairy - water access	Indirect
CV 11		Dairy - Irrigation costs	Indirect
CV 12		Dairy - production costs / commodity prices	Indirect
CV 13		Reliance on external food and commodities	Indirect
CV 14	Increase in average temperatures	Extent / location of agricultural land	Indirect
CV 15		Length of bushland / urban interface	Direct
CV 16		Dairy - irrigation costs	Indirect
CV 17	Increase hot days (35+)	Distribution / location of towns, villages and settlements	Direct
CV 18		Linear power network	Indirect
CV 19		Reliance on external energy production	Indirect
CV 20		Aquaculture – ecosystem health	Indirect
CV 21		Ageing population	Indirect
CV 22	More intense storms	Linear power netowrk	Indirect
CV 23		Reliance on external energy production	Indirect
CV 24	Change in ocean temperature and pH	Estuary exo system helath	Indirect
CV 25		Aquaculture - ecosystem health	Indirect

The Climate Resilience Strategy

The Strategy establishes the overarching framework for the continued implementation of existing climate resilience mitigation adaptation actions and the pursuit of new initiatives that fill existing gaps in our community's climate resilience.

The Strategy groups climate resilience actions into eight Key Response Areas (Figure 20).

1. Natural Systems
2. Preparing for Natural Hazards
3. Liveable and Connected Places
4. Safe, Healthy and Inclusive Community
5. Diverse and Thriving Economy
6. Energy Security
7. Food Security

Each Key Response Area identifies relevant vulnerabilities, challenges and benefits, describes existing programs, and proposes mitigation and adaptation actions.

The individual resilience initiatives do not operate in isolation, they are a collective set of actions, interlinked across Key Response Areas. For example, actions to protect estuary health have resilience benefits to multiple Key Response Areas including Natural Systems – Coasts and Marine, Thriving and Diverse Economy – Aquaculture / Tourism and Liveable and Connected Places.

Achieving climate resilience in individual Key Response Areas is vital for subsequent Key Response Areas. Each layer of the resilience pyramid cumulatively contribute to a resilient Shire.

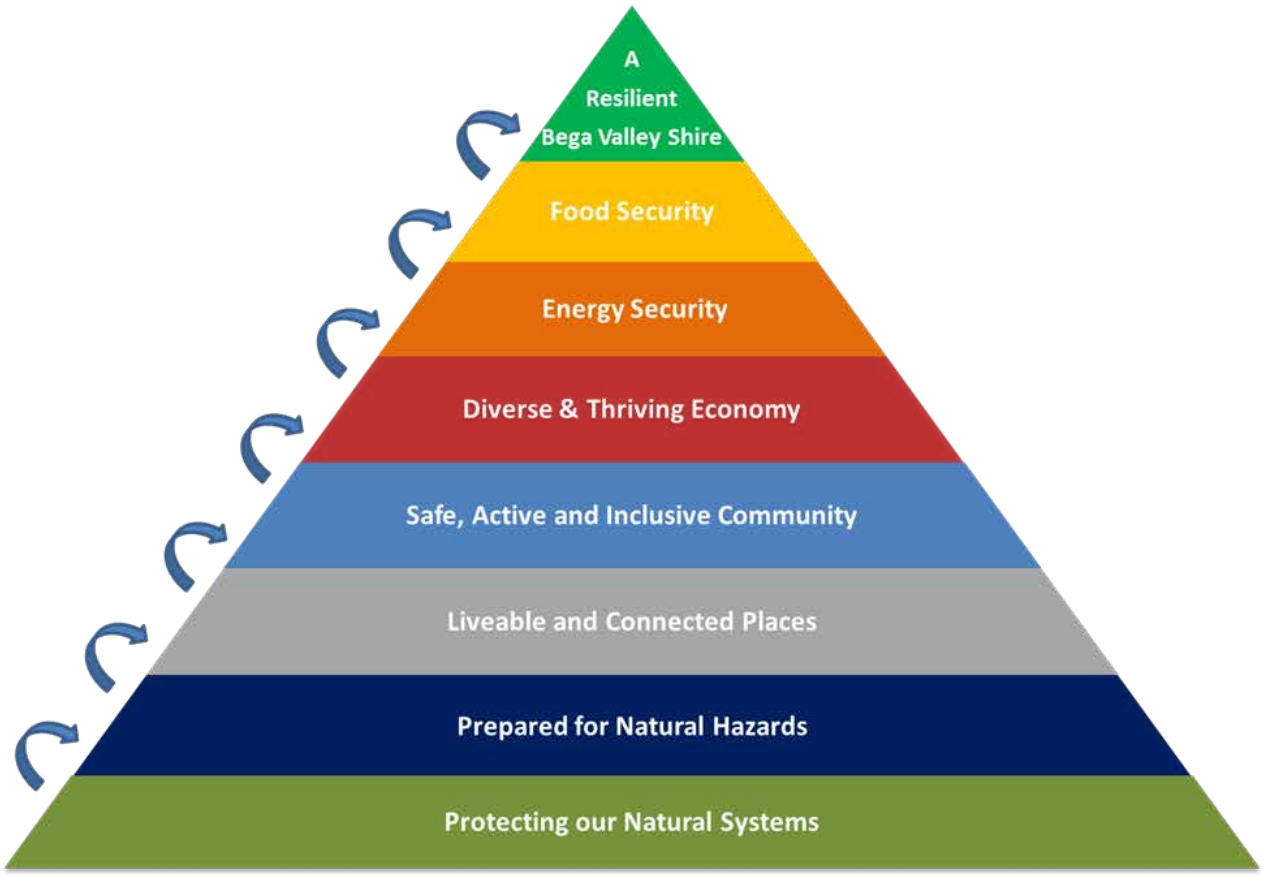


Figure 20: *Bega Valley Shire resilience pyramid*

The resilience pyramid reflects the importance of each of the lower layers as foundations for the subsequent layers. Essentially without resilience in the base layers of the pyramid there cannot be resilience in the upper layers of the pyramid.

Whole of system resilience approach

While the direct impacts of the Black Summer bushfires on towns and people were felt immediately, longer-term cascading impacts are yet to fully emerge. For example, food production systems will be impacted from loss of equipment, livestock, crops and ecosystem functions, such as loss of pollinators, polluted water sources, and reduced genetic diversity in stock and crops. There will be delayed health impacts from prolonged smoke exposure and less visible mental health and domestic abuse impacts. Cascading indirect consequences will include economic impacts on livelihoods due to lost tourism and farming revenues and high reliance on volunteer work, and substantial costs to the finance and insurance industry – which may in turn be passed on to those who live in high-risk areas and are already impacted.

Addressing the root causes and effects of these vulnerabilities will involve bringing together diverse stakeholders from business, communities, social services, research and government to better understand these systemic causes and effects, identify points of failure, and reveal future mitigation options.

The real opportunity right now is to manage the recovery process in such a way that it builds in reduced emissions, increased adaptation, preparedness and resilience for next time. Instead of doing this separately for infrastructure, communities, industries, health and other social services, it could be done as integrated planning, informed by deep knowledge of the process of social change, as well as key data and analyses.

Trade-offs will need to be found with new 'balance' points – for example, the balance between relying on volunteer force for firefighting compared with professionals; the costs of stand-alone power sources in regional areas and less exposed power generation and distribution infrastructure, compared with replacing current infrastructure quickly; the costs of rebuilding homes or infrastructure with higher building codes, compared to cheaper and more rapid replacements of the same types of construction; the pleasure and amenity of choosing to live close to forest and trees, compared to the feeling of safety being away from higher risk areas. This can only be done by involving a wider range of people, organisations and perspectives in the planning process.

There are few 'off-the-shelf' solutions; we don't know exactly what the future holds, but we do know how to use place-based resilience-building planning to move forward and learn as we go. We can use our experience of what has happened in 2019-20 to make some different choices in the future and structure our learning to make it more likely that we move towards futures that can deliver on the values of our region – ones that explicitly acknowledge the changing nature of the systems around us.

Mitigation and adaptation

Climate change strategies have traditionally been delivered through a suite of mitigation and adaptation actions. This Strategy aims to build the Shire's overall resilience capacity that place BVSC and the wider community in a stronger position to be able to implement mitigation and adaptation. Each climate resilience action is identified as being a mitigation or adaptation action. In some case they can have both mitigation and adaptation benefits.

Mitigation

Climate change mitigation refers to direct action to reduce emissions of greenhouse gases and decrease the severity of climate change. The more greenhouse gases that are emitted (both presently and in the future) the greater the scale of future climate change and associated impacts.

Adaptation

Climate change adaptation refers to changes in human or natural systems in response to actual or expected climate changes in order to minimise impacts or increase beneficial opportunities.

The greater the degree of proactive adaptation that occurs in expectation of specific climate change impacts, the less impact that climate change will have on human and/ or natural systems i.e. the expected climate change will still occur but the impact is expected to be reduced.

Relationship between mitigation and adaptation

While mitigation addresses the causes of climate change, adaptation addresses the effects of climate change. There is a level of inter-relationship between mitigation and adaptation. The more mitigation that occurs i.e. reduction of emissions, the less severe the climate change and the less adaptation will be required (Figure 21).

Bega Valley Shire has been undertaking adaptation policy, strategy and on-ground adaptation initiatives to address the predicted impacts of unavoidable climate change. We have also been doing our part to reduce emissions and hence minimise the severity of climate change.

While adaptation and mitigation have two distinct purposes, single strategies can address both mitigation and adaptation. For example the installation of solar arrays contributes to a reduction in the Shire's greenhouse gas emissions (i.e. mitigation), whilst also making the Shire more resilient to future energy price increases.

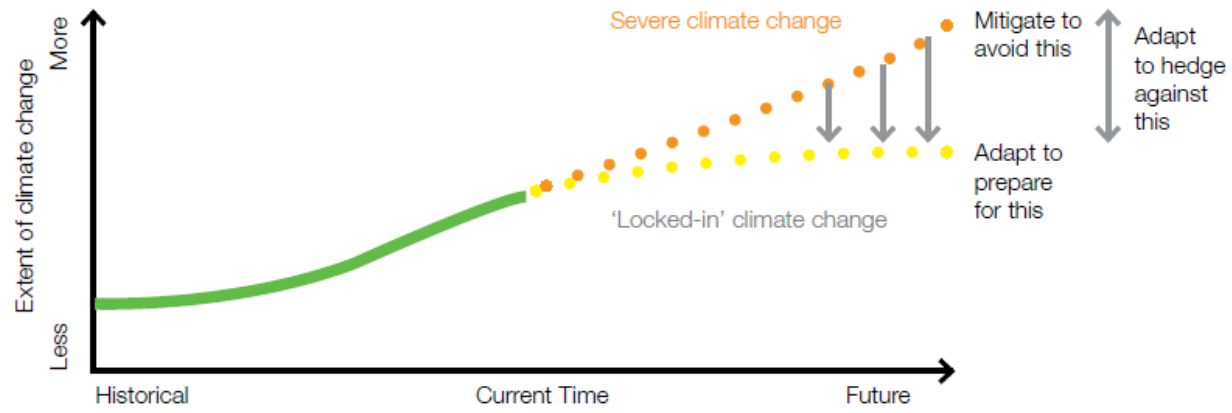


Figure 21: *Relationship between mitigation and adaptation*

Solution multipliers

Climate change has been identified as a threat multiplier by several international agencies such as the US Department of Defence, United Nations Security Council and NATO. Climate change can exacerbate existing threats such as severe drought, severe storms and heat stress and may result in crop failure, mass migration or political upheaval.

Conversely this Strategy identifies a number of "solution multipliers", or natural assets of the Shire, that provide multiple climate change resilience benefits over and above their primary ecosystem or physical function. These natural assets have the added benefit of already being in our landscape and requiring little management intervention or enhancement. As such they present low cost and resource efficient ways in which we can strengthen our resilience and provide a foundation to address our climate resilience challenges across all sectors (see Table 13 for examples).

Table 13: *Contribution of natural assets to climate resilience.*

Natural Asset	Key Ecological or other Function	Additional Climate Resilience Value
Wetlands	Habitat, water filtering, sediment deposition	Carbon sequestration, storm surge buffer
Mangrove	Habitat, sediment deposition	Carbon sequestration, foreshore stabilisation
Dune systems	Habitat, sediment storage	Open coast recession buffer, storm bite erosion buffer
Forest	Habitat, oxygen production, catchment protection, timber production	Carbon sequestration, localised temperature moderation

Natural Asset	Key Ecological or other Function	Additional Climate Resilience Value
Grasslands	Habitat, agricultural production, catchment protection	Carbon sequestration, reduction in transpiration
Oyster reefs	Habitat, food source	Storm surge buffer, foreshore erosion buffer, increase in height with sea level
Catchments	Habitat, water supply	Carbon sequestration, buffer intense rainfall events
Street trees / parks and reserves	Habitat, shade, amenity	Reduction of urban temperature, carbon sequestration, shade relief

BVSC / community partnership – the key to success

This Strategy is a key document that will help set our Shire up to be a safer place in an uncertain future and will help us to cope with the challenges that climate change may bring. For this Strategy to be successful in creating a climate resilient Bega Valley Shire, it is vital that we work closely together as a community.

BVSC has a critical leadership role, facilitating, coordinating and catalysing actions to see the successful implementation of this plan. Delivering all these actions depends on partnerships between BVSC, other government agencies, industry, not-for-profit groups, and individuals across the Shire.

This Strategy will require changes in thinking and approach across all sectors of our community. It is important that opposing views are heard and considered, but these cannot delay the timely response to taking action to boost the Shire's resilience.

> "I believe we will require a series of 'resilience conversations' on selected topics, with the intent of bringing community members accessible information on climate resilience and its benefits. This process will in turn require a consensus approach where we can all come to pretty much agreed positions on issues like bush fire risk and how to deal with it, water security, storm surge, biodiversity, etc." - BVSC Technical Panel Member

It is critical that the conversations across our community and with BVSC do not become polarised and instead focus on the risks that climate change will likely bring (while acknowledging uncertainty about exactly when those risks will occur) and making the case that these risks can be better managed if we start acting now.

Strategy Implementation and Review

Implementation of the individual actions will be driven by the responsible agency identified against each action. BVSC's priorities will be based on responding to high climate resilience risks as listed in the previous section and driven through our Integrated, Planning and Reporting Process, specifically the annual Operational Plan. Opportunities for grants from other tiers of government will also be sought to assist in the delivery of the required actions. Community partnership arrangements will also be pursued.

For each action a timeframe for implementation and likely cost of action are identified (Table 14), as well as the responsibility for delivering the action (see list of acronyms for organization names).

It is proposed to review the implementation of the Climate Resilience Strategy on an annual basis as part of Councils Integrated Planning and Reporting framework. The climate projections within the document will be reviewed following the release of the IPCC's assessment reports.

Table 14: *Key to timeframes and cost estimates of actions.*

Implementation Timeframe	Indicative Implementation Cost
Ongoing	Nil
Short 2020 - 2025	Low
Medium 2025 - 2030	Medium
Long term 2031 - 2050	High

Climate Resilience Challenges

Five of the Shire's six major settlements occur in the coastal zone and 50% of the Shire's population lives within 1.5km of the coast. Forty-five percent of the Shire's population lives adjacent to only 10% of our coastline, focusing pressures on a limited number of our beach and estuarine environments.

This population concentration, when combined with seasonal tourist and local visitor usage, places pressure on our coastal environment, that will have to be carefully managed into the future to ensure one of the premier "natural advantages" is protected.

The marine environment of the Bega Valley Shire sees the meeting of two major bioregions; the Batemans Shelf and Twofold Shelf Bioregions. These areas meet off the coast of Tathra and are the focus of scientific research into the impacts of climate change on marine ecosystems, changes in ocean temperature and ocean currents, due to the global significance with regard their diversity of geomorphology, ecology and ecosystem health (Figure 22) .

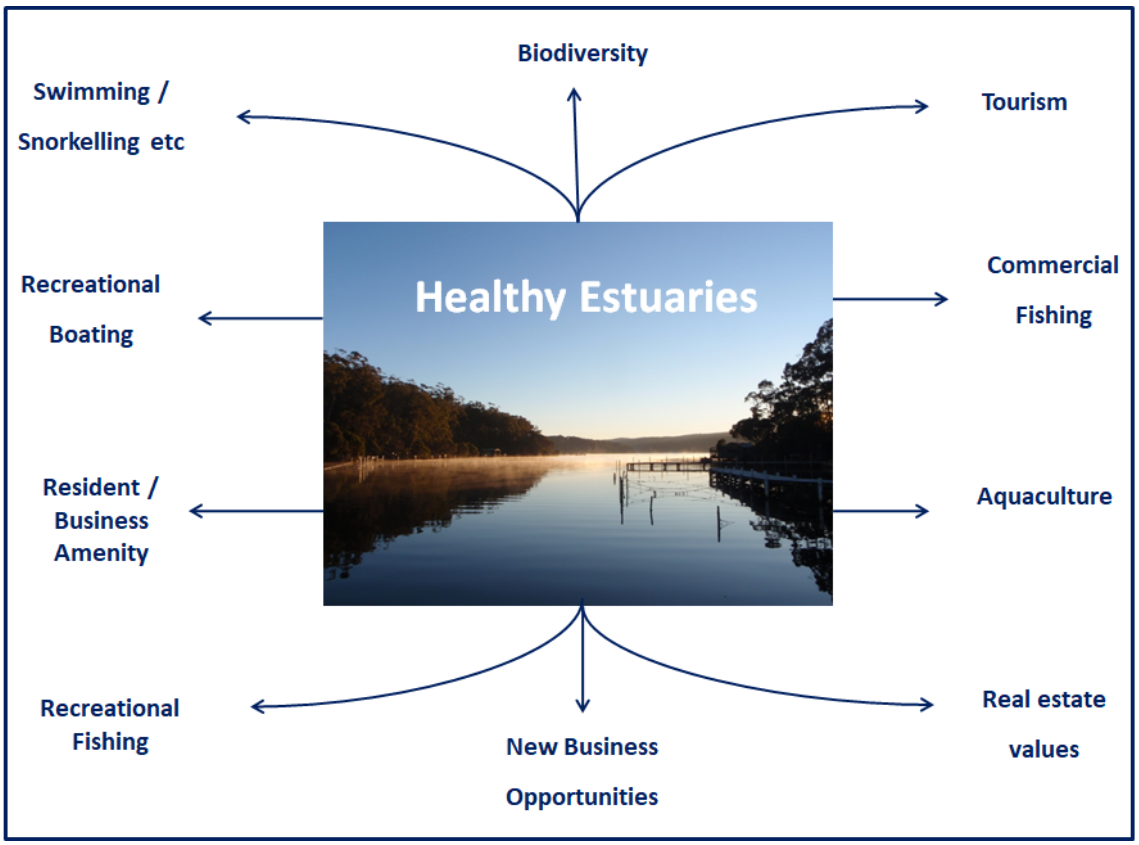


Figure 22: *Healthy estuaries ecosystem services*

The East Australian Current is now penetrating further south along our coastline, resulting in warmer offshore ocean temperatures increasing sightings of tropical species beyond their normal range and a southern retraction of bull kelp forests. These changes to current and temperature have the potential to result in dramatic changes in species distribution, diversity and the abundance of key target commercial species.

