Climate Change Adaptation Strategy

Alpine Resorts Victoria

Version 01, published May 2025

Traditional Owner Acknowledgment

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land, waters and mountains, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose wisdom has ensured the continuation of culture and traditional practices.

We acknowledge the profound impacts of climate change on Country and recognise the power of Traditional Owner knowledge in responding to and adapting to change. 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.

Author

Developed by ARV with the support of Nation Partners, with additional input from Climate Comms and Frontier Economics.

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PURPOSE AND OVERVIEW

The impacts of climate change are already being experienced across Australia, and with continued changes in the frequency, severity and intensity of climate-related hazards and events, alpine regions are projected to experience climate-driven losses in ecosystems, landscapes and culture. In accordance with our legislative obligations, Alpine Resorts Victoria (ARV) recognises the need for a proactive approach to addressing evolving climatic conditions to maintain the alpine region's recreational, economic and ecological integrity.

Our Climate Change Adaptation Strategy (the Strategy) builds on the established resilience and adaptability that has long defined alpine resorts, providing a forward-looking framework for guiding adaptation with practical ARV-led actions over the next ten years. It adopts an 'all resorts, all climate hazards' approach and has considered the range of climate impacts which may be experienced by resorts, challenges and opportunities related to the low emissions transition, and each resort's unique qualities.

ABOUT ALPINE RESORTS VICTORIA

ARV is a statutory authority established by the Victorian Government in 2022 to bring a sector-wide focus and strategic leadership to the management of Victoria's six alpine resorts: Falls Creek, Mt Buller, Mt Hotham, Mt Baw Baw, Mt Stirling and Lake Mountain. As the Crown land manager, we perform council-like services and functions for the alpine resorts, which in turn contribute to the Victorian visitor economy and provide thousands of regional jobs.

HOW WAS THIS STRATEGY DEVELOPED?

This Strategy was developed following extensive engagement with stakeholders including resort Stakeholder Consultative Committees, Traditional Owners, lift companies, water authorities, and ARV staff. Findings from this engagement were combined with the outputs of desktop research into contemporary climate science, adaptation approaches being implemented in alpine regions in Australia and around the world, and resort-specific weather observation and operational data. We then applied a multi-criteria analysis framework to select a suite of practical ARV-led adaptation actions.

VALUES AT RISK FROM CLIMATE CHANGE

ARV is committed to preserving what matters most to alpine communities and all Victorians in the face of climate change. This strategy is grounded in an understanding of the key values supported by our alpine resorts, all of which are vulnerable to impacts from climate change; these include:

- **Snow activity participation** – Our alpine resorts are the only places in Victoria where people can easily enjoy most snow-based activities, and white season is our main economic driver.
- **Green season tourism** – The alpine resorts have much to offer in the green season, but growing non-snow dependant visitation is challenging as there are limited investment funds for and return from green season activities.
- **Community values and culture** – Sustaining the alpine resorts and their activity and nature-based cultures will maintain the social fabric of alpine communities. Victorian Traditional Owners are the original custodians of the alpine regions, and caring for Country inherently incorporates a changing climate.
- **Biodiversity** – The natural environment of the alpine resorts is unique in the world. Everything we do, including any efforts to further develop the alpine resorts, must be delivered in a way that protects these values.
- **Economic development and commercial viability** – Maintaining the resorts' economic activity is a key priority, as it delivers value to all Victorians through the significant contribution made to the State's visitor economy.

Each alpine resort has unique strengths derived from its geography, natural environment, physical infrastructure and community and visitor base. These resort-specific features are a source of resilience and will be considered in ARV's ongoing leadership in the adaptation to climate change impacts.

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WHAT DOES THE SCIENCE SAY?

This Strategy is underpinned by the latest climate science, to ensure we understand what the possible future might look like for Victoria's alpine resorts. Key hazards of concern, climate change trends and projections, and selected impacts for ARV and alpine communities, have been summarised.

Hazard	What changes are we seeing?	Selected impacts
Snow 	Continued reduction in natural snowfall and snow depth are anticipated compared to a 1980–1999 baseline. Large natural variability will continue to occur from year to year, but there will be an increased risk of poor seasons for natural snowfall.	Need for continued investment in sustainable and affordable water and electricity infrastructure to support increased snowmaking. Reduced water supply for alpine streams and water storages due to lower average precipitation (snow and rain).
Rainfall 	Less average rainfall but with more intense downpours. By the 2050s, the Ovens-Murray and Gippsland regions are projected to experience an increase in time spent in drought of between 6% and 16%.	Less rainfall and more time in drought may result in tighter limits on acceptable water uses or extraction amounts. Higher risk of flooding caused by intense rainfall events may temporarily affect service delivery.
Bushfire 	Australia has experienced more frequent and extreme fire weather since 1950, particularly in the south-east. By the 2050s, the annual number of extreme fire weather days may increase by up to 30%.	Increased emergency management and business continuity planning to prepare for severe bushfire weather, including poor air quality due to smoke. Damage to and loss of ARV and community assets and infrastructure. Bushfire risk may impact green season visitation.
Temperature 	Over the Australian Alps, the annual average temperature has risen by about 1.4°C since 1950. The January 2009 and 2014 Victorian heat waves saw unprecedented temperatures and consecutive hot days across the State. Victoria's two hottest temperatures on record occurred in 2009, followed by the 3rd and 4th hottest in 2019.	Possible increase in visitation as tourists seek refuge at higher altitudes during the green season. Higher demand for snowmaking due to warmer temperatures in winter. Rising average and extreme temperatures place some sensitive alpine flora and fauna under stress.
Extreme winds, storms and hail 	We have seen some recent increases in the frequency and intensity of extreme wind and storm events. The number of hail-prone days has increased across south-east Australia.	Increased need to allocate budgets for emergency response, and potential for higher insurance premiums. Extreme winds impact ski lift and snowmaking operations.
Low emission transition 	Australia's electricity generation from renewable sources has more than doubled over the last decade. Higher wholesale costs are currently driving higher electricity prices – future prices are difficult to predict.	Potential operating cost and emissions savings from cheaper, greener power, but this requires upfront investment. Decisions around the low emissions transition (e.g. installing renewable energy generation and EV charging) can lead to community disagreement.

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ARV'S CLIMATE ADAPTATION VISION – WHERE WILL WE BE IN TEN YEARS?

ARV will be more resilient to a changing climate, demonstrating viable adaptation options that contribute to an economically, environmentally and socially sustainable alpine industry.

OUR ADAPTATION ROADMAP

Our vision is supported by the following three cross-cutting principles, which are considered in the design of every action within the Strategy:

- Embed climate change into ARV decision-making
- Enhance the climate resilience of our unique alpine landscape
- Partner with Traditional Owners to support their continued economic development and care for Country.

We have developed the following six objectives, which are underpinned by 33 practical actions that support achievement of our climate adaptation vision:

- **Objective 1 – Provide infrastructure and services that build industry and community climate resilience**
  Include climate change in asset planning, future investments, and emergency management, supported by community capacity building and informed by the latest science.
- **Objective 2 – Tell our whole story**
  Proactively promote ARV's and the sector's resilience and contribution to Victoria through targeted research and collaborative communications.
- **Objective 3 – Future-proof energy and water systems**
  Enhance water and energy systems and management in anticipation of the future climate and energy transition, given each resort's specific context.
- **Objective 4 – Tap into growing demand for sustainable tourism**
  Ensure ARV and resorts are prepared for the continued evolution of low-carbon and sustainable activities, services and mobility.
- **Objective 5 – Support world-leading snow management**
  Play our part in sustainably maximising operational days and the quality of all snow-based activities.
- **Objective 6 – Diversify the visitor experience**
  Work with stakeholders and government to secure investment for evolving offerings that respond to a changing climate, with a focus on shoulder and green seasons.

EMBEDDING CLIMATE CHANGE IN DECISION-MAKING

To accompany this Strategy, we have developed a clear, actionable framework to support ARV staff in considering climate change when making relevant decisions. Based around the six guiding principles of the *Climate Change Act 2017*, the framework will guide us on applying these principles in different decision-making contexts, such as when briefing the Board on matters where climate change is important, in corporate risk management, in procurement, and when developing or renewing policies and plans.

Key terms and abbreviations

Term	Abbreviation (if applicable)	Definition
Adaptation		In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.
Adaptive capacity		The ability of systems, institutions and organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences.
Aggregate risk		The accumulation of impacts from multiple risks with unrelated causes.
Asset Management Accountability Framework	AMAF	A framework established by the Victorian Government that sets out the mandatory requirements and best practice asset management recommendations for government agency asset portfolios.
Alpine Resorts (Management) Act 1997	ARM Act	The principle governing legislation for Victoria's alpine resorts. Amendments in 2022 established Alpine Resorts Victoria as the single entity responsible for managing the resorts.
Alpine Resorts Victoria	ARV	The statutory authority that manages Victoria's six alpine resorts.
Bushfire Attack Level	BAL	A method for rating the intensity of a building's exposure to ember attack, radiant heat and direct flame and is used to inform construction requirements for fire protection.
Cascading risk		Cascading impacts from extreme weather/climate events occur when an extreme hazard generates a sequence of secondary events in natural and human systems that result in physical, natural, social or economic disruption, whereby the resulting impact is significantly larger than the initial impact. Cascading impacts are complex and multi-dimensional and are associated more with the magnitude of vulnerability than with that of the hazard.
Country Fire Authority	CFA	The volunteer fire service responsible for fire suppression, rescues, and response to other accidents and hazards across most of Victoria.
Climate resilience		The ability for people, communities, and ecosystems to adapt and recover from the impacts of climate change such as more frequent bushfires or rising sea levels.
Climate risk		The potential for negative consequences from climate change on the environment, society, and economy. For example, damage to transport infrastructure from increased intense rainfall and flooding.
Compound risk		Arise from the interaction of hazards, which may be characterised by single extreme events or multiple coincident or sequential events that interact with exposed systems or sectors.
Crown land		Land held and managed by the state government on behalf of the public.
Emissions scenarios		Projections of varying levels of greenhouse gas emitted from human activities. Based on varying extents of global action to reduce greenhouse gas emissions.

Key terms and abbreviations

Term	Abbreviation (if applicable)	Definition
Exposure		The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.
Green season		Seasons during which no snowfall is expected, and other alpine-friendly outdoor activities are popular such as walking, hiking and mountain biking. Starts when the snow has melted, usually around November, and runs until the end of May.
Greenhouse gas		Gases that absorb infrared radiation and contribute to warming of the lower atmosphere (known as the greenhouse effect). Carbon dioxide, methane and water vapour are examples of greenhouse gases.
Grid instability		When the amount of electricity produced within the grid does not match the electricity demand, leading to instability and potential disruptions.
Hazard		The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.
Impacts		The consequences of realised risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and wellbeing, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial.
Intergovernmental Panel on Climate Change	IPCC	An intergovernmental body of the United Nations responsible in advancing scientific knowledge on climate change, its implications and potential risks, as well as adaptation and mitigation options.
Low carbon economy		An economy that has less reliance on fossil fuels and reduced levels of greenhouse gas emissions.
Low emissions transition		The complex process of shifting human activities from a high-carbon to low-carbon economy. For example, shifting from fossil fuel to renewable energy sources.
Municipal Emergency Management Plan	MEMP	A plan developed by local governments to help communities prepare for and respond to emergencies at a municipality scale.
Micro hydropower system		A form of renewable energy that generates electricity from flowing water.
Million hectares	Mha	Area measurement unit
Nature-positive		Describes stopping biodiversity loss and restoring nature to pre-2020 levels by 2030 – with an aim for full and ongoing ecosystem recovery by 2050.
Photovoltaic	PV	The process of converting light into electricity using semiconductor materials.

