BARWON DROUGHT RESILIENCE PLAN

Acknowledgement of Country

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. The recognised Traditional Owners in the Barwon Region include the Wadawurrung and Eastern Maar Peoples.

We honour Elders past and present, whose knowledge and wisdom have ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

This Plan was jointly funded by the Victorian and Commonwealth Government under the Future Drought Fund.

Preface

Drought is a prolonged, abnormally dry period that results in significant impacts to communities, businesses and the environment.

The Barwon Drought Resilience Plan is one of nine regional plans developed in Victoria, as part of the Regional Drought Resilience Planning Program, under the Future Drought Fund. Barwon communities are committed to taking steps now to prepare for and build resilience to dry seasonal conditions and drought.

The $5 billion Future Drought Fund invests in a wide range of drought related initiatives to help Australian communities prepare for the impacts of drought. These are implemented through a suite of programs under four focus areas:

- Better climate information
- Better practices
- Better planning
- Better prepared communities

The Regional Drought Resilience Planning (RDRP) Program is part of the 'better planning' focus area and supports the development of regional drought resilience plans throughout Australia from 2021 to 2025.

This Drought Resilience Plan for the Barwon region (the Plan) has been developed through consultation with a wide range of local individuals, groups and organisations. The Plan includes a collectively agreed framework for building economic, environmental and social resilience to guide regional effort and investment.

The Plan builds on historic and recent experiences of drought and integrates existing drought-related programs and strategies. Some of the key programs and documents that informed the Plan are:

- South-West node of the Victorian Drought Resilience Adoption and Innovation Hub
- Barwon South West Regional Climate Adaptation Strategy 2020–2025
- Central and Gippsland Region Sustainable Water Strategy
- Corangamite Regional Catchment Strategy
- Victorian Government's 'Strong, Innovative, Sustainable: A New Strategy for Agriculture in Victoria'
- Future Drought Fund's Farm Business Resilience Program
- Future Drought Funds' Helping Regional Communities Prepare for Drought Initiative – Community Impact Program

Some aspects of the Plan have been developed using a consistent methodology across Victoria including:

- **Drought impact analysis** to understand the prevalence, severity and frequency of past, present and future drought impacts.
- **Stakeholder engagement** to identify key insights and suggested priority areas for action to build drought resilience.

As part of the planning process a Drought Resilience Reference Group was established for the region. This group included key stakeholders with specialist knowledge of agriculture, health, finance, water, community and environment. The Barwon Reference Group included the organisations:

- City of Greater Geelong Council
- Surf Coast Shire Council
- Colac Otway Shire Council
- Corangamite Catchment Management Authority
- Southern Farming Systems
- South West Node of the Victorian Drought Resilience Adoption and Innovation Hub
- WestVic Dairy
- Barwon Water
- Southern Rural Water
- Rural Financial Counselling Service
- Department of Energy, Environment and Climate Action
- Department of Families, Fairness and Housing
- Department of Health and Human Services
- National Emergency Management Agency

Photo: Surf Coast Shire

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INTRODUCTION

Photo: Tracey McRae

Drought is a recurring feature in the Australian landscape, and has been for thousands of years. However, the impacts of climate change are increasing the frequency and severity of drought. The Australian and Victorian Governments have partnered to support regional areas in building resilience to future droughts, with a focus on adaptative and transformational change. The Australian Government's Drought Response, Resilience and Preparedness Program vision is to have farm businesses and rural communities that are prepared for, and capable of managing drought in pursuit of a prosperous and sustainable future.

Government, industry and community have contributed to the development of this place-based drought resilience plan for the Barwon region. A wide range of stakeholders have participated in either group discussions or one-on-one interviews (Appendix 1). Future engagement will ensure Traditional Owners self-determine their involvement in the Plan.

Purpose and Goals

Development of the Plan has encouraged a collaborative and coordinated approach to building drought resilience in the Barwon region. The Plan includes a collectively agreed framework for building **economic, environmental and social resilience.**

The long-term objectives of the Plan are to:

- Build the social capital of Barwon communities through increased connectivity, improved wellbeing and a greater sense of security.
- Empower Barwon communities and businesses to implement activities to build their economic resilience to drought.
- Support Barwon land managers to adopt approaches which will improve the natural resource base for long term productivity and landscape health.
- Support Traditional Owners and Aboriginal communities to continue to self-determine and care for Country in the lead up to, and during, times of drought.

For this Plan, drought resilience is defined as the ability to maintain function while effectively responding to the impacts of drought. It is about being able to adapt, thrive and take advantage of new opportunities rather than trying to maintain the status quo. This includes the ability to be flexible yet decisive during periods of uncertainty and change.

Resilience is critically important in rural and regional communities because it assists individuals and groups to develop the mindset, social network and business skills to navigate difficult periods and extreme events.

Droughts also pose a key threat for Traditional Owners, impacting the health of Country, and affecting their rights and responsibilities in caring for Country.

For Traditional Owners and Aboriginal Victorians, caring for Country extends beyond physical landscapes and involves the natural waters, animals and resources and how they influence and impact each other. Healing Country in the wake of drought events is essential to ensuring positive health and wellbeing outcomes for Aboriginal Victorians.

A partnership approach will be needed with Traditional Owners, in line with the Government's policy and legal commitments, including the Victorian Aboriginal Affairs Framework and the Department of Energy, Environment and Climate Action's *Pupangarli Marnmarnepu 'Owning Our Future' – Aboriginal Self-Determination Reform Strategy 2020–2025.*

Photo: Surf Coast Shire

Plan design and development

Action learning is central to the way this Plan has been developed, by listening to diverse perspectives about how drought has been managed in the past and determining which strategies will likely work best in the future. The Plan was developed over nine months, drawing on conversations with stakeholders through workshops and meetings, community feedback through the Victorian Government's public consultation platform Engage Victoria and reviewing existing strategic plans for common themes.

During community conversations, local stakeholders told us that drought is experienced differently across the region and that the pathway to resilience will vary depending on individual circumstances. They also commented on the connection between drought, fire and floods, and suggested that a more integrated approach to risk mitigation is required.

The community believe that increased awareness and preparedness is essential to building improved social, environmental, and economic resilience. They agreed that all businesses have a responsibility to prepare for variable seasons and drought and that the best way to mitigate the impacts are by understanding the risks and being well prepared.

In this plan, five themes were identified as critical to building drought resilience:

- Resilient communities
- Sustainable management of natural resources
- Resilient local businesses and regional economies
- Innovation and skills development
- Key enablers

Under each theme, stakeholders identified **outcomes and actions** to focus effort and guide investment for building drought resilience. The proposed actions capture the lived experience, local knowledge and solutions identified by the Barwon community through nine months of conversations. Some of the actions can be addressed directly by the community, while others require broader cooperation from governments, agencies, community organisations or the private sector.

The themes, outcomes and actions that have been developed provide a robust framework for building regional resilience based on current knowledge of the most effective ways to prepare for drought.

Ultimately, this document is a snapshot of the priorities of the community at a point in time. Barwon's drought resilience story does not begin or end with this Plan. Rather, these priorities will evolve as our understanding of drought, variable seasons, risk and resilience improve. An implementation plan detailing costed activities and their timelines will be developed once the Plan is approved.

The Barwon Drought Resilience Plan Reference Group (the Reference Group) oversaw the consultation process, and developed the thematic framework based on feedback received from local stakeholders. This thematic framework includes themes, outcomes and proposed actions for building resilience. The Reference Group noted that the framework:

- Provides a 'collectively agreed framework' to focus effort and guide future investment.
- Builds on and complements existing drought related strategies and plans (Appendix 2).
- Captures knowledge of recent drought experience in a form that can be used to improve preparedness and response.
- Provides an avenue for ongoing conversations with community.
- Provides the basis to develop an implementation plan with specific actions.

The Reference Group would like to acknowledge and thank the many organisations and individuals who contributed their time and expertise to shape this Plan.

VISION AND OUR GUIDING PRINCIPLES

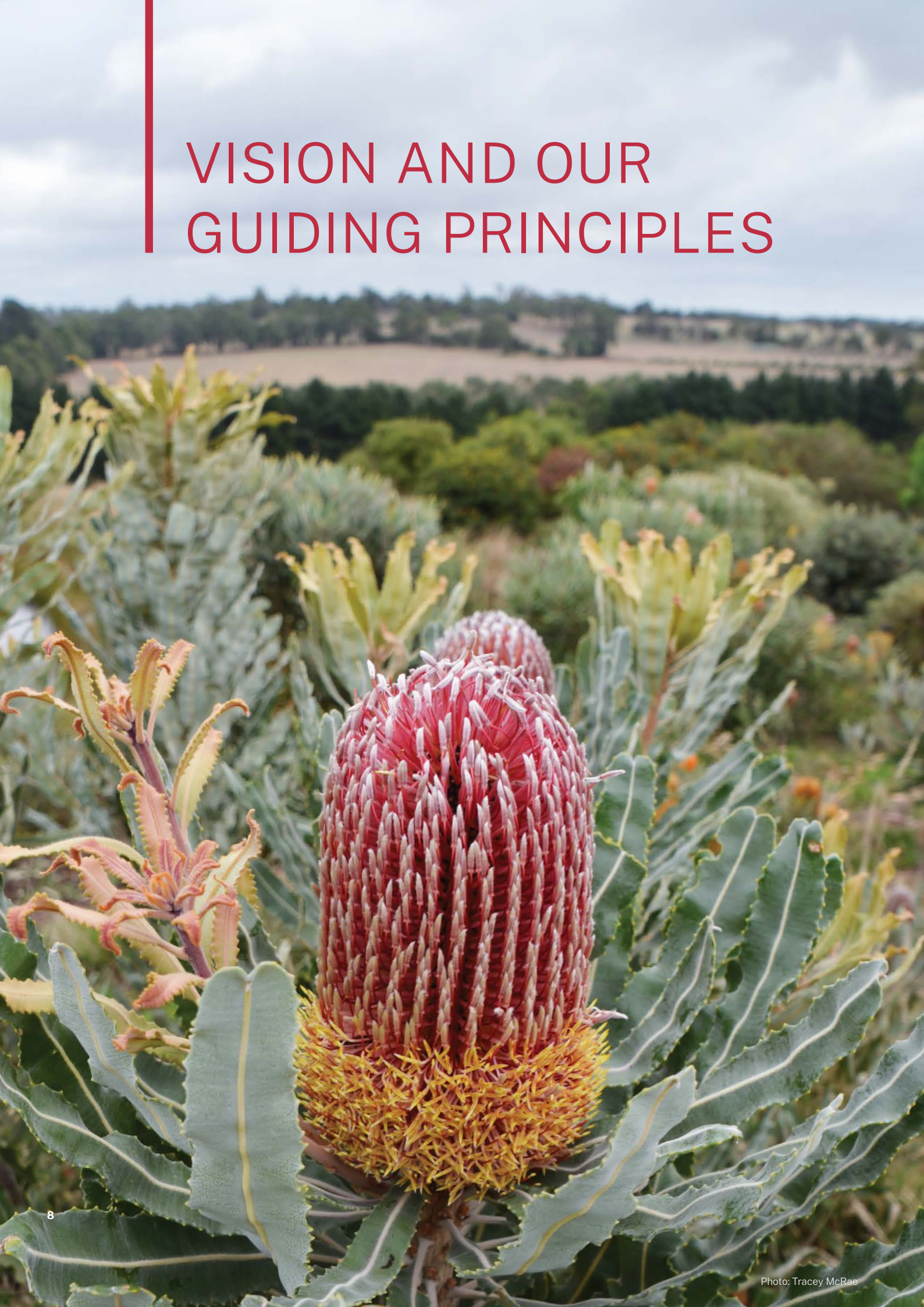


Photo: Tracey McRae

"Encourage collaboration, not competition".

— Nina O'Brien, Foundation for Rural Regional Renewal

A vision was developed to articulate what the Reference Group hopes to achieve through the implementation of the Plan. This was done in a collaborative manner and the guiding principles were considered in the development of the vision.

Vision: Barwon region's thriving and resilient communities are proactively planning for and prepared to respond to drought; community networks are ready to provide support and effective governance structures are in place.

Guiding Principles

The following principles are known to have positive benefits in building resilience:

1 **Self-reliance and risk mitigation:** drought is not an exceptional circumstance, but a risk to be managed along with other business risks.

2 **Encourage preparedness:** investment should focus on supporting community connectedness and wellbeing and increasing preparedness in good years.

3 **Collaboration, inclusiveness and co-design:** putting local people, including Traditional Owners (as determined by them), at the forefront of decision making by ensuring programs are co-designed with local stakeholders to ensure community priorities are addressed.

4 **Improved decision making:** providing the best possible information and tools to support evidence-based decision-making for communities, business and government.

5 **Integration:** fostering collaboration between organisations to deliver timely, place-based and integrated services.

6 **Leadership and community networks:** support local leaders and design and deliver programs in partnership with trusted, established networks and Traditional Owners/First Peoples.