Rising sea levels are a key climate impact risk for our saltmarsh and wetland areas and their ability to migrate with higher estuarine water levels. The existing foreshore land forms (cliff, rocky shore, gentle slopes, floodplains) and land use (urban, open space or farmland) will determine whether these vital ecosystems can migrate, avoid being "squeezed out" and continue to provide their vital ecosystem services. Increasing estuarine water temperatures and changes to water chemistry, will be a major stressor on the sustainability of foreshore wetlands, seagrass and saltmarsh areas.

The protection of our dune systems has long been a key adaptation focus for BVSC and agencies such as LLS (CMA, DLWC) and our local land care groups in Tathra, Bermagui and Merimbula. Our dune systems are our primary defence to the impacts of coastal erosion events such as the 2016 east coast low, providing a substantial buffer between the storm waves and public and private assets. Rising sea levels increase the potential for increased foreshore recession (in the absence of sediment supplies) and the need for robust dune systems.

Climate Resilience Benefits

- ✓ Multi - benefit from natural system-based solutions
- ✓ Low cost adaptation and mitigation actions
- ✓ Estuarine health
- ✓ Support resilience of industries based on natural resource use (aquaculture, fishing, abalone)
- ✓ Protect recreational amenity
- ✓ Carbon sequestration
- ✓ Coastal erosion buffer
- ✓ Species diversity
- ✓ Habitat protection

Natural Systems – Coast and Marine

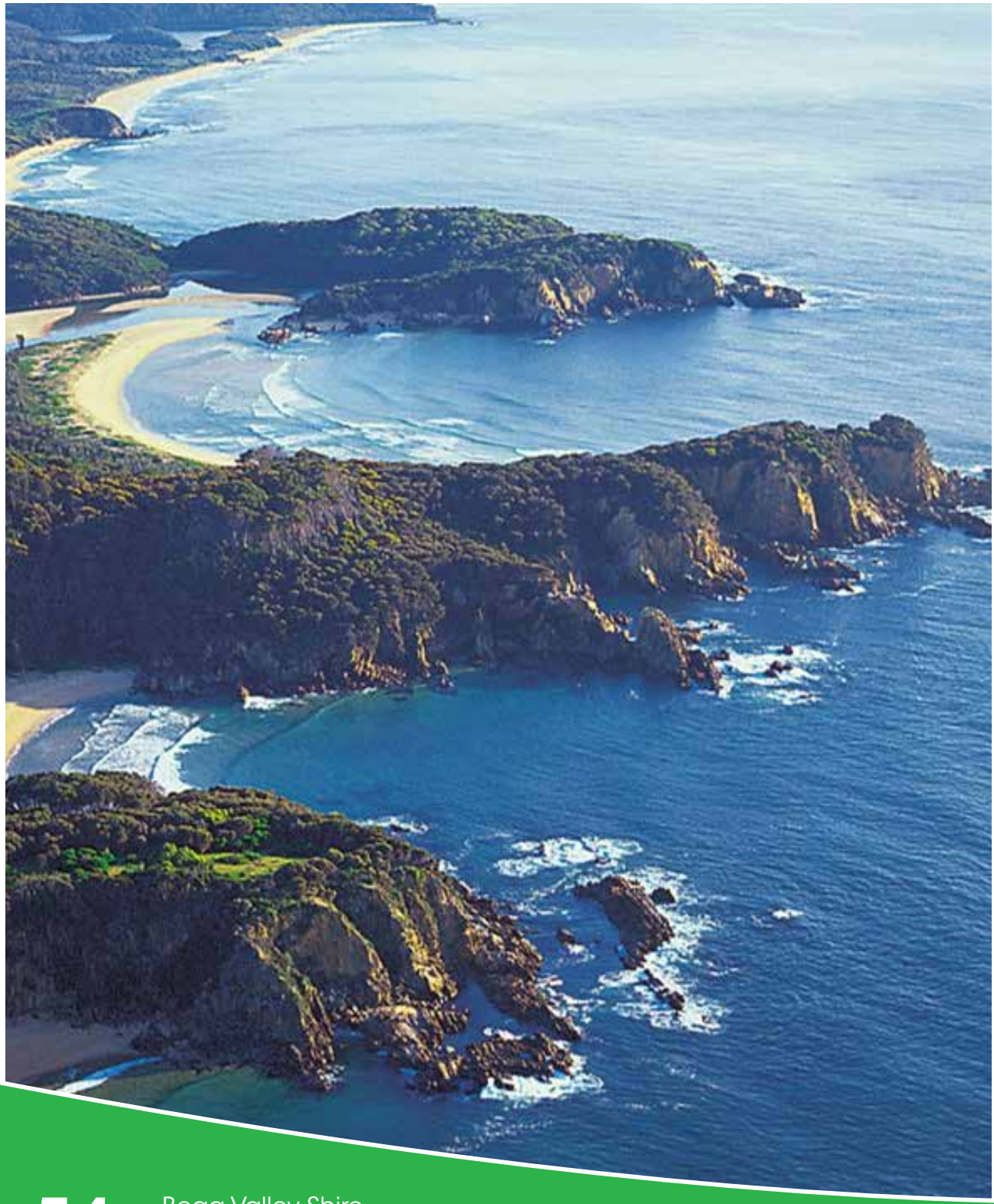
Performance Measures and Targets	• Increase in area of wetland protected. • Increase in estuarine health.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
Wallaga Lake, Bermagui River, Merimbula and Back Lake, Lake Curalo Coastal Management Program	CV1, CV2, CV3, CV4, CV5, CV7, CV 24, C25	✓	✓	BVSC, DPIE
Marine Estate Management Strategy	CV1, CV2, CV3, CV 24, C25	✓	✓	DPI
Coastal Weeds and Marine Debris project	CV2, CV3		✓	FSCLCA
Love Our Lakes Program	CV2, CV7 CV20		✓	BVSC, IND
BVS Dune Protection and Management Program.	CV3		✓	BVSC
Wapengo, Middle Lagoon, Cuttagee and Baragaoot Rapid Catchment Assessments	CV2, CV7		✓	BVSC
BVS Estuary Entrance Management Policies	CV4, CV5, CV7		✓	BVSC
Bega River Estuary Management Plan	CV2, CV5	✓	✓	BVSC, DPIE, DPI
Pambula Lake Coastal Management Plan	CV2, CV5, CV7	✓	✓	BVSC, DPIE, DPI, IND
Community Environment Grants	CV2, CV3, CV7	✓	✓	BVSC

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
N1	Expand dune protection and revegetation program across the Shire, with a key focus on Bermagui, Tathra, Merimbula, Pambula and Aslings Beaches.	CV1, CV3		✓	BVSC, LLS	Short	Med
N2	Identify critical wetlands, saltmarsh on private land and develop incentives for protection of these areas.	CV7	✓	✓	BVSC, DPI, LLS, COM	Short	Low
N3	Identify strategic migration sites for wetlands, saltmarsh and mangrove communities.	CV7	✓	✓	BVSC, LLS, DPI,	Short	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
N4	Specific estuarine health monitoring programs targeted at high risk estuaries.	CV7, CV24		✓	BVSC, DPI,	Ongoing	Low
N5	Species diversity and abundance surveys of estuaries and key marine indicator species.	CV7, CV13, CV20, CV24		✓	DPI	Ongoing	Low
N6	Monitor changes in marine algae diversity, distribution and oyster health as key indicators of changes to near shore ocean temperatures and current penetration.	CV24		✓	DPI	Ongoing	Low
N7	Undertake community engagement activities to increase awareness of local natural values.	CV1, CV2, CV3	✓	✓	BVSC, DPI	Short	Low
N8	Undertake oyster reef restoration trials	CV2, CV7		✓	DPI, LLS	Short	Low
N9	Strategic sand pumping in Bega River Estuary to improve flushing of Mogareeka, Black Ada and Racecourse creek sections of the estuary.	CV4, CV5		✓	BVSC, IND	Short	Med
N10	Implement Local Strategic Planning Statement review of planning provisions through a climate resilience framework to ensure vulnerable landscapes are adequately protected.	CV 1, CV2, CV4		✓	BVSC	Short	Low
N11	Investigate opportunities on BVSC owned land to develop and undertake flagship on-ground climate resilience projects, including offsetting sites as a source of income for the management of high value sites.	CV8		✓	BVSC	Short	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
N12	Collaborate and partner with research institutions to investigate opportunities for climate resilience research on existing or new projects.	CV8, CV15 CV25	✓	✓	BVSC, UNI	Ongoing	Low



Natural Systems – Catchments and Forests

Climate Resilience Challenges

Bega Valley Shire has three major river catchments, the Bega, Brogo and Towamba River systems. These catchments supply all the Shire's urban and village water supplies and are home to the majority of the Shire's agricultural industry. The Narrira Creek catchment and part of the Tuross River catchment encompasses the Cobargo, Wandella and Yowrie agricultural areas. All the catchments have been heavily modified, with most drainage lines being heavily incised, suffering varying degrees of erosion and sedimentation.

The protection of our upland swamps and floodplain wetlands are of vital importance in retaining water in our catchments and moderating runoff from intense rainfall events. The restoration of our catchment areas to achieve greater natural system water storage, riparian revegetation and improved soil moisture retention is one of the greatest challenges in increasing our resilience to potential climate impacts.

Our forest areas provide a range of values including ecological, catchment protection, carbon sinks, forest products and tourism. Some of them are uniquely evolved to cope with fire regimes, however changes to average temperatures, rainfall patterns, droughts and subsequent reductions in soil moisture are likely to alter fire regimes and make our forests more susceptible to large, destructive bushfire and inhibit their ability to recover post fire. Current research underway examining the response of various forest types to climate change are indicating that the forests will be more susceptible to stressors such as drought, fungal and pathogen attack and bell minor dieback susceptibility.

Disturbances such as development, fires and drought are likely to lead to further degradation or loss of ecological communities. There is likely to be increased vulnerability of natural systems to pest species exacerbated by drought, extreme weather and changes to climate patterns.

Invasive plants and animals continue to exert further pressure on ecological communities and native species and in some cases have health and safety implications for residents (Asian Paper and European Wasp). How a changing climate will impact or magnify the threats from invasive species is unclear, however it will likely make our local ecosystems (terrestrial and marine) more susceptible to impact from invasive species.

Climate Resilience Benefits

- ✓ Retention of water in catchments, enhance natural system storage
- ✓ Slow release of water to rivers and streams
- ✓ Protection of water quality and flows to estuaries
- ✓ Soil moisture
- ✓ Agriculture production
- ✓ Tourism opportunities
- ✓ Carbon sequestration potential
- ✓ Sustainable forest management
- ✓ Species diversity
- ✓ Habitat protection

Natural Systems – Catchments and Forests	
Performance Measures and Targets	• Increase in area of endangered ecological communities. • Increase in condition of riparian corridors. • Increase in average annual stream flow volumes as measured at Morans Crossing, Kanoona and Angledale.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
SRCMA (LLS)– South East Catchment Action Plan and FSCLCA Bush Connect Project	CV1,CV2, CV3, CV7, CV9, CV14. CV24	✓	✓	LLS, FSCLA
Marine Estate Management Plan	CV1,CV2, CV3, CV24, C25	✓	✓	MEMA
Draft Regional Water Plan	CV9, CV10, CV11		✓	WATER
Wapengo, Middle Lagoon, Cuttagee and Baragaoot Rapid Catchment Assessments	CV2, CV7, CV20, CV24	✓	✓	BVSC
South East Weed Management Plan	CV9		✓	BVSC, LLS
OEH Saving Our Species Program	CV7, CV8, CV22		✓	BVSC
South East LLS Local Strategic Plan 2016-2021	CV1, CV2, CV7, CV9, CV10, CV14	✓	✓	BVSC, DPIE, DPI
Regional Land Partnership outcomes - Federal government NLP2 funding program	CV8, CV9, CV14	✓	✓	BVSC, DPIE, DPI, IND
Coastal Forests Management Plan	CV8	✓	✓	FCORP
Regional Corridor Strategy (SRCMA)	CV8, CV9, CV15		✓	LLS, DPIE
Koala Recovery Strategy	CV8		✓	DPIE

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
C1	Initiate a catchment management program targeting private land managers to protect and enhance landscape attributes and biodiversity values critical to climate adaptation and mitigation.	CV7, CV8, CV9	✓	✓	BVSC, LLS, DPI,	Short	med
C2	Catchment to coast projects focusing on critical catchments of oyster producing lakes.	CV7, CV20, CV24, CV25		✓	BVSC, MEMA	Short	Med
C3	Support landscape stewardship by individuals and organisations in partnership with local natural resource management organisations.	CV8, CV9, CV14	✓	✓	LLS, BVSC	Med	Med

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
C4	BVSC partner with LLS in the advocating for ongoing funding for Landcare and restoration of on-farm revegetation funding programs.	CV8	✓	✓	LLS, BVSC	Ongoing	Low
C5	Strategic wildlife corridor identification and enhancement.	CV8, CV9		✓	BVSC, LLS DPIE	Med	Low
C6	Upland swamps, hanging swamps and flood plain wetland protection and restoration, focused on the Bega and Towamba River Catchments.	CV10		✓	LLS, COM	Med	Med
C7	Identify off stream water storage dam/s – for harvest storage of flood water.	CV9, CV10, CV11, CV16	✓	✓	BVSC, LLS, WATNSW	Med	Med
C8	Improve on farm storage potential through regenerative farming practices, riparian restoration and appropriately located storage dams.	CV9, CV10, CV11, CV18		✓	LLS	Ongoing	Med
C9	Identify and protect key instream refuge pools for drought periods – designated for access to water, wildlife preservation and recovery. These sites to be focus of catchment rehabilitation efforts and identified in emergency plan.	CV8		✓	BVSC, LLS, DPIE	Short	Med
C10	Establish long term forest community health assessment research and monitoring with Forestry Corp. and NPWS.	CV8	✓	✓	NPWS, FCORP	Ongoing	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
C11	Review active management requirements of regrowth forests within National Park Estate or State Forests Flora Reserves to improve biodiversity, catchment management and bushfire resilience.	CV8	✓	✓	NPWS, FCORP	Short	Low
C12	Establish carbon sequestration study of forest and rural landscapes across the Shire to in-form long term management of these areas.	CV9	✓	✓	FCORP, UNI	Ongoing	Low
C13	Implement South East Weed Management Plan – Priority Actions.	CV8, CV14	✓	✓	BVSC, LLS, DPI,	Ongoing	Low
C14	Monitor target threatened and selected indicator species population and distribution.	CV7, CV8, CV24		✓	LLS, DPI, BVSC	Med	Low
C15	Increase community capacity to manage and their awareness of invasive species incursions and undertake strategic control programs.	CV3, CV9		✓	LLS, DPI, BVSC	Ongoing	Low
C16	Cooperative cross tenure approach to pest animal management.	CV9	✓	✓	LLS, DPI	Ongoing	Low
C17	Maintain high focus on the management of African Lovegrass across the landscape due to its impact on productivity, natural systems and increase in bushfire hazard.	CV9 CV14	✓		LLS, DPI, BVSC	Ongoing	Med
C18	Provide report cards on condition or health of naturals systems on a five yearly basis.	CV7 CV24	✓	✓	BVSC, FCORP, NPWS, DPI	Ongoing	Low

Preparing for Natural Hazards

Climate Resilience Challenges

Our town layouts have a range of vulnerabilities to physical hazards. Low lying areas of Bermagui, Merimbula and Eden have susceptibility to inundation events and are likely to be impacted by changes in sea levels and tidal regimes into the future. This presents a land use and development planning challenge, with regard to when and what action needs to be taken.

The majority of our beaches suffered significant erosion through a series of storm events during the 1970s, resulting in surf clubs, caravan parks, roads and bridges being damaged or under severe threat. The extensive dune rehabilitation program undertaken by the former NSW Soil Conservation Service and BVSC saw the dunes accrete large volumes of sand and the recovery of dune vegetation communities. The health of our dune systems was critical in buffering the impact of the 2016 East Coast Low storm event.