Key terms and abbreviations

Term	Abbreviation (if applicable)	Definition
Resist-Accept-Direct	RAD	A framework that helps make informed decisions for responding to climate change.
Resilient Building Council	RBC	An organisation that brings together Australia's leading independent resilience and sustainability experts to increase community resilience to extreme weather and disasters.
Resilience dividend		The benefit from investing in measures to improve an asset, system or community to improve ability to withstand and/or recover from extreme climate events.
Risk		The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change.
Stakeholder Consultative Committees	SCC	Committees at each resort comprised of key stakeholder representatives who provide advice on strategic and operational matters affecting the resorts.
Skier days		A measure to track the number of days of skiing or snowboarding purchased within a ski area.
Snowmaking		The process of manufacturing snow through pressurising air and water through a snow gun or other technology.
Snow season		A period declared by ARV during which a fee is charged to enter the alpine resorts, usually commencing on the Friday prior to the King's Birthday weekend in June and ending on the last weekend of September or the first weekend in October in accordance with the Alpine Resorts (Management) Regulations 2020.
Shared Socioeconomic Pathways	SSP	A set of scenarios that describe how the global economy, demographics, and society might change up to 2100. These scenarios are used to analyse how these changes could affect climate change and global greenhouse gas emissions.
United Nations Office for Disaster Risk Reduction	UNDRR	A global organisation that focuses on reducing the risk and impact of disasters caused by natural hazards. Works with governments, local authorities and other international organisations to achieve this.
Victoria's Climate Science Report 2024	VCSR24	A 2024 report published by the Victorian Government summarising the best available scientific evidence on the climate for the state. Builds on the earlier Victoria's Climate Science Report 2019 (VCSR19) which remains a relevant component of the scientific evidence base.
Victoria's Future Climate Tool		A publicly available online tool that provides climate trends and projections in Victoria for various climate variables such as annual rainfall, average annual temperature and number of heatwaves per year.
Vulnerability		The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
White season		The winter period during which snowfall supports snow-based activities such as skiing, snowboarding and tobogganing.

Introduction

The impacts of climate change are already being experienced across Australia, with the climate warming by an average of 1.51°C since records began in 1910, April to October rainfall decreasing 9% since 1994 in the south-east, and heavy rainfall events becoming more intense.[1] With continued changes to the frequency, severity and intensity of climate-related hazards and events, alpine regions are projected to experience climate-driven losses in ecosystems, landscapes and culture.[2]

Alpine Resorts Victoria (ARV) manages Victoria's six alpine resorts and recognises the need for a proactive approach to managing evolving conditions to maintain the region's recreational, economic and ecological integrity.

The *Climate Change Act 2017* establishes the legislative foundation for ARV's management of climate change adaptation. Through its *Letter of Expectations (2022)*, the Victorian Government has provided clear direction to ARV to integrate climate adaptation into decision-making and assume a leadership role in supporting alpine communities to adapt to the impacts of climate change. This acknowledges the current and future challenges posed by climate change to ARV's financial sustainability, social licence and very reason for being.

Our Climate Change Adaptation Strategy (the Strategy) builds on the established resilience and adaptability that has long defined alpine resorts, providing a forward-looking framework for guiding adaptation across the resorts over the next ten years. Developed through extensive engagement with stakeholders and staff, our Strategy adopts an 'all resorts, all climate hazards' approach, and has considered the range of projected climate impacts which may be experienced by resorts, as well as each resort's unique qualities and characteristics. Challenges and opportunities related to the low emissions transition are also covered by this Strategy.

ARV is committed to leading adaptation efforts in the alpine sector and serving as an exemplar and facilitator of resilience to climate change. In delivering the actions outlined in this Strategy, we hope to inspire and promote further adaptation actions by stakeholders to elevate the overall resilience of Victoria's alpine sector.

1 CSIRO and Bureau of Meteorology. (2024). *State of the Climate*. https://www.csiro.au/en/research/environmental-impacts/climate-change/state-of-the-climate

2 Adler, C., Wester, P., Bhatt, I., Huggel, C., Insarov, G.E., Morecroft, M.D., Muccione, V., and Prakash, A. (2022). Cross-Chapter Paper 5: Mountains. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. https://www.ipcc.ch/report/ar6/wg2/chapter/ccp5

About Alpine Resorts Victoria

ARV is a statutory authority established by the Victorian Government in 2022 to bring a sector-wide focus and strategic leadership to the management of Victoria's six alpine resorts: Falls Creek, Mt Buller, Mt Hotham, Mt Baw Baw, Mt Stirling and Lake Mountain. Key expectations set out for us by the Minister include building economic resilience and financial sustainability for the alpine sector and integrating climate change adaptation into decision-making.

ARV acts as the Crown land manager for each of the six resorts and performs council-like services and functions (see page 10). In performing our functions and services, ARV must pay regard to the following principles as defined in the *Alpine Resorts (Management) Act 1997* (ARM Act):

- Protecting the unique environmental, social, cultural and economic characteristics of each alpine resort.
- Planning for and managing all alpine resorts in a co-ordinated manner that adapts to and responds to the impacts and risks of climate change.
- The ongoing impact of the use of the alpine resorts on natural and cultural features and the ecology of the alpine resorts.
- Respecting, protecting and promoting Aboriginal self-determination, cultural values, practices, heritage and knowledge in the alpine resorts.
- Partnering with Traditional Owners in policy development, planning, and decision-making in the alpine resorts.
- Protecting and enhancing the amenity access, and use of each alpine resort, for the benefit and enjoyment of current and future generations of all Victorians.
- Promoting investment in a diverse range of tourism and recreation experiences, for all seasons, in each alpine resort.

Victoria's alpine resorts are a major contributor to the Victorian visitor economy. The resorts currently generate $2.14 billion in economic output annually, with $1.33 billion generated directly by visitor expenditure – 8% of our State's tourism. We see 1.4 million visitors come through our gates, and provide over 12,000 jobs, all in regional areas.[3]

Further details of ARV's purpose, priorities and objectives, with which this Climate Change Adaptation Strategy is aligned, can be found in the following documents:

- *Letter of Expectations* – Alpine Resorts Victoria, October 2022
- *Alpine Resorts Corporate Plan 2024–2027*
- *Alpine Resorts Strategic Plan 2020–2025*
- *Alpine Resorts Strategic Plan 2020–2025 Action Plan*.

3 SGS Economics. (2024). *Economic Contributions and Benefits of Victoria's Alpine Resorts.*

About Alpine Resorts Victoria

ARV'S CORE FUNCTIONS

This Strategy focuses on actions within ARV's current legislated responsibilities, as shown below. Some actions in this strategy call for specific delivery responsibilities to be revisited in support of more effective responses to emerging challenges presented by climate change. Such changes would require engagement with the Victorian Government and potential amendments to legislation or regulations.

Managing each resort in accordance with the Act and alpine resorts principles.

Strategic planning for the development, promotion, and management of ARV principles.

Strategic tourism activities and marketing.

SERVICE PROVISION

Snowmaking

Electricity

Waste and recycling

Gas Supply

Water supply

Roads

Drainage and sewerage

Fire protection

Ski patrol

Transport

Source: Section 21 of the *Alpine Resorts (Management) Act 1997* (and 2022 amendments).

What does this document include?

This Strategy describes practical actions ARV can pursue over the next ten years to adapt to climate change to protect individuals, communities, infrastructure, and natural systems, and increase overall resilience of the resorts. Included in this Strategy is:

> A summary of the latest climate science and research into the impacts of climate change on Victoria's alpine resorts.
> Overarching objectives that consider the sector's economic and social significance to the State and the regions where we operate.
> A decision-making framework for good adaptation governance.
> A model reporting template for use by ARV to disclose progress related to climate risk management.

ARV'S APPROACH TO CLIMATE ADAPTATION

ADDRESSING DETERMINANTS OF RISK

Climate adaptation is defined as the "process of adjusting to actual or expected climate change and its effects". This Strategy focuses on pursuing practical actions that address the underlying determinants of climate-related risk.

Ideally, this involves **reducing exposure to hazards** – in other words, keeping things we value (e.g. infrastructure, ARV staff, biodiversity) out of places that could be adversely affected by climate-related events. However, the location of Victoria's alpine resorts is fixed, and many assets are purposefully located in areas exposed to hazards (e.g. ski slopes prone to high winds). This means reducing exposure is not always an option.

Accepting that ARV will always have a degree of hazard exposure, more adaptation actions focus on **reducing vulnerability**. This can involve a mixture of actions to:

> Reduce **sensitivity** (i.e. susceptibility to harm); for example, designing buildings to a higher level of bushfire resilience.
> Increase **adaptive capacity** by ensuring a viable Plan B is available when climate-related events place systems under stress (e.g. backup power supply to support resort operations and snowmaking in the event of a network outage).

USING THE RAD FRAMEWORK TO SUPPORT PLACE-BASED ADAPTATION

ARV uses the Resist-Accept-Direct (RAD) framework to support effective decisions around longer-term climate change adaptation related to specific locations or values (e.g. a resort, ski run, or waterway). Initially developed by the US Parks and Wildlife Service and used by Parks Victoria, the approach allows for flexible responses that respond to changing conditions and new evidence as it comes to hand.