7 **Traditional Owner self-determination:** work with Traditional Owners to provide opportunities for them to be involved in, and have their self-determined goals reflected in, drought preparedness and resilience activities.

THE BARWON REGION

Region and Community

The recognised Traditional Owners of the Barwon region include the Wadawurrung and Eastern Maar Peoples. They have inhabited the area for millennia and maintain a strong connection to land and water through cultural practices and spiritual beliefs.

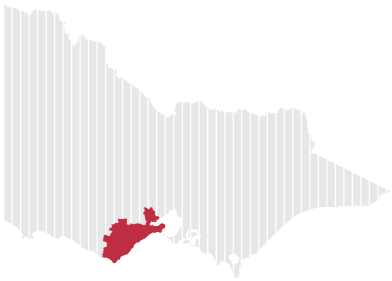
The region includes the local government areas of the City of Greater Geelong, Surf Coast Shire, Colac Otway Shire and the Borough of Queenscliff, and is home to Victoria's largest regional city, Geelong. Other significant towns in the region include Lara, Ocean Grove, Torquay and Colac. The Barwon region hosts historic townships, vibrant growing communities, passionate residents, progressive businesses, and wide-ranging recreational choices.

Geography

The region primarily falls within the catchments of the Barwon River and the Otway Coast basin, encompassing the south-western Victorian coastline from the heads of Port Phillip Bay at Queenscliff to Cape Otway. The urban fringe of Melbourne is to the north, and the agricultural community of Colac is in the south-west of the region. There is a distinctive blend of coastal, mountain, forest, agricultural and urban landscapes, with the Great Ocean Road, You Yangs and the Otway Ranges attracting visitors, while the central and western districts are highly productive agricultural areas.

Figure 1. Satellite image of the Barwon region showing coastline and forested areas

Google Earth (2024)



POPULATION
(2020)

324,300

POPULATION GROWTH
(2011–20)

21.8%

GROSS REGIONAL PRODUCT
(2020)

$17.6 billion

Source: Barwon Regional Economic Development Strategy (2022)

Population

The Barwon region is projected to grow from 325,000 to 505,000 people by 2030, an increase of 21% from 2021 (Barwon Regional Economic Development Strategy, 2022). Strong population growth of 13.3% over the past decade has predominantly been around Geelong, reflecting the livability, close proximity to city markets, and numerous educational and employment opportunities of the area. Colac Otway Shire has seen subdued population growth and internal migration out of the region, especially in younger cohorts.

Industry/employment

Located in close proximity to Victoria's capital city of Melbourne, the region has both social and economic advantages which attracts businesses, workers and tourists. Once renowned for manufacturing, the region's most significant sectors now reflect a more diverse economy, comprising construction, health care and social assistance, manufacturing, public administration and safety, and education and training.

The region's fertile soil and relatively abundant rainfall support a robust agriculture sector including dairy, livestock (sheep, cattle and pigs), horticulture, and poultry. Food production, with farmgate experiences, wineries and food trails, primarily located in the Surf Coast, Bellarine Peninsula and Otway Ranges, are also a major contributor to the economy (Barwon Regional Economic Development Strategy, 2022). Direct agricultural employment across the region is low (2%), however, for the Colac Otway Local Government Authority (LGA) this increases to 11.4% (Frontier Economics, 2022).

Deakin University has two Geelong campuses with a strong focus on manufacturing, materials, data analytics, agriculture and health. CSIRO's Australian Centre for Disease Preparedness facility in Geelong has a high-containment facility designed to protect Australia's multi-billion-dollar livestock and aquaculture industries from the threat of infectious disease.

$13.8 billion GVA (2020)

Top sectors by GVA ($ billion):

1.	Construction	$1.9
2.	Health care and social assistance	$1.8
3.	Manufacturing	$1.5
4.	Public administration and safety	$1.2
5.	Education and training	$1.2

Figure 2. Top sectors by Gross Value Added ($ billion)

Barwon Regional Economic Development Strategy (2022)

It is recognised that many communities, including Traditional Owner communities, do not operate strictly within regional boundaries, nor do the organisations and businesses that support them. Despite being developed for the Barwon region, the actions identified in the Plan often have inter-regional impacts. It is important to cooperate and share information on resilience with neighboring municipalities and regions, and across other states and territories.

Similarly, it is acknowledged that for many Traditional Owners, connection to Country is more holistic and not bound by the region and constructs of the Plan, and that impacts are likely to be broader than the Barwon region and the actions identified in the Plan.

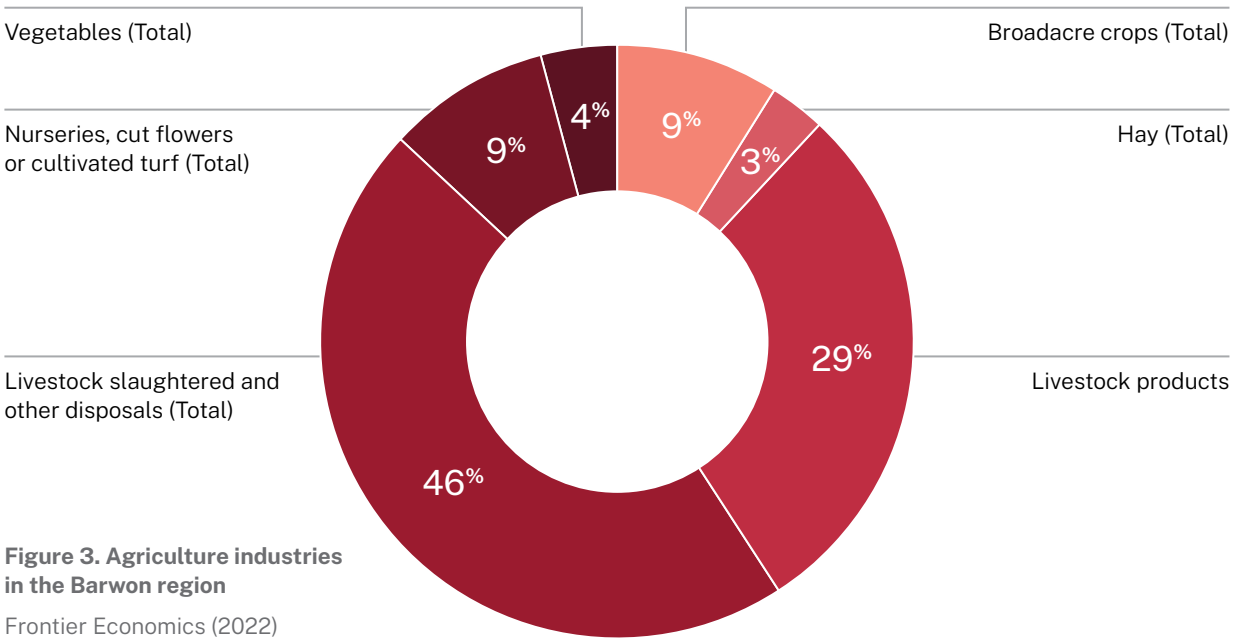


Figure 3. Agriculture industries in the Barwon region

Frontier Economics (2022)

Climate trends

Rainfall in the Barwon region occurs predominantly in winter and spring and is generally the result of rain-bearing weather systems from the west. Most areas receive between 600–700mm of rain per year. The highest rainfall occurs in the Colac Otway Shire, at just below 900mm annually, while Geelong records just above 450mm per year. Since the 1950s, average rainfall has declined across the Barwon region, especially in autumn.

Climate projections for the region based on climate change scenario modelling (Frontier Economics, 2022) indicate continued variability and change in future with:

- average temperatures to increase by 1.4–1.9°C
- spring rainfall to decrease by 6–11%
- an increase in fire danger days of 49%
- a decrease in frost risk.

DROUGHT IN THE BARWON REGION

Drought has always been and will continue to be a feature of the Barwon climate. Droughts can easily be characterised in hindsight, however in reality they are slow moving, complex and dynamic. The impacts of drought can be highly variable across the region depending on rainfall, soil type and topography.

An assessment by Frontier Economics (2022) of the socio-economic and environmental impacts of past and future droughts can be found in the supplementary report – Drought in the Barwon Region. The report looks at not only the effect drought has on agriculture, but also the flow on effects to regional communities.

The Wadawurrung Traditional Owners Plan 'Paleert Tjaara Dja' (Let's make Country good together 2020–2030. Wadawurrung Country Plan)

Photo: Elizabeth Ryan

identifies drought as one of the key threats that can negatively impact on the health of things that they value. In Paleert Tjaara Dja, drought is considered to have a high impact on Wadawurrung sites, places and culture.

The Eastern Maar Country Plan 'Meerreengeeye Ngakeepoorryeeyt' does not specifically mention drought. However, goal 4 of Meerreengeeye Ngakeepoorryeeyt, 'Our Country is healthy, and our natural resources are managed and used sustainably' is strongly aligned to one of the key themes of this Plan which is 'sustainable management of natural resources.'

The effects of climate change, including drought, significantly impact on Aboriginal communities across Victoria. Drought harms Country and people, through impacts on waterways, plants, animals, ecosystems and seasons, making it hard to practice culture and heal Country. Cultural heritage sites are also damaged by fire, drying soils and erosion, caused by drought.

The impact of drought on farms can be very different across the region. Some farms will prosper if they are well prepared, act early and take advantage of high prices associated with reduced supply. However, in general there is an economic downturn associated with drought including reduced cash flow through the local economy. The Colac area tends to be more impacted by drought due to its inland location and large agricultural industry. Areas closer to Geelong and the coast tend to have larger, more diverse economies and a milder climate.

Recent experience of drought

Drought has affected the Barwon region to varying degrees in recent decades with each drought being unique in its severity, duration and distribution. The Millennium Drought spanned more than a decade from 1997 to 2009, and more recently the region experienced a drought from 2013 to 2015.

During the Millennium Drought, the Barwon region experienced conditions that significantly lowered agricultural production and had flow on effects for the community. The following section provides an insight into the community's experience when the conditions were most severe. Lessons learned from this period have greatly influenced the development of this Plan.

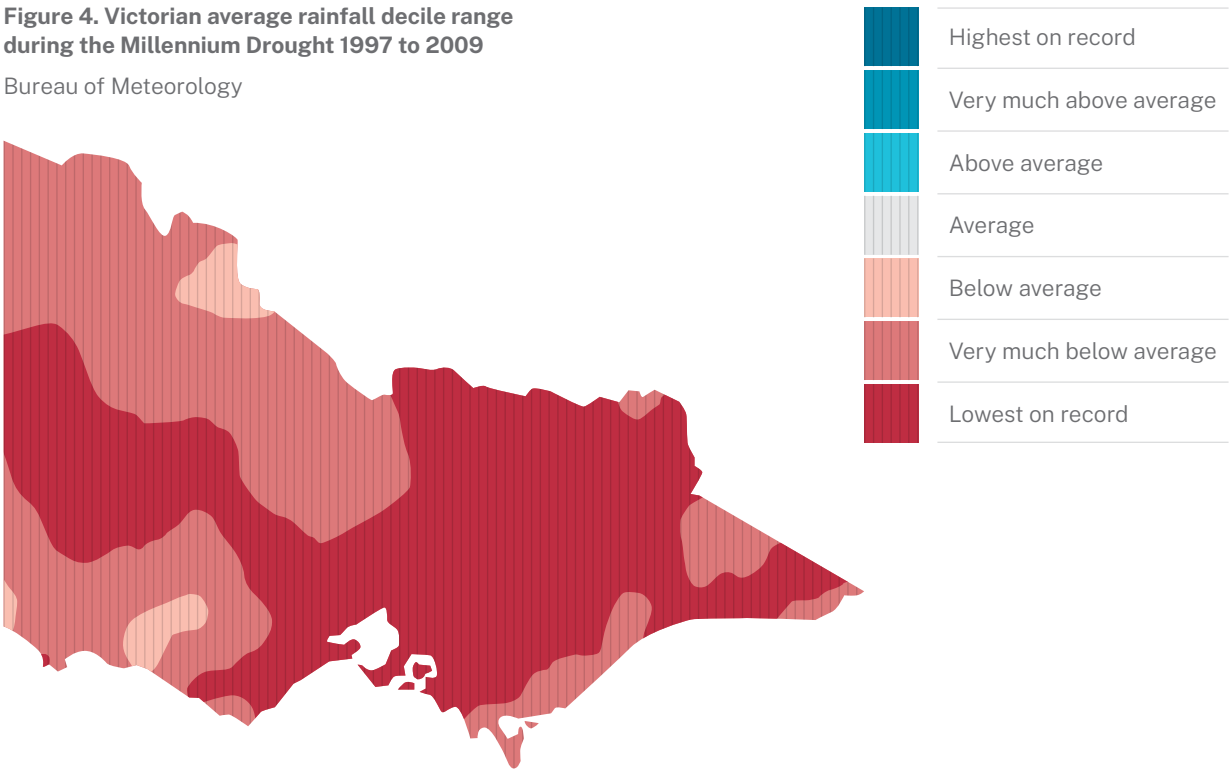
Figure 8 highlights the severity of the Millennium Drought from 1997 to 2009, with average temperatures consistently warmer than the median, and the lowest rainfall on record experienced for much of the region.