There are only a small number of private properties identified in coastal hazard zones for coastal erosion and shoreline recession. The majority of the land currently mapped within these hazard lines is high value public open space, beaches, recreation facilities and caravan parks. Critical infrastructure such as sewage pump stations, Cuttagee bridge and adjoining section of the coast road are currently mapped within high hazard areas and are examples of the adaptation challenges that confront BVSC and our community.

Our major coastal towns are surrounded by large forested areas and are susceptible to bushfire impact as seen in the 2019 / 20 bushfires and previous events in 2018 (Tathra) in 1952 (Eden and Tathra). Development in areas of Merimbula, Tura Beach, Eden, Pambula Beach, Tathra and Bermagui in particular, has increased the length of urban / bushland interface and has greatly increased the vulnerability of populations to the impacts of bushfires. The majority of the Shire is identified as being bushfire prone including the grasslands of the rural valleys. There are key challenges for our community in how to adapt to changed fire regimes and intensities, that may impact our existing settlements, agricultural areas, timber industries and forest ecosystems.

> “The big research challenge is how we’re going to adapt, and build resilient communities, and how will our ecosystems cope with the double combination of fire and drought. [There has been] really no concerted effort to understand the resilience of our human systems to the multiple challenges of drought and fire, and those knowledge gaps could prove costly to communities.” - Professor Ross Bradstock

One of our community's greatest existing vulnerabilities is the extent of our infrastructure network, to service what is a relatively small population base. Due to the Shire's land use, topography and distribution of settlements, the road, water, sewage and electricity infrastructure network in particular is extensive and linear in nature.

Apart from the financial implications for our community in being able to fund this infrastructure network, the extent and linear network make it susceptible to impact from operational breakdowns, natural hazards such as flood, bushfire or storms or climate extremes such as prolonged heatwaves.

The physical location of our sewage infrastructure, popular recreation facilities and critical transport infrastructure like the airport and key connector roads increase the vulnerability to natural hazards impacts. Due to the Shire's topography and functional requirements of the infra-structure, there are limited opportunities for relocations of these assets.

Climate Resilience Benefits

- ✓ Community safety, health and wellbeing
- ✓ Infrastructure protection
- ✓ Protection of high value natural systems
- ✓ Shorten recovery process
- ✓ Avoid impacts and disruptions to essential service, transport and supply routes
- ✓ Reduction in economic loss and insurance costs

Preparing for Natural Hazards	
Performance Measures and Targets	• Increase in beach dune sand volume. • Increase in number of dwellings designed to withstand natural disasters. • Reduction in annual average insured losses.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaption	Lead
Bega Valley Shire Bushfire Risk Management Plan	CV9, CV14, CV15, CV17, CV18		✓	RFS, NPWS, FCORP, BVSC
Bega Valley Shire Hazard Reduction Program	CV15, CV17		✓	BVSC
Bega Valley Shire Coastal Processes and Hazards Definition Study	CV1, CV2, CV3, CV4, CV5, CV6		✓	BVSC
Bega Valley Shire Coastal Hazards CMP	CV1, CV2, CV3, CV4, CV5, CV6	✓	✓	BVSC
NSW RFS Planning for Bushfire Protection	CV14, CV15, CV17		✓	RFS
Bega / Brogo River Flood Management Plan	CV4, CV5,		✓	BVSC, DPIE
Eden / Towamba Flood Management Program	CV4, CV5,		✓	BVSC, DPIE
Merimbula Flood Management Program	CV4, CV5, CV6		✓	BVSC, DPIE
Get Ready Council Emergency Preparation Program	CV18, CV22		✓	BVSC, OEM

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
H1	Prepare strategic asset adaptation plans for high risk BVSC assets, including the relocation (where practical) of high risk facilities.	CV4, CV5, CV6		✓	BVSC	Med	Med
H2	Develop design guidelines for infrastructure and assets vulnerable to climate impacts.	CV4, CV5		✓	BVSC	Short	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
H3	Develop local adaptation plans for communities vulnerable to high climate change risks.	CV4, CV9, CV15		✓	BVSC, DPIE, COM	Short	Med
H4	Undertake detailed coastal hazard investigations of Horseshoe Bay, Tathra, Merimbula Beach, Pambula Beach, Aslings Beach to provide finer scale mapping than existing in Coastal Hazards Study.	CV1, CV3, CV4, CV5		✓	BVSC	Med	Med
H5	Prepare development approval matrix for coastal hazard and flood zones.	CV4		✓	BVSC, DPIE	Short	Low
H6	Implement dune protection and management program.	CV3		✓	BVSC, DPIE	Short	Low
H7	Undertake flood study and floodplain risk management plan of Bermagui River estuary Merimbula and Towamba/Eden and Pambula Flood Management Programs.	CV4, CV5		✓	BVSC, DPIE	Medium	High
H8	Implement Bega and Brogo River Flood Risk Management Plan.	CV4, CV5		✓	BVSC	Medium	High
H9	Review climate change hazards at 10 year intervals to incorporate new scientific information.	All		✓	BVSC, DPIE, UNI	Medium	Med
H10	Implement BVS Bushfire Hazard Management Plan.	CV15 CV17		✓	RFS, NPWS, FCORP, BVSC	Ongoing	Med
H11	Pursue underground power to new developments in high fire prone areas.	CV17, CV18, CV22		✓	EE	Ongoing	High

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
H12	Support opportunities for cultural burning on publicly managed land.	CV15		✓	BVSC, LALC, RFS, DPI, NPWS, FCORP	Ongoing	Low
H13	Plan for and implement hazard reduction and ecological burns on public land, particularly targeting the urban bush interface.	CV15		✓	RFS, BVSC, DPI	Ongoing	Med
H14	Undertake hazard reduction works on LALC holdings and train landholders in cultural burning practices.	CV15		✓	LALC, RFS, NPWS, FCORP	Ongoing	Low
H15	Actively manage asset protection zones including development of community protection plans.	R6		✓	BVSC, COM, NPWS, DPI, RCORP	Ongoing	Med
H16	Expand bushfire preparedness community education program across Shire.	CV17	✓	✓	RFS	Short	Low
H17	Undertake specific studies on forest fire behaviour risk at key sites in Bermagui, Tura Beach, Eden and Wonboyn and selected grassland sites.	CV15		✓	RFS, NPWS, FCORP, BVSC	Ongoing	Low
H18	Promote the role and function of Local Emergency Management Committee to the wider community	CV17, CV21, CV22		✓	BVSC	Short	Low
H19	Support the post bushfire redevelopment recovery.	CV15, CV17		✓	BVSC	Ongoing	Med

Liveable and Connected Places

Climate Resilience Challenges

The Shire's major land uses (National Parks, State Forest and Agriculture) are acutely vulnerable to changing rainfall patterns, drought and the risk of bushfire. These major land uses are the drivers of our local dairy, beef, tourism and timber industries and enhancing our understanding of how climate change will impact on these land-uses is critical for the sustainability of these industries and the future strategic land use planning of the Shire.

The distance between our towns and villages and sparse distribution of our population presents a range of resilience challenges. Residential subdivisions, particularly through the 1980s have relied on vehicle transport for most journeys with limited access to everyday services within walking distance.

The popularity of rural residential living has resulted in over 30% of the Shire's population being located outside of towns and villages. These residents are generally self-reliant with regard to water supply and grid connected for power supply, which has increased the length of the electricity network.

The Shire's water supply is heavily reliant on two major bore fields (Bega River / Towamba Rivers), the Brogo Dam, Cochrane Dam (Bemboka River) and Tantawangalo Weirs. These sources are all some distance from their most distant potable water recipient. The reticulation of the Shire's water supply relies on an extensive network of water mains, pumps stations, holding dams and reservoirs.

A key function underpinning the sustainability of our community and reduction of our green-house emissions is the effective management of our waste stream. Bega Valley Shire has transitioned to a more efficient, centralised waste collection and disposal operation, with a strong focus on resource recovery and diversion of recyclable products. The lack of local recycled materials processing facility means the majority of recycled material needs to be transported out of the Shire. Not only is this a lost economic opportunity, it further increases our greenhouse emissions, as these resources are transported to other regional centres.

Housing trends have seen the average house increase in size, increasing energy requirements and the hard surface coverage of the allotment and reducing the area available for garden plantings, vegetable gardens and canopy tree plantings. These factors have the potential to exacerbate increased average temperatures or prolonged heatwave conditions.

The Bega Valley Shire has had a traditionally strong sporting culture, thanks partly to our access to extensive sporting facilities. The playability of these sports fields is based on good grass cover, requiring irrigation, which is generally drawn from reticulated water supply systems. Potential increases in average temperatures, increased transpiration rates and rainfall variability will put pressure on BVSC to be able to maintain these facilities and other non-irrigated urban parklands.

Climate Resilience Benefits

- ✓ Sustainable development and growth
- ✓ Efficient land use
- ✓ Economic sustainability
- ✓ Improved neighbourhood amenity and access to open space networks
- ✓ Pedestrian friendly town layouts
- ✓ Improved health through pedestrian and cycle opportunities
- ✓ Local access to essential services
- ✓ Reduction in vehicle reliance
- ✓ Reduced emissions and transport costs
- ✓ Reduced consumption
- ✓ Recycling value adding
- ✓ Reduced need for landfill sites
- ✓ Produce energy from waste
- ✓ Water efficiency

Liveable and Connected Places

Performance Measures and Targets	• Increase in population living within 800 metres of the centres of our major towns. • Increase in built facilities to enable use of active transport. • Reduction in waste to landfill.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
Bega Valley Shire Council CLEP (2013)	CV4, CV9, CV14, CV15, CV17		✓	BVSC, DPIE
BVSC Local Strategic Planning Statements	CV4, CV9, CV14,	✓	✓	BVSC
Bega Valley CBD Masterplans	CV4		✓	BVSC
Urban Ecosystem Restoration Program	CV8	✓	✓	BVSC
BVSC Bike Plan	CV17	✓	✓	BVSC
South East and Tablelands Regional Plan	CV4, CV5, CV6, CV7, CV9, CV10, CV11	✓	✓	DPIE, BVSC
BVSC Residential Strategy	CV4		✓	BVSC
BVSC Rural Residential Strategy	CV9, CV14	✓	✓	BVSC, DPIE
BVSC Natural Assets Management Strategy	CV1, CV2, CV3, CV7		✓	BVSC
Waste Management and Resource Recovery Strategy (2018-2028) 'Recycling the Future'	-	✓	✓	BVSC

	Climate Resilience Projects / Programs	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
L1	Apply smart growth and climate ready principles to new development.	CV4, CV5, CV22	✓	✓	BVSC	Ongoing	Nil
L2	Review major towns for opportunity for more compact, higher density living opportunities, close to town centres.	CV4, CV5, CV17, CV21	✓	✓	BVSC	Short	Low
L3	Place based planning for key town centres with a focus on adapting them for a warming climate.	CV17	✓	✓	BVSC	Short	Low

	Climate Resilience Projects / Programs	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
L4	Implement BVSC Bike Plan with a key focus on improving pedestrian and cycling connectivity between residential areas, town centres, schools and open space networks.	CV17	✓	✓	BVSC	Ongoing	Med
L5	Implement street tree, open space and parkland tree planting program across all towns and villages to mitigate heat stress.	CV8	✓	✓	BVSC	Short	Low
L6	Incorporate native plantings into all infrastructure development, minimise mowing and maintenance.	CV8	✓	✓	BVSC	Ongoing	Low
L7	Expand urban ecosystem restoration program to villages and connectivity to adjoining natural areas.	CV9	✓	✓	BVSC, DPIE	Short	Low
L8	Incorporate new technology into new developments including micro gridding, energy efficiency and virtual gridding.	CV19 CV23	✓	✓	EE, BVSC, COM	Medium	Med
L9	Facilitate access of multi-unit housing residents to renewable energy generation opportunities.	CV19	✓	✓	BVSC	Medium	Nil
L10	Ensure rural residential development adjoins existing development, does not increase infrastructure network, hazard exposure or car reliance.	CV9, CV14, CV17 CV18, CV22	✓	✓	BVSC	Ongoing	Nil
L11	Allow for more flexible and sustainable housing options.	CV17, CV19	✓	✓	BVSC	Short	Nil

	Climate Resilience Projects / Programs	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
L12	Develop options for CBD parklands in Merimbula, Eden and Pambula.	CV8	✓	✓	BVSC	Short	Low
L13	Seek funding program to subsidise the installation of domestic scale /garden water tanks.	-	✓	✓	BVSC	Short	Low
L14	Identification of strategic land acquisition / dedication priorities for key public access, facility expansion or critical environmental assets.	CV4		✓	BVSC	Short	Low
L15	Maximise reuse of water, energy and materials in BVSC assets.	CV5, CV9, CV11, CV19, CV23	✓	✓	RFS	Ongoing	High
L16	Education programs and interactive workshops around reuse and recycling opportunities.	-	✓	✓	BVSC	Ongoing	Low
L17	Upgrade communications infrastructure and coverage for emergencies with goal of complete Shirewide mobile coverage by 2025.	CV22		✓	BVSC, EE, NBN, TELSTRA	Short	High
L18	Update BVSC's Development Control Plan and Engineering Guidelines to support sustainable building and advocate for changes to BCA to consider climate change.	CV4,CV17	✓	✓	BVSC	Medium	Low

Safe, Healthy and Inclusive Community

Climate Resilience Challenges

The Shire's population is ageing, which will increase the pressures on our health services, aged care / housing sector, disability services and community transport providers.

A warming climate and predicted increase in the number of hot days and length of heatwaves, is the most significant challenge to the physical health of our residents.

The mental health impacts on residents directly affected by climate extremes (e.g. primary producers) and people who are experiencing a heightened level of anxiety based on concerns around the impacts of climate change are an emerging public health concern.

The Shire has an extremely tight rental market, with many residents having difficulty finding rental properties in close proximity to their place of employment. Transitioning existing housing stock to more energy efficient and climate ready is a major challenge for owners of private property, government and community housing providers.

The rapid increase in land and housing prices within the Shire and in particular our highly desirable coastal locations has had major implications for local residents looking to enter the housing market, who are increasingly competing with people moving to the Shire from Sydney, Melbourne and Canberra. This has had the effect of our villages being seen as increasingly important suppliers of more affordable land and housing options, along with some of our inland rural residential areas.

Whilst there have been improvements in local educational opportunities and access to tertiary education and training opportunities via online providers, they are still limited and continue to contribute to the loss of younger age cohorts from our region. The Shire has an unemployment rate of 6.7% in comparison to the NSW Regional rate of 5.9%, which is a further key driver of the loss of younger people from our Shire.

A key measure of resilience is the strength of an areas social and community networks. These networks are vital in the retention of local knowledge and skills, integration of new residents and providing support during challenging times such as natural disasters or personal difficulties. A critical factor in the success of social and community networks is the contribution of volunteers to a range of community and sporting groups, emergency services and service providers. Our volunteers are a key factor in the resilience of our individual towns and villages and for the Shire as a whole as demonstrated in the Tathra and Bemboka bushfires in 2018.

Climate Resilience Benefits

- ✓ Reduction in heat induced mortality and illness
- ✓ Reduced mental health pressures
- ✓ Increased volunteerism
- ✓ Better connected, integrated community
- ✓ Access to climate ready accommodation
- ✓ Sustained community activities

Safe, Healthy and Inclusive Community

Performance Measures and Targets	• Reduction in heat related morbidity and mortality. • Increase in volunteer hours. • Improvement in average SEIFA index .

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
Drought Communities Program	CV9		✓	DPI, LLS, BVSC, IND
BVSC Residential Strategy	CV4, CV17		✓	BVSC
Cooler places in a Warmer Climate Project	CV17, CV18, CV21	✓	✓	BVSC
Statewide Heatwave Sub Plan	CV21	✓	✓	OEM, SES, HEALTH, BVSC
NSW Climate Change Fund – renewable energy and efficiency programs	CV19	✓	✓	DPIE
Rural Advisory Mental Adversity Program	-		✓	HEALTH, LLS, IND, COM

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
S1	Support for climate ready affordable and community housing.	CV19, CV21, CV23	✓	✓	HOUSING, BVSC, DPIE	Medium	Nil
S2	Community wide targeted extreme heat information campaign.	CV21	✓	✓	BVSC, OEM, HEALTH	Ongoing	Low
S3	Review Senior Housing Developments extreme weather preparedness and procedures.	CV21, CV23		✓	IND, HEALTH, OEM	Medium	Low
S4	Ensure SRH has full capacity to deal with heat waves.	CV21	✓	✓	HEALTH	Short	Low
S5	Ongoing support for mental health awareness and access to sup- port services for at risk sectors.	-		✓	HEALTH	Ongoing	Med

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
S6	Work with neighbouring councils to advocate for greater funding to homelessness services and infrastructure to support increase in vulnerable people within the area.	-		✓	BVSC, ESC, HOUSING	Medium	Low
S7	Ensure renewable energy development programs (retrofits, solar PV) are based on social equity principles and provide access opportunities to all members of the community.	CV19, CV23	✓	✓	DPIE	Ongoing	Nil
S8	Seek funding to facilitate a climate resilience network to drive implementation of this Strategy, including specific engagement with our youth.	ALL	✓	✓	BVSC	Ongoing	Nil
S9	Support community leaders and community resilience coordinators.	ALL	✓	✓	BVSC	Short	Low
S10	Promote, encourage and support diversity to strengthen our communities expertise, knowledge resilience.	ALL		✓	BVSC, FACS	Ongoing	Nil
S11	Community Hall's promoted as the hub of community driven outcomes, resilience and emergency preparations and fire safety drills.	CV17	✓	✓	BVSC	Short	Low
S12	Increase rates of volunteerism across all sectors, through administration, risk and technical support.	CV17, CV21	✓	✓	BVSC, LLS, RFS, SES	Ongoing	Nil
S13	Enhance resilience and partnerships with local Aboriginal community.	CV21	✓	✓	BVSC, LALC	Short	Low

Diverse and Thriving Economy – Dairy and Agriculture

Climate Resilience Challenges

No local industry is as exposed to the potential impacts of climatic variations as the dairy industry, with its reliance on water access and irrigation. Eighty percent of milk supplied to the Bega Cheese plant comes from irrigated pasture within the Bega Valley. The over allocation of water from Brogo Dam, the prioritising of Cochrane Dam for electricity production and the unregulated status of the Bega River are key challenges for the parts of the agricultural sector with reliance on irrigation.