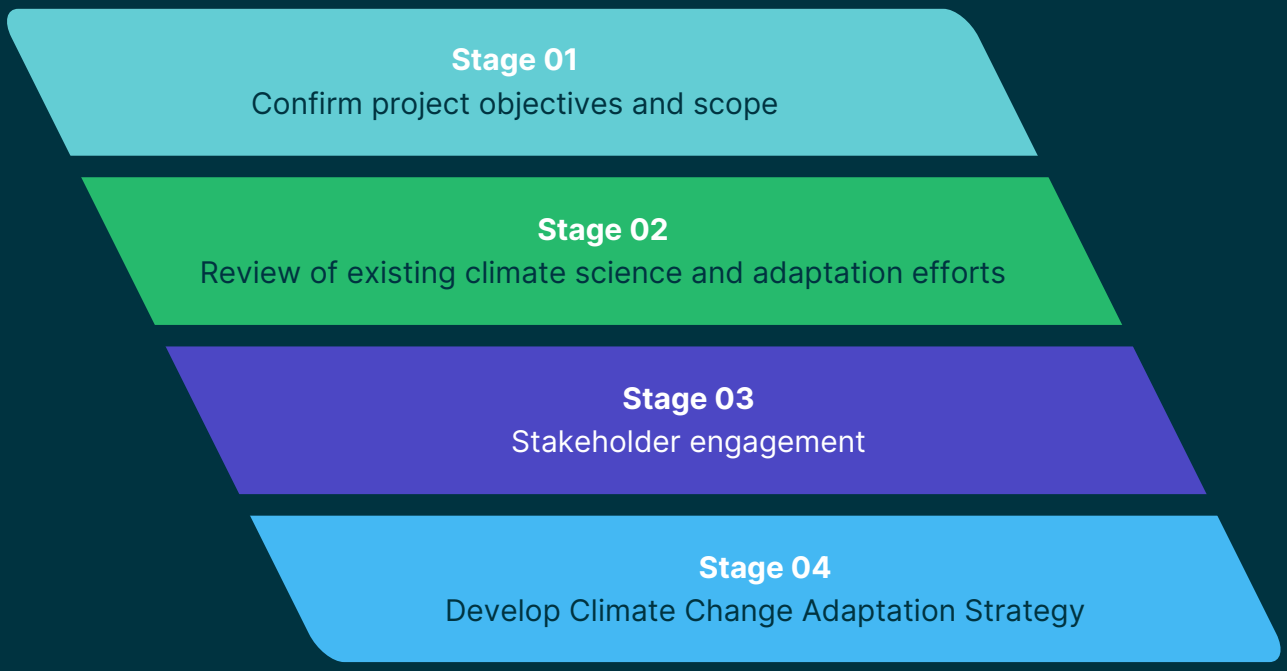
RAD Strategy	Approach	Example action
Resist	Trying to maintain historical conditions	Increased investment in snowmaking to retain all downhill skiing areas
Accept	Allowing change without intervention	Divestment in areas expected to be unprofitable in a climate change affected future
Direct	Actively guiding towards new conditions better suited to the future climate	Seeking investment to support diversification of income-generating activities beyond snow

How was the Strategy developed?

This Strategy was developed throughout 2024 via engagement with internal and external ARV stakeholders, as well as desktop research and analysis of resort-held data and insights. It aligns with relevant Victorian Government expectations, climate change policy and guidance; this includes:

> *Alpine Resorts (Management) Act 1997* and subsequent *Alpine Resorts Legislative Amendment Act 2022*
> *Minister's Letter of Expectations* (24 October 2022)
> *Alpine Resorts (Management) Regulations 2020*
> *Climate Change Act 2017* (CC Act)
> *Alpine Resort Futures Vulnerability Assessment* (Department of Environment, Land, Water and Planning, 2017)
> Victoria's Climate Change Strategy and accompanying *Adaptation Action Plans*.

An overview of the stages of Strategy development is presented below.



How was the Strategy developed?

STAGE 1 – CONFIRM PROJECT OBJECTIVES AND SCOPE

In accordance with Victorian Government expectations and ARV strategic objectives, we established the overall scope and direction for the Strategy in collaboration with the ARV leadership team.

STAGE 2 – REVIEW OF EXISTING CLIMATE SCIENCE AND ADAPTATION EFFORTS

The project commenced with a desktop review of contemporary climate science and research from Australia and abroad, along with consideration of resort-specific weather and operational data. This focused on the observed and potential impacts of climate change on alpine resorts, with reference to ARV's core legislative functions. It also included desktop analysis of adaptation approaches being implemented in other alpine regions in Australia and around the world, which has informed identification of actions described later in this document.

STAGE 3 – STAKEHOLDER ENGAGEMENT

Between July and November 2024, we met with stakeholders from across the alpine resorts sector to better understand unique resort characteristics, existing adaptation efforts, and opportunities for future collaboration with ARV. This included:

> Resort Stakeholder Consultative Committees (SCCs)

> Traditional Owners

> Lift companies (Vail Resorts and Buller Ski Lifts)

> Parks Victoria

> Water authorities

> ARV staff, Executive and Board.

STAGE 4 – DEVELOP CLIMATE CHANGE ADAPTATION STRATEGY

The outcomes of the desktop research and stakeholder engagement were synthesised to produce a concise summary of our climate change adaptation priorities and a short-list of potential ARV-led adaptation actions. We used the following multi-criteria analysis framework to support selection of actions for implementation:

> **Importance** – reflecting the effectiveness of an action in reducing risk, and alignment with ARV's strategic direction.

> **Technical feasibility** – whether the action has been successfully implemented under similar conditions.

> **Cost** – consideration of both the capital and operational cost implications for ARV.

> **Benefit** – broad assessment of potential social, environmental and economic benefits.

> **Impact on Victoria's emissions profile** – whether the action would meaningfully reduce or increase greenhouse gas emissions.

> **Stakeholder acceptance** – the extent to which community and stakeholders are anticipated to support the action, based on stakeholder engagement undertaken.

> **Implications for vulnerable communities and future generations** – whether the action will disproportionately affect vulnerable communities or intergenerational equity.

We also developed a framework for integrating climate change adaptation into decision-making across the business (described further in "Our approach to adaptation decision-making") and a template for ensuring we report transparently on our climate change adaptation and mitigation obligations.

Key values supported by our alpine resorts

This Strategy is built on a strong commitment to preserving what matters most to alpine communities, all Victorians, and ARV in the face of climate change. The alpine resorts offer diverse experiences in some of Australia's most unique landscapes, making a significant contribution to Victoria's tourism economy and supporting a range of environmental, social, cultural, and economic values. By integrating these values into adaptation planning, we ensure our response is tailored to the specific needs and aspirations of alpine communities and stakeholders.

Through engagement, we identified five key value themes, which also align with those highlighted in the 2016 *Alpine Resorts Futures* project. Understanding these values and the climate change impacts they may experience helps lay the foundation for our Strategy.

Key values supported by our alpine resorts

Theme	Key insights	Potential impacts	Potential opportunities
Snow activity participation	The alpine resorts are the only places in Victoria where people can easily enjoy snow activities. While many are willing to travel long distances for this experience, resorts located closer to Melbourne enable this within an easy day trip. Skiing and snowboarding remain popular, and there is also growing interest in snow play, tobogganing and snowshoeing activities, driven in part by Melbourne's growing population. White season is the main economic driver for the resorts, with visitation closely linked to the amount and quality of snow, whether natural or manufactured.	In the event of unreliable or inconsistent snow, visitors may adjust their travel plans by rescheduling their trips, staying for shorter periods, shifting their focus to alternative activities, or choosing not to visit Victorian alpine resorts altogether. Other climate hazards such as high winds, extreme rain and bushfire weather also pose a threat to critical alpine resort assets such as civil infrastructure, roads and carparks.	Continued advancements in snowmaking technology are enabling manufactured snow to be produced under warmer conditions, alongside improved snow management techniques that keep snow on the ground for longer. This helps to offset the impacts of variability in natural snowfall.
Green season tourism	The alpine regions are a popular destination for activities that are not snow-dependent, such as hiking, sightseeing and mountain biking. However, the green season generates much lower revenue than the white season for ARV and other alpine resort stakeholders. The green season in Victoria is projected to become longer and warmer due to climate change. Additional investment in infrastructure would be required to support diversification of activities for the green season.	In the short term, it is challenging for ARV to derive an income from green season tourism, which poses a significant barrier to justifying investment in green season activation. ARV's lack of funds inhibit us from taking a loss leader approach to the green season. Any investment by ARV in the green season will need to be balanced by careful consideration of the risks posed by bushfire weather, the chance of increasingly severe storms, and additional costs required to support ongoing white season activities.	Private sector investors offer a potential source of capital and expertise required to develop and effectively operate successful green season activities not currently offered. Alpine resorts may serve as a cool refuge for visitors and community in the summer months. There is the potential for green season to provide increasing economic benefits for the alpine resorts and regions, even if ARV is less able to monetise these activities.

Key values supported by our alpine resorts

Theme	Key insights	Potential impacts	Potential opportunities
Community values and culture	Many people have deep multi-generational bonds to the alpine sector, and to specific alpine resorts. Sustaining the alpine resorts and their activity-based and nature-based cultures is extremely important for maintaining the social fabric of alpine communities. Victorian Traditional Owners are the original custodians of the land, water and mountains with a profound connection to Country. Reading, healing and caring for Country inherently incorporates a changing climate.	Social consequences of a changed alpine environment may be driven by growing economic pressures, loss of employment, and loss of familiar experiences and established activities.	Meaningful engagement will increase the likelihood that adaptation responses are designed and implemented in a manner that is supported by, and delivers benefits for, a wide range of stakeholders. A climate-resilient future for the alpine resorts relies on both ARV and stakeholders playing their part in implementing adaptation actions. The strength of alpine communities will be an asset in progressing together towards this goal.
Biodiversity	The alpine resorts sustain significant environmental values, including many flora and fauna species, including those that are snow-dependent, unique in the world and significant to Victoria. Efforts to diversify tourist offerings (e.g. expansion of walking and mountain biking tracks) need to be delivered in a way that protects these values.	A changing climate has already contributed to environmental disturbance in Victoria's alps, both through warming temperatures, reduced snow cover, and extreme events such as bushfires. This will continue to challenge the adaptive capacity of iconic species such as the Mountain Pygmy-possum.	The unique biodiversity of Victoria's alps is a major drawcard for tourism. ARV can build on a strong track record of delivering effective and innovative management strategies for species such as the Mountain Pygmy-possum.
Economic development and commercial viability	Maintaining the resorts' economic activity is a key priority and value to protect. Alpine resorts in Victoria are a major contributor to the tourism economy, generating thousands of direct and indirect jobs, and providing an Annual Economic Output of $2.14 billion.[4] Our resorts also support substantial private sector investment relative to government costs, which means that every $1 of government investment into assets has leveraged $4 of private sector asset investment.[4] The resorts' continued economic contribution to regional Victoria is particularly important given the transitions of the native timber harvesting and power industries in neighbouring communities.	Reductions in natural snowfall may adversely affect winter and spring revenue without greater investment in snowmaking and enhanced snow management. These financial pressures would adversely impact economic activity and, most likely, employment. While an increased emphasis on green season tourism may go some way to address shortfalls from the white season, the lower average daily spend in the green season makes it difficult to fully offset the additional financial stressors facing white season activities.	The cost of climate inaction – failure to act on adaptation and emissions reduction – is projected to be significant. While many climate adaptation measures involve upfront costs, if designed and implemented appropriately they will provide a return on investment through a mixture of avoided losses, reduced ongoing operating costs, and new revenue streams.

4 SGS Economics. (2024). *Economic Contributions and Benefits of Victoria's Alpine Resorts.*

Key values supported by our alpine resorts

Each resort has unique strengths derived from its geography, natural environment, physical infrastructure and community and visitor base. These resort-specific features are a source of resilience and will be considered in ARV's ongoing leadership in the management of climate change impacts.