The Bureau of Meteorology reported that the Millennium Drought was essentially a cool-season drought in southern mainland Australia, with low rainfall in Winter and Spring, and above average warm-season rainfall (November to March) received in many areas (Bureau of Meteorology, 2022).

The lack of rainfall during this time resulted in rapidly declining water storages. In many towns water restrictions became so severe that only 25% of sporting fields and public sporting facilities were being irrigated. As a consequence, some sporting fields could not be used as the playing surface was unsafe. A unique feature of the Millennium Drought was the long intervals without any significant rain.

Figure 4. Victorian average rainfall decile range during the Millennium Drought 1997 to 2009

Bureau of Meteorology



Drought has many pervasive impacts on communities. As surface water and subsoil moisture continued to decline during the Millennium Drought the cash, fodder and water reserves of many farms became extremely low or fully depleted. Compounding the issue of reduced cash flow were the high supplementary feed or agistment costs, as well as the additional work of carting water for stock. Agricultural businesses look for ways to reduce their spending on household needs such as groceries, healthcare and education. The reduced spending of farmers flows to other regional businesses and impacts the regional supply chain.

During the Millennium Drought, families, businesses, communities, infrastructure, the regional economy and local ecosystems were all impacted in different ways. Rainfall in 2009 continued to be below average, especially in the east. During this period local media were reporting:

- Negative impacts in the local rivers, lakes and dams, with 10 of the region's 28 lakes experiencing increases in lake salinity due to increased evaporation.
- Culturally significant sites for Traditional Owners, predominantly located on flood plains were increasingly becoming vulnerable to drying soils and erosion.
- Two of the region's biggest eel habitats, Lake Colac and Lake Bolac, were empty, causing the Victorian Commercial Eel Fisherman's Association to declare that the dry conditions had vastly reduced the state's eel haul.
- Community leaders were calling for improved access to mental health support.
- Invasive pests such as rabbits, mice and kangaroos were causing widespread damage on public and private land.
- Many towns encountering Stage 4 urban water restrictions, prohibiting the watering of outdoor spaces, experienced substantial impacts on the community's wellbeing and livability.
- Coastal tourism continued to provide much needed income diversity, however, for those towns enduring Stage 4 water restrictions, the dry conditions affected the tourist's amenity when visiting local towns and tourist destinations.
- While it did not receive significant media coverage, the Department is aware that drought also had a significant impact on Traditional Owners to care for Country.

Higher temperatures during these dry years led to increased evaporation rates which caused severe drying of the landscape. The conditions, which peaked during the Black Saturday (2009) heatwave and bushfires, culminated in the loss of 173 lives in Victoria (Bureau of Meteorology, 2022).

Our emergency services recognise the cyclical connection between drought, fire and floods, and the hazards these cause to properties and landscapes. Dry periods can increase the risk of bushfire, as well as increasing the risk to public and private assets and community wellbeing.

The social, economic and environmental vulnerabilities that exist in communities are amplified as the conditions of drought unfold. Table 1 summarises the interconnected impacts of drought as described by community stakeholders.

Photo: Tracey McRae

Social

- Reduced health and wellbeing
- Workforce changes
- Increased transition to retirements
- Water restrictions in urban areas causing societal impacts. Lack of water available to keep sporting grounds in a safe state
- Increase in domestic violence
- Uncertainty leading to fatigue, anxiety and mental health issues
- Individuals withdraw and stop community participation impacting family life
- Less attractive rural landscapes. Water recreation is reduced
- Tensions around sharing of water that is left between urban, agriculture and environment, all of which are under stress
- Higher risk of fires
- Traditional Owners unable to practice culture and care for Country
- Damage to cultural heritage sites

Economic

- Job losses. Loss of individual and family income
- Increased financial hardship for the families, businesses, and local communities
- Reduction in income for the region, decline in supply chain businesses
- High levels of restrictions on extractions from rivers and streams, and in some areas on aquifer extractions
- Reduced pastures for livestock
- Reduced on farm water storages
- Increased supplementary feed and agistment costs
- Supply chain impacts on major food producers e.g., Bulla/Australian Lamb Company
- Economic impact in smaller towns with less disposable income. Smaller, more remote communities are more exposed to financial risks
- Reduced investment in farm development
- Decline in tourism

Environment

- Soil damage, loss of species (both plants and animals)
- Environmental: habitat loss and species population decline
- Reduced river and stream flows leading to water shortages. e.g., The Barwon River ceased to flow
- Negative impacts on fish, stock and wildlife
- Increased strain on aquifers. Colac, Barwon Downs, Anglesea bore fields took a long time to recover
- Reduced water quality and increased algae blooms
- Lake Colac dried up which had an environmental impact and increased risks of salinity
- Overuse of bore water impacting aquifers
- Pressure on land management decisions
- The integrity of many dam walls deteriorated significantly, so when they suddenly filled after the drought, the chance of collapse and failure was greatly increased
- Increased weeds
- Increased threat from invasive pests and wildlife which caused further damage to agricultural landscapes and slowed recovery
- Linear reserves e.g., roadsides that host endangered communities faced pressure from stock grazing and invasive pests
- Wetlands and ground water dried out
- Loss of topsoil to erosion
- Time and costs for restorative work to soils and pastures
- Carbon loss
- Stressed trees and loss of habitat leading to carbon loss, loss of biodiversity soil damage
- Increased fire risk
- Traditional Owners' ability to care for Country using traditional and culturally appropriate tools is reduced.
- Culturally significant places, species and ecosystems impacted
- Cultural water flows reduced

Table 1. The interconnected impacts of drought in the Barwon region

"Better preparation, more detailed modelling and scenario planning will assist in preparation".

— Peter Morgan, Barwon Water

Future drought scenarios

Future drought modelling by Frontier Economics (2022) includes the below scenarios:

- Gross Domestic Product (GDP) falling by 12.7%, a reduction of more than 1400 jobs, and a reduction of 4% in consumer spending;
- River flows and lakes levels to decline with negative impacts on biodiversity;
- Social and economic impacts on the community;
- Fluctuating tourist numbers when water restrictions are implemented or following bushfire;
- Parks and sporting precincts face water restrictions;
- Services such as healthcare and Rural Financial Counselling see increasing wait times.

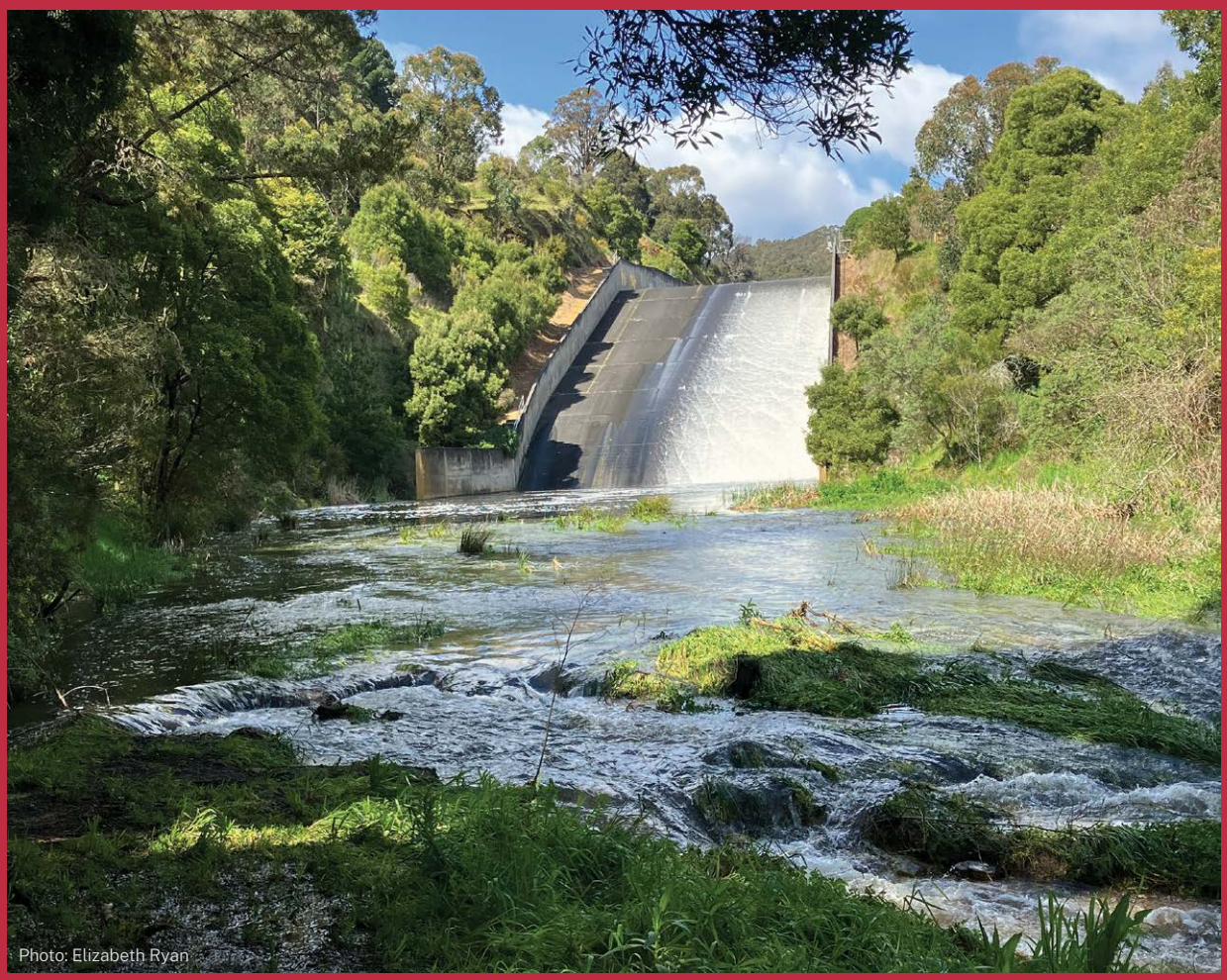


Photo: Elizabeth Ryan

RESILIENCE

Definitions of Resilience

Walker (2020) defines resilience as the capacity of a system to absorb a disturbance and reorganise to keep functioning in the same kind of way. Rather than just bouncing back, resilience is about changing and adapting to new circumstances.

For this Plan, resilience is described as the ability to effectively respond to the impacts of drought and maintain function. It is about being able to adapt, thrive and take advantage of opportunities when encountering change. Rather than maintaining a persistent or stoic response to the situation, resilience includes the ability to make tactical decisions in times of uncertainty.

Resilience assists individuals and groups to build the mindset, social network and business skills required to navigate the challenges encountered in difficult seasons.

Community Resilience

In our discussions with regional stakeholders, we heard that resilient communities demonstrate some, or all, of the following characteristics:

- Local leadership and initiative
- Adaptive governance that embraces change
- Connection through formal and informal networks
- Diversity of experience and needs, including of different parts of the community, including Traditional Owners.

Photo: Elizabeth Ryan

Photo: Oz Aerial

The Victorian Community Resilience Framework for Emergency Management (2020) provides a coherent perspective on community resilience. Although drought is not a legislated emergency, it is closely aligned to the guiding principles of this document, which offers a useful foundation on which to build a more resilient region. It is composed of the following seven characteristics that lead to greater resilience:

1. Safe and well
2. Connected, inclusive and empowered
3. Culturally rich and vibrant
4. Sustainable built and natural environment
5. Dynamic and diverse local economy
6. Reflective and aware
7. Democratic and engaged

Building resilience includes a focus on well-functioning communities with the explicit objective of strengthening the liveability, viability, and wellbeing of both the people and the region.

Although there is no one-size-fits-all solution, alignment with this community resilience framework will support organisations to:

- Better understand and participate in building safer and more resilient communities
- Improve collaboration within and between organisations
- Use connected networks to support wellbeing, liveability and sustainability
- Utilise planning systems to mitigate risk
- Align adaptive governance, policies and programs to strengthen community resilience
- Partner with Traditional Owners to support culturally appropriate practices in emergency events.

BARWON DROUGHT FRAMEWORK

The Themes, Outcomes and Actions (the Framework) detailed below capture the lived experience and local knowledge of the Barwon community. The Framework was developed through nine months of conversation and engagement with community members and organisations. It considers relevant regional plans and policy documents and aligns with these.

The Framework consists of five themes, each with an outcome, and a list of actions to move the region towards achieving its vision. Some actions can be addressed directly by the Barwon community, while others will require broader cooperation from governments, agencies, and industry.

Many actions identified in the Plan are incremental, building on existing approaches such as improving water use efficiency and better business planning across the region. However, incremental changes alone are not sufficient to adapt to a changing climate and at some point, transformational change is required.