The ability to produce fodder on farm is also impacted by air temperature, rainfall and soil moisture. In recent years local farmers have looked to strengthen their resilience by increasing their capacity to store fodder on farm during good seasons to reduce the need to transport grain and hay from other parts of NSW and Victoria. Climate change modelling indicates the inland areas of NSW and Victoria are predicted to be impacted by reductions in rainfall and temperature increases, which may see external animal fodder availability come under further pressure in the future.

Our existing beef producers and emerging agricultural industries such as small lot agriculture and specialist horticulture also have a high sensitivity and exposure to changes in climatic conditions and subsequent physical impacts. These industries also rely on access to external markets and are subject to competition from other regions.

Climate Resilience Benefits

- ✓ Sustainability and profitably of all agricultural sectors
- ✓ Local economy multiplier effect of dairy industry
- ✓ Health and wellbeing of our farmers
- ✓ Animal health
- ✓ Local food and fibre production
- ✓ Agricultural diversity and new economic opportunities

Diverse and Thriving Economy – Dairy and Agriculture

Performance Measures and Targets	• Increase in area of existing cleared rural land being actively farmed for food and fibre production. • Increase catchment storage capacity across the Bega, Brogo, Murrah, Bermagui, Towamba River and Narira Creek Basins.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
Southern Livestock Adaptation 2030 initiative	CV12	✓	✓	DPI, LLS, BVSC
Bega Cheese BEMS Farm Sustainability Program	CV10, CV11, CV13, CV16	✓	✓	IND, BVSC
Bega / Brogo and Towamba Water Sharing Plans	CV10, CV12	✓	✓	WATER, BVSC
NSW Regional Water Management Strategy	CV10, CV11	✓	✓	WATER, BVSC
BVSC CLEP (2013)	CV9, CV10, CV14		✓	BVSC
Dairy Australia Climate Toolkit	CV10, CV11, CV12		✓	IND, COM

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
A1	Investigate raising of Brogo Dam spillway to increase dam storage.	CV10, CV11, CV12		✓	WATER, IND BVSC	Short	Med
A2	Support ongoing research by Dairy NSW and MLA impact on cattle health and production.	CV12, CV14, C16	✓	✓	DPI, IND, COM	Ongoing	Nil
A3	Protect farmland along river valleys and large intact holdings.	CV9, CV13, CV14		✓	BVSC, DPI, COM	Short	Nil
A4	Establish farm shelter belts, shade planting and natural systems storage projects .	CV8, CV10, CV12	✓	✓	COM, DPI, LLS, IND	Short	Med
A5	Support the increase of local fodder production and storage capacity.	CV11, CV12, CV13	✓	✓	DPI, LLS, IND	Short	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
A6	Develop locally based research trials into high quality feed source development.	CV12	✓	✓	DPI, LLS, IND	Medium	Low
A7	Implement soil carbon enhancement programs across all agricultural and horticultural sectors.	CV12	✓	✓	LLS	Short	Low
A8	Extend beneficial reuse schemes to ensure all farm, commercial and residential wastewater reuse options for agriculture.	CV10, CV11. CV12,		✓	BVSC, LLS	Medium	High
A9	Support new small acreage farmers moving into the valley, with locally relevant climate and agronomy data.	CV9,	✓	✓	DPI, LLS, IND	Ongoing	Nil
A10	Retain the Bega saleyards as key asset in local food production and reduction in transport emissions.	CV12	✓	✓	BVSC	Ongoing	Low
A11	Ensure existing rural zonings adequately identify high value agricultural land and provide sufficient flexibility for new agricultural industries.	CV9, CV13, CV14		✓	BVSC	Short	Nil
A12	Provide funding / support for Local Farmers network.	CV10, CV12, CV20	✓	✓	DPI, LLS, IND	Ongoing	Low
A13	Undertake specialised energy audits and efficiency programs for farms.	CV11, CV19,	✓	✓	DPI, LLS, DPIE	Short	Low
A14	Undertake education and capacity building in water use efficiency, irrigation scheduling and effluent re-use.	CV10, CV11	✓	✓	DPI, LLS, IND	Short	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
A15	Improved grazing management practices based on understanding of impacts of climate change on local production.	CV12	✓	✓	DPI, LLS, IND	Ongoing	Low
A16	Construct appropriate water storage options and technologies to allow optimal water capture, reduce evaporation losses and retain water quality.	CV9. CV10	✓	✓	DPI, LLS, IND	Ongoing	High
A17	Increase awareness and capacity of landowners to improve soil health, leading to greater water infiltration, higher fertility (leading to greater drought resilience and better drought recovery in pastures as well as greater carbon sequestration).	CV10, CV11	✓	✓	DPI, LLS, IND	Ongoing	Low
A18	Undertake research into improved pasture management, including deeper rooted perennials and inclusion of species more resilient to climate change, while also providing enhance animal nutrition.	CV12	✓	✓	DPI, LLS, IND	Short	Med
A19	Review the approval of larger on farm dams in sub-catchments that do not impact downstream residential or other rural users and the approval requirements of large water tanks on rural properties.	CV9, CV10, CV11	✓	✓	WATER, BVSC	Medium	Low
A20	Plan for future saltwater intrusion into low-lying farm land and water storages.	CV11		✓	LLS, WATER	Medium	Med

Diverse and Thriving Economy – Tourism

Climate Resilience Challenges

The tourism industry still retains a degree of seasonality, increasing the sustainability challenges for tourism based operators and other businesses that rely on tourism income. Further, the tourism season mirrors our highest risk bushfire period.

The various components of our tourism industry are heavily reliant on the quality of the natural environment and the productivity of the various marine, estuarine and forest ecosystems. Potential impacts on our environment have a direct relationship to the tourist and visitor economies, including estuarine health, changes in fish stocks, beach recession and loss of tourism focused recreational assets.

The majority of our tourism is focused in our coastal zone where the most significant impacts of climate change are predicted to occur. Modelled coastal inundation in key tourist locations is a major land use planning challenge for BVSC and the tourism sector.

Climate Resilience Benefits

- ✓ Sustainability of industry
- ✓ Local economic multiplier
- ✓ Emergency preparedness
- ✓ Competitive advantage

Diverse and Thriving Economy – Tourism

Performance Measures and Targets	• Increase in the value of visitor economy.

Climate Resilience Projects	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
Tathra - It's in our Nature Report and Get Ready Sapphire Coast - Crisis Management Hub	CV15		✓	IND, BVSC
Tourism Emergency Management Fact Sheet	CV15		✓	OEM, RFS
NRMA Electrical Vehicle Charging Project	CV19	✓	✓	IND, BVSC

	Climate Resilience Projects / Programs	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
T1	Specific impacts of climate change on tourism incorporated into local adaptation plans.	CV1, CV2, CV4, CV5, CV18, CV22		✓	BVSC	Short	Low
T2	Support enhanced adaptive capacity of the tourism sector to climate change and disaster risks.	CV4, CV5, CV22, CV23		✓	DEST NSW, IND, BVSC	Ongoing	Low
T3	Diversification of industry into non nature based attractions.	CV1, CV2, CV3	✓	✓	IND, BVSC	Medium	Low
T4	Develop guidelines for future climate ready tourism infrastructure.	CV4, CV5, CV19, CV23	✓	✓	IND, BVSC	Medium	Low
T5	Adopt and promote best practice guides to emissions management for use by destinations, business event organisers and enterprises.	CV19, CV23	✓		DPIE	Short	Low
T6	Undertake emergency planning and readiness programs for local tourism accommodation providers.	CV19, CV22, CV23		✓	OEM, INC	Short	Low
T7	Improve and promote water and energy efficiency measures to tourist and visitors.	CV19	✓	✓	IND	Ongoing	Low
T8	Promotion of Shire as a climate resilient destination.	-		✓	BVSC, IND	Medium	Low
T9	Identify audiences for tourism climate awareness programmes including tourist operators, communities, etc.	CV4, CV7, CV19	✓	✓	BVSC, IND	Medium	Low

Diverse and Thriving Economy – Logistics and Transport

Climate Resilience Challenges

The reliance on external food and manufactured goods production requires a sustainable and efficient transports and logistics system, which is currently a challenge with available technology. The freight transport and logistics system is reliant on semi-trailers and a supporting network of smaller trucks to meet the point to point nature of our supply and distribution system.

There has been significant improvements in the efficiency of diesel engines over recent decades, which has the net result of lowering fuel consumption and emissions. Despite advancements in electric engine technologies and penetration of this technology to the light truck market, there has not yet been successful development of heavy truck electric engines with the requisite power, capacity or reliability required to service current industry needs.

The use of large trucks to reduce emissions from the freight industry, by reducing the number of trucks is required as part of the logistics supply chain. However the use of large trucks is inhibited by current access restrictions north of Bega on the Princes Hwy and to the west by Brown Mountain.

Provision of long-term air services is challenging with the location and height of the Merimbula Airport runway, which is subject to future tidal inundation.

Climate Resilience Benefits

- ✓ Access to markets for local goods
- ✓ Import of externally grown food and manufactured goods
- ✓ Local employment
- ✓ Sustainability of airport infrastructure

Diverse and Thriving Economy – Logistics and Transport

Performance Measures and Target	• Increase in electric vehicle registration and associated. infrastructure Reduction in per pallet freight relative cost.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
NSW Regional and Infrastructure Plan (Future Transport)	CV13, CV17	✓	✓	RMS
BVSC Bike Plan	CV17	✓	✓	BVSC
RMS Highway Corridor Strategy	CV13		✓	BVSC
Merimbula Airport Master Plan	CV6		✓	BVSC
NRMA Electrical Vehicle Charging Project	CV19	✓	✓	RMS

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
LT1	Partner with local freight companies, trucking companies and Universities in undertaking research and trials on fuel efficiency for large trucking fleet.	CV13	✓	✓	IND, UNI, BVSC	Short	Med
LT2	Transition vehicles across the Shire fleet to electric, hydrogen and biofuel fleet.	CV19, CV23	✓	✓	IND, COM, BVSC	Short	Med
LT3	Lobby for State Government take over ownership of Imlay Rd and undertake upgrades as medium term solution for east – west freight access.	CV13		✓	BVSC, IND	Short	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
LT4	Advocate for improved B-Double Access into the Shire to reduce individual truck movements, increase fleet efficiency and access to larger freight movements.	CV17	✓	✓	BVSC, IND	Short	Low
LT5	Support local public transport, within and between towns and villages.	CV17	✓	✓	TFNSW	Medium	Low
LT6	Implement BVSC Bike Plan, including shared pathway Bega – Tathra, Tura – Merimbula, Cuttagee to Wallaga, Bega – Tarraganda, Bega to South Bega.	CV17	✓	✓	BVSC	Ongoing	
LT7	Ensure active transport is key priority in town centre CBD planning and design of new subdivisions.	CV17	✓		BVSC	Ongoing	Nil
LT8	Identify key transport links in Bermagui, Tathra and Merimbula areas subject to future inundation and develop long-term strategies for inclusion in BVSC Transport Asset Plan.	CV17		✓	BVSC	Medium	Nil
LT9	Promote reducing single person commuting trips.	CV19	✓	✓	TF NSW, COM	Short	Nil
LT10	Provide long term funding for community transport program.	CV17		✓	TF NSW	Ongoing	Low

Diverse and Thriving Economy – Aquaculture, Fishing & Forestry

Climate Resilience Challenges

Bega Valley Shire's oyster industry is concentrated in six estuaries between Bermagui and Wonboyn and has a unique dependence on the ecological health of our estuaries and specifically the water physio-chemical parameters and levels of organic and chemical pollutants. Predicted changes in rainfall intensities and distribution, increasing average temperatures and heatwaves, in combination, will exert significant pressures on oyster aquaculture.

The recent move to floating infrastructure, rather than traditional stick and rack methods, will help the industry cope with changes in sea levels. However, sea level rise will pose a long term threat to shore-based infrastructure. Impacts on oyster growth rates and production levels from any potential changes in estuarine ecology and water quality factors is a further key threat to the aquaculture industry, including the mussel leases in Twofold Bay. Pathogens and introduced species and diseases that arrive via international shipping are a key threat to our marine ecology.

Both the professional and recreational fishing industries are reliant on the health of our estuaries and the offshore marine environment. Current regulations governing the Estuary General Fishery have resulted in professional effort being focused in a small number of estuaries, which is a further stressor on target species abundance.

The Eden and Bermagui fishing fleets are reliant on fishing grounds across the South East Australian marine region and are particularly susceptible to any changes in species distribution and abundance. Any changes to the sustainability of the industry will have direct impacts on the Eden and Bermagui economies. Both the estuary and marine based fishing industries provide our Shire with locally produced food sources, that would otherwise be sourced from areas beyond the Shire.

The State Forest Estate encompasses 1300km^2 and is focused in the southern part of the Shire. The majority of this area is dedicated timber production of pulpwood, hardwood logs and softwood plantations in the Towamba Valley. The timber industry is a significant employer within the Eden area in particular, with direct employment forest management, harvesting, manufacturing and export. Like the dairy and tourism industries there are important multiplier impacts of these jobs in the local economy.

The likely combined stressors of changing rainfall, increased temperatures and reduced soil moistures, and the increased incidence of disease, will outweigh any modelled growth benefits from increased atmospheric carbon. Further, forests under stress are likely to be more vulnerable to impact from disease and pathogens.

Climate Resilience Benefits

- ✓ Industry sustainability
- ✓ Estuarine health
- ✓ Local economy
- ✓ Local food production
- ✓ High value timber production
- ✓ Carbon sequestration

Diverse and Thriving Economy – Aquaculture, Fishing & Forestry

Performance Measures and Target	• Increase in aquaculture production. • Increase in value of timber production.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
Bega Valley Shire Bushfire Risk Management Plan	CV15, CV17		✓	RFS, NPWS, FCORP, BVSC
Environmental Mgmt. Systems (Oyster Industry)	CV20, CV25		✓	BVSC, IND
Marine Estate Management Plan	CV20, CV25		✓	MEMA, BVSC, IND
Coastal Forests Management Plan	CV8	✓	✓	FCORP
BVSC Love Our Lakes Program	CV2, CV24		✓	BVSC, IND

	Climate Resilience Projects / Programs	CV	Mitigation	Adaption	Lead	Timeframe	Cost
F1	Examine options for co-funded water quality monitoring programs focusing on estuarine health and key climate change indicators.	CV7, CV20, CV24, CV25		✓	BVSC, IND	Short	Med
F2	Establish baseline data on water temp. and pH, to complement existing MER data collected by BVSC and DPIE.	CV7, CV20, CV24, CV25		✓	BVSC, LLS, DPIE	Short	Low
F3	Allow landward migration of wetlands.	CV2, CV7			BVSC, DPI, COM	Short	Med
F4	Protect estuary foreshores and sensitive estuarine catchments.	CV2		✓	BVSC, DPIE	Ongoing	Low
F5	Partner with oyster industry in the development of “Onshore Infrastructure Expansion Strategy” to identify areas to relocate vulnerable facilities and expand storage and sorting	CV2		✓	IND, BVSC, DPIE	Medium	Med

	Climate Resilience Projects / Programs	CV	Mitigation	Adaption	Lead	Timeframe	Cost
F6	Develop high value timber products and other post-harvest locally based value adding and manufacturing.	-	✓	✓	FCORP, IND	Long term	Med
F7	Work with industry to examine reafforestation potential of low value agricultural land for silviculture and carbon offsetting sites.	CV8	✓		FCORP, IND, COM	Medium	Low
F8	Investigate potential for non-harvest areas of State Forest to attract carbon credits.	CV8	✓	✓	FCORP, RFS, IND	Short	Nil
F9	Examine options for irrigating waste water on tree plantations and the harvest of trees for chip or biochar products.	CV8, CV15	✓		FCORP, IND	Medium	Low
F10	Instigate baseline research into species diversity and abundance of key commercial aquatic species including the abalone fisheries.	CV20, CV25		✓	MEMA, DPI, IND	Short	Low
F11	Identify new marine and estuarine industries including seaweed farming, blue carbon industries and carbon sequestration	CV20, CV24	✓	✓	UNI, BVSC, DPI, UNI	Short	Low
F12	Examine sustainability of estuary fishery in ICOLLs experiencing prolonged closures.	CV7, CV24		✓	DPI, MEMA	Medium	Low

Energy Security

Climate Resilience Challenges

The Shire is reliant on external sources for the vast majority of its energy supply and generation. While the Bega Valley Shire has a relatively high uptake of solar arrays by private residents and business, the majority of our electricity needs are generated elsewhere. The import of this electricity into the Shire is reliant on the major west – east high voltage line running from the Monaro, down Brown Mountain into the Bega Valley.

This single point of connection to the external electricity grid, leaves the Shire highly exposed to climatic driven physical impacts to the major distribution infrastructure or operational breakdowns within the electricity network. Beyond the transmission network, we are experiencing challenges with generation capacity restrictions and high demand blackouts.