Falls Creek	Mt Buller	Mt Hotham	Mt Baw Baw	Mt Stirling	Lake Mountain
Natural beauty in summer and is more accessible than some of the other resorts Snowmaking infrastructure and water supply can be used to defend critical lifting infrastructure from bushfire Sufficient water is available but not in all the specific locations where it's needed Services the beginner and intermediate skier/ boarder market More gentle terrain enables better snow retention (relative to Mt Hotham) Is a cross country skiing hub Established year-round community and events Extensive existing tourism infrastructure	Highest visitation of all Victorian resorts – due to extensive and high-capacity facilities and infrastructure, plus its closer proximity to Melbourne Buller Ski Lifts has significant experience in snowmaking and snow management technologies Diverse terrain with ski slopes for all competency levels Extensive existing tourism infrastructure Located close to Mt Stirling Snowmaking infrastructure and water supply can be used to defend critical lifting infrastructure from bushfire Water availability is a critical issue	Highest elevation resort, which may therefore be subject to the lowest and slowest level of warming Extensive existing tourism infrastructure Snowmaking infrastructure and water supply can be used to defend critical lifting infrastructure from bushfire Great Alpine Road runs through the site making the Resort accessible from both sides of the Dividing Range Victoria's best resort for intermediate and advanced terrain Close to the established Alpine settlement of Dinner Plain, which provides other activity and accommodation options	Closer to Melbourne than the northern resorts, offering an entry-level snow experience Services the Gippsland market, with a major visitor base from south-eastern Melbourne and Culturally and Linguistically Diverse (CALD) communities Local vegetation species are a draw for naturalists Significant area of peatlands/Alpine bogs contribute to catchment water quantity and quality Has two access roads, although the clearing and accessibility of one of those routes is subject to further negotiations with the responsible authority beyond 2025	Undeveloped natural environment Large alpine offset site, which helps to enable development at other resorts (particularly Mt Buller) Close to Mt Buller and its extensive infrastructure Modest but consistent flow of school groups and educational programs Diverse green season activities, including being the only resort to permit horse riding, with popular and iconic trail rides commencing in the resort Only resort offering patrolled back country skiing and snow camping Major gateway to Victoria's High Country outside the Resort boundaries	Nearest resort to Melbourne, offering a low-cost snow experience Built infrastructure is modern and has extensive solar PV Provides a low-cost snow experience, with a focus on families ARV is the only on-mountain stakeholder, giving it more autonomy around operational decisions Strong snow play product supported by a SnowFactory Easy and safe access road

Climate science and impacts

This section summarises key trends, projections and impacts facing Victoria's alpine resorts due to climate change. Where possible, this draws on Victoria's Climate Science Report 2024 (VCSR24), which represents the most up-to-date view of how the State's climate is projected to change over the rest of this century.

However, VCSR24 does not include projection data for snow, which is a critical issue for ARV and this Strategy. A range of alternative sources have been used to provide a sense of projected future snow conditions (e.g. days of snow cover, depth, suitable snowmaking conditions), noting that these sources use a range of different underlying assumptions.

TABLE 1: UNDERSTANDING CLIMATE PROJECTIONS

Effective adaptation planning means taking actions that can build ARV's climate resilience under different emissions scenarios. VCSR24 uses different Shared Socioeconomic Pathways (SSPs) to how societal choices – such as population growth, economic growth, urbanisation and technological developments – could affect global greenhouse gas emissions and the rate of climate change.

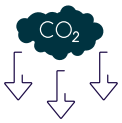
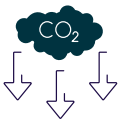
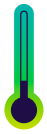
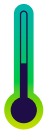
	SSP1-1.9 'Sustainability'	SSP1-2.6 'Sustainability'	SSP2-4.5 'Middle of the road'	SSP3-7.0 'Regional rivalry'	SSP5-8.5 'Fossil-fuelled development'
RCP equivalent	No equivalent RCP	RCP2.6	RCP4.5	No equivalent RCP	RCP8.5
The way the world might change in the future					
Emissions reduction	 Very high and immediate	 High and immediate	 Moderate from 2040s	 None	 None
Energy sources	 Renewables	 Renewables and biofuels	 Renewables and fossil fuels	 Fossil fuels	 Increased fossil fuels
Carbon dioxide removal	 New technology	 New technology	None	None	None
Global socio-economic trends	Gradual move towards sustainability and environmental respect; increasing action towards Sustainable Development Goals (SDGs)	Gradual move towards sustainability and environmental respect; increasing action towards SDGs	Similar to the past; unevenly distributed; slow progress towards SDGs	Slow growth at the expense of the environment and increasingly unequal	Rapid growth at the expense of the environment; resource-intensive lifestyles and industries; dependence on technological solutions
What the future climate may look like under each SSP					
Global warming by 2100	 1.0–1.8 °C	 1.3–2.4 °C	 2.1–3.5 °C	 2.8–4.6 °C	 3.3–5.7 °C

Figure above: An overview of the five SSPs used in modelling the global climate[5]

How we use climate data also varies depending on the types of decisions we are making. For shorter term decisions we may only need to consider the projected climate in the 2030s, but for major decisions with long-term implications (e.g. investment in new civil infrastructure), we must consider what our climate could look like in 2100 and beyond.

5 Department of Energy, Environment and Climate Action. (2024). Victoria's Climate Science Report 2024 (p.31). https://www.climatechange.vic.gov.au/victorias-changing-climate/Victorias-Climate-Science-Report-2024.pdf

Snow

Our alpine resorts are all accustomed to year-to-year variability in natural snow cover, having developed and refined a range of techniques to make the most of the snow that does fall, and augmenting this with manufactured snow where needed. However, climate change is expected to increase this challenge, with reduced natural snow depth expected under all emissions scenarios.

Changes in snowfall patterns are likely to increase financial and resource (power and water) investment in snowmaking and may affect visitation during the white season, although the resorts' present snowmaking capabilities have already established a level of resilience to this impact (see Table 2). Available data also suggests a projected decrease in relative humidity across this century,[6] which could enable more desirable snowmaking conditions by lowering wet bulb temperatures.

Trends		Key Projections	
	Reduced natural snowfall in the Australian Alps, with decreasing trends in max. snow depth of 0.4cm to 0.6cm per year observed in the Snowy Mountains since the 1950s[7]		Continued reduction in natural snowfall and snow depth are anticipated compared to a 1980-1999 baseline[8]
	Shorter natural snow seasons relative to the 1960s; with seasons starting later and finishing earlier		Changes to the natural snow season with projections indicating an earlier end to natural snowfall but not necessarily a later start[9]
			Large natural variability will continue to occur from year to year, but there will be an increased risk of poor seasons for natural snowfall

Impacts for ARV

- Potential reduction in a key revenue stream (resort entry) if white season visitation not maintained
- Need for continued investment in sustainable and affordable water and electricity infrastructure to support increased snowmaking
- Increased impetus to continue diversifying activity offerings beyond snow-based activities

Impacts for the sector and alpine communities

- Reduced water supply for alpine streams and water storages due to lower average precipitation (snow and rain)
- Increased risk of rain-on-snow flooding exceeding drainage capacity

6 Clarke, J.M. et al. (2019). Vic Climate Projections 2019 Technical Report_1.pdf (climatechangeinaustralia.gov.au)

7 Grose, M. & Hennessy, K. (2024). *Climate concerns: Trends in Australian snow*. https://www.csiro.au/en/news/All/Articles/2024/June/snow-trends-Australia

8 Bhend, J., Bathols, J. & Hennessy, K. (2012). *Climate change impacts on snow in Victoria*. CSIRO Marine and Atmospheric Research, Melbourne, Australia.

9 Harris, R., Remenyi, T. & Bindoff, N. (2016). *The Potential Impacts of Climate Change on Victorian Alpine Resorts*. https://swift.rc.nectar.org.au/v1/AUTH_4a33cd0edb47438ca9029479f143496b/rd-rocftr/CFA_-_Alpine_Resorts_Study.pdf

Snow

TABLE 2: EFFECTS OF SNOWMAKING ON VISITATION

We commissioned analysis of visitation and snow data at Mt Buller to understand how manufactured snow has contributed to maintaining visitation during periods of varying natural snowfall. Although the data is specific to Mt Buller, it reflects the trends observed across the alpine resorts, with snowmaking occurring at all except Mt Stirling.

The analysis found that – up to a threshold of 68 centimetres total depth (natural and manufactured) – a one-centimetre increase in manufactured snow depth is associated with an increase of approximately:

> 70 visitors per day.

> 41 unique skier scans per day.

The study suggests that in 2023, snowmaking activities increased total skier days by 21%, and skier scans by 60% compared to a scenario where no snowmaking occurs. This data also shows that snowmaking has strongest benefits towards the start and end of the white season when natural snow levels are lower. Snowmaking has been estimated to increase the overall number of visitor days between 2017 and 2024 by an average of 16%, and the number of skier days by an average of 12%. Actual (with snowmaking) and projected (without snowmaking) visitor days and skier scans for Mt Buller in 2023 are shown in Figures 4.1 and 4.2.

Additionally, as shown in Figure 4.3, while natural snowfall at Mt Buller exhibited a decreasing trend between 1985 and 2024, the total number of visitor days increased across the same period. Although visitation is influenced by a range of factors, snowmaking has been a major contributor to maintaining an upward trend.

Figure 4.1
Actual and projected visitor days for Mt Buller in 2023

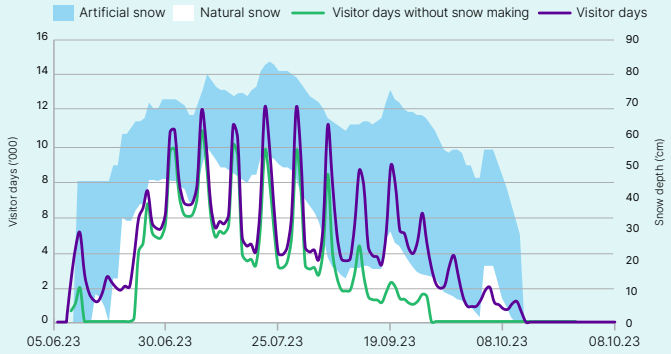


Figure 4.2
Actual and projected skier scans for Mt Buller in 2023

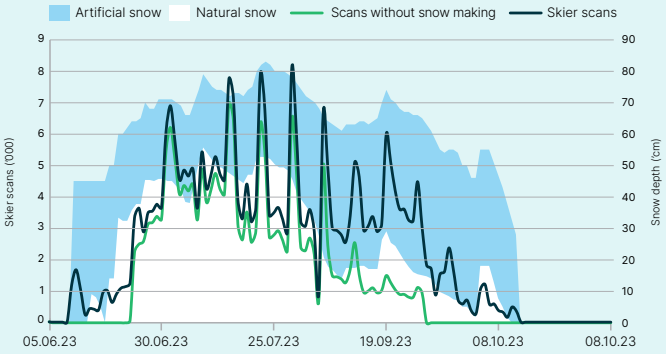
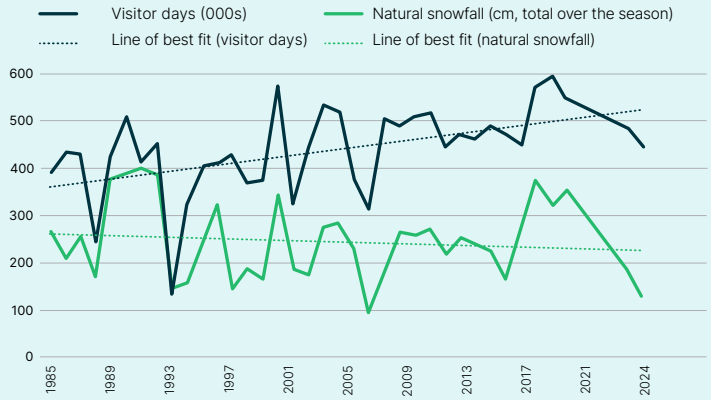


Figure 4.3
Visitor days and natural snow depth at Mt Buller 1985-2024 (excluding COVID-affected years of 2020-2022)



Rainfall

Across all resorts, available data indicates a trend towards less average rainfall but with more intense downpours. While reduced overall rainfall points to increased challenges for streamflow, water availability and bushfire risk, heavier extreme rainfall events may offer opportunities to capture and store water for later use (e.g. for drinking or snowmaking). Heavy rainfall can cause erosion and landslides, especially in mountainous terrain, while replenishing aquifers and recharging groundwater can benefit the natural environment.