Transformation requires a significant change to how things are currently done. For example, land use change where a higher water use industry, like dairy, is replaced by a lower water use industry, like beef cattle. Transformational changes can be disruptive, and the businesses and communities involved may often require support to navigate these changes.

The actions identified encourage preparedness for drought, including the need for adaptive and transformational change. Actions include implementing sustainable water practices, adopting different farming methods, fostering community engagement, and encouraging innovation.

Barwon Themes

Theme 1: Resilient communities

Theme 2: Sustainable management of natural resources

Theme 3: Resilient local businesses and regional economies

Theme 4: Innovation and skills development

Theme 5: Key enablers

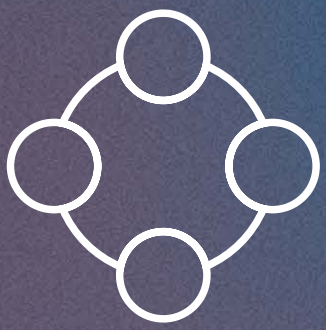
"Increase self-determination of local community and industry groups through co-developed partnerships".

— Rebecca Lester, Centre for Regional and Rural Futures

Photo: Tracey McRae

Theme 1

RESILIENT COMMUNITIES



Theme 1 is about building and maintaining resilient communities with a focus on connectedness, accessible health services, collaborative leadership, educational opportunities, skill development and networking. The actions reflect a community commitment to enhance wellbeing in preparedness for drought and other related challenges.

Outcome:

Barwon communities have strong, self-sustaining networks that are responsive and welcoming. Physical and mental health services are easy to access and there are ample educational and leadership opportunities.

Actions	
1.1	Develop and promote opportunities to maintain social connectedness and to create new connections across communities.
1.2	Support improved access to health and wellbeing programs; ensuring services are accessible, convenient, and relevant. (See case study 1)
1.3	Foster a culture of collaborative leadership across agencies, industry, emerging leaders, and community groups.
1.4	Establish or strengthen programs such as youth networks, vocational training in high schools and scholarships to make careers in agriculture more accessible and attractive.
1.5	Promote training to maintain the currency of a skilled agricultural workforce to better deal with the challenges of drought and other climate related risks.
1.6	Facilitate the networking of community, industry, government, and the financial sector to focus on drought preparedness.
1.7	Support opportunities for Traditional Owners to build drought resilience and preparedness efforts, in line with their self-determined values, goals and aspirations for Country and Community.

"Preparedness is about planning and anticipating the implications if we do or don't act in certain ways. If we don't manage our dry feed, we will pay for it in winter in lower pasture production. The same applies when managing through drought — plan and prepare when times are good, not when we are in the middle and are trying to survive".

— Scott Chirnside, Chairman of Southern Farming Systems

Photo: Southern Farming Systems

Theme 2

SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES

Theme 2 is about proactive management of the regions natural resources to reduce the impacts of drought, balance competing water demands, foster sustainable and resilient farming practices, protect biodiversity, and collaborate and partner with Traditional Owners, to share learnings.

Outcome:

Land managers are aware of the impacts of drought and have measures in place to reduce the impacts, hasten recovery, and protect biodiversity and other natural assets. Current and potential water resources are well understood and managed in line with regional water strategies.

Actions

2.1	Support and empower farmers to accelerate the adoption of innovative and resilient farming practices that best suit their needs and circumstances.
2.2	Diversify water storage and supply options on farm and in communities. (See case study 2)
2.3	Promote the availability and maintain the functioning of the regional emergency water points (locations, operation, ownership, maintenance) to ensure the region can maintain sufficient access during times of drought.
2.4	Highlight the benefits of farm water management planning and implementation.
2.5	Promote the maintenance of ground cover to support healthy soils that are more resilient during droughts.
2.6	Promote dialogue around managing the competing water needs of cities, regional communities, Traditional Owners, agriculture, and the environment.
2.7	Improve sustainable land and water management practices through collaboration and partnership with Traditional Owners and First Peoples, in line with Government's legal and policy obligations.
2.8	Promote the importance of protecting biodiversity and other natural assets and support the work that Landcare and other groups do in this area.

Theme 3

RESILIENT LOCAL BUSINESSES AND REGIONAL ECONOMIES

Theme 3 is about maintaining resilient businesses and a strong regional economy. This can be achieved through business planning, providing access to financial advice, building financial buffers, and encouraging business diversification.

Outcome:

Regional economies are supported by flexible and diverse businesses that have considered how they will respond to drought. All businesses within the Barwon region can access quality business planning and financial advice that is affordable.

Actions

3.1	Encourage small business owners to regularly undertake business planning with an accredited provider, including planning for business risks like drought. (See case study 3)
3.2	Promote, encourage and support Barwon businesses to utilise financial advice and advocate for improved access to these services.
3.3	Provide opportunities for small business owners to network with and choose the right 'team' of advisors to generate financial success and resilience.
3.4	Highlight the benefits of building financial buffers during good years that can be used during difficult times, like drought.
3.5	Promote diversification as a way to build resilience for local businesses and economies.

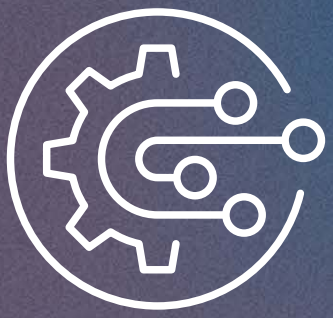
"Put in place preventative measures before the crisis occurs".

— Karen Brady, Rural Financial Counselling Service Victoria West

Photo: Surf Coast Shire

Theme 4

INNOVATION AND SKILLS DEVELOPMENT



Theme 4 is about encouraging innovation and skills development through the sharing of research outcomes, building a shared knowledge base and taking on improved processes and technologies. This theme emphasizes collaboration, co-design, and economic assessment to drive effective drought resilience solutions. The theme also prioritizes access to information products for drought resilience, ensuring that valuable knowledge reaches a wide audience and contributes to the overall preparedness of the region.

Outcome:

Community, industry and government work collaboratively to identify key drought related issues and develop innovative solutions. Information products relating to drought resilience are widely shared and can be easily accessed.

Actions	
4.1	Strengthen and expand locally specific and relevant agricultural research, innovation and extension. (See case study 4)
4.2	Document and share drought related research, innovation and extension knowledge and activities.
4.3	Identify and promote opportunities that best contribute to drought resilience arising from new and emerging technologies and high value products.
4.4	Increase the relevance and uptake of farm innovation practices by co-designing research and extension programs with local farming communities.
4.5	Commission an assessment of the economic benefits of investing in resilience building activities in preparation for drought.
4.6	Identify, in partnership with Traditional Owners, opportunities to use traditional knowledge, and culturally appropriate tools to heal and care for Country

"Promote research to facilitate drought resilience in agriculture".

— Rebecca Lester, Centre for Regional and Rural Futures

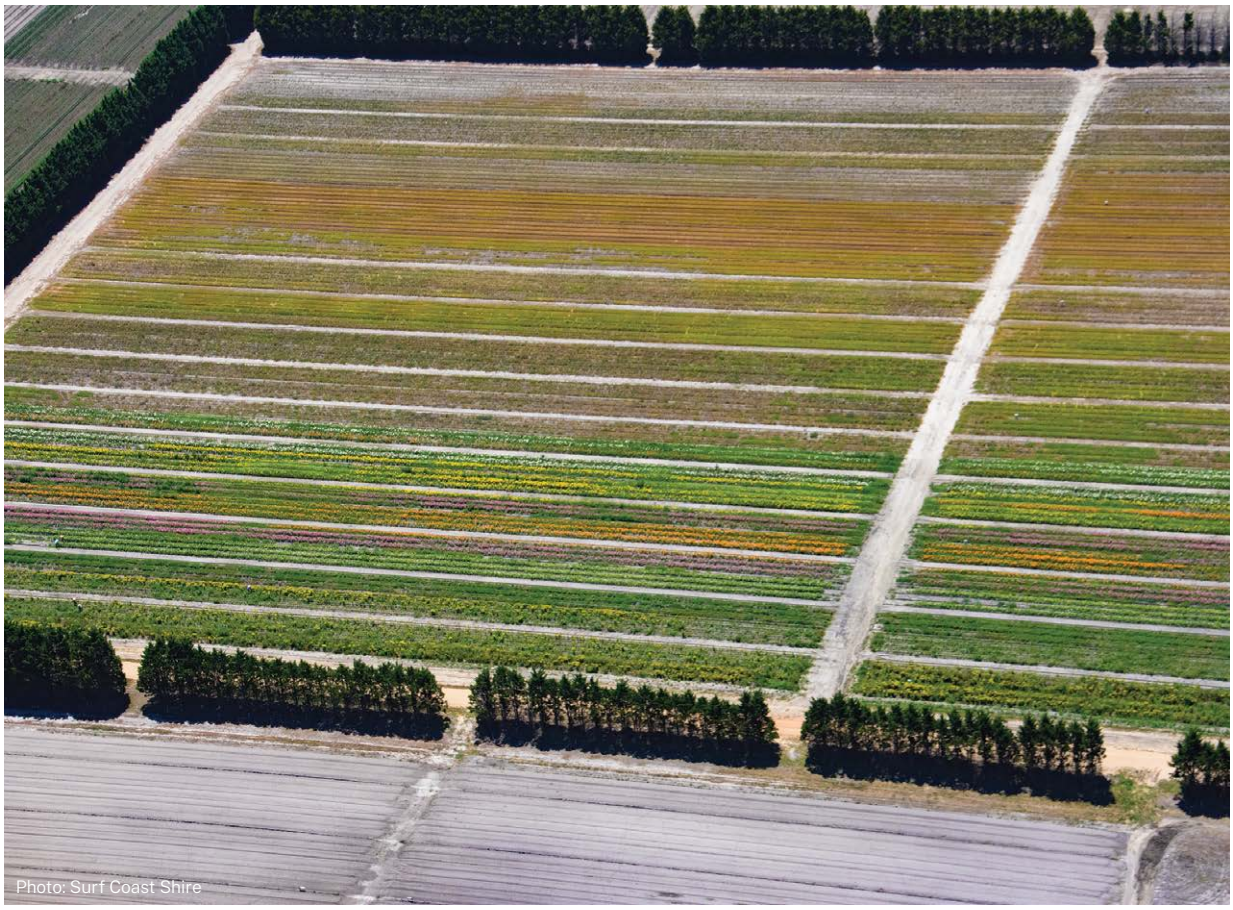


Photo: Surf Coast Shire

Theme 5

KEY ENABLERS

Theme 5 identifies the key enablers that are critical for effective drought preparedness and response. Clear coordination arrangements, defined responsibilities, a Resilience Advisory Group, inter-agency planning, and the integration of drought preparedness will support stakeholders to work together and actively contribute to the region's collaborative drought resilience efforts.

Outcome:

Community, industry and government are clear on their responsibilities relating to drought preparedness and response. A standing Resilience Advisory Group maintains a functioning network of stakeholders and helps coordinate preparedness activities.

Actions

5.1	Develop clear regional drought coordination arrangements with appropriate industry, community, not-for-profit and agency leaders.
5.2	Define and articulate the responsibilities of all stakeholders in drought preparedness, then maintain and regularly review these for drought response and recovery.
5.3	Establish a permanent Resilience Advisory Group to coordinate the delivery of the Barwon Drought Resilience Plan.
5.4	Promote inter-agency planning and build drought preparedness into relevant strategies and plans. (See case study 5)
5.5	Encourage each agency and organisation to consider drought preparedness and incorporate mitigation actions into relevant strategies and plans.
5.6	Develop working partnerships with relevant Traditional Owners on matters relating to drought preparedness and responses in the Barwon area.

Photo: Tracey McRae

Barwon Resilience Case Studies

The following case studies provide examples of lived experience in the Barwon community each highlighting different aspects of building drought resilience including community leadership, health and wellbeing, sustainable land management, self-responsibility, inclusivity, and connectivity.

Theme 1: Resilient Communities
Steering Straight: Improving mental health in farming communities

Theme 2: Sustainable management of natural resources
The benefits of shared environmental water delivery

Theme 3: Resilient local businesses and regional economies
The importance of having a business plan

Theme 4: Innovation and skills development
Better understand your soils

Theme 5: Key enablers
Preparing local government for climate change in emergency management

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THEME 1: RESILIENT COMMUNITIES

Improving mental health in farming communities

Those in rural farming communities are at a higher risk of suicide than average Australians. Farmers are known to be generous in providing help to others, but they are often reluctant to ask for help themselves. Access to mental health support in rural areas is limited, and where support is available, providers may have poor understanding of the realities of life and work in the farming environment.

Recognising these risk factors, the National Centre for Farmer Health worked in collaboration with Great South Coast community members to develop a dedicated resource for farmers and farming communities.