The majority of energy production in NSW is from fossil fuel fire power stations, with the electricity production sector being the largest emitter of greenhouse gasses in Australia. If our Shire is to achieve a future net zero emission target, we will be reliant on continued energy efficiency measures, increased local renewable generation developments, access to external renewable energy sources and large-scale carbon offsetting projects. A further impact of our reliance on external energy sources is the loss of dollars from our local economy.

All petrol, diesel and gas supplies are brought into the Shire via road transport following the decommissioning of distribution and storage facilities at the port of Eden. This reliance on external fuel supplies is predicted to continue and is a challenge for the future. Private and industry fuel use and subsequent greenhouse gas emission is a reality of life in a rural area and our distance from larger centres and markets.

As with electricity consumption, a mix of improved vehicle efficiencies, technological advancement with electric and hydrogen cell engines, charging station networks and carbon offsetting will be required if we are to achieve carbon neutrality.

Climate Resilience Benefits

- ✓ Reliable energy supply
- ✓ Energy price stabilisation
- ✓ Infrastructure resilience
- ✓ Retention of energy funds in local economy
- ✓ Dispatchable local energy supply
- ✓ New industry development
- ✓ Lower emissions
- ✓ Energy independence

Energy Security

Performance Measures and Target	• Reduction in cost of household energy. • Net zero emissions (with interim target of 100% renewable electricity by 2030).

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
BVSC Council Clean Energy Plan (2050)	CV19, CV23	✓	✓	BVSC

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
E1	Develop pathway to net zero greenhouse gas emissions by 2040.	CV19, CV23	✓	✓	BVSC	Short	Med
E2	Implement BVSC Clean Energy Plan.	CV19, CV23	✓		BVSC	Ongoing	Med
E3	Develop a program of mitigation activities for implementation across Shire, including the identification of primary sequestration and offsetting options.	CV19, CV23	✓		BVSC, COM, IND, DPIE	Medium	Med
E4	Remove barriers to micro grid and virtual grid opportunitieswithin and between communities and partnerships with energy retailers.	CV19, CV23	✓	✓	BVSC, EE, IND	Medium	Low
E5	Develop best practice community renewable energy projects for roll out across the Shire.	CV19, CV23	✓	✓	BVSC, COM, DPIE, IND	Short	Low
E6	Develop new re-newable energy opportunities within the Shire including pumped hydro, wave power and pyrolysis, as they become financially viable.	CV19, CV23	✓		ND, COM	Ongoing	High
E7	Support new and emerging technologies and research opportunities within the Shire, as they become feasible.	CV13, CV19	✓		BVSC, EE, COM, UNI, IND	Ongoing	Low
E8	Promote energy efficiency as part of new developments and pursue retrofitting of older housing and commercial stock.	CV19	✓	✓	EE, BVSC, COM, IND	Short	Low

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
E9	Undertake feasibility study on the development of hydrogen export plant at Twofold Bay.	CV19, CV23	✓	✓	DPI	Short	Med
E10	Incentives for development and relocation of light industries focusing on transition opportunities.	CV13, CV19, CV23		✓	DPIE, BVSC	Medium	Med
E11	Establish Electric vehicle charging network throughout Shire and require new large commercial development to install as development consent condition.	CV19	✓	✓	BVSC, RMS, IND	Medium	High
E12	Support local networks and organisations to advance innovative renewable energy projects with maximum public benefit, including bulk buy programs.	CV19, CV23	✓	✓	BVSC, COM	Ongoing	Nil
E13	Develop projects to support low socio-economic sectors of our community to access renewable energy.	CV21	✓		BVSC, IND, COM	Medium	Med
E14	Adopt renewable energy technologies.	CV19, CV23	✓	✓	COM, IND	Ongoing	Low
E15	Promote the Shire as leader in renewable energy development, research and business opportunities.	CV19	✓	✓	BVSC	Ongoing	Low
E16	Explore options for remote communities to be off grid and served by solar and battery systems.	CV18, CV22	✓	✓	BVSC, EE	Medium	Low

Food Security

Climate Resilience Challenges

As with our energy and fuel imports, the Shire is heavily dependent on external suppliers for majority of manufactured goods and food. Despite the Shire producing high quality meat, vegetable, seafood and dairy products, the scale of production does not meet the requirements of our local populations.

The entire Bega Valley Shire population is currently reliant on only six major and four minor supermarket outlets for the vast majority of our food supply, fresh and manufactured. Whilst community markets and home-grown food provide a source of locally produced food, the vast majority of our food is produced elsewhere. This external food production is exposed to climatic conditions in other regions across Australia and any shock to the logistics and transport network will affect our food supply chain.

Barriers to the expansion of the local food production industry, include water access, ability to sell produce at significant scale through local supermarkets, distance from markets and competition from imported products. Pathways to local food security will be heavily impacted by future climate variability, and in particular rainfall variability and temperature increases.

Climate Resilience Benefits

- ✓ Locally produced food
- ✓ Reduced greenhouse gas emissions
- ✓ Niche product developments opportunities
- ✓ Local employment
- ✓ Food providence
- ✓ Reduction in “food miles” and carbon footprint
- ✓ Increased community knowledge
- ✓ Permaculture and regenerative farming

Food Security

Performance Measures and Target	• Increase in locally produced food. • Increase in area of land zoned for small lot agriculture.

Climate Resilience Projects / Programs	Climate Vulnerability (CV)	Mitigation	Adaptation	Lead
SCPA South East Food Plan	CV9, CV13	✓	✓	COM, IND
Bega Valley CLEP (2013)	CV9	✓	✓	BVSC
SCPA Climate Smart Farming Project	CV12, CV13	✓		COM
DPI Important Agricultural Land Identification Project	CV9, CV10, CV14	✓	✓	DPI

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
F1	Ensure high priority productive land is protected from urban or commercial development.	CV12, CV13, CV14, CV17		✓	BVSC	Short	Nil
F2	Support small lot agriculture.	CV9, CV13	✓	✓	BVSC, DPI, LLS, SCPA	Short	Nil
F3	Apply regenerative farming practices to in crease the productive capacity of rural land for food production.	CV12, CV13	✓	✓	LLS, IND, COM, SCPA	Ongoing	Low
F4	Develop incentives based schemes to attract new horticultural or agricultural enterprises, particularly to under-utilised rural land.	CV13		✓	DPI, SCPA	Medium	Med
F5	Promote Artisan and Gourmet food setups and pop-ups through marketing and business setup advice.	CV13	✓		BVSC, DPIE	Short	Low
F6	Seek funding to support community based food production groups and extension activities.	CV13	✓	✓	BVSC, IND, COM, SCPA	Short	Nil

	Climate Resilience Actions	CV	Mitigation	Adaptation	Lead	Timeframe	Cost
F7	Capitalise on the benefits of renewable energy technologies and their integration into farming enterprises.	CV11, CV12, CV19	✓	✓	LLS, DPI, IND	Ongoing	Low
F8	Support high value small farm enterprise opportunities unique to the Bega Valley's climate and soils.	CV13	✓		LLS, BVSC, SCPA	Medium	Low
F9	Develop food trail maps and tours.			✓	IND, BVSC, DNSW	Medium	Low
F10	Increase knowledge and skills of local food producers in a diversity of food production opportunities in the Bega Valley.	CV13	✓	✓	COM, LLS, SCPA	Short	Low
F11	Encourage water security with home water tanks, appropriate landscaping, and sensitive urban water design.		✓	✓	BVSC	Short	Low
F12	Support local production of small animal meat products.	CV13	✓	✓	COM, IND	Medium	Low
F13	Develop distribution and logistics systems to export locally produced food.	CV13	✓	✓	IND, COM, BVSC	Medium	Low
F14	Encourage new technologies for sustainable food production.	CV13	✓		BVSC	Ongoing	Low
F15	Support sustainable local food education and production initiatives.	CV13	✓		LLS, DPI, BVSC	Medium	Low
F16	BVSC to support local procurement, where available and cost effective.	CV13	✓		BVSC	Ongoing	Low

Appendix

Appendix 1 - Local Resilience Case Studies

Case study in resilience and recovery

Tathra – Reedy Swamp – Vimy Ridge

The Tathra, Reedy Swamp and Vimy Ridge communities were devastated by a out of season wildfire in March 2018. The fire saw the loss of 65 homes and units and 1000 ha's of the surrounding landscape blackened.

The fire created a range of physical, financial and emotional impacts on the residents of these communities and resulted in many residents having to find accommodation in other local towns. There was a large BVSC, State Agency and Charity organisation response to the disaster. Even more critical in the initial response and ongoing recovery was the Tathra community and the various community groups that form the backbone of this tightknit community.

The Tathra Lions Club, Surf Club, Tathra Sunshine Boardriders Club, Local Churches, Tathra School community, Tathra Bowling Club and Country Clubs are just some of the local community groups who all swung into action to provide physical, financial, emotional and social support to all those impacted by the community.

The strength of the existing Tathra based community groups and well developed networks have undoubtably hastened the recovery of Tathra, Reedy Swamp and Vimy Ridge, including the restoration of the much valued natural environment and local outdoor recreational facilities that were damaged during the fires.

Green Shoots
BUSHFIRE RECOVERY

Case study in industry resilience

The dairy industry

No other local industry is as exposed to the challenges of climatic variations than the dairy industry. From its establishment in the late 1800's to the present day the dairy industry has battled intense droughts, water shortages and devastating floods.

In more recent years industry restructures, global market forces, landuse pressures and supermarket milk price wars are examples of non-climatic shocks and pressures that have weighed heavily on our local farmers and the many hundreds of local residents who rely on this industry for employment.

Despite the loss of some local farmers from the industry, competition from other regions and continued climatic challenges, the remaining farmers have exhibited resilience through innovation, adaptation and passion for the industry and their land. Embracing technology, changing milking and feeding practices, pursuing improvements in fodder quality and achieving irrigation efficiency are just some ways the dairy industry is demonstrating it ongoing resilience.

The passion of our local farmers for their industry, their animals and their land has seen them challenge political and bureaucratic barriers, remain competitive in and aggressive global market and pursue the ongoing environmental on farm enhancement.

Case study in community resilience - Eden

The Eden community has had a traditional reliance on natural resource based industries such as the fishing and forestry and their respective onshore value adding sectors e.g. fish processing, former tuna cannery, sawmill and chip mill. These industries also had an important local economic multiplier impacts with numerous local service businesses reliant on these primary industries.

This reliance on natural resource based industries has seen Eden susceptible to shocks and stressors, such as the closure of the Tuna cannery in 1999 with the loss of over 200 jobs and ongoing contractions of the timber industry.

Having a reliance on natural resources also exposes industries to climate change driven environmental or species changes and the impact pf more severe natural hazards.

Despite all the tremendous challenges that have confronted the Eden community over the last 20 years, they have endured and continued the fight for the survival and success of their town. Rather than allow the past economic factors to define the towns future, the Eden community has worked tirelessly to look for other opportunities that provide a sustainable future for the town and its residents.

Eden is blessed with perhaps the most spectacularly beautiful and dramatic coastline on the south coast, focused around the magnificent natural asset that is Twofold Bay. Rather than waiting for external help, the Eden community had recognised the opportunity that its amazing natural setting and Twofold Bay presents and have worked tirelessly to develop new industries based on these assets.

The recent completion of the Snug Cove wharf extension has cemented the cruise industry as prominent part of Eden's future. Early adaptors of change such as the Eden Smokehouse, Southland Fish Supplies and Eden Mussels have helped arrest the economic decline, along with the expanding nature based tourism activities such as whale watching, marine discovery centre and popular camping and multi-day walking opportunities.

The Eden community has demonstrated key characteristics of a resilient system: flexibility, adaptive, responsive to change and resourcefulness. The Eden example also highlights the importance of strong community leaders from across the community being inclusive and working hard for the benefit for the whole community.

Case study in environmental resilience – ICOLLs

There are 28 estuaries in the Bega Valley Shire, 23 of which are intermittently closed or open lakes and lagoons or 'ICOLLs'. ICOLL's are characterised by periods of entrance closure, resulting in fluctuating water levels, changes in water chemistry and ecological variability.

Each ICOLL has evolved a unique ecology that is able to withstand long periods of closure (Wallagoot Lake has experienced a 14 year closure) and resultant changes in salinity. Being at the bottom of the catchment, our ICOLL's are vulnerable to catchment inputs and resultant nutrient fluctuations.

Periods of drought and flood also have dramatic physical impacts on ICOLL's. Despite these often dramatic fluctuations in ecological conditions, resident aquatic flora and fauna found in our ICOLL's has evolved to adapt to these conditions.

Following European settlement, catchment clearing, agriculture expansion and urban development has placed increasing pressures on ICOLL resilience. Low lying development, vital transport assets and recreational areas are subject to inundation during periods of closure, requiring BVSC to artificially open the entrance bars of ICOLL's such as Wallaga Lake, Back Lake and Lake Curalo.

This early intervention in the opening / closure cycles of ICOLL's has impacts on the estuary's ecology and the adjoining wetlands and fringing vegetation communities.

Despite the natural environmental fluctuations and human induced pressures on the ICOLL's they have maintained high levels of ecological health and biological production. The resilience of ICOLL's is an example of the resilience of natural systems to external shocks, pressures and environmental variability. This resilience will likely be tested by the projected impacts of climate change on our marine, estuarine and terrestrial ecosystems.

Appendix 2 - Existing programs and strategies that support climate resilience

Project / Program	Mitigation	Adaptation	Organisation
BVS Coastal Processes & Hazards Definition Study		x	BVSC
Bega Valley Shire CLEP 2013	x	x	BVSC
Bega Valley Shire DCP 2013	x	x	BVSC
Bega Valley Shire Climate Adaptation Risk Assessment	x	x	BVSC
Bega Valley Shire Clean Energy Plan	x		BVSC
Bega River Estuary Management Plan		x	BVSC
Pambula Lake Coastal Management Plan		x	BVSC
BVSC Coastal Management Program – Coastal Hazards (Draft)		x	BVSC
Bermagui River Coastal Management Program (Draft)		x	BVSC
Lake Curalo Coastal Management Program (Draft)		x	BVSC
Merimbula Lake Coastal Management Plan (Draft)		x	BVSC
Wallaga Lake Coastal Management Plan (Draft)		x	BVSC
Bega Valley Shire Bushfire Risk Management Program		x	BVSC
BVSC Entrance Management Policy		x	BVSC
NSW RFS Bega Valley Bushfire Risk Management Plan	x	x	NSW RFS
NSW Marine Estate Management Strategy	x	x	MEMA
South East NSW Integrated Regional Vulnerability Assessment	x	x	OEH
Catchment Action Plan 2013 – 2023	x	x	LLS
South East Regional Strategic Weed Management Plan 2017-22		x	LLS
25% of Bega Valley Shire houses have Solar installations	x	x	Community
Drought Management Plan	x	x	BVSC
BVSC Waste Strategy	x	x	BVSC
Bega / Brogo Rivers Flood Risk Management Plan	x	x	BVSC
Merimbula and Back Lakes Flood Risk Study		x	BVSC
Eden Towamba Flood Risk Study		x	BVSC
BVSC Local Strategic Planning Statement	x	x	BVSC

Appendix 3 - Climate Resilience Vulnerability Assessment

Natural Systems Climate Resilience Vulnerability Assessment

	Climate Change Impacts					
Key Vulnerabilities: Natural Systems	Sea level rise	Rainfall variability	Increase in average temps.	Increased hot days (35+)	More intense storms	Change in ocean temp. and Ph
Decline in tree canopy cover	1	5	4	3	2	N/A
Fragmentation of wildlife corridors	N/A	3	2	3	1	N/A
Biodiversity – threatened species	4	4	4	3	1	4
Bio-diversity – Invasive species (weeds)	1	3	3	2	1	2
Bio-diversity – Invasive species (fauna)	1	1	2	3	1	2
Length of coastline	5	3	2	2	4	4
Length of Estuarine foreshore	5	3	3	3	2	1
Estuary ecosystem health	4	4	4	4	3	5
Lack of riparian vegetation	3	4	4	3	4	N/A
Extent of dune systems	5	3	2	4	4	N/A

Land use and Settlement Climate Resilience Vulnerability Assessment

	Climate Change Impacts					
Key Vulnerabilities: Land use and Settlement	Sea level rise	Rainfall variability	Increase in average temps.	Increased hot days (35+)	More intense storms	Change in ocean temp. and Ph
Area of Nat Park or State Forests	2	4	4	4	3	2
Extent / location of agricultural land	1	5	5	4	4	N/A
Distribution / location of towns, villages and settlements	4	4	3	5	3	N/A
Location of rural residential development	1	4	3	4	3	N/A
Low lying development	5	4	1	1	4	1
Length of bushland / urban interface	N/A	4	5	4	3	N/A
Lack of connectivity between and within settlements	2	1	3	4	4	N/A
Vehicle dependence	N/A	N/A	3	4	4	N/A
Lack of public transport	N/A	N/A	3	4	2	N/A
Limited housing styles	N/A	N/A	2	3	2	N/A
Reliance on major towns	4	3	3	4	3	N/A

Infrastructure Climate Resilience Vulnerability Assessment

Key Vulnerabilities: Infrastructure	Climate Change Impacts					
	Sea level rise	Rainfall variabil-ity	Increase in average temps.	In-creased hot days (35+)	More intense storms	Change in ocean temp. and Ph
Extent of Bitumen Road Network	3	3	4	4	3	1
Extent of Gravel Road Network	3	4	4	3	4	N/A
Low lying water and sewer infrastructure	5	4	2	N/A	4	N/A
Location of airport	5	3	1	1	4	N/A
Water supply system	3	4	3	3	3	N/A
Capacity of stormwater network	4	4	1	1	4	1
Linear power network	1	2	4	5	5	N/A
BVSC asset portfolio	4	3	4	4	3	1
Telecommunication infrastructure	N/A	N/A	4	4	4	N/A
Distribution of recreational assets	4	3	3	3	3	N/A
Condition of major highways	N/A	1	1	1	1	N/A
Number of bridges and culverts	3	4	3	3	4	1
Management of waste products	1	3	3	4	3	N/A