There are competing demands for water at the resorts, from residential to snowmaking and environmental needs. Reduced average rainfall and more time in drought could pose practical challenges for some resorts, although some (e.g. Falls Creek) have plentiful groundwater supplies. Use of water for snowmaking can give rise to public perception issues that may increase under climate change, although it should be noted that most of the water used for snowmaking does return to the local catchment.

Trends		**Key Projections**	
	A 9% decrease in April-October rainfall over south-east Australia since 1994 has contributed to drier conditions[10]		Further reductions in average rainfall have been projected for the coming decades over the Ovens-Murray and Gippsland regions, including the alpine resorts, with the strongest decrease during winter and spring
	Despite the decrease in April-October rainfall, there has been an increase in the intensity of heavy rainfall events over Australia in recent decades[11]		By 2050, decreases in annual rainfall between -5% to -9% may be seen
			More time spent in drought, with a projected increase of between 6% and 16% by 2050[12]

Impacts for ARV

- Additional investment may be required to seize opportunities for water capture and storage during heavy rainfall events
- Higher scrutiny from the public on resort water consumption during periods of low water supply
- Higher risk of flooding caused by intense rainfall events temporarily affect service delivery
- Extreme rainfall causing damage to infrastructure assets such as roads, drainage, and third-party critical infrastructure (e.g. energy grid; telecommunications)

Impacts for the sector and alpine communities

- Less rainfall and more time in drought may result in the introduction and/or tightening of limits on acceptable water uses or extraction amounts
- Flooding caused by intense rainfall events may create unsafe driving conditions
- Drier conditions increase risk of bushfire, requiring extra spend on fire protection

10 Clarke, J.M. et al. (2019). Vic Climate Projections 2019 Technical Report_1.pdf (climatechangeinaustralia.gov.au)

11 CSIRO & Australian Bureau of Meteorology. (2022). *State of the Climate 2022*. http://www.bom.gov.au/state-of-the-climate/2022/documents/2022-state-of-the-climate-web.pdf

12 Climate Measurement Standards Initiative. (2020). *Scenario analysis of climate-related physical risk for buildings and infrastructure: climate science guidance.* https://uploads-ssl.webflow.com/5f1bdaf710347301b0c01fd4/5f5c2f4dbab6710bcc21a93c_CMSI%20-%20Climate%20Science%20Guidelines.pdf

Bushfire

Bushfire risk management is complex in alpine areas due to their isolated location, steep topography, climate variability, environmental significance, and unique vegetation. With a projected increase in extreme fire danger days and longer bushfire seasons, it is important for future developments to actively plan for expected future conditions. While our larger resorts can make use of snowmaking infrastructure to support firefighting, the availability and cost of bushfire insurance remains a major challenge for our alpine resort stakeholders.

The projected increase in fire risk places properties and infrastructure at greater risk, may affect tourism outside the white season, increases the need for fire risk management, and can cause loss of biodiversity (e.g. Mountain Ash trees failing to regenerate following a major bushfire).

Trends		Key Projections	
	More frequent and extreme fire weather in Australia since 1950 due to warmer and drier conditions, particularly in south-east Australia[13]		The annual number of extreme fire weather days may increase up to 30% by 2050[14]
	Higher occurrence of extreme fire weather days in south-east Australia since 2000[15]		Increase in fire weather, burned area, and forest megafires are likely to continue
	The frequency of megafire years (>1 Mha burned) has increased since 2000[13]		Fire seasons may start earlier and end later[16]

Impacts for ARV

- Increased need for development approvals to consider future projections and increased resilience measures (e.g. higher Bushfire Attack Levels)
- More frequent bushfire events reducing suitable windows for fire risk reduction activities and other development works
- Increased emergency management and business continuity planning to prepare for more severe bush-fire weather, including poor air quality due to smoke
- Increased need to communicate bushfire risks to the community and tourists
- Damage to and loss of ARV assets
- Higher post-event recovery and rehabilitation costs

Impacts for the sector and alpine communities

- Impacts on tourism outside the white season
- Damage to electricity transmission, resulting in loss of power to homes and businesses
- Inability to access roads due to damage, dangerous/fallen trees and debris
- Increased need for fire protection for residential properties and businesses, and rising insurance premiums
- Respiratory illness and poor visibility due to smoke
- Failure to recover adequately following a fire event could impact white season product and service delivery, with major social and economic consequences

13 Canadell, J.G. et al (2021). Multi-decadal increase of forest burned area in Australia is linked to climate change | Nature Communications. https://www.nature.com/articles/s41467-021-27225-4

14 CSIRO and Australian Bureau of Meteorology (2015). Climate change in Australia: Technical Report. https://www.climatechangeinaustralia.gov.au

15 Jones et al., (2022). Global and Regional Trends and Drivers of Fire Under Climate Change. Reviews of Geophysics. https://doi.org/10.1029/2020RG000726

16 Lucas, C., Hennessy, K., Mills, G. and Bathols, J. (2007). Bushfire Weather in Southeast Australia: Recent Trends and Projected Climate Change Impacts. Report for the Climate Institute of Australia by the Bushfire CRC, BoM and CSIRO.

Temperature

During the green season, the likelihood of more frequent and extreme heatwaves may have some positive consequences for resorts as tourists seek a cool refuge at higher altitudes. However, it should be acknowledged that such conditions may also coincide with periods of heightened bushfire risk.

Trends		Key Projections	
	Over the alps in south-eastern Australia, the annual average temperature has risen by about 1.4°C since 1950[17]		Average temperatures in Victoria are projected to be between 0.9 to 1.8°C warmer by the 2050s compared to 1986-2005[18]
	Victoria has experienced more warm years than cool years since the 1960s[18]		The number of annual heatwave days in the alpine regions may increase by up to 25 days by the 2050s
	Victoria's two hottest temperatures on record occurred in 2009, followed by the third and fourth hottest in 2019[19]		Average minimum winter temperatures may increase across the resorts by between 1.2–1.6°C by the 2050s

Impacts for ARV

- Possible increase in visitation as tourists seek refuge at higher altitudes during the green season
- Higher demand for snowmaking due to warmer temperatures
- Greater need to communicate heat risks to green season tourists

Impacts for the sector and alpine communities

- Reductions in natural snow cover and more instances of extreme heat, both placing sensitive alpine flora and fauna under stress
- Increased variability and faster thawing of snow; if followed by freezing conditions this can create more instances of hazardous ice
- Higher risk of heat stress impacts to visitors and communities
- Rising electricity consumption for cooling and air-conditioning
- Reduced winter power consumption for heating

17 CSIRO and Australian Bureau of Meteorology (2022). State of the Climate 2022. https://www.csiro.au/en/research/environmental-impacts/climate-change/state-of-the-climate

18 Victorian Government Department of Environment, Land, Water and Planning. (2019). Victoria's Climate Science Report 2019. https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0029/442964/Victorias-Climate-Science-Report-2019.pdf

19 Australian Bureau of Meteorology, 'Rainfall and temperature records'. (2022). http://www.bom.gov.au/climate/extreme/records.shtml

Extreme winds, storms and hail

While uncertainty remains around projected changes, and studies focusing on our alpine regions are limited, we have seen some recent increases in the frequency and intensity of extreme wind, storm and hail events. Extreme wind, storm or hail events can create unsafe conditions for ARV employees, residents and visitors and cause significant and costly damage to infrastructure, which may in turn inhibit service delivery. Assets in purposefully exposed locations (e.g. transmission towers, solar PV arrays) are among the most at-risk from high winds and hailstorms – this may drive increases in maintenance costs and insurance premiums.

In addition to direct impacts on ARV assets, we are also affected by storm damage to critical infrastructure in other locations. This includes power transmission lines, telecommunications, drainage, and major transport routes leading to resorts.

Trends		Key Projections	
	The number of hail-prone days between 1979 and 2021 has increased across south-east and south-west Australia[20]		7-8% increase in the frequency of favourable conditions for severe convective winds in Southern and Eastern Australia by the 2090s[21]
	In 2021, severe winds and thunderstorms across Victoria resulted in damage claims totalling $839 million[22]		The number of severe thunderstorm days per year may rise by 22% in Melbourne by the 2070s[23]
			Although there is low agreement between studies, hailstorms in Eastern Australia may increase in frequency and severity, as well as expand their existing range[24]

Impacts for ARV

- Increased need to allocate budgets for disaster and emergency response management
- Potential for higher insurance premiums
- Increased need to communicate storm risks, safety and preparation for visitors
- Impacts to infrastructure and operations, such as local flooding impacting roads and carparks
- Turbid water in catchments affects ability to pump for potable supply

Impacts for the sector and alpine communities

- Damage to grid network from fallen trees or hail resulting in disruption to power supply
- Road closures due to damage from storms and hail
- Unsafe driving conditions in extreme wind, storm or hail event
- Extreme winds impacting ski lift and snowmaking operations

20 Raupach, T.H., Soderholm, J.S., Warren, R.A. et al. (2023). *Changes in hail hazard across Australia: 1979–2021.* npj Clim Atmos Sci 6, 143 https://doi.org/10.1038/s41612-023-00454-8

21 Dowdy, A., Brown A., Pepler A., et al. (2021). *Extreme temperature, wind and bushfire weather projections using a standardised Method.*

22 Australian Institute for Disaster Resilience. (2022). *Major Incidents Report 2021–22.*

23 Allen, J.T., Karoly, D.J., & Walsh, K.J. (2014). *Future Australian severe thunderstorm environments Part B: The influence of a strongly warming climate on convective environments.* Journal of Climate, 27: 3848-3868, DOI: 10.1175/ JCLI-D-13-00426.1

24 Raupach, T.H., Martius, O., Allen, J.T., Kunz, M., Lasher-Trapp, S., Mohr, S., Rasmussen, K.L., Trapp, R.J., & Zhang, Q. (2021). *The effects of climate change on hailstorms.* Nature Reviews Earth and Environment. 2, 213-236.

The low emissions transition

In line with the Paris Climate Agreement, we are seeing a global shift away from fossil fuel energy sources to more renewable alternatives that generate significantly lower or no emissions. This transition to a low-carbon economy is well underway in Australia and is being accompanied by other trends that enhance environmental sustainability, such as pursuing nature repair and a circular economy.