Steering Straight empowers farmers to reflect on and prioritise their health and wellbeing by identifying personalised, practical steps to take when navigating difficult situations. It helps to:

- Identify personal signs of stress
- Identify and plan helpful activities
- Break down goals into manageable steps
- Know who to call for support

Written by Dr Alison Kennedy from the National Centre for Farmer Health. ***Steering Straight*** *and the* ***Managing Stress on the Farm*** *publication were developed as part of the Great South Coast Suicide Prevention Place-Based Trial, and are now being used across Australia and internationally. www.farmerhealth.org.au/managing-stress-book*

THEME 2: SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES

Managing water to sustain our waterways

The Moorabool River passes near the towns of Ballan, Morrisons, Batesford and Fyansford and is fed by the Moorabool, Bostock and Lal Reservoirs. It is one of the most 'flow-stressed' rivers in Victoria and is very dependent on water released from Lal Reservoir to maintain flows over dry periods. These flows maintain the life of the river and the health of the surrounding environment.

However, current water entitlements limit such releases to 7,500 megalitres over 3 years – only a small proportion of what the river and environment requires for basic ecological function. Corangamite Catchment Management Authority have worked in partnership with community members to clarify an environmental watering objective to guide the use of water to sustain the health of the river and its ecological system.

Photo: Batesford Fyansford Stonehaven Landcare Group

This proactive approach to environmental water releases is improving the Moorabool River's flow-dependent ecological values and services through the provision of environmental water, while also providing for social and cultural values for future generations.

Written by Jayden Woolley from the Corangamite Catchment Management Authority.

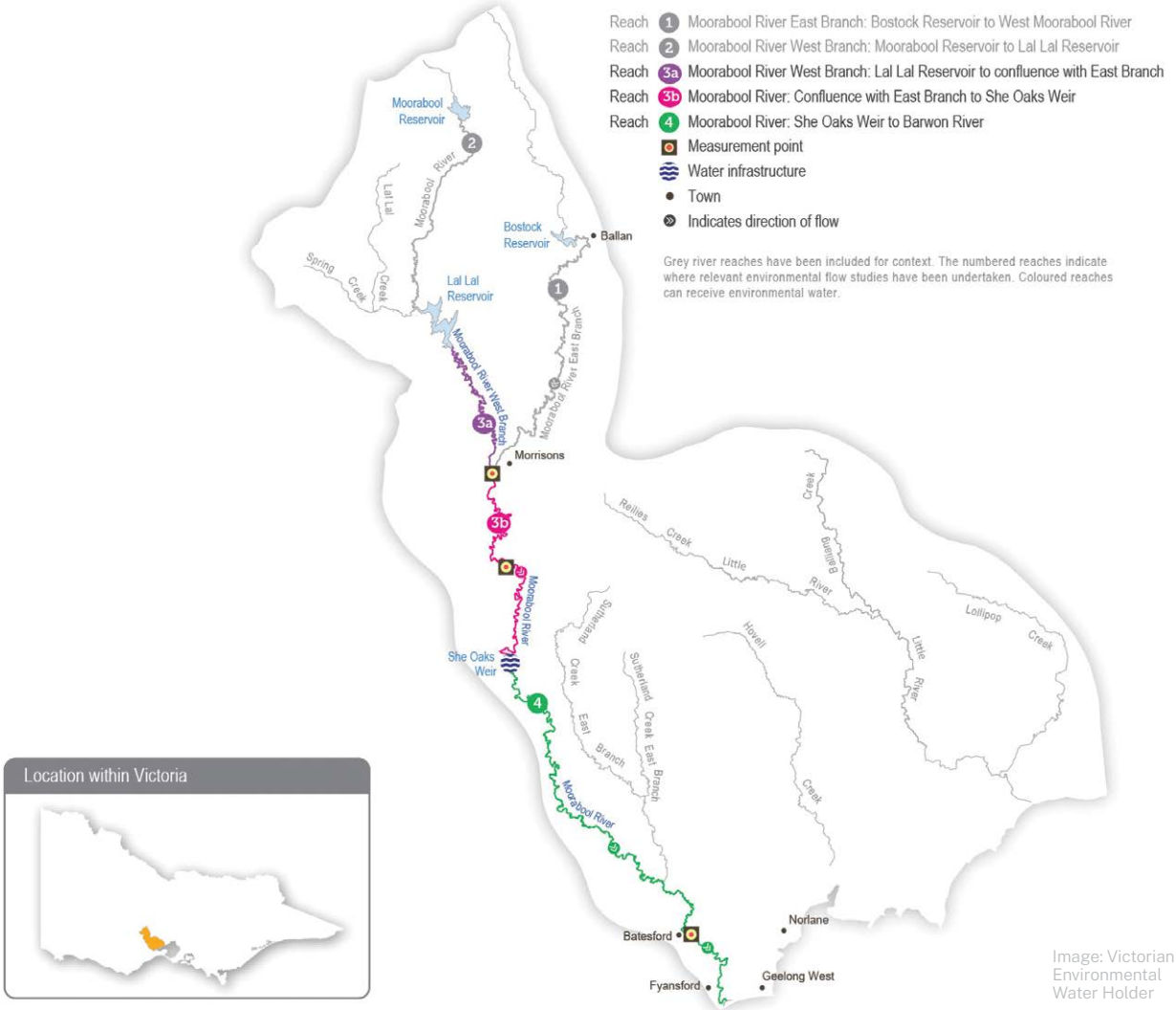


Image: Victorian Environmental Water Holder

THEME 3: RESILIENT LOCAL BUSINESSES AND REGIONAL ECONOMIES

The importance of business planning

Less than 1,000 farms between Geelong and the South Australian border produce more than 20% of Australia's milk. Dairy Australia's WestVic Dairy team support these businesses and their 6,000 employees to manage their businesses in a changing economic and environmental climate.

The **Our Farm, Our Plan** program helps farmers to develop a well-designed business plan, getting everyone in the business on the same page, clarifying where the farm business needs to go, and understanding how to get there.

Through a series of structured workshops, farmers identify their goals and explore opportunities to optimise their farm production and profitability. The program uses measurements and metrics to inform decision making and track progress. This information also empowers farmers to understand opportunities for their businesses to embed best practice approaches, test new ideas, and manage risk and volatility.

By encouraging participants to connect with discussion groups throughout the program, **Our Farm, Our Plan** helps farmers to build more resilient farming businesses, and a more connected industry and agricultural community.

Written by the WestVic Dairy
www.dairyaustralia.com.au/westvic-dairy/farm-business/our-farm-our-plan

THEME 4: INNOVATION AND SKILLS DEVELOPMENT

Better understand your soils

Grain and oilseed growers Stewart and Pip Hamilton know first-hand the benefits of data-led decisions when investing in soil health.

The Hamiltons manage vastly different soils across their 2830 hectare operation – from shallow sandy loam river flats to heavy volcanic clay soils at Inverleigh, to black self-mulching soils with red rises and sandy dunes at Wycheproof. To get the best out of these different soils and invest in soil health, paddock testing of soils has provided the Hamiltons the data needed to make targeted investment on farm.

Inadequate organic matter in soils degrades soil structure and ability of the soil to retain moisture. This challenges water retention in dry times, and water penetration during wet times. Stewart and Pip recognised this was a significant risk to their business and since the 1990s they have worked to improve drainage and improve soil aeration.

By employing grid mapping across their land, Stewart and Pip are now armed with accurate soil information to manage risks and get better return on investment, for example with targeted fertilised application. Stewart and Pip are confident with data from subsequent soil tests supporting their approach.

As active members of Southern Farming Systems the Hamiltons are no strangers to on-farm trials and testing new techniques to suit their needs. They believe that this approach has given them the soil data they need for improved decision making, increased yields, and healthier soils for greater resilience in the long term.

Written by Society of Precision Agriculture Australia

THEME 4: INNOVATION AND SKILLS DEVELOPMENT

Creating innovative solutions for local problems

Southern Farming systems (SFS) coordinates the South West Node of the Victorian Drought Resilience Adoption and Innovation Hub - part of the Future Drought Fund.

Working with universities, regional development, catchment management organisations and private sector partners, this role builds on the SFS commitment to support farming businesses by identifying and promoting opportunities that best contribute to drought resilience arising from new and emerging technologies.

A recent collaboration with National Landcare has enabled two innovative tools to improve on-farm decision making:

MyFarm Dashboard centralises real-time information on climate, soil moisture, prices and pasture into a dashboard to inform common decisions to address soil constraints and optimise soil health.

Decision Wizard helps farmers to structure the decisions they make on-farm to yield better choices and a more resilient farm business.

These world-leading solutions for local problems, are enabling innovation in farming systems and supporting farmers to implement adaptive practices on-farm.

Written by Cam Nicholson
www.myfarmdashboard.sfs.org.au
www.decisionwizard.sfs.org.au

THEME 5: KEY ENABLERS

Preparing councils for a changing climate

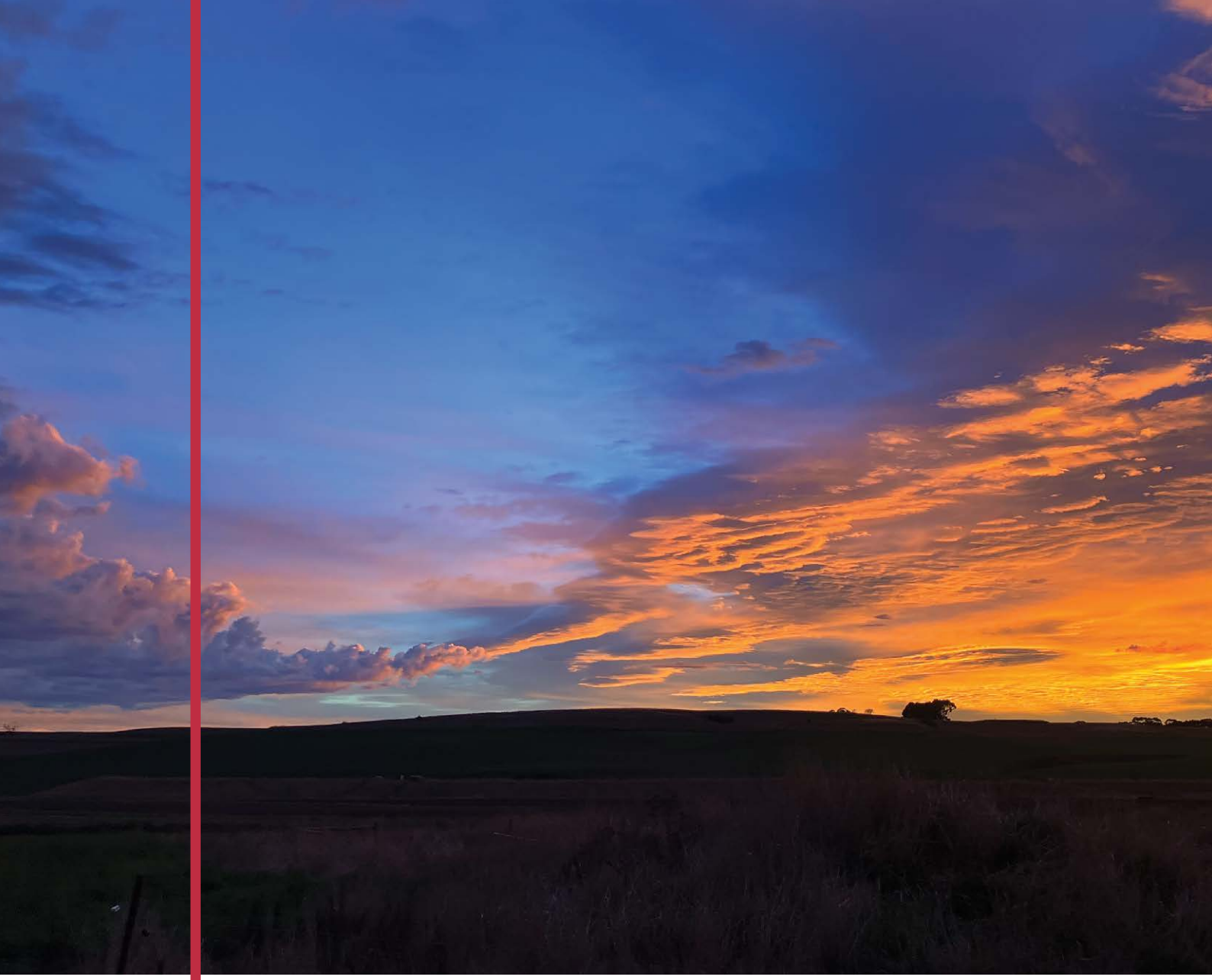
Having recently experienced a number of extreme weather events, the realities of a changing climate are hitting home for the Barwon region. Knowing the anticipated increase in frequency and intensity of extreme weather events will result in significant financial and social costs for their communities, the region's Councils wanted to better understand the potential impacts of climate change on their region.

City of Greater Geelong, Borough of Queenscliff, Colac Otway Shire Council and Surf Coast Shire Council worked together through the Barwon Regional Partnership to develop a detailed understanding of likely impacts, and the consequences for all aspects of council operations.