Economy Climate Resilience Vulnerability Assessment

Key Vulnerabilities: Economy	Climate Change Impacts					
	Sea level rise	Rainfall variabil-ity	Increase in average temps.	In-creased hot days (35+)	More intense storms	Change in ocean temp. and Ph
Lack of industry diversity	1	3	1	3	3	3
Reliance on major employers incl. Gov.	N/A	N/A	N/A	N/A	N/A	1
Dairy – water access	2	5	4	4	3	N/A
Dairy – irrigation costs	N/A	5	5	5	2	N/A
Dairy – production costs /commodity prices	N/A	5	4	4	2	N/A
Beef – commodity prices	N/A	4	4	4	2	N/A
Tourism - seasonality	N/A	4	4	4	4	3
Tourism – market competition	3	1	3	3	3	N/A
Tourism - reliance on natural env.	4	4	4	4	3	2
Distance from markets	N/A	N/A	2	1	2	N/A
Reliance on external food and commodities	N/A	5	4	3	3	3
Reliance on external energy production	N/A	N/A	3	5	5	N/A
Aquaculture – ecosystem health	5	4	4	5	3	5
Internet access / quality	N/A	N/A	N/A	N/A	2	N/A
Online shopping / retail trends	N/A	N/A	N/A	N/A	N/A	N/A
Reliance on road transportation	3	3	3	4	3	N/A

Community Climate Resilience Vulnerability Assessment

Key Vulnerabilities: Our Community	Climate Change Impacts					
	Sea level rise	Rainfall variability	Increase in average temps.	Increased hot days (35+)	More intense storms	Change in ocean temp. and Ph
Ageing population	N/A	N/A	4	5	4	N/A
Limited education & training opps.	N/A	N/A	N/A	N/A	N/A	N/A
Limited employment opportunities	N/A	N/A	N/A	N/A	N/A	N/A
Availability of specialist medical services	N/A	N/A	3	3	2	N/A
Absentee property owners	N/A	3	N/A	N/A	2	N/A
Rates of volunteerism	N/A	3	3	4	4	N/A
Reliance on social and community networks	N/A	3	2	3	3	N/A
Lack of cultural diversity	N/A	N/A	N/A	N/A	N/A	N/A
Housing affordability	N/A	N/A	N/A	N/A	N/A	N/A
Income inequality	N/A	N/A	N/A	3	N/A	N/A
Integration of new residents	N/A	N/A	N/A	N/A	N/A	N/A
Cost of living pressures	N/A	N/A	3	4	2	0
Disability services	0	0	3	4	0	0
Long term knowledge and skill availability	0	3	3	3	3	0

Appendix 4 - Bega Valley Shire vulnerabilities

The following tables list the existing environmental, physical and socio-economic vulnerabilities that characterise our Shire and community. These vulnerabilities were identified through workshop sessions with BVSC's community technical advisory panel, existing research, BVSC staff and industry experts. A range of existing stressors and historic shocks have been identified to which the vulnerabilities have some level of sensitivity or exposure. Climate change is predicted to exacerbate the severity of these stressors and shocks and hence increase our vulnerability. The climate change factors predicted to impact individual vulnerabilities are highlighted

Key Vulnerabilities	Existing Stressors								Historic Shocks					
	External Economy Factors	Local Economy	Under employ-ment	Low Median Income	Housing Avail-ability	Energy Price	Natural Resource Use	Drought	Heat Wave	Bushfire	Flood	Storm / ECL	Coastal Erosion	Industry Closure /restruc.
Natural Systems														
Percentage of forest cover across Shire							**RN**	**RN TP**	**TP**	**TP RN**				
Loss of wildlife corridors								**RN TP**		**TP HD**				
Biodiversity – threatened species								**RN TP**	**OT TP**	**TP RN**	**SL RN**		**SL ST**	
Bio-diversity – Invasive species (weeds)								**RN TP**	**OT TP**	**TP RN**	**SL RN**			
Bio-diversity – Invasive species (fauna)								**RN TP**	**OT TP**	**TP RN**				
Length of coastline									**OT**		**SL RN**	**SL RN ST**	**SL ST**	
Length of Estuarine foreshore								**RN TP**	**OT TP**		**SL RN**	**SL RN ST**		
Estuary ecosystem health								**RN TP**	**OT TP**		**SL RN**	**SL RN ST**	**SL ST**	
Degraded catchments								**RN TP**	**RN TP HD**	**TP RN HD**	**RN**	**ST RN**		
Dune systems								**RN TP**		**TP OT**		**ST SL**	**SL ST**	

Predicted climate change factors that will exacerbate existing stressors and shocks	Sea level rise	**SL**
	Changes in ocean temp and pH	**OT**
	Increased rainfall seasonality	**RN**
	Increased average temperatures	**TP**
	Increased hot days (35 deg+)	**HD**
	More intense storms	**ST**

Key Vulnerabilities	Existing Stressors								Historic Shocks					
	External Economy Factors	Local Economy	Under employ-ment	Low Median Income	Housing Avail-ability	Energy Price	Natural Resource Use	Drought	Heat Wave	Bushfire	Flood	Storm / ECL	Coastal Erosion	Industry Closure /restruc.
Infrastructure														
Extent of Bitumen Road Network									**TP HD**		**RN ST**	**SL RN ST**	**SL ST**	
Extent of Gravel Road Network								**RN TP**			**RN ST**	**SL RN ST**		
Low lying water and sewer infrastructure											**SL RN**	**SL RN**		
Location of airport											**SL RN ST**	**SL RN ST**		
Water supply system							**RN TP**	**RN TP**	**TP HD**	**TP HD**	**RN**	**SL RN**		
Capacity of stormwater network											**SL RN**	**SL RN**	**SL RN**	
Linear power network									**TP HD**	**TP HD**	**RN**	**RN**		
BVSC's asset portfolio							**RN**	**RN TP**	**TP HD**	**TP HD**	**SL RN**	**SL RN**	**SL RN**	
Telecommunication infrastructure									**TP HD**	**TP HD**	**RN**	**RN**		
Distribution of recreational assets							**RN**	**TP**	**TP HD**	**TP HD**	**SL RN**	**SL RN**	**SL**	
Condition of major highways							**RN**				**SL RN**	**SL RN**		
Number of bridges and culverts							**RN**				**SL RN ST**	**SL RN ST**	**SL ST**	
Management of waste products										**RN TP**	**RN**			

Predicted climate change factors that will exacerbate existing stressors and shocks	Sea level rise	**SL**
	Changes in ocean temp and pH	**OT**
	Increased rainfall seasonality	**RN**
	Increased average temperatures	**TP**
	Increased hot days (35 deg+)	**HD**
	More intense storms	**ST**

Key Vulnerabilities	Existing Stressors								Historic Shocks					
	External Economy Factors	Local Economy	Under employ-ment	Low Median Income	Housing Avail-ability	Energy / fuel Price	Natural Resource Use	Drought	Heat Wave	Bushfire	Flood	Storm / ECL	Coastal Erosion	Industry Closure /restruc.
Land use and Settlement														
Location of rural residential development									**HD**	**TP RN HD**	**SL RN ST**	**SL RN ST**		
Extent / location of agricultural land							**RN**	**HD TP RN**	**HD TP**	**TP RN**	**RN**			
Area of Shire within NP or State Forests								**RN TP**		**HD TP RN**	**RN**	**SL RN**	**SL**	
Distribution / location of towns, villages & settlements								**RN**		**TP RN**	**SL RN**	**SL RN**	**SL**	
Low lying development											**SL RN**	**SL**	**SL**	
Length of bushland / urban interface								**HD TP RN**	**HD TP RN**	**HD TP RN**				
Lack of connectivity between and within settlements									**HD**	**TP**				
Vehicle dependence									**HD TP**	**TP**				
Lack of public transport									**HD TP**					
Limited housing styles														
Reliance on major towns										**HD TP**		**SL**		

Predicted climate change factors that will exacerbate existing stressors and shocks	Sea level rise	**SL**
	Changes in ocean temp and pH	**OT**
	Increased rainfall seasonality	**RN**
	Increased average temperatures	**TP**
	Increased hot days (35 deg+)	**HD**
	More intense storms	**ST**

Key Vulnerabilities	Existing Stressors								Historic Shocks					
	External Economy Factors	Local Economy	Under employ-ment	Low Median Income	Housing Avail-ability	Energy / fuel Price	Natural Resource Availability	Drought	Heat Wave	Bushfire	Flood	Storm / ECL	Coastal Erosion	Industry Closure /restruc.
Economy														
Lack of industry diversity							RN	RN TP			RN			
Reliance on major employers including Gov.														
Dairy – water access		RN					RN	RN TP			RN			
Dairy – irrigation costs	RN													
Dairy – production costs /commodity prices	RN	RN					RN	RN TP			RN			
Beef – commodity prices	RN	RN					RN	RN TP						
Tourism - seasonality		RN TP					TP	RN TP	TP HD	RN	RN			
Tourism – market competition														
Tourism - reliance on natural environment		RN					RN	RN		RN	SL RN	RN	SL	
Distance from markets							RN				RN ST			
Reliance on external food and commodities	RN	RN						RN TP			RN ST			
Reliance on external energy production	ST	ST				ST								
Aquaculture – ecosystem health		RN					RN OT TP	RN TP	OT RN		RN	SL RN ST	SL	
Internet access / quality														
Online shopping / changing retail trends														
Reliance on road transportation										RN	RN ST	ST		

Predicted climate change factors that will exacerbate existing stressors and shocks	Sea level rise	**SL**
	Changes in ocean temp and pH	**OT**
	Increased rainfall seasonality	**RN**
	Increased average temperatures	**TP**
	Increased hot days (35 deg+)	**HD**
	More intense storms	**ST**

Key Vulnerabilities	Existing Stressors								Historic Shocks					
	External Economy Factors	Local Economy	Under employ-ment	Low Median Income	Housing Avail-ability	Energy / fuel Price	Natural Resource Availability	Drought	Heat Wave	Bushfire	Flood	Storm / ECL	Coastal Erosion	Industry Closure /restruc.
Our Community														
Ageing population									**TP HD**					
Limited education & training opportunities														
Limited employment opportunities														
Availability of specialist medical services														
Absentee prop. owners										**RN TP**	**RN**	**RN ST**		
Reduced volunteerism							**RN TP**		**TP HD**	**RN TP**	**RN**	**RN ST**		
Reliance on social and community networks							**RN TP**	**TP**	**TP HD**	**RN TP**	**RN**	**RN ST**		
Lack of cultural diversity														
Housing affordability														
Income inequality														
Integration of new residents														
Cost of living pressures						**TP HD**			**TP HD**					
Disability services														
Long term knowledge and skill availability								**TP**	**TP HD**	**RN TP**	**RN**	**RN ST**	**ST**	

Predicted climate change factors that will exacerbate existing stressors and shocks	Sea level rise	**SL**
	Changes in ocean temp and pH	**OT**
	Increased rainfall seasonality	**RN**
	Increased average temperatures	**TP**
	Increased hot days (35 deg+)	**HD**
	More intense storms	**ST**

Appendix 5 - Bega Valley Shire Council Climate Change Risk Assessment 2020

STATEWIDE MUTUAL PROGRAM

CLIMATE CHANGE RISK ASSESSMENT

BEGA VALLEY SHIRE COUNCIL

17 MARCH 2020



Prepared for

Bega Valley Shire Council

Developed by

Statewide Mutual

Editorial Team

Mrs Ellie Diaz, Principal

Mr Tony Schaefer - Consultant

Disclaimer

The Climate Change Risk Management Assessments contained within this report have been developed solely on the site-specific information supplied by various participants and have been prima facie accepted by the authors of this report. The information has not been independently verified for accuracy. JLT accepts no responsibility for any loss that arises out of Council having failed to bring all relevant facts to our attention or having provided inaccurate information.

Assumptions & Limitations

It is understood that there is a level of uncertainty regarding climate change projections, including those for New South Wales. JLT acknowledges that climate change data may change, and has committed to the scenarios available at the time of the assessments.

The focus of the Climate Change Risk Assessments is one of understanding the risk exposure – not adaptation or mitigation.

Use of this Report

This report has been prepared by JLT on behalf of Statewide Mutual for Council for the purpose of providing an informed view of the Council's approach to Climate Change Risk Management.



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Executive Summary

Bega Valley Shire Council, as member of the Statewide Mutual Liability Scheme (Statewide Mutual) selected to participate in the Climate Change Risk Assessment program proudly offered to member Councils as part of its series of funded initiatives.

Statewide Mutual understands the impact that Climate Change can potentially have on Council operations and the importance of understanding the risks associated.

Bega Valley Shire Valley Council participated in the Climate Change Risk Assessment workshop on 17 March 2020 with representation from most areas of the organisation and identified a total of **34** risks; the ratings as follows.

Four (0) rated	LOW
Twelve (12) risks rated	MEDIUM
Thirteen (13) risks rated	HIGH
Nine (9) risks rated	VERY HIGH

This project was undertaken using the latest Climate data and scenarios available.

The NSW and ACT Governments and the Climate Change Research Centre (NARCliM) at the University of NSW. together with other NSW Government authorities have partnered to develop Regional Climate Modelling for key catchment areas with climate change projections at a regional scale through interactive mapping.

The workshop made use of the projected impacts of climate variation that are specifically related to its region, thus providing a more accurate assessment of the impacts on Bega Valley Shire Council.

This report outlines the findings and results of the risk assessment based on the applied methodology.

The following illustrates the result of the risk assessment.



Analysis of all Impacts

Table 1 – Number of Risks per Scenario and Risk Rating

Table 1 - Impact Rankings by Scenario								Table 1 Ranking All Impacts Total	
	Temperature	Hot Days	Rain	Fire Weather	Sea Level	Wind			
Low	0	0	0	0	0	0		**Low**	**0**
Medium	4	6	2	0	0	0		**Medium**	**12**
High	2	2	2	2	5	0		**High**	**13**
Very High	1	0	3	3	2	0		**Very High**	**9**
	7	**8**	**7**	**5**	**7**	**0**	**0**	**34**	**34**



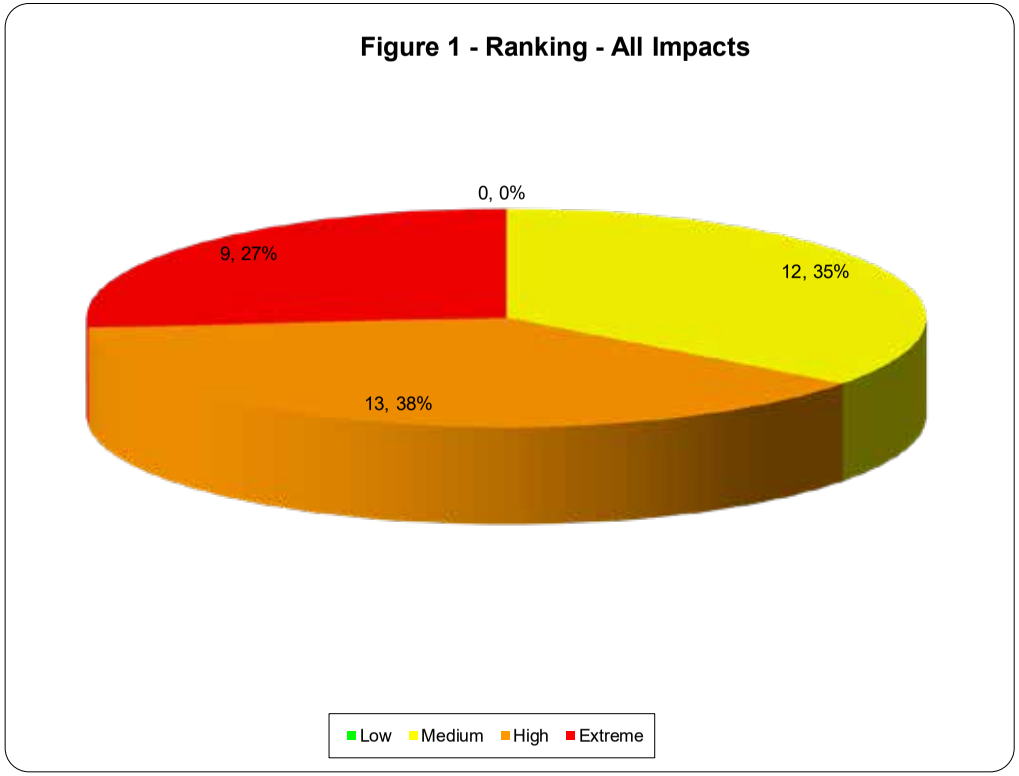
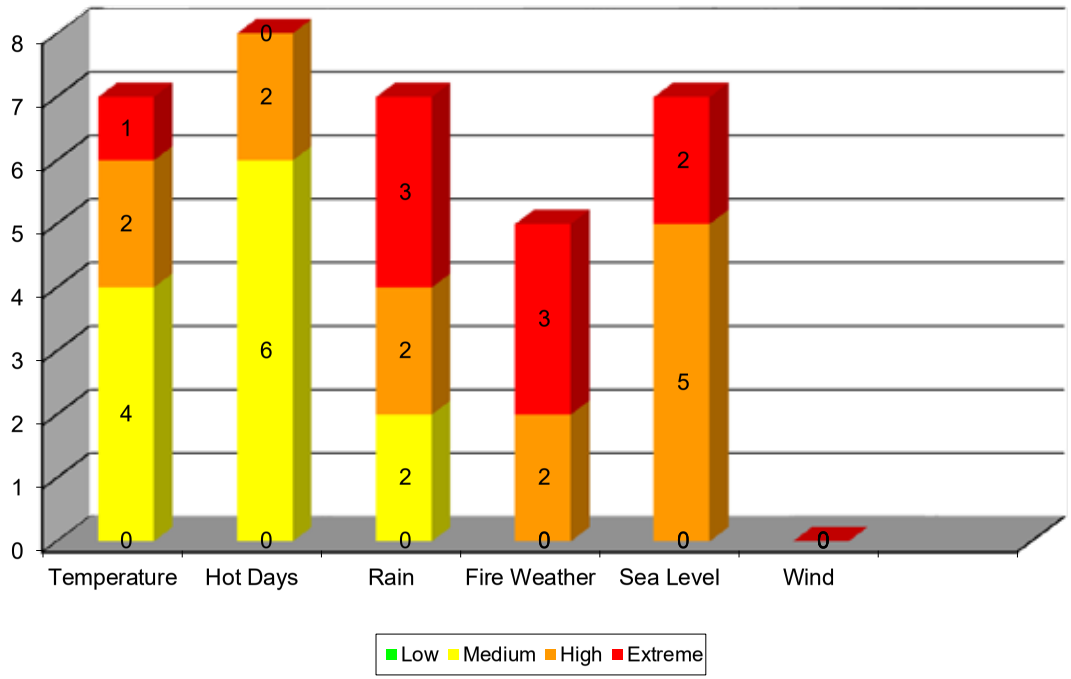