A rapid and orderly low emissions transition presents a major opportunity for ARV. It could deliver cheaper, greener and plentiful electricity, which would:

> Reduce operating costs

> Increase the sector's capacity to cost-effectively undertake additional snowmaking, pending reliable and sustainable water supplies

> Drastically reduce the carbon footprint of resort operations, which is increasingly important to visitors.

ARV is already pursuing low emissions energy through investment in solar and micro hydro power facilities across several resorts. However, most of our resorts will always rely on some grid-supplied electricity. As such, a disorderly low emissions transition could make our climate adaptation journey more challenging, particularly if electricity prices were to rise significantly.

<table>
<tr><th colspan="2">Trends</th><th colspan="2">Key Projections</th></tr>
<tr><td>  </td><td>Australia's electricity generation from renewable sources has more than doubled over the last decade[25]</td><td>  </td><td>Higher wholesale costs are currently driving higher electricity prices – future prices are difficult to predict[26]</td></tr>
<tr><td>  </td><td>In the year to December 2023, annual net greenhouse gas emissions were 29% lower than the year to June 2005[27]</td><td rowspan="2">  </td><td rowspan="2">The cost of carbon offsets may increase over time as more organisations are required to meet their net zero goals</td></tr>
<tr><td>  </td><td>Victoria has set world-leading targets to achieve net zero greenhouse gas emissions by 2045</td></tr>
<tr><td colspan="2">Impacts for ARV
> Potential operating cost and emissions savings from cheaper, greener power, but this requires upfront investment
> Initial electricity price rises may cause financial strain on operations
> Increased public awareness and scrutiny on ARV's actions in the low emissions transition</td><td colspan="2">Impacts for the sector and alpine communities
> As per ARV, potential operating cost and emissions savings from cheaper, greener power, but many stakeholders lack the financial capacity to make the upfront investments required to access these energy sources
> Decisions around the low emissions transition (e.g. installing renewable energy generation and EV charging) can lead to community disagreement</td></tr>
</table>

25 Department of Climate Change, Energy, the Environment and Water. (n.d). Renewables, Australian Government. https://www.energy.gov.au/energy-data/australian-energy-statistics/renewables

26 Essential Services Commission. (n.d). *Victorian Default Offer price review 2023–24.* https://www.esc.vic.gov.au/electricity-and-gas/prices-tariffs-and-benchmarks/victorian-default-offer/victorian-default-offer-price-review-2023-24

27 Australian Bureau of Statistics. (2024). *Emissions reduction.* https://www.abs.gov.au/statistics/measuring-what-matters/measuring-what-matters-themes-and-indicators/sustainable/emissions-reduction

Interacting risks highlight the importance of proactive adaptation

Individual climate hazards could present challenges and opportunities for our alpine resorts. There are also complex relationships between these hazards.

Relationships between hazards can be:

- **Compound** – when multiple hazards occur at the same time or in close succession. For example:

  When damaging storms and flooding followed the 2019/2020 Black Summer bushfires, affected communities had lower adaptive capacity as they were still in the process of recovering from the previous event.

- **Cascading** – when an initial trend or impact triggers others. For example:

  Extreme rainfall events may trigger landslides, which cause road closures and delays to emergency services, heightening community safety risks.

- **Aggregate** – cumulative impacts from multiple drivers of risk, including those not related to the climate. For example:

  A storm simultaneously causing a loss of telecommunications, disruption to lift operations and snowmaking, transport delays, and physical injury to resort users.

The challenge of interacting risks is not reserved to our sector – the University of Melbourne found that, by 2050, costs to Australia's economy from climate change impacts could total $762 billion in present value terms.[28]

This underscores the importance of investing in climate adaptation and disaster risk reduction to lessen the potential impacts of extreme events before they occur. While there remains no agreed method for measuring the return on investment for these measures, the United Nations Office for Disaster Risk Reduction (UNDRR) argues that every $1 invested in risk reduction and prevention can save up to $15 in post-event recovery.[29]

28 Kompas, T., Witte, E. & Keegan, M. (2019). *Australia's Clean Energy Future: Costs and Benefits*, MSSI Issues Paper 12, Melbourne Sustainable Society Institute, The University of Melbourne. https://sgsep.com.au/assets/main/Australias_Clean_Economy_MSSI_Issues_Paper12.pdf

29 United Nations Office for Disaster Risk Reduction. (n.d.). Our impact. https://www.undrr.org/our-work/our-impact

Our adaptation roadmap

Our adaptation roadmap

Vision *Where will ARV be in ten years?*	ARV is more resilient to a changing climate, demonstrating viable adaptation options that contribute to an economically, environmentally and socially sustainable alpine industry.
Cross-cutting principles *Non-negotiables and part of everything we do*	> Embed climate change into ARV decision-making > Enhance the climate resilience of our unique alpine landscape > Partner with Traditional Owners to support their continued economic development and care for Country

Priority challenges *Why do we need to adapt?*	*Climate change is putting more pressure on our assets and alpine communities*	*Negative public narrative about alpine viability, especially in lead-up to snow seasons, erodes market confidence*	*Increasing reliance on, and less availability of, energy and water*	*Evolving expectations for sustainable, low carbon and nature-positive tourism*	*Consistent snow levels are critical to the ongoing viability of the resorts*	*Over-reliance on the snow-based activity offering*
Objectives *What will we do better in support of the vision?*	**Objective 01** **Provide infrastructure and services that build industry and community climate resilience**	**Objective 02** **Tell our whole story**	**Objective 03** Future-proof energy and water systems	**Objective 04** **Tap into growing demand for sustainable tourism**	**Objective 05** **Support world-leading snow management**	**Objective 06** Diversify the visitor experience
	Include climate change in asset planning, future investments, and emergency management, supported by community capacity building and informed by the latest science.	Proactively promote ARV's and the sector's resilience and contribution to Victoria through targeted research and collaborative communications.	Enhance water and energy systems and management in anticipation of the future climate and energy transition, given each resort's specific context.	Ensure ARV and resorts are prepared for the continued evolution of low-carbon and sustainable activities, services and mobility.	Play our part in sustainably maximising operational days and the quality of all snow-based activities.	Work with stakeholders and government to secure investment for evolving offerings that respond to a changing climate, with a focus on shoulder and green seasons.

Actions	The following pages describe the suite of actions we can pursue over the next ten years in support of ARV's climate adaptation vision. Actions have been mapped to the most relevant of the six objectives, although many actions contribute to achievement of multiple objectives. Each objective section includes one 'showcase action' – these are important initiatives that will play a central role in ARV's climate adaptation journey over the next 10 years. They also provide examples of practical action that can be taken by other members of the alpine sector. An indicative timeline for all actions has been provided; however, implementation will be subject to annual budgets and priorities that are set in consultation with each resort's SCCs.

Objective 01
Provide infrastructure and services that build industry and community climate resilience

WHY DO WE NEED TO ADAPT?

Alpine Resorts Victoria is steward to an aging infrastructure portfolio valued at over $520 million. Historically there has been an under investment in the renewal of existing infrastructure, with climate change exacerbating this issue as further capital investments are required in many assets to build the required level of resilience to hazards such as bushfires and storms.

While obtaining the capital investment required for asset renewal is a significant challenge for ARV, such investments offer a range of longer-term benefits often referred to as the “resilience dividend”. This refers to the benefits gained from investing in measures that enhance an asset, system or community ability to withstand and recover from disruptions. By prioritising resilience, such as building stronger infrastructure, improving emergency preparedness, and fostering social cohesion, our resorts can not only reduce costs associated with damage and recovery but also see long-term economic, social, and environmental benefits.

Actions under objective 1 seek to include climate change in asset planning, future investments, and emergency management, supported by community capacity building and informed by the latest science.

HOW IS ARV ALREADY ADAPTING?

ARV has identified asset management in accordance with the Victorian Government’s Asset Management Accountability Framework (AMAF) as a key strategic focus area for our organisation. In parallel to this Strategy, we are conducting Asset Management Strategy and Critical Infrastructure Resilience projects, which will include a range of recommendations around infrastructure investments required to build all-hazards resilience.

Objective 01

Provide infrastructure and services that build industry and community climate resilience

SHOWCASE ACTION

Action 1.1: Proactively establish climate-resilient infrastructure by incorporating climate change considerations and the findings of the Critical Infrastructure Resilience and Asset Management Strategy projects into all future asset investment decisions

Climate change is shifting the physical conditions in which ARV's assets, infrastructure and services must operate. As such, it is critical that major decisions around new infrastructure and asset renewal consider the projected future climate conditions over the life of the contract or asset's design life, rather than only the historic baseline. This action will ensure that climate change considerations (e.g. allowances for increased rainfall intensity in civil designs) are appropriately built into the planning and delivery of investments identified through parallel projects and documented within resort-specific capital investment planning.

Relevant hazards							
RAD classification	Resist						
How would the action build climate resilience?	By considering future climate conditions (as relevant to the asset design life) in infrastructure decision-making, ARV will be able to make better informed decisions that reduce the exposure and vulnerability of assets to climate hazards. Over the life of assets, proactive investments in risk reduction can result in significant avoided costs associated with closures, repairs and reinstatement after extreme weather events.						
How will we measure success?	> Inclusion of climate change considerations in ARV Asset Management Strategy and resort-specific Capital Investment Plans > % of capital projects with appropriate allowances for projected climate conditions						
Indicative implementation timeline	**Short** (2025–2027)		**Medium** (2028–2030)		**Long** (2031–2034+)		
	Ongoing: implementing findings of Critical Infrastructure Resilience project 2025-onwards						

Objective 01

Provide infrastructure and services that build industry and community climate resilience

OTHER ACTIONS UNDER OBJECTIVE 01

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031-2034+)
1.2	Provide targeted support/capacity-building for resort stakeholders seeking to access grant funding opportunities and advocate with government for measures that help them meet the increasing costs of building the climate resilience and reducing the emissions intensity of their assets (e.g. increased energy efficiency, bushfire ratings, and wind loadings).	All hazards	Depends on how action is designed and implemented	Helps to reduce sensitivity of infrastructure to climate-related impacts	Number of stakeholders offered support			
1.3	Collaborate with relevant stakeholders to formalise, document and expand water infrastructure for bushfire protection (e.g. snowmaking infrastructure, existing hydrants).	Bushfire	Resist	Builds adaptive capacity to bushfire and grassfire events	Practices formalised and documented, and opportunities for expansion identified for Mt Buller, Falls Creek and Mt Hotham			
1.4	Advocate with government for funding to assess the feasibility of upgrading existing public shelters to serve as versatile community venues during the green season and provide essential relief centres / Neighbourhood Safer Places during emergencies.	All hazards	Resist	Funding would help build resilience to extreme events and provide valuable assets that support year-round community cohesion	Number of shelters upgraded			

Objective 01

Provide infrastructure and services that build industry and community climate resilience