The partnership approach better utilises regional resources and best practice tools to prepare for the changing climate. Working together builds Councils' capacity to prepare for and respond to potential emergency events. The collaborative approach has also identified the need for changes to business-as-usual Council operations.

The work provides Councils and other government agencies with information to prioritise the funding and investment required to mitigate the potential impacts of climate change for their organisations and their communities.

Written by State of Victoria (first appeared in the Barwon South West Regional Climate Adaption Strategy 2020–2025, p55.)



NEXT STEPS

This Plan has been drafted with input from community members and organisations who have an important part to play in realising the Plan's vision. It provides a Framework for focusing effort and guiding investment decisions to enhance drought resilience in the Barwon region.

The Framework is only the first step in identifying the priorities of the community and we know that continued collective action is necessary for the Plan to succeed.

This Plan is a document to be used by the community, in collaboration and partnership with First Peoples, industry, the not-for-profit sector, and all levels of government to:

- coordinate investment
- align to other plans or strategies to support funding proposals
- collaborate for shared outcomes
- inform future drought resilience priorities
- develop drought resilience programs
- monitor resilience to future droughts.

Some of the actions identified can be addressed directly by the community, while others will require broader cooperation from governments, not-for-profit organisations, and industry. Many of the actions identified in the Plan will require investment if they are to be undertaken.

"Don't use a one solution suits all approach".

— Karen Brady, Rural Financial Counselling Service Victoria West

Immediate next steps include securing resources to support delivery of actions within the Plan, identification of a lead organisation to coordinate the Plan's delivery, and establishment of a governance group to support and collaborate on the Plan's implementation.

The Plan Coordinator will ensure engagement with community, industry, business, not-for-profit, and government stakeholders. They will continue to identify roles and responsibilities to deliver the Plan and achieve the desired outcomes.

Partnerships with Traditional Owners/First Peoples of the Barwon region will ensure their unique rights and responsibilities, and self-determined goals and aspirations for Country, are reflected during implementation of Plan actions.

It is acknowledged that the Plan will need to be agile and adapt in response to changes in the natural environment, operational and policy environments, evaluation and learning as well as the changing needs of the community.

The Barwon Reference Group acknowledges the experience, knowledge and generosity of organisations and individuals who contributed to the development of this Plan. Increased awareness and preparedness are essential to building resilience, and everyone has a responsibility to prepare for variable climatic conditions. An integrated approach to managing risk is critical to mitigating the impacts of drought.

This approach will support Barwon communities to be better prepared for, and capable of managing, drought in the pursuit of a prosperous and sustainable future.

MONITORING, EVALUATION AND LEARNING

The collaborative effort and shared expertise used to prepare the Plan is an important first step in building drought resilience in the Barwon region. Work was been done by the region to articulate the actions needed to achieve desired regional outcomes. The next step is for the actions and activities identified in the Plan to be implemented, evaluated and adapted as needed to achieve the longer-term outcomes for drought resilience.

Monitoring, evaluation and learning (MEL) is a key element of the Regional Drought Resilience Planning program. Program objectives, outcomes and measures of success are clearly articulated at all levels of program delivery (national, state and regional) and are over a range of short, medium and long timeframes.

Figure 5. Pathway of program delivery through discovery, engagement, development, implementation and evaluation

Measuring success

The outcomes identified in this Plan are community and region wide, and dependent on the fourth step of implementation identified in the pathway of program delivery (Figure 5). Given the long-term outcomes of the Plan, the MEL framework below outlines how progress toward success will be measured.

Management and reporting

The successful lead organisation chosen to coordinate delivery of the Plan will work with Agriculture Victoria to provide up-to-date data and information to support program implementation and planning. Monitoring and reporting will enable: key learnings to be identified, effective reporting, and adaptive program management.

A range of assessment tools may be used to indicate progress including, but not limited to, surveys, case studies, stakeholder interviews and engagement data analysis. Data and information will be collected at various intervals across implementation planning, and during and after activities are implemented.

Assumptions underpinning success of the Plan

Measuring success and reporting on progress toward regionally specific outcomes is dependent on several key assumptions.

Key assumptions affecting short-term outcomes (1–2 years)

- Regional stakeholders have the capacity and capability to participate in strategic planning.
- Regional stakeholders are willing to cooperate with each other for regional planning.
- Program design is sufficient to give regional stakeholders opportunities to identify and communicate regional drought resilience needs.
- Regional communities are motivated to take ownership of completed plans and actively seek to implement them.
- There are sufficient learnings to continuously improve program implementation.

Key assumptions affecting medium term outcomes (2–4 years)

- Supporting regional stakeholders through program implementation will result in change in practice in the Barwon region.
- There are sufficient opportunities and funding for the region to implement elements of the Plan.
- Plans contain implementable activities to build drought resilience.
- The Barwon Plan Coordinator and regional stakeholders continue to review and implement the Plan.

MEL Framework

Key regional themes and outcomes are matched with relevant Future Drought Fund strategic priorities, regional progress measures (2–4 years) and indicators.

The MEL Framework is aligned to existing MEL plans at the Program and Fund level to ensure consistency and to ensure the data collection tools provide information across a range of learning and reporting requirements.

Table 2. MEL Framework for the Barwon

FDF[1] Strategic priority	Progress measures (2–4 years)	Indicators
Resilient communities Barwon communities have strong, self-sustaining networks that are responsive and welcoming. Physical and mental health services are easy to access and there are ample educational and leadership opportunities.		
Social resilience for resourceful and adaptable communities	Communities are coming together to prepare for and respond to drought. Communities are learning and building capability, capacity, expertise, and sharing innovative ways to build social resilience. Improved community awareness of and access to health and wellbeing services.	Groups and networks continue to function and work well together. Leaders in the region are more confident to implement strategic actions. Stakeholders are working together to plan and deliver on actions across the region.
Sustainable management of natural resources Land managers are aware of the impacts of drought and have measures in place to reduce the impacts, hasten recovery, and protect biodiversity and other natural assets. Current and potential water resources are well understood and managed in line with regional water strategies.		
Environmental resilience for sustainable and improved functioning of our natural landscapes	Primary producers and businesses are better able to prepare for drought. Knowledge and understanding of resilience of natural resources across the region is increasing. Capability to manage natural resource to build resilience is improving across region.	Farmers are learning about and implementing new business strategies and practices. Farmers and agricultural industries have an improved understanding of drought resilience specific to their region. Stakeholders have increased understanding of natural resource management to build drought resilience.
Resilient local businesses and regional economies Regional economies are supported by flexible and diverse businesses that have considered how they will respond to drought. All businesses within the Barwon region can access quality business planning and financial advice that is affordable.		
Economic resilience for an innovative and profitable communities	Impacts of drought on the economies of region are known and prepared for. Businesses are identifying, managing and planning for the business risks associated with drought.	Increased community understanding of the region's current and future drought resilience, considering the region's unique economic characteristics. Innovative pathways and opportunities for business diversity are identified.

1. Future Drought Fund (FDF)

FDF[1] Strategic priority	Progress measures (2–4 years)	Indicators
Innovation and skills development Community, industry and government work collaboratively to identify key drought related issues and develop innovative solutions. Information products relating to drought resilience are widely shared and can be easily accessed.		
Social resilience for resourceful and adaptable communities **Environmental resilience for sustainable and improved functioning of our natural landscapes** **Economic resilience for an innovative and profitable agricultural sector**	Innovative pathways and opportunities to improve drought resilience in the region are being identified. New technologies and practices are known and being adopted to support primary producers and communities to adapt. Plan actions and opportunities are incorporated into other strategic planning across the region.	Best practice approaches are being used to identify opportunities to build drought resilience in the region. Stakeholders are learning about, implementing and adopting new practices.
Key enablers Community, industry and government are clear on their responsibilities relating to drought preparedness and response. A standing Resilience Advisory Group maintains a functioning network of stakeholders and helps coordinate preparedness activities.		
Social resilience for resourceful and adaptable communities **Environmental resilience for sustainable and improved functioning of our natural landscapes** **Economic resilience for an innovative and profitable agricultural sector**	Communities are communicating regional drought resilience needs and priorities to inform investment. Improved collaboration and coordination between governments, industry, communities and other networks. Regions are monitoring their resilience to drought in accordance with the Plan. Traditional Owners are engaged in regional drought preparedness activities, and those activities reflect Traditional Owners' priorities.	Increased community understanding of the region's current and future drought resilience, considering the region's unique economic, environmental and social characteristics. Communities are using their knowledge to plan for drought resilience. Traditional Owners are increasingly involved in drought programs and activities.

APPENDICES

Appendix 1
Stakeholders consulted

Development of the Barwon Drought Resilience Plan (the Plan) was based on in-depth conversations with the organisations and individuals listed below.

The Barwon Drought Resilience Plan Reference Group was established to provide expert input to the Plan and ensure that the outcomes and actions identified represent a coherent and balanced view of stakeholder feedback. We acknowledge and appreciate all of the knowledge, insight and support that we have received in the creation of this Plan.

The Barwon region includes the following Local Government Areas:

- Borough of Queenscliff
- City of Greater Geelong
- Colac Otway Shire
- Surf Coast Shire

Barwon Regional Drought Resilience Plan Reference Group Members

Agriculture Victoria (Chair)

City of Greater Geelong

Surf Coast Shire

Colac Otway Shire

Barwon Water

Corangamite Catchment Management Authority

Department of Environment, Land, Water and Planning

Department of Families, Fairness and Housing

Department of Health

National Emergency Management Agency

Southern Farming Systems

Southern Rural Water

South West Node of the Victorian Drought Hub

Rural Financial Counselling Service

West Vic Dairy

Agricultural Industry and Farm Business Services

Agriculture industry representatives

Agriculture consultants

Finance

WestVic Dairy

Community and Not-for-Profit Organisations

Australian Red Cross (State-wide and regional programs)

Lions Need for Feed (Victoria)

Tourism Greater Geelong and Bellarine

Community Health Organisations

National Centre for Farmer Health

Community Leaders

G21 Geelong Region Alliance, Chair

G21 Geelong Region Alliance, CEO

The Gordon TAFE, Head of Centre (Science and Technology) The Gordon TAFE

Education and Capability Building

Deakin University

Federation University (Future Regions Research Centre)

The Gordon TAFE

Farmer Groups and Local Business Leaders

Municipal agriculture sector advisory groups

Victorian Farmers Federation

United Dairy Farmers Victoria

Southern Farming Systems

Rural Financial Counselling Service

Small Business Mentoring Service

Government Agencies and Statutory Authorities

Barwon Southwest Climate Alliance

Barwon Regional Emergency Management Team

Centre for Regional and Rural Futures

Climate Change Adaptation, Community & Partnership Programs

Country Fire Authority

Cross Border Commissioner

Department of Energy, Environment and Climate Action

Department of Environment Water and Planning

Department of Family, Fairness & Housing

Emergency Management Victoria

Emergency Recovery Victoria (formerly Bushfire Recovery Victoria)

Fire and Forest Operations

National Recovery and Resilience Agency

Rural Assistance Commissioner

Small Business Victoria

Victoria Police

Agriculture Victoria

Major farmer, industry, and community events

Victoria Drought Adoption and Innovation Hub's Drought Think Tank, Bendigo (23 March 2023)

Victoria Drought Adoption and Innovation Hub's Innovation Showcase, Geelong (21 June 2023)

Natural Resource Management Organisations

Corangamite Catchment Management Authority

Barwon Water

Landcare networks

Parks Victoria

Southern Rural Water

Other Future Drought Fund Programs

Victorian Drought Resilience Adoption and Innovation Hub

Victorian Drought Resilience Adoption and Innovation Hub – South West Node (Southern Farming Systems)

Victorian Drought Resilience Adoption and Innovation Hub – South West Node (Food & Fibre)

Leadership development program (Australian Rural Leadership Foundation)

Farm Business Resilience program (Agriculture Victoria)

Regional Drought Resilience Planning program – Pilot regions – Goulburn, Gippsland, and Wimmera Southern Mallee (Agriculture Victoria)

Agriculture Dependent Resilient Communities Community of Practice

Regional Development Organisations

G21 – Geelong Region Alliance

The Agricollective

Small Business Organisations

Small Business Victoria

Traditional Owners

Wadawurrung Traditional Owners Aboriginal Corporation

Appendix 2
Barwon References

This Appendix outlines some of the existing strategies, reports and programs that have been reviewed for their relevance in building drought resilience in the region. It is intended to be used as a resource document.