Figure 1 - Ranking - All Impacts
0, 0%
9, 27%
12, 35%
13, 38%
Low
Medium
High
Extreme

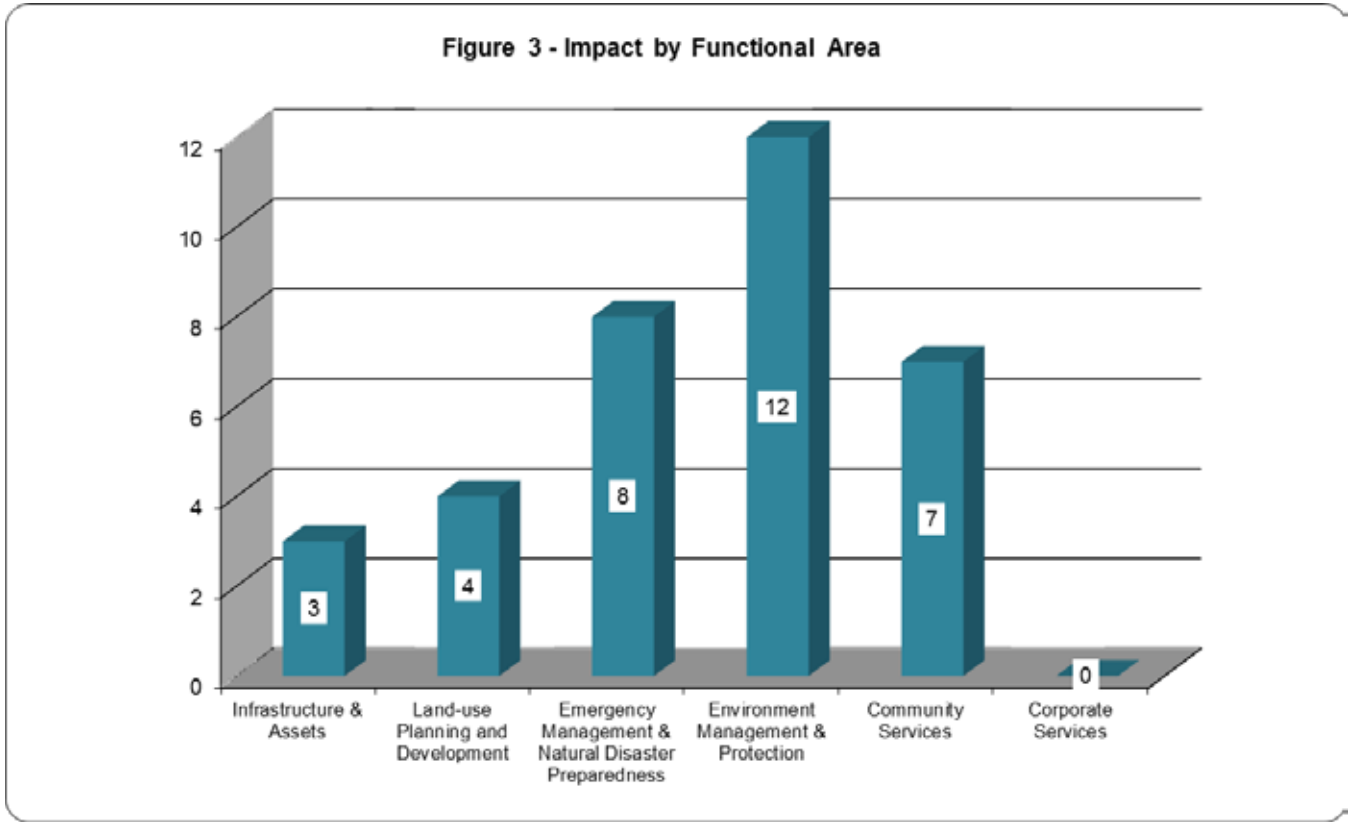


Figure 2 - Impact Ranking by Scenario





statewide mutual.





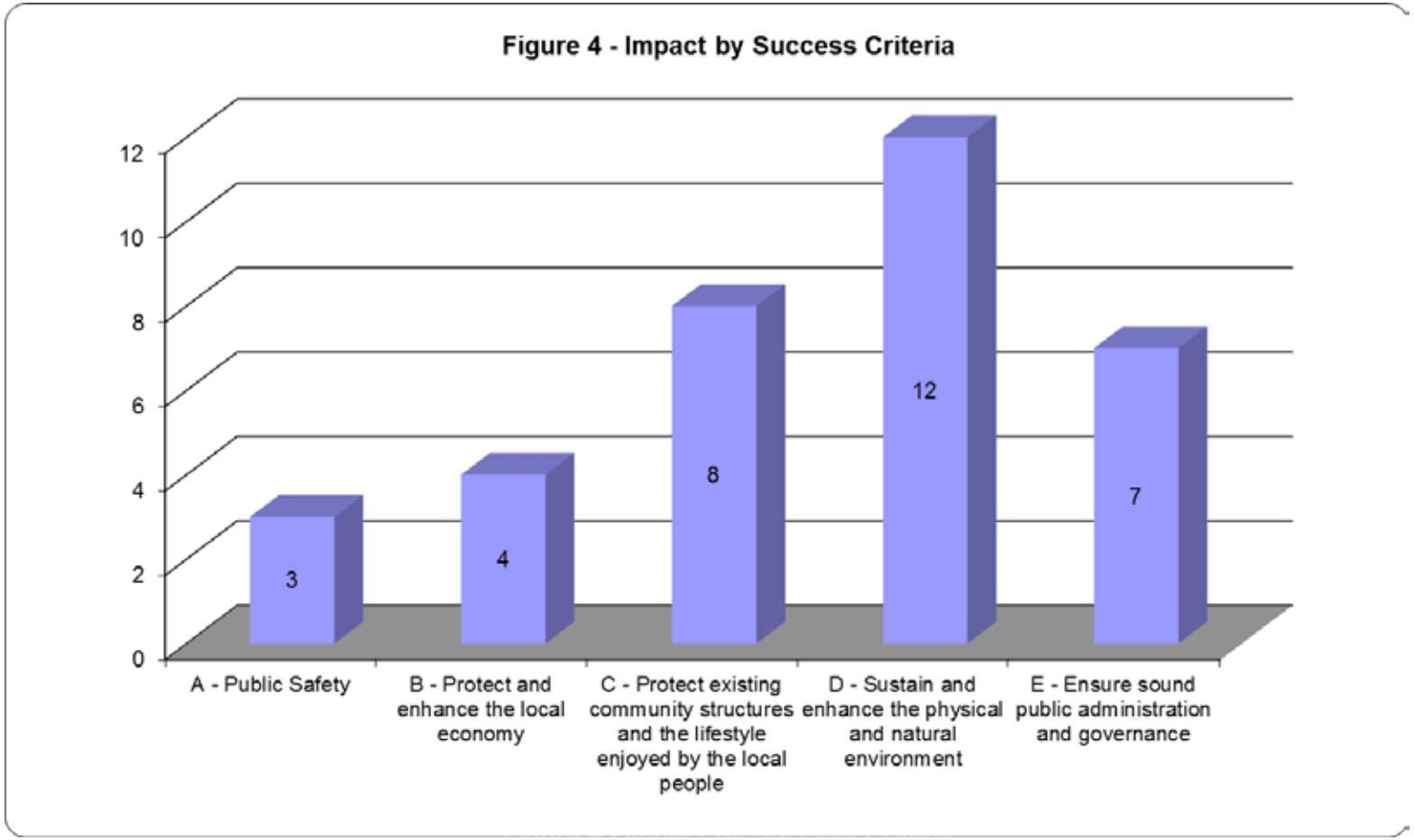


Figure 4 - Impact by Success Criteria
12
10
8
6
4
2
0
3
4
8
12
7
A - Public Safety
B - Protect and enhance the local economy
C - Protect existing community structures and the lifestyle enjoyed by the local people
D - Sustain and enhance the physical and natural environment
E - Ensure sound public administration and governance



Methodology

The Climate Change Risk Assessment process is broken down into three stages:

- Research on the relevant Climate data
- Workshop facilitation and
- Development of a report outlining the risk assessment results.

The process is facilitated by a JLT Consultant on behalf of Statewide Mutual. The Consultant's role is to guide attendees through the risk assessment process utilising Climate specific tools and information.

Central to the process is the Australian Standard for Risk management – as ISO 31000 and provides the framework for assessing climate change impacts.

The risk assessment process largely based on the likelihood and consequence approach and a standard/ recognised risk matrix for evaluating the risks. This process was enhanced with the use of:

- Climate Change Scenarios and specific projections that best reflected Council's geographical location.
- The impact on Functional Areas posed by the Scenarios
- Against Council's objective or Success Criteria and impact on its ability to achieve them

Details of these three parameters are found at **Appendix 4.**



This project and assessment utilises data is based on scientific research and studies published in the Intergovernmental Panel on Climate Change (IPCC) in its Fifth Assessment Report (2013) and information data and resources made available through the National Climate Change Adaptation Research Facility (NCCARF), Dept. of Environment and the NSW Office of Environment and Heritage (OEH).

It shows further warming of the atmosphere and oceans in the Australian region, as is happening globally. This change is occurring against the background of high climate variability, but the signal is clear.

Air and ocean temperatures across Australia are now, on average, almost a degree Celsius warmer than they were in 1910, with most of the warming occurring since 1950… …Rainfall averaged across all of Australia has slightly increased since 1900. Since 1970, there have been large increases in annual rainfall in the northwest and decreases in the southwest. Autumn and early winter rainfall has mostly been below average in the southeast since 1990.

Atmospheric greenhouse gas concentrations continue to rise and continued emissions will cause further warming over this century. Limiting the magnitude of future climate change requires large and sustained net global reductions in greenhouse gases.".

State of the Climate 2014 – CSIRO & BOM

"Observed impacts of climate change are widespread and consequential. Recent changes in climate have caused impacts on natural and human systems on all continents and across the oceans. This conclusion is strengthened by more numerous and improved observations and analyses since the AR4. For many natural systems on land and in the ocean, new or stronger evidence exists for substantial and wide-ranging climate change impacts.."

IPCC WGAR5 accepted March 2014



Climate Change Risk Assessment

Scenario for HOT DAYS

The number of very hot days (>35oC)
Recent Past
Then number of very hot days was 3.9
By 2030
The number of very hot days is projected to be 6.2
By 2070
The number of very hot days is projected to be 10.2

ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
HDEI1	An increase in the number of hot days may cause heat stress in operational staff in relation to personal health and safety	E - Ensure sound public administration and governance	Infrastructure & Assets	Procedure in place (6.05.7)	Mostly beneficial (reduces consequence)	Almost Certain	Minor	**Medium**	**Yes**
HDEI2	An increase in the number of hot days may cause heat stress in operational staff resulting in loss of productivity	E - Ensure sound public administration and governance	Infrastructure & Assets	Procedure in place (6.05.7)	Mostly beneficial (reduces consequence)	Almost Certain	Minor	**Medium**	**Yes**
HDCI3	An increase in the number of hot days may cause shift in demand and hours of usage for outdoor sporting facilities	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	None	No benefit	Almost Certain	Minor	**Medium**	**Yes**



ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
HDACS 4	An increase in hot days may shift attendance and enjoyment by the community at Council events or at Council venues	A - Maintain public safety	Corporate Services	None	No benefit	Almost Certain	Moderate	**High**	**Yes**
HDBCS 6	An increase in hot days may shift attendance and enjoyment by the community at Council events or at Council venues	B - Protect and enhance the local economy	Corporate Services	Risk Assessments carried out	Mostly beneficial (reduces consequence)	Almost Certain	Moderate	**High**	**Yes**
HDEI7	An increase in hot days lead to an increased risk of power usage and possible outage at Council facilities	E - Ensure sound public administration and governance	Infrastructure & Assets	BCP in place	Mostly beneficial (reduces consequence)	Possible	Moderate	**Medium**	**Yes**
HDDI8	An increase in hot days will lead to an increased demand for water for the community	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	Asset Management Plan Water (2015) Strategic Business Plan (2014)	Mostly beneficial (reduces consequence)	Almost Certain	Minor	**Medium**	**Yes**
HDEI9	There is a risk that as a result of an increased number of hot days, there may be greater incidents of transport infrastructure impacts within the LGA	E - Ensure sound public administration and governance	Infrastructure & Assets	Transport Asset Management Plan (2017)	Mostly beneficial (reduces consequence)	Almost Certain	Minor	**Medium**	**Yes**



Scenario for TEMPERATURE

Maximum Temperature
Recent past
Max Temperature is projected to be 37.5oC
By 2030
Max temperature is projected to be 38.4oC
By 2070
Maximum Temperature is projected to be 39.8oC

ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
TCI1	An increase in temperature may shift the demand of recreational areas e.g. increased demand for swimming facilities	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	None	No benefit	Almost Certain	Minor	**Medium**	**Yes**
TAI2	An increase in temperature may see an increase in damage/reduced healthiness to/of vegetation in public areas/reserves/car parks	A - Maintain public safety	Infrastructure & Assets	None	No benefit	Unlikely	Major	**Medium**	**Yes**
TECS3	An increase in temperature may cause greater energy usage and costs at Council's facilities	E - Ensure sound public administration and governance	Corporate Services	Clean Energy Plan	Mostly beneficial (reduces consequence)	Almost Certain	Minor	**Medium**	**No**
TCI5	An increase in temperature may cause greater degradation of Council's assets and infrastructure	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	Asset Management Plans	Mostly beneficial (reduces consequence)	Possible	Moderate	**Medium**	**Yes**



ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
TDE7	An increase in temperature may cause changes in biodiversity & ecosystems	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Estuary Management Plan	Some Benefit (reduces likelihood)	Almost Certain	Major	**Very High**	**Yes**
TEI8	An increase in temperature may result in greater demand/usage of water	E - Ensure sound public administration and governance	Infrastructure & Assets	Asset Management Plan Water (2015) Strategic Business Plan (2014)	Some Benefit (reduces likelihood)	Almost Certain	Moderate	**High**	**Yes**
TDI9	An increase in temperature may see an increase in damage/reduced healthiness to/of vegetation in public areas/reserves/car parks	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	None	No benefit	Almost Certain	Moderate	**High**	**Yes**



Scenario for RAINFALL

Annual precipitation (mm)
Recent Past
Annual precipitation was 873.5 mm
By 2030
Annual precipitation is projected to be 861.4 mm
By 2070
Annual precipitation is projected to be 906.2 mm

ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
RD1	There is a risk that there will be an increase in frequency and severity of flood events that may cause damage to Council's infrastructure	D - Sustain and enhance the physical and natural environment	Land-use Planning and Development	Flood management plans and studies	Mostly beneficial (reduces consequence)	Almost Certain	Major	Very High	Yes
RDI2	There is a risk of reduced yield into water storages during certain periods of the year	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	Asset Management Plan Water (2015) Strategic Business Plan (2014)	No benefit	Possible	Minor	Medium	Yes
RDI3	An increase in rainfall intensity may cause increased operational resourcing	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	Asset Management Plans	No benefit	Possible	Major	High	Yes
RCI4	An increase in rainfall intensity may cause more frequent closure of infrastructure and facilities	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	Asset Management Plans and Emergency Management Plan	Mostly beneficial (reduces consequence)	Almost Certain	Minor	Medium	No



ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
RAI5	An increase in rainfall intensity may cause significant increase in public safety risks via asset damage	A - Maintain public safety	Infrastructure & Assets	Asset Management Plans and Emergency Management Plan	Mostly beneficial (reduces consequence)	Almost Certain	Catastrophic	**Very High**	**Yes**
RDE6	An increase in rainfall intensity may cause increased environmental impacts from runoff	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	SOPs in place and licences in place	Mostly beneficial (reduces consequence)	Likely	Major	**High**	**Yes**
RB7	An increase in rainfall variability may change economic activity	B - Protect and enhance the local economy	Land-use Planning and Development	Economic Development Strategy Climate Resilience Strategy Asset Management Plan	Mostly beneficial (reduces consequence)	Almost Certain	Major	**Very High**	**Yes**



Scenario for FIRE WEATHER

Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines observations of temperature, humidity and wind speed. Fire weather is classified as severe when the FFDI is above 50.
Number of days where FFDI is severe:
Recent past
The number of days where FFDI was 0.7
By 2030
The number of days where the FFDI is projected to be 0.8
By 2070
Then number of days where the FFDI is projected to be 1.3

ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
FWCI1	There is a risk that there will be an increase in frequency of fires and severe rated days in Council areas impacting upon infrastructure and assets	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	Emergency and Bush Fire Management Plans	Mostly beneficial (reduces consequence)	Likely	Catastrophic	Very High	Yes
FWBCS 2	There is a risk that there will be an increase in frequency of fires and severe rated days in Council areas impacting upon the community and local economy	B - Protect and enhance the local economy	Corporate Services	Economic Development Team and Strategy NSW Disaster Management framework	Mostly beneficial (reduces consequence)	Almost Certain	Catastrophic	Very High	Yes
FWDE3	There is a risk that there will be an increase in frequency of fires and severe rated days in Council areas impacting upon the environment and heritage	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Emergency and Bush Fire Management Plans	Some Benefit (reduces likelihood)	Almost Certain	Catastrophic	Very High	Yes



ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
FWECS 4	There is a risk that climate change will lead to an increase in bush fire activity that will increase demand for resources.	E - Ensure sound public administration and governance	Corporate Services	Various Plans	Mostly beneficial (reduces consequence)	Almost Certain	Moderate	**High**	**Yes**
FWDCS 5	There is a risk that there will be an increase in demand for hazard reduction	D - Sustain and enhance the physical and natural environment	Corporate Services	Existing legislative framework	No benefit	Almost Certain	Moderate	**High**	**Yes**



Scenario for SEA LEVEL

There is a risk that the sea level will rise by up to 0.45m by 2070.

ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
SLCI1	There is a risk that tidal flooding will reduce capacity of stormwater drainage	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	various flood management plans Asset management plans	Some Benefit (reduces likelihood)	Almost Certain	Moderate	**High**	Yes
SLC2	There is a risk that permanent inundation will increase loss of land	C - Protect existing community structures and the lifestyle enjoyed by the local people	Land-use Planning and Development	Various flood management plans and strategy plans	Some Benefit (reduces likelihood)	Almost Certain	Moderate	**High**	Yes
SLDE3	There is a risk of increased tidal inundation and destruction of coastal ecosystems	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Coastal Management Plans	Mostly beneficial (reduces consequence)	Almost Certain	Major	**Very High**	Yes
SLB4	There is a risk of a loss to the local economy due to destruction of land and assets by tidal flooding or coastal erosion	B - Protect and enhance the local economy	Land-use Planning and Development	Coastal Management Plans	Some Benefit (reduces likelihood)	Almost Certain	Moderate	**High**	Yes
SLCI5	There is a risk of increased tidal inundation and destruction of critical infrastructure	C - Protect existing community structures and the	Infrastructure & Assets	Coastal Management Plans and Asset	Some Benefit (reduces likelihood)	Almost Certain	Moderate	**High**	Yes



ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Likelihood	Consequence	Rating	Requires Future Adaptation Initiative/s YES / NO
		lifestyle enjoyed by the local people		Management Plans					
SLDI6	There is a risk of increased tidal inundation affecting fresh water availability from ground water supplies	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	None	No benefit	Likely	Moderate	**High**	**Yes**
SLDE7	There is a risk of increased coastal erosion affecting coastal ecosystems	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Coastal Management Plans and Asset Management Plans	Some Benefit (reduces likelihood)	Almost Certain	Major	**Very High**	**Yes**



Summary of Risks Requiring Future Adaptation Planning

ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Rating	Requires Future Adaptation Initiative/s YES / NO
TDE7	An increase in temperature may cause changes in biodiversity & ecosystems	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Estuary Management Plan	Some Benefit (reduces likelihood)	Very High	Yes
RD1	There is a risk that there will be an increase in frequency and severity of flood events that may cause damage to Council's infrastructure	D - Sustain and enhance the physical and natural environment	Land-use Planning and Development	Flood management plans and studies	Mostly beneficial (reduces consequence)	Very High	Yes
RAI5	An increase in rainfall intensity may cause significant increase in public safety risks via asset damage	A - Maintain public safety	Infrastructure & Assets	Asset Management Plans and Emergency Management Plan	Mostly beneficial (reduces consequence)	Very High	Yes
RB7	An increase in rainfall variability may change economic activity	B - Protect and enhance the local economy	Land-use Planning and Development	Economic Development Strategy Climate Resilience Strategy Asset Management Plan	Mostly beneficial (reduces consequence)	Very High	Yes
FWCI1	There is a risk that there will be an increase in frequency of fires and severe rated days in Council areas impacting upon infrastructure and assets	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	Emergency and Bush Fire Management Plans	Mostly beneficial (reduces consequence)	Very High	Yes
FWBCS2	There is a risk that there will be an increase in frequency of fires and severe rated days in Council areas impacting upon the community and local economy	B - Protect and enhance the local economy	Corporate Services	Economic Development Team and Strategy NSW Disaster Management framework	Mostly beneficial (reduces consequence)	Very High	Yes



ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Rating	Requires Future Adaptation Initiative/s YES / NO
FWDE3	There is a risk that there will be an increase in frequency of fires and severe rated days in Council areas impacting upon the environment and heritage	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Emergency and Bush Fire Management Plans	Some Benefit (reduces likelihood)	**Very High**	**Yes**
SLDE3	There is a risk of increased tidal inundation and destruction of coastal ecosystems	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Coastal Management Plans	Mostly beneficial (reduces consequence)	**Very High**	**Yes**
SLDE7	There is a risk of increased coastal erosion affecting coastal ecosystems	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	Coastal Management Plans and Asset Management Plans	Some Benefit (reduces likelihood)	**Very High**	**Yes**
HDACS4	An increase in hot days may shift attendance and enjoyment by the community at Council events or at Council venues	A - Maintain public safety	Corporate Services	None	No benefit	**High**	**Yes**
HDBCS6	An increase in hot days may shift attendance and enjoyment by the community at Council events or at Council venues	B - Protect and enhance the local economy	Corporate Services	Risk Assessments carried out	Mostly beneficial (reduces consequence)	**High**	**Yes**
TEI8	An increase in temperature may result in greater demand/usage of water	E - Ensure sound public administration and governance	Infrastructure & Assets	Asset Management Plan Water (2015) Strategic Business Plan (2014)	Some Benefit (reduces likelihood)	**High**	**Yes**
TDI9	An increase in temperature may see an increase in damage/reduced healthiness to/of vegetation in public areas/reserves/car parks	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	None	No benefit	**High**	**Yes**
RDI3	An increase in rainfall intensity may cause increased operational resourcing	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	Asset Management Plans	No benefit	**High**	**Yes**



ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Rating	Requires Future Adaptation Initiative/s YES / NO
RDE6	An increase in rainfall intensity may cause increased environmental impacts from runoff	D - Sustain and enhance the physical and natural environment	Environment Management & Protection	SOPs in place and licences in place	Mostly beneficial (reduces consequence)	High	Yes
FWECS4	There is a risk that climate change will lead to an increase in bush fire activity that will increase demand for resources.	E - Ensure sound public administration and governance	Corporate Services	Various Plans	Mostly beneficial (reduces consequence)	High	Yes
FWDCS5	There is a risk that there will be an increase in demand for hazard reduction	D - Sustain and enhance the physical and natural environment	Corporate Services	Existing legislative framework	No benefit	High	Yes
SLCI1	There is a risk that tidal flooding will reduce capacity of stormwater drainage	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	various flood management plans Asset management plans	Some Benefit (reduces likelihood)	High	Yes
SLC2	There is a risk that permanent inundation will increase loss of land	C - Protect existing community structures and the lifestyle enjoyed by the local people	Land-use Planning and Development	Various flood management plans and strategy plans	Some Benefit (reduces likelihood)	High	Yes
SLB4	There is a risk of a loss to the local economy due to destruction of land and assets by tidal flooding or coastal erosion	B - Protect and enhance the local economy	Land-use Planning and Development	Coastal Management Plans	Some Benefit (reduces likelihood)	High	Yes
SLCI5	There is a risk of increased tidal inundation and destruction of critical infrastructure	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	Coastal Management Plans and Asset Management Plans	Some Benefit (reduces likelihood)	High	Yes
SLDI6	There is a risk of increased tidal inundation affecting fresh water availability from ground water supplies	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	None	No benefit	High	Yes
HDEI1	An increase in the number of hot days may cause heat stress in operational staff in relation to personal health and safety	E - Ensure sound public administration and governance	Infrastructure & Assets	Procedure in place (6.05.7)	Mostly beneficial (reduces consequence)	Medium	Yes
HDEI2	An increase in the number of hot days may cause heat stress in operational staff resulting in loss of productivity	E - Ensure sound public administration and governance	Infrastructure & Assets	Procedure in place (6.05.7)	Mostly beneficial (reduces consequence)	Medium	Yes

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ID	Risk Statement	Impact on Council's ability to:	Functional Area	Current Controls	Adequacy of Control	Rating	Requires Future Adaptation Initiative/s YES / NO
HDCI3	An increase in the number of hot days may cause shift in demand and hours of usage for outdoor sporting facilities	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	None	No benefit	**Medium**	**Yes**
HDEI7	An increase in hot days lead to an increased risk of power usage and possible outage at Council facilities	E - Ensure sound public administration and governance	Infrastructure & Assets	BCP in place	Mostly beneficial (reduces consequence)	**Medium**	**Yes**
HDDI8	An increase in hot days will lead to an increased demand for water for the community	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	Asset Management Plan Water (2015) Strategic Bus. Plan (2014)	Mostly beneficial (reduces consequence)	**Medium**	**Yes**
HDEI9	There is a risk that as a result of an increased number of hot days, there may be greater incidents of transport infrastructure impacts within the LGA	E - Ensure sound public administration and governance	Infrastructure & Assets	Transport Asset Management Plan (2017)	Mostly beneficial (reduces consequence)	**Medium**	**Yes**
TCI1	An increase in temperature may shift the demand of recreational areas e.g. increased demand for swimming facilities	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	None	No benefit	**Medium**	**Yes**
TAI2	An increase in temperature may see an increase in damage/reduced healthiness to/of vegetation in public areas/reserves/car parks	A - Maintain public safety	Infrastructure & Assets	None	No benefit	**Medium**	**Yes**
TCI5	An increase in temperature may cause greater degradation of Council's assets and infrastructure	C - Protect existing community structures and the lifestyle enjoyed by the local people	Infrastructure & Assets	Asset Management Plans	Mostly beneficial (reduces consequence)	**Medium**	**Yes**
RDI2	There is a risk of reduced yield into water storages during certain periods of the year	D - Sustain and enhance the physical and natural environment	Infrastructure & Assets	Asset Management Plan Water (2015) Strategic Bus. Plan (2014)	No benefit	**Medium**	**Yes**

Total 32 (Very High = 9; High = 13; Medium = 10)



What is Next

The nature of Local Government, in its services and functions, means it will feel the impacts of climate change considerably and directly. Many impacts of climate change present risks that require treatment at a 'local' level. Others, due to their scope may require collaboration with key stakeholders, private and public.

Identifying and understanding the potential risks that Climate Change may pose is important. More important however are the actions that Council takes as a result of the assessment.

Council is encouraged to review the outcome of the risk assessment and consider:

- Developing adaptation initiatives for risks rated Very High, High and any appropriate rated Medium
- Periodically review all risks including those rated Medium and Low in light of current climate change information
- The impact of climate change on the operating environment, legislation, economy and other factors relevant to Council
- Categorising potential actions into short, medium and long term plans
- Including climate change risk assessment results into strategic and other management planning processes.

Appendices

Appendix 1 – Participation

The following Bega Valley Shire Council personnel participated in the CCRA workshop held on 17 March 2020. Their contribution was central to the success of the project.

Name	Position
Derek Van Bracht	Environment and Sustainability Coordinator
Michael Fiedler	Environmental Management Officer
Alice Howe	Director Community, Environment & Planning
Rachel Duczynski	Coastal Management Officer
Kurt Marsh	Waste Operations Superintendent
Bruce Powell	Water & Sewer Operations Superintendent
Joley Vidau	Waste Management Co-ordinator
Jason Heffernan	Works Engineer
Sophie Thomson	Strategic Planning Coordinator
Anne Cleverley	Manager Community Connections
Gary Louie	Asset Management Coordinator
Edward Crothers	Recreation Assets Officer
Cecily Hancock	Planning Coordinator
Daniel Djikic	Manager Property & Project Services
John Grady	Leisure & Recreation Manager



Appendix 2: Consequence and Likelihood Descriptors

Success Criteria	Consequence Rating				
	Insignificant	Minor	Moderate	Major	Catastrophic
A Maintain public safety	Appearance of a threat but no actual harm	Serious near misses or minor injuries	Small numbers of injuries	Isolated instances of serious injuries or loss of lives	Large numbers of serious injuries or loss of lives
B Protect and enhance the local economy	Minor shortfall relative to current forecasts	Individually significant but isolated areas of reduction in economic performance relative to current forecasts	Significant general reduction in economic performance relative to current forecasts	Regional stagnation such that businesses are unable to thrive and employment does not keep pace with population growth	Regional decline leading to widespread business failure, loss of employment and hardship
C Protect existing community structures and the lifestyle enjoyed by the local people	There would be minor areas in which the region was unable to maintain its current services	Isolated but noticeable examples of decline in services	General appreciable decline in services	Severe and widespread decline in services and quality of life within the community	The region would be seen as very unattractive, moribund and unable to support its community
D Sustain and enhance the physical and natural environment	No environmental damage	Minor instances of environmental damage that could be reversed	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Severe loss of environmental amenity and a danger of continuing environmental damage	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage
E Ensure sound public administration and governance	There would be minor instances of public administration being under more than usual stress but it could be managed	Isolated instances of public administration being under severe pressure	Public administration would be under severe pressure on several fronts	Public administration would struggle to remain effective and would be seen to be in danger of failing completely	Public administration would fall into decay and cease to be effective

Appendix 3 - Likelihood Descriptors

Likelihood Rating	Recurrent Risks	Single Events
Almost Certain	Could occur several times per year	More likely than not - Probability greater than 50%
Likely	May arise about once a year	As likely as not - 50/50 chance
Possible	May arise once in ten years	Less likely than not but still appreciable - Probability less than 50% but still quite high
Unlikely	May arise once in ten to 25 years	Unlikely but not negligible - Probability low but noticeably greater than zero
Rare	Unlikely during the next 25 years	Negligible - Probability very small, close to zero.



Appendix 3: Risk Evaluation Matrix

CONSEQUENCE

	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain					
Likely					
Possible					
Unlikely					
Rare					

KEY

VERY HIGH	
HIGH	
MEDIUM	
LOW	

VERY HIGH	**Very High** risks demand/require urgent attention at the most senior level and action plans and management responses are required; cannot be simply accepted as a part of routine operations.
HIGH	**High** risks are the most severe that can be accepted as a part of routine operations but must be managed by a senior manager who reports on progress to the Executive.
MEDIUM	**Medium** risks can be expected to form part of routine operations where specific monitoring and response procedures exist. Management will be assigned to a particular manager and reported on at senior management level.
LOW	**Low** risks will be part of routine operations and expected to be managed by existing controls.



Appendix 4: Climate Change Scenarios and Success Criteria

Climate Change Scenarios

A key feature of the Risk Assessment process is the use of various authoritative sources for climate change scenarios that were applied in this project. The Scenarios applicable for Bega Valley Shire Council are:

HD	**Hot Days**	The number of very hot days (>35ºC) **Recent Past** Then number of very hot days was 3.9 **By 2030** The number of very hot days is projected to be 6.2 **By 2070** The number of very hot days is projected to be 10.2
T	**Temperature**	Maximum Temperature **Recent past** Max Temperature is projected to be 37.5ºC **By 2030** Max temperature is projected to be 38.4ºC **By 2070** Maximum Temperature is projected to be 39.8°C
R	**Rainfall**	Annual precipitation (mm) **Recent Past** Annual precipitation was 873.5 mm **By 2030** Annual precipitation is projected to be 861.4 mm **By 2070** Annual precipitation is projected to be 906.2 mm
W	**Wind**	Not assessed due to unavailability of up-to-date data
FW	**Fire Weather**	Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines observations of temperature, humidity and wind speed. Fire weather is classified as severe when the FFDI is above 50. Number of days where FFDI is severe: **Recent past** The number of days where FFDI was 0.7 **By 2030** The number of days where the FFDI is projected to be 0.8 **By 2070** Then number of days where the FFDI is projected to be 1.3
SL	**Sea Level**	There is a risk that the sea level will rise by up to 0.45m by 2070.



Functional Areas of Council

Potential Climate Change impacts were considered in relation to the following Council Functional Areas:

I	Infrastructure and Assets
E	Environment Management & Protection
CS	Community Services
L	Land-use Planning and Development
D	Emergency Management & Natural Disaster Preparedness
C	Corporate Services

All Council business operations have been distributed in the appropriate area for consistency.

Success Criteria

Success criteria can be best described as long term objectives, and provide a perspective from which to conduct a risk assessment. In many cases a single climate change risk is assessed from a number of perspectives. The following success criteria have been applied and adopted as part of the risk assessment:

A	Maintain public safety
B	Protect and enhance the local economy
C	Protect existing community structures and the lifestyle enjoyed by the local people
D	Sustain and enhance the physical and natural environment
E	Ensure sound public administration and governance

Note: 'Success Criteria' are a summary representation of Council's long term objectives.

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bega valley shire council