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031-2034+)
1.5	Explore a potential partnership with Resilient Building Council (RBC) to establish bushfire resilience ratings scheme for resort tenants. The current RBC scheme for residential buildings has enabled those who complete the rating process to access premium discounts from participating insurers.	Bushfire	Direct	Scheme would reduce sensitivity of assets to bushfire and could aid insurance affordability	ARV actively explores a partnership			
1.6	Trial supporting stakeholders to plan pop-up activation initiatives that can be rapidly deployed according to changing weather conditions and/or events.	All hazards	Direct	Builds flexibility and adaptive capacity	Number of pop-up initiatives developed with ARV input			
1.7	Encourage and support resort communities to explore local factors that influence their resilience and develop community led actions in response.	All hazards	Direct	Supports year-round, place-based community resilience	Number of discussions held via Chamber of Commerce/Ratepayers meetings and any resultant community resilience outcomes			
1.8	Build on recent spatial hazard mapping work to include the projected influence of climate change where possible and ensure this information informs land use, infrastructure planning, design and investment decisions. Leverage existing information such as the Critical Infrastructure Resilience Project and Victoria's Future Climate Tool.	All hazards	Direct	Helps ensure key decisions have integrated contemporary information on climate change impacts	% of relevant ARV decisions where climate has been considered in accordance with the ARV Climate Change Decision-making Framework			

Objective 01

Provide infrastructure and services that build industry and community climate resilience

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031-2034+)
1.9	When next-generation bushfire risk modelling that accounts for climate change becomes available, review strategic planning and resort emergency response plans.	Bushfire	Depends on how action is designed and implemented	Helps ensure key decisions have integrated contemporary information on climate change impacts	Completion of a review of strategic and emergency planning, including bushfire management plan(s), in light of new information, once available			
1.10	Identify, assess and implement carbon insetting opportunities for reducing greenhouse gas emissions within ARV's value chain.	Low carbon transition	Depends on how action is designed and implemented	Reduces ARV's exposure to transition risk by reducing carbon footprint	tCO_2-e abatement through ARV insetting			
1.11	Ensure ARV's emergency management planning is climate-ready by taking into account current climate and near-term projections (not only historical data and lived experience), when participating in the revision of Community Emergency Risk Assessments and ARV's Municipal Emergency Management Plan.	All hazards	Depends on how action is designed and implemented	Helps ensure key decisions have integrated contemporary information on climate change impacts	Future climate has been demonstrably considered in revisions of these documents			

Objective 02
Tell our whole story

WHY DO WE NEED TO ADAPT?

Media reports and public discourse, particularly in the lead-up to winter, often focus on projections of reduced snowfall due to climate change. This can lead to perceptions that the alpine regions are no longer reliable for winter activities, posing a significant challenge for ARV and the wider industry. A strong and resilient alpine sector depends heavily on early white season momentum from confident visitors – negative public narrative can erode market confidence by discouraging potential visitors, as well as investors who may question the long-term sustainability and profitability of the alpine resorts.

While it is true that our alpine resorts face increased challenges because of climate change, ARV and other stakeholders are actively adapting and drawing on the resilience that has long defined our sector. Correcting any unbalanced narrative requires proactive communication strategies, showcasing the diverse experience offered by the alpine region year-round, the practical actions we are taking to support the key values that draw people to our resorts, and the potential for game changing innovations in areas like snowmaking and renewable energy.

HOW IS ARV ALREADY ADAPTING?

Through our strategic marketing function, ARV undertakes extensive communications to support visitation to our resorts. We promote our sustainability-focused initiatives (e.g. waste segregation and recycling; rooftop solar installation at Lake Mountain) directly to visitors through social media, websites, stakeholder newsletters, signage and press releases, but there is more we can be doing to communicate our and stakeholders' efforts to build climate resilience.

Objective 02
Tell our whole story

SHOWCASE ACTION

Action 2.1:
Strategic and collaborative public relations and communications to counteract common negative messaging around the sector's climate resilience

ARV has commissioned a range of studies that confirm our sector's considerable economic contribution to Victoria and the regions. We will work collaboratively with key resort stakeholders to better promote this contribution, as well as shine a stronger light on existing efforts to build the sector's resilience to climate change. This is critical for offsetting the unbalanced narrative that is particularly prevalent in the lead-up to snow seasons.

This will require an active focus on media engagement to ensure the message is heard. We will ensure promotion aligns with, and builds on, the efforts of others (e.g. lift companies), minimises duplication of effort, is evidence-based, and ramps up in the lead-in to each snow season.

Relevant hazards						
RAD classification	Direct					
How would the action build climate resilience?	This action will foster increased confidence in the sector among prospective visitors and investors. This would support ARV and resort stakeholders' financial position and capacity to pursue additional climate adaptation initiatives.					
How will we measure success?	> Number of positive media articles published, and audience reached > Surveys assessing changes in consumer confidence and perceptions relating to alpine resort snow product					
Indicative implementation timeline	**Short** (2025–2027)		**Medium** (2028–2030)		**Long** (2031–2034+)	

Objective 02
Tell our whole story

OTHER ACTIONS UNDER OBJECTIVE 02

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031–2034+)
2.2	Model future visitation and skiable days considering influence of snowmaking, building on the work summarised in Table 2. Most existing studies into sector viability do not factor in current snowmaking, and those that do fail to account for expected future advancements and investments (e.g. improved efficiency, greener grid). This modelling would become a key source of evidence for Action 2.1.	Snow	Direct	Increased consumer and investor confidence supports the sector's financial capacity to adapt	Modelling is completed and findings communicated			
2.3	In collaboration with lift companies for data provision, research and publicise the actual environmental impacts of snowmaking (water, power) to support improved community understanding. This would become a source of evidence for Action 2.1.	Snow, rainfall, low emissions transition	Direct	Builds confidence among consumers and investors, many of whom are placing an increased emphasis on environmental, social and governance (ESG) performance	Research completed and findings publicised			

Objective 02
Tell our whole story

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031–2034+)
2.4	Develop key messaging to promote the seasonal advantages of Victoria's alpine resorts (such as milder summer temperatures) to support year-round visitation.	Temperature	Direct	Supports with diversification of resort offerings and supports financial capacity of ARV and sector to implement other adaptation measures	Key messaging developed and distributed			
2.5		Snow	Direct	Supports visitor satisfaction, which in turn supports the sector's adaptive capacity	Key messaging developed and distributed Customer satisfaction surveys indicate customers are satisfied			

Objective 03
Future-proof energy and water systems

WHY DO WE NEED TO ADAPT?

Our alpine resorts increasingly rely on energy and water to deliver a safe, comfortable and high-quality visitor experience. These resources are fundamental in resort operations, from snowmaking to lift operations, as well as providing essential amenities such as heating and lighting. Accessing energy and water in the alpine regions is challenging, with electricity prices increasing in recent years, several resorts lacking electricity grid connections, and some struggling to meet their white season needs under current water offtake agreements. Climate change is expected to exacerbate these issues, reducing average rainfall and causing more extreme weather events like bushfires and storms which can interrupt water and energy supplies.

Global efforts to slow climate change by reducing greenhouse gas emissions are also influencing our energy system to transition away from fossil-fuel energy sources. It is our responsibility to proactively plan and implement actions to reduce our emissions through energy efficiency and investigation of alternative technologies, while maintaining operational continuity and ensuring high-standard visitor experiences.

Without action to future-proof our energy and water systems, we risk unsustainable operating costs and negative environmental impacts, which threatens our long-term viability. Actions under objective 3 pursue reliable, sustainable and affordable energy and water sources for the resorts.

HOW IS ARV ALREADY ADAPTING?

Many of our resorts have been equipped with sustainable energy sources, providing them with resilience to changing power prices and grid instability. This includes the off-grid micro hydropower system at Mt Stirling, and solar power and battery storage systems at Lake Mountain and Mt Baw Baw. We have also invested in expanding water storage and recycling infrastructure at Mt Hotham and Mt Buller in the last 20 years.

Objective 03
Future-proof energy and water systems

SHOWCASE ACTION

Action 3.1: Develop and implement Integrated Water Management Plans in accordance with Victorian policy requirements and considering potential climate change impacts on supply and demand to improve water security

Integrated water management is a holistic approach to planning for and managing all elements of the water cycle,[30] including making use of alternative water sources – like recycled water and stormwater.[31] It also involves collaboration – with water authorities, alpine communities, water customers and other stakeholders – to identify and maximise available water resources and secure the right balance between catchment yield, regional demand, environmental values, and resort economic viability.

It's imperative we understand all the resorts' potential water sources and end uses to ensure a reliable supply, particularly during peak demand periods. We will develop informed and proactive plans to maintain an accessible and reliable water supply in line with operational, community and environmental needs. This will include exploring innovative methods for optimising water collection and storage through expansion of rainwater collection, and stormwater harvesting for example. The plans may also include measures for establishing or enhancing wastewater recycling, noting Mt Hotham already has a treatment plant, while Mt Buller has a mothballed treatment facility.

Relevant hazards		RAD classification	Direct
How would the action build climate resilience?	Establishing additional water sources and using water more efficiently enhances resorts' adaptive capacity in the face of decreasing average rainfall, reducing vulnerability to a drying climate. Expanding rainwater and stormwater harvesting may also enable us to increase yields due to the projected increasing intensity of extreme rainfall events.		
How will we measure success?	> Reduction in L potable water consumed per visitor day > Ability to consistently meet compliance requirements and water demand across the resorts > kL water saved through infrastructure, efficiency, reuse or recycling initiatives		
Indicative implementation timeline	**Short** (2025–2027)	**Medium** (2028–2030)	**Long** (2031–2034+)
	Develop	*Implement, Review & Refine*	

30 Department of Energy, Environment and Climate Action. (2023). *Integrated Water Management, Victorian State Government*. https://www.water.vic.gov.au/our-programs/integrated-water-management

31 Melbourne Water. (2024). *Integrated water management*. https://www.melbournewater.com.au/water-and-environment/energy/integrated-water-management

Objective 03
Future-proof energy and water systems

OTHER ACTIONS UNDER OBJECTIVE 03

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031–2034+)
3.2	Undertake extensive options analysis on provision of more affordable, reliable and sustainable power to the resorts.	All hazards Low carbon transition	Depends on how action is designed and implemented	Can reduce exposure to fluctuations in the price and availability of fossil fuels, and may increase adaptive capacity by building greater redundancy into energy systems	Energy Performance and Feasibility Analyses completed for Lake Mountain and Mt Baw Baw Options analyses completed for other resorts Lower cost per unit of energy (e.g. $/kWh)			
3.3	Embed actions to protect key biodiversity and catchment assets when updating environmental management plan for the resorts.	All hazards	Depends on how action is designed and implemented	Depends on how action is designed and implemented – may reduce either exposure or vulnerability	Environmental Management Plans updated Positive biodiversity monitoring results Positive waterway health monitoring results			

Objective 04
Tap into growing demand for sustainable tourism

WHY DO WE NEED TO ADAPT?

Visitor expectations are evolving, and there is increasing demand for tourism offerings to be sustainable, low carbon and nature-positive. This reflects a heightened public awareness of environmental degradation, escalating extreme weather events, and an urgent need to reduce our collective carbon footprint. People are becoming more conscious of how travel and tourism may cause negative impacts, and this shift in consumer behaviour stems from the visible and growing effects of climate change. This is coupled with climate change directly disrupting the alpine resorts' traditional tourism model, with more variability in natural snowfall and a projected increased risk of extreme weather events. Therefore, it makes sense for both operators and visitors to pivot towards a more sustainable, adaptive tourism model that will be less vulnerable to climate impacts.