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G21 Agribusiness Economic Profile (2018). City of Greater Geelong

Barwon Regional Digital Plan (2022). Regional Partnerships Barwon, Regional Development Victoria. Victorian Government

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National Climate Resilience and Adaptation Strategy 2021–2025 (2021). Department of Agriculture, Water and Environment, Australian Government

National Drought Response, Resilience & Preparedness Plan (2019). Department of Agriculture, Australian Government

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Strong, Innovative, Sustainable – A New Strategy for Agriculture in Victoria (2020). Victorian Government

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For more information on the Future Drought Fund visit:
www.agriculture.gov.au/fdf

For more information on Victoria's Regional Drought Resilience Planning program visit:
www.agriculture.vic.gov.au/futuredroughtfund

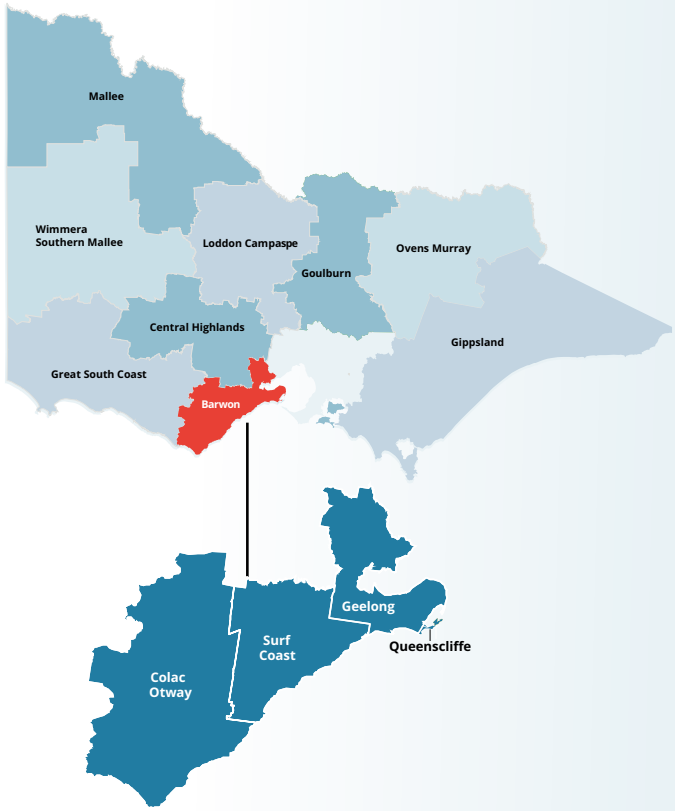
frontier economics

Drought in the Barwon Region

Information to support the Barwon Regional Drought Resilience Plan

November 2022

This research was jointly funded by the Australian Government and Victorian Government under the Future Drought Fund.



Regional summary

The Barwon region is the most densely populated of the nine Regional Partnerships across Victoria and includes a large section of the Great Ocean Road. The area stretches from Geelong to the Otway forests and has a Gross Regional Product (GRP) of $17.6 billion. The Barwon region's largest city is Geelong, and the region is also home to numerous coastal towns and the inland city of Colac. The region had a population of 334,450 in 2021.

Key industries for employment in the Barwon region in 2021 included health care and social assistance, retail trade, construction and education and training. Agriculture, forestry and fishing industries contributed 2.0 % employment to the region in 2021. The Barwon region has extensive coastal tourism given its proximity to Melbourne, with key tourism towns of Torquay, Anglesea and Lorne located at various points along the Great Ocean Road.

The Barwon region includes the traditional lands of the Wadawurrung and Eastern Maar peoples as well as other Traditional Owner groups in Victoria who are not formally recognised.

Water is sourced predominately from rainfall with access to recycled water, groundwater, rivers, creeks, lakes and on-farm dams providing additional sources. The region is also home to Lake Corangamite, the largest permanent salt-water lake in Australia, with a surveyed area of over 23,000 hectares. It is a RAMSAR site and is therefore internationally protected.

The region recently experienced drought and dry seasonal conditions during the Millennium drought, 2013 to 2015 and 2017 to 2019.

Assessing the impacts of drought

The Regional Drought Resilience Planning Program (RDRP Program) is about planning with communities at the regional level to better prepare for the next drought and forms part of the Commonwealth Government's Future Drought Fund.

Economic analysis, research and stakeholder discussions have been undertaken to consider three questions:

The prevalence, severity and impacts of drought in the past

How this may change in the future

The Barwon region's vulnerabilities and gaps in preparedness for drought

Consultation with local stakeholders was a key factor to the analysis, which enabled a better and more localised understanding of how droughts impact the region.

This research was jointly funded by the Australian Government and Victorian Government under the Future Drought Fund.

Drought

The definition of drought varies depending on region, needs and disciplines. Below are four ways to measure whether a region is in drought.

1. Meteorological drought: degree of dryness or rainfall deficit

2. Hydrological drought: precipitation shortfalls on surface or subsurface water supply

3. Agricultural drought: links various characteristics of meteorological (or hydrological) drought to agricultural impacts

4. Socioeconomic drought: associates the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought.

The first three approaches deal with ways to measure drought as a physical phenomenon. The last deals with drought in terms of supply and demand, tracking the effects of water shortfall as it ripples through socioeconomic systems.

However, there is no one definition that encompasses all factors that bring rise to drought conditions — and the resultant impacts on regions and communities. Drought is complex and dynamic, meaning a universal 'definition' is near impossible. For example, when referring to the Millennium drought in practice it was a combination of the types of drought listed above.

Assessment framework

In order to consider how drought affects farms and the wider community, the following analytical framework distinguishes between agricultural impacts and non-agricultural impacts of drought. The framework is designed to consider the implications of specific drought impacts and what the outcomes of these implications will be. Within the two distinctions, the framework considers the social, economic and environmental impacts, to develop a more complete understanding of how drought impacts flow through the community.

Figure 1 demonstrates how this analytical framework can be applied to agriculture. Drought reduces agricultural productivity, which results in a change in primary production on farm. This impacts farm income, consumption of farm inputs, and production of farm outputs. These on-farm implications of drought flow through to the community to generate a range of outcomes. The existence of agricultural markets (e.g. sheep and cattle prices, crop prices, etc) means the impact of drought on agriculture is easier to quantify than other non-market impacts of drought.

Figure 1 also considers how drought impacts non-agricultural settings. Drought can lead to significant water restrictions and low availability of water in lakes, rivers and dams. A reduction in water availability may mean community greenspace is reduced which will in turn reduce liveability benefits in the community and the amenity values from the green space. Furthermore, there are flow on effects if parks and sportsgrounds cannot be used including impact on community cohesiveness. A lack of water in lakes, rivers and dams could also hurt tourism in the region as there is a reduced ability to boat, water ski or fish. This in turn reduces the income and spending within the regional economy.

Figure 2 demonstrates the structure of the analysis for both past and future drought periods, with considerations from both agricultural and non-agricultural impacts of drought flowing through to community outcomes

Figure 1 Impacts of drought and flow on effects

Drought impact	Implications	Outcomes	
Change in agricultural productivity	• Change in primary production • Change in farm income • Change in farm inputs • Change in farm outputs	• Reduced spending in the community • Reduced demand for ag farm services (but could increase in demand for feed) • Reduced output associated	• transport, processing/ manufacturing • Reduced primary production for distribution and value-add • Mental toll (and potential migration)
Water restrictions	• Households: outdoor water use • Community green assets: parklands and sportsgrounds	• Liveability and mental health • Mental toll • Potential migration	• Access to green space and flow on effects (i.e. footy clubs, parent groups etc) • Amenity values from green space
Water availability in lakes, rivers & dams	• Less water available for recreation (boating, water skiing, etc) • Reduced fishing opportunities	• Reduced recreation and tourism	

Note: this summary does not provide an exhaustive list of impacts, but rather is about providing a consistent evidence base across Victoria's nine regions

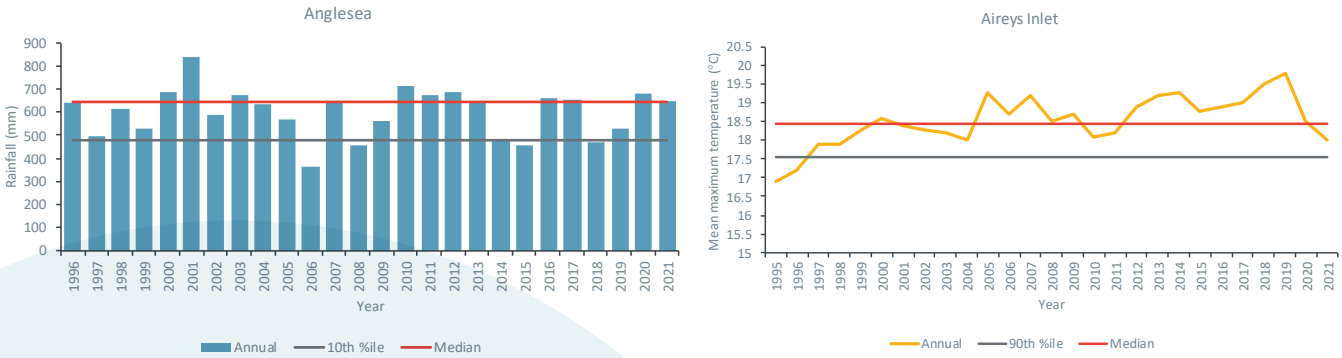
Figure 2 Structure of analysis

01 Past drought conditions

Large drought events have had wide effects across Victoria, with each drought being different in its regional severity and distribution. The last 25 years has seen Barwon experience extensive drought periods, starting with the Millennium drought from 1997 to 2009 and more recently the dry conditions experienced from 2013 to 2015 and to a lesser extent 2017 to 2019.

The historical rainfall and temperature charts for Anglesea and Aireys Inlet in **Figure 3**, provides evidence of the severity of these recent drought events. During periods of the Millennium drought and especially during recent dry periods the average maximum temperature has been consistently hotter than the median. The Millennium drought also resulted in below average rainfall, however apart from 2006 and 2008 when rainfall was below the 10th percentile, the Barwon region experienced more consistent rainfall than other parts of Victoria. This was again the case in the recent 2017 to 2019 dry period which was much more significant in the east of Victoria.

Figure 3 Annual rainfall and average maximum temperature in Barwon region



Recently experienced droughts and dry periods in the region:

- Millennium drought
- 2013 to 2015
- 2017 to 2019

02 Agricultural impacts and implications of drought + Non-agricultural impacts and implications

The Colac Otway Local Government Area (LGA) is most likely to be heavily impacted by drought in the Barwon region due to its larger agricultural industry, where 1 in 8 jobs are directly associated with primary production. Areas closer to the coast attracted a range of tourists based on a number of drought resilient activities, which continued to provide income during past drought and dry periods. This coupled with larger diverse economies around Geelong and to a lesser extent Melbourne means drought impacts varied significantly across the region.

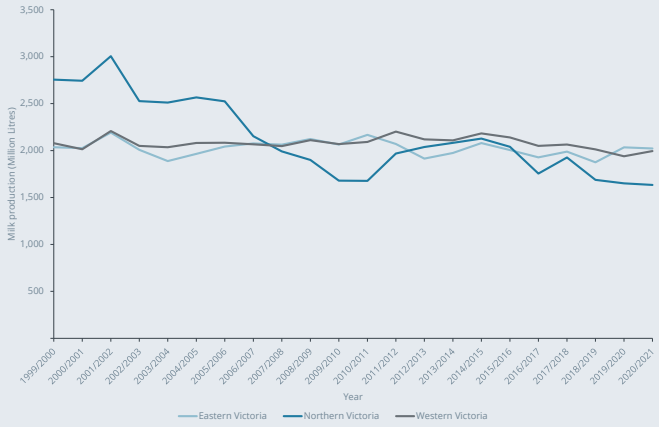
While direct agricultural employment across the region is low, for the Colac Otway LGA it is 11.4%. Agricultural importance for the value-add of the region also varies significantly, with it accounting for as much as 25% in the Barwon West and Colac & Corio SA3 regions, while accounting for less than 2% in the Surf Coast and Geelong and its surrounds. Food manufacturing is the second largest manufacturing sub-sector, utilising primary production from the region as well as from South West Victoria. The major food processing centres are located in Colac and Geelong.

Agricultural production in the region is dominated by livestock farms – with extensive dairy, beef and cattle as well as intensive poultry and pigs – and the majority of sourced water is used for pastures or grain. Other agricultural production includes nurseries and cut flowers and broadacre cropping such as wheat, barley and canola.

During drought, livestock farms have been impacted by:

- Reduced pastures and feed for livestock
- Reduced on farm water storages and rainfall for pasture growth
- Increased reliance on hay which can be more costly
- Higher reliance on livestock prices to manage destocking if required

Figure 4 Victorian annual dairy production



In the Barwon region drought and dry conditions generally involve a "failed" spring, where insufficient rainfall is received during the Spring growing season. For example, in 2016 livestock farms faced challenging conditions when the region experienced its second "failed" spring in a row and many farmers were low on stored fodder, with stock water also in shortage. Responding to these conditions can require high supplementary feed and/or agistment costs.

Regional milk production in Western Victoria, which includes the Great South Coast and Barwon regions, remained relatively steady at around 2 to 2.1 billion litres during the Millennium drought. In contrast, Northern Victoria experienced a significant decline in milk production during the Millenium drought (see **Figure 4**). Western Victorian production levels were likely less impacted due to:

- Significant levels of dryland dairy production not linked to irrigation
- Varying dairy locations that are not reliant on a single connected water source
- Drought conditions not being as severe as in Northern Victoria
- Additional access to fodder (for example failed cereal crops)

Town water

Towns in the Barwon region were faced with prolonged periods on Stage 4 urban water restrictions during the Millennium drought, particularly during the period from 2006 to 2009. Stage 4 water restrictions prohibit the watering of any outdoor space, amongst other restrictions, which had profound impacts on the community's liveability.

The Lorne system is an example of the diverse experiences in the region. During the Millennium drought demand was unrestricted, however, dry conditions in the summer of 2015-16 led to Stage 3 restrictions and water carting.

Recreation and Tourism

Coastal tourism in the region is significant and provided much needed income to the region during prior drought periods. However, drought conditions still affected tourist's amenity benefit from visiting the towns and landscapes in the region, particularly those that were experiencing stage 4 water restrictions.

Environment

There were negative impacts on riverbank and in-stream vegetation in the rivers, lakes and dams in the region during the Millennium drought. At least 10 of the 28 monitored lakes changed from groundwater throughflow or discharge lakes to recharge lakes that dried. There was also an observed increase in lake salinity due to increased evaporation, or a combination of increases in the evaporation and groundwater to lakes volume ratios.

Traditional owners

Culturally significant sites, particularly those located on flood plains and/or are water dependent were exposed and became vulnerable to damage. Additionally, the movement of stock to areas where there were feed reserves meant stock was placed in areas of cultural significance. Damage to these sites can lead to distress within the community.

03 Community outcomes in past droughts

Barwon is one of the most diversified regions in Victoria with extensive manufacturing, construction and health care and social assistance sectors, although the manufacturing sector is in decline due to decreasing petroleum and coal product manufacturing. This diversity cushioned the region from some of the community impacts experienced in other more agriculturally reliant regions in Victoria. However, the more agriculturally reliant and isolated Colac Otway LGA was exposed. Farming communities , such as those in the Colac Otway LGA, are severely impacted during periods of drought, due to:

- Financial pressures from decreased on-farm income and increased costs
- On-farm challenges relating to lack of water and feed for stock, and poor yields on crops
- Pressures from invasive native and pest animals on farms
- Physical and mental health and wellbeing impacts on individuals and families
- Flow on financial pressures being experienced by supporting businesses in the community.

The impact on agricultural production during drought in the Barwon region also affects a range of agricultural farm service providers, support businesse and processing facilities in the region, in turn affecting spending and business activity across the broader community.

Overall, the cumulation of impacts on production, regional economies, and liveability from drought led to significant impacts on the regional communities in the Barwon region. An increase demand for mental health services and Rural Financial Counselling Services was also evident.

01 **Future drought conditions + Changes in the Barwon region**

02 Agricultural impacts and implications of drought + Non-agricultural impacts and implications

03 Community outcomes of future drought

Future Impacts of drought

Future impacts will differ from past impacts depending on the severity of future droughts, and the changes in the characteristics of the Barwon region and its communities.

01 Future drought conditions

Climate change is likely to increase the variability of the weather in the Barwon region with future droughts expected to be longer, more frequent and more severe. Climate projections show that by 2050 the Barwon region on average will be hotter, drier and be exposed to a growing number of fire danger days. Similar to the past, the region and sub-regions will continue to face variable conditions within and across seasons — however in the future this variability will be around a lower average rainfall and higher average temperature than previously experienced. This means that, compared to current conditions, it is likely that parts of Barwon will face some seasons with rainfall significantly below and temperatures significantly above current averages.

The significant prevalence of dryland agriculture, which relies on timing and quantity of rainfall, does not offer resilience options that irrigated agriculture has access to (as they have continued access to water that can be drawn upon during dry periods).

Changes in the Barwon region

There have been a number of changes in the Barwon region that will alter the impacts of drought in the future, including:

- Town water security planning and investment has increased in the region, including key investments made since the Millennium drought, such as the Melbourne to Geelong and Barwon to Colac pipelines.
- Population changes (including an increase in sea/tree-changers due to Covid19) bringing additional water demand to the region.
- Increase in peri-urban development and number of lifestyle/hobby farmers which will change the water demands in the region.
- Continuing diversification of the region's economy away from agricultural production.

It is noteworthy that limited opportunities for water trade and irrigation distribution mean the Barwon region is less exposed to broader 'system level' responses to drought and a changing climate (as compared, for example, to the Northern Victorian regions) — including interregional water trade and Basin Plan water recovery.

Figure 5 Climate projections for the Barwon region

Future droughts are likely to be longer, more frequent and more severe: By the 2050s

1.4 to 1.9 °C ↑

Average maximum temperatures in spring expected to increase by up to 2.2°C. Number of days over 35°C increasing from 6.4 days to 8-16 days.

6-11% ↓

Rainfall will continue to be very variable. Average rainfall in spring expected to decrease by 12-22%.

49% ↑

Number of very high fire danger days to increase by 9 days per year

02 Agricultural impacts and implications of drought + Non-agricultural impacts and implications

Agricultural production in dairy and dryland farming operations are likely to be most exposed to the increasing likelihood and severity of future droughts as they are dependent on rainfall to feed and water their livestock. The adaptiveness of these producers, with farmers already having many strategies to manage drought, and their ability to maintain sufficient reserves will be critical to their farm profitability. However, the growing number of hobby farms in the region may not have as many strategies in place and could be more exposed during a prolonged drought. The prevailing circumstances of a future drought — such as commodity prices, interest rates and fuel and fertiliser costs — will also play a role in resultant impacts.

While manufacturing is strong in the region (although declining), the large proportion of manufacturing related to agriculture will reduce the ability of the manufacturing sector to provided diversified income during times of drought. Therefore, the impacts of decreases in primary production are likely to be exacerbated as the impact of drought flows through to down-stream markets such as food processing and manufacturing. Declines in dairy production will have flow on effects to dairy processing facilities, which may need to be rationalised if dairy production levels are not able to recover.

Future implications of drought are likely to continue to impact the wellbeing and mental health of the local communities. Farmers and community businesses are likely to continue to rely on financial counselling services and the broader community will continue to rely on mental health services.

Access to mental health services need to be emphasised moving into the next drought. People trying to make tough decisions in drought are already in a vulnerable space and support needs to be readily available. The physical and mental health of the community may also be impacted as community green spaces, trees and waterways are impacted.

Town water

Connectivity from the Melbourne to Geelong and Barwon to Colac pipelines will decrease the likelihood of severe water restrictions in town (as compared to the Millennium drought).

Town water security planning has improved with lessons from drought. Likewise, Urban Water Strategies are now required to incorporate future impacts of climate change (including potential droughts). For example, Barwon Water has used the Department of Environment, Land, Water and Planning's 2020 'Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria' to undertake water demand system forecasts and identify a range of climate scenarios to assess potential impacts on water supply and customer demand.

Barwon Water's Urban Water Strategy 2022 looks to further increase water security in the region by expanding the reach of the Melbourne to Geelong Pipeline to service more areas in the region, increase the use of recycled water as well as returning water to the flow stressed Moorabool River.

Recreation and Tourism

Tourism will continue to be exposed to fluctuations in water access under future drought. Initiatives that are not dependent on water availability could boost visitors to the region. The Barwon region is also better placed than many other regions in Victoria due to the majority of tourism being related to the coast, which is less rainfall dependant. COVID-19 has provided a boost to regional travel and relocation, evidenced by an increase in population from 2016 to 2021.

Environment

Inland lakes, rivers and dams are likely to be at lower levels during times of drought which will impact the native biodiversity living in and relying on these water bodies. There is likely to be a lack of food and drinking water for wild animals living in the region. Additionally, the increased risk of wildfires will have significant environmental and economic impacts.

Traditional owners

Culturally significant sites particularly those located on flood plains and/or water dependent will increasingly be exposed to damage. Damage to these sites can lead to distress within the community.

03 Community outcomes in future droughts

Economic modelling of potential future drought in Victoria, undertaken by Victoria University's Centre of Policy Studies, found the Barwon region would be significantly affected with GDP falling by 12.7 % and a reduction more than 1400 jobs in the region (see **Figure 6**).
The modelled three-year drought, while prolonged, is not equivalent to the most severe recorded in Victoria.

Figure 6 Computable General Equilibrium (CGE) Modelling for a future drought

Flow through impacts from agriculture to the community

The increased likelihood and severity of drought in the future and the increased competition for water under these conditions will mean that the drought impacts on the community from agricultural consequences of drought are expected to be larger than have been historically observed.

Impacts on GDP

Economic modelling of potential future drought in Victoria found the Barwon to be significantly affected, with:

- GDP impact:
  - Direct agriculture impact -10.2%
  - Regional impact -12.7%
- A fall in employment of more than 1,400 jobs.
- This would flow through the region reducing consumption/spending by 4%.

12.87% GDP

1,400 jobs

Employment and value add impacts

The effects on employment will not be distributed equally across the regions, with the more agriculturally dependent regions likely to experience larger decreases in employment.

The economic modelling finds that the large impact of drought on value-added output of agricultural primary production has **significant impacts on the value-added output of the livestock sector.**

Access to local mental health services will be vital as drought and dry conditions become more prevalent. Not only are mental health services important during times of drought, but improved mental health increase a person's ability to adapt. This can improve drought resilience by allowing people to effectively plan for future drought conditions.

Greenspace and associated community sport are drivers of community spirit and liveability within local communities. Water Corporations and Councils now have a strong understanding of the importance of greenspace for their communities. However, should town water supply not allow watering of gardens this will have a mental health toll on residents.

The diversity of the Barwon region will continue to mean that some areas will be impacted by future droughts more than others — especially the more agriculturally reliant Colac Otway LGA. The region will continue to be exposed to dry and drought conditions, and smaller communities that are highly dependent on agriculture and more geographically isolated will be most exposed. Declining populations in smaller towns, due in part to larger farm properties and remote farming, may mean they are more vulnerable to change.

Overall, the Barwon region has a more diverse economy than many other parts of Victoria, but there is still potential for significant community impacts from future drought.

Vulnerabilities and gaps in preparedness

The diverse Barwon region already has many drought resilience measures in place or in development.

Agricultural research, innovation and extension will remain important to support the ongoing adaptation in agriculture and will aid preparedness to future drought. Farmers capacity to adequately prepare for drought differs significantly within the Barwon region. Farmers can be better prepared for future droughts by addressing gaps in on-farm business and decision-making skills. There is an ongoing need to close the gap in farmer's skills and capabilities to be more adaptive and prepared for the next drought.

A vulnerability to livestock industries during drought is the limited hay and grain production in the region, meaning that supplementary feeds costs will include a significant transport component. Access to feed and the price at which it is available is also a concern if drought is widespread and prevalent in other regions.

Drought will also have a different impact on those livestock producers that do not have access to Barwon Water's reticulated rural supply water network, compared to those that do. This relates to the reliability of stock water supply as well as the water quality issues that can arise in stream and farm dams during drought.

The increase in the number of small block farms, either lifestyle farms or artisan producers, is also relevant to drought management. New farmers may have less experience with drought and be more exposed to risks. It may also be that some of these blocks are managed using regenerative farming approaches which may help retain soil moisture and manage drought.

Tourism will continue to provide much needed income to the region during times of drought. Key tourist locations along the Great Ocean Road are relatively rainfall independent. Other coastal towns should also benefit from this source of income.

Diversification is a key mechanism for the regional economy to contain the drought impacts flowing from the agricultural sector. Towns throughout the Barwon region have varying degrees of diversification with larger, centrally located towns more likely to experience these benefits. Specifically:

- The city of Geelong will provide somewhat of a buffer to these drought impacts as it has a diverse economy. Geelong itself will be buffered to some degree from reductions in agricultural output as it has alternative industries (such as health, education and retail). Townships near Geelong can also benefit from some of this buffering in the face of less agricultural activity due to drought. This is especially the case for townships within an approximately 50km radius of the city, which offers the benefits of rural living while also allowing access to employment opportunities in the larger centre. Colac is also likely to offer some diversification benefits although the economy is much more heavily linked to agricultural production.
- Medium to smaller sized communities are likely vary significantly in their drought resilience. Those communities that are located close to the coast or the metropolitan regions of Geelong and Melbourne are likely to have additional opportunities during times of drought.
- Smaller, more agriculturally reliant communities that are not located near the coast, such as those found in the Colac Otways LGA will be more severely affected by drought, as there are limited alternatives that can replace the people and economic activity provided by agriculture.

Access to services such as mental health and Rural Financial Counselling are particularly important to manage drought. These kinds of health services have long wait times in the region, even outside of drought. Following the onset of a drought there is a general lag in the provision of additional health services. This means that individuals unable to access these services are having to make drought management decisions under significant stress.

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