Actions under objective 4 look to foster visitor experiences that meet modern expectations for environmental sustainability taking care to reduce our emissions footprint and avoid environmental impacts.

HOW IS ARV ALREADY ADAPTING?

As leaders in Victoria's outdoor recreation and nature-based tourism sector, our resorts are popular destinations year-round and are increasingly attracting larger shares of visitors in both the green and white seasons. We have invested in sustainable and carbon-reduction initiatives to reduce our environmental footprint, such as implementing organic waste collection and solar energy, and we continue to provide and upgrade walking, hiking and mountain bike trail networks across each mountain to enable passive enjoyment of the alpine environment during green season.

Taking care of the unique ecosystems that draw visitors to Victoria's alpine resorts is also a key priority. As the Crown land manager, we implement pest and animal control programs, oversee vegetation management, and undertake monitoring and management of threatened species. We have played a significant role in conservation efforts for the Mountain Pygmy-possum through a mixture of habitat re-creation and revegetation, genetic rescue and research initiatives, resulting in an increase in the recorded population between 2008 and 2015,[32] and the largest ever population numbers recorded in spring 2023.[33]

32 Weeks, A.R. et al. (2017). *Genetic rescue increases fitness and aids rapid recovery of an endangered marsupial population.* Nature Communications, 8, 1071. https://www.nature.com/articles/s41467-017-01182-3

33 ARV. (2024). *Annual Report 2023*. p. 27 https://www.alpineresorts.vic.gov.au/__data/assets/pdf_file/0020/723206/arv_annual_report_2023_FA5.pdf

Objective 04

Tap into growing demand for sustainable tourism

SHOWCASE ACTION

Action 4.1:
Collaboratively develop an ARV low emissions mobility strategy for all resorts

We will work with stakeholders to design and implement a strategy to reduce transport greenhouse gas emissions associated with visitor, stakeholder and staff travel to, from and within the alpine resorts. This will place ARV as a "fast follower" of transitional mobility, preparing for rising numbers of electric vehicles by planning appropriate power and charging infrastructure, while learning from others who are "early adopters" of low emissions vehicle technologies within Victoria and globally in alpine areas. The strategy will focus on promoting sustainable mobility options such as public and active transport and will leverage the resorts' collective buying power to reduce capital expenditure for both ARV and stakeholders wherever possible.

Relevant hazards		RAD classification	Direct
How would the action build climate resilience?	By lowering our dependence on fossil fuels, our vulnerability to fluctuating fuel prices and supply chain disruptions is reduced. It also increases our resilience to potential future shifts in government regulations relating to carbon emissions.		
How will we measure success?	> ARV low emissions mobility strategy complete > % electric / hybrid vehicles in ARV fleet		
Indicative implementation timeline	**Short** (2025–2027)	**Medium** (2028–2030)	**Long** (2031–2034+)
	Develop	*Implement, Review & Refine*	

Objective 04
Tap into growing demand for sustainable tourism

OTHER ACTIONS UNDER OBJECTIVE 04

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031–2034+)
4.2	Develop an electric vehicle transition strategy for the ARV fleet, in line with Victorian Government policy and commitments and taking into consideration the effects of cold weather on vehicle performance.	Low carbon transition	Direct	Reduces vulnerability to fuel price and supply chain disruption, or changes to government regulations	ARV Fleet EV Transition Strategy complete % electric / hybrid vehicles in ARV fleet	*Develop*	*Implement*	
4.3	Encourage opportunities to alleviate the use of private cars and improve the affordability of travelling to all resorts by promoting more sustainable travel choices such as carpooling and advocating for the Victorian Government to investigate alternative mass transport options.	Low carbon transition	Direct	Supports visitors and community to reduce their carbon emissions, while promoting increased year-round visitation through improved affordability	Increase in average number of people per vehicle entering resorts Increasing number of visitors arriving by bus/increasing number of buses			
4.4	Investigate ways to generate income from existing green season activities.	Snowfall	Direct	Reduces sensitivity to increasingly variable natural snowfall	Green season revenue			

Objective 05
Support world-leading snow management

WHY DO WE NEED TO ADAPT?

The ability to participate in a diverse range of snow-based activities while taking advantage of established infrastructure, accommodation and visitor amenities makes the alpine resorts unique in Victoria and drives strong visitor demand during white season. Snow is fundamental to a successful white season: in sufficient quantities, in the right places, and at the right time. Victoria's alpine resorts have always experienced year-on-year variability in natural snowfall, and ARV and lift companies already employ snow management techniques and extensive snowmaking technologies to optimise our white seasons. As natural snowfall becomes increasingly unpredictable due to climate change, we need to reinforce our snow management and snowmaking approach to maintain high quality snow activity products into the future.

We acknowledge that snowmaking consumes precious resources – energy and water – which aren't always abundant in the alpine resorts. That's why any expansion of snowmaking activities will need to be carefully balanced with an understanding of resorts' energy and water supplies and needs, including what's needed to support healthy alpine ecosystems. It's also why we'll need to remain aware of future technological developments which will enable more efficient use of resources, or broaden the conditions which are suitable for snowmaking, and take advantage of these developments where possible.

Actions under objective 5 aim to streamline, formalise, and consolidate ARV's support of snowmaking and snow management efforts in a financially and environmentally sustainable way, so we can continue to optimise winter for the enjoyment of all resort communities and visitors.

HOW IS ARV ALREADY ADAPTING?

ARV implements and supports effective snow management practices across the resorts, such as snow harvesting and reuse, strategic snow grooming for improved retention and snow holding, and the strategic placement of snow fences for snow retention. These are measures with proven effectiveness in making the most of existing snow. ARV implements snowmaking at Lake Mountain (using SnowFactory technology) and Mt Baw Baw, while Vail Ski Lifts performs this task at Mt Hotham and Falls Creek. ARV partners with Buller Ski Lifts to deliver snowmaking infrastructure and activities at Mt Buller.

Objective 05
Support world-leading snow management

SHOWCASE ACTION

Action 5.1:
Collaborate with stakeholders to support the development and implementation of Snow Area Management Plans at all resorts

ARV and lift operators engage in snow management and snowmaking across the alpine resorts and are leaders in managing low-snow conditions. We will build on this existing world-class expertise by collaborating with and supporting stakeholders to develop and implement strategic Snow Area Management Plans. These plans will formally document and refine snow management processes, encourage and promote knowledge sharing, minimise duplication of effort between ARV and lift operators, and facilitate continued improvements in the effectiveness and efficiency of snowmaking (where applicable), snow management and summer grooming.

Relevant hazards		RAD classification	Direct
How would the action build climate resilience?	Formalising snow management and supporting knowledge and expertise sharing helps to optimise practices across resorts. This elevates the sector's overall ability to respond effectively to variable snow conditions and provides a foundation for more strategic snow management decision-making. Documenting best practices will also help minimise resource wastage and environmental impacts, building longer-term sustainability in the face of climate change pressures.		
How will we measure success?	> Snow Area Management Plans developed and implemented for all resorts		
Indicative implementation timeline	**Short** (2025–2027)	**Medium** (2028–2030)	**Long** (2031–2034+)
	Develop	*Implement, Review & Refine*	

Objective 05
Support world-leading snow management

OTHER ACTIONS UNDER OBJECTIVE 05

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	Medium (2028–2030)	Long (2031–2034+)
5.2	Pursue a planning scheme amendment that supports streamlined approvals and permitting for recognised climate adaptation measures (e.g. vegetation management to facilitate more effective summer grooming, establishing new low-impact snow fences)	All hazards	Direct	Reduces a key barrier for the implementation of adaptation measures	Approval of a planning scheme amendment Average duration of relevant planning / permitting approval processes			
5.3	Investigate application of ARV's reticulated water and snowmaking infrastructure for environmental benefits such as recharging Alpine bogs or supporting snow-dependent species.	Snowfall, extreme heat, rainfall	Resist	Reduces the exposure of fragile alpine ecosystems to key climate hazards	Positive Alpine bog health monitoring results Positive snow-dependent species population monitoring results			

Objective 06
Diversify the visitor experience

WHY DO WE NEED TO ADAPT?

The alpine resorts presently rely heavily on the white season to drive visitor spending – winter tourism generates the majority (78%) of the resorts' combined $2.14 billion annual contribution to the Victorian economy.[34] Increasing variability in natural snowfall, along with evolving visitor expectations, means we can't afford to focus only on traditional snow experiences to secure our future. With that in mind, we are already in the process of diversifying our year-round visitor offerings, paying particular attention to off-snow, low-snow and green season activities that will be more resilient to a changing climate.

Diversification also broadens the appeal of alpine resorts to a wider audience, including those who don't participate in snow sports, providing the opportunity to widen both the white and green season markets. However, investment in green season attractions needs to be carefully planned to ensure a financial return for ARV and stakeholders, and climate-related summer risks such as bushfire must be accounted for.

Our alpine resorts are also fortunate to be rich in environmental assets, although many of our fragile alpine ecosystems are under threat from a changing climate. Expanding the range of offerings that allow visitors to connect with the environment may enable us to create new revenue streams, while also encouraging appreciation and stewardship of natural landscapes, and helping to preserve these ecosystems that play critical roles in carbon sequestration and healthy water catchments.

Actions under objective 6 will build on the solid foundation of the resorts' existing assets, strategies, amenities and unique environment, to support the resorts' long-term relevance and financial sustainability.

HOW IS ARV ALREADY ADAPTING?

Promoting investment in a diverse range of tourism and recreation experiences is embedded in our operations as a principle of the *Alpine Resorts (Management) Act 1997* and is also a key theme in the recommendations of the *Victorian Alpine Resorts Visitor Economy Development Plan* (2021). Recent projects have included construction of new mountain biking and walking trails, scheduling cultural events throughout the year such as food and music festivals, and cross-seasonal marketing investment in alternative activities such as snowshoeing. We have also expanded the snow play product offerings at Lake Mountain and Mt Baw Baw in response to market demand and changing environmental conditions. Many of our resort stakeholders are also increasingly investing in green season offerings such as the RockWire Via Ferrata at Mt Buller.

34 SGS Economics. (2024). Economic Contributions and Benefits of Victoria's Alpine Resorts – Findings Report.

Objective 06
Diversify the visitor experience

SHOWCASE ACTION

Action 6.1: Engage with prospective investors in financially viable year-round and green season activation projects from the *Victorian Alpine Resorts Visitor Economy Development Plan* that responsibly promote unique environmental values and are feasible under a range of climate futures

The *Victorian Alpine Resorts Visitor Economy Development Plan* identifies over 100 projects across the alpine resorts to deliver future growth and attract private sector investment, which were projected to double the economic contribution of the resorts to Victoria by 2031.[35] Projects to encourage year-round tourism fall within three themes:

> **Vibrant, accessible and diverse alpine villages** – covering placemaking activation projects such as amenity and beautification projects, public art, and village squares; and commercial development to diversify retail, dining, night life, function, passive recreation, wellness and accommodation options.

> **Compelling and quality winter experience for all visitors** – such as expansion of snow play and non-traditional snow activities, and investment in attractions like scenic gondolas.

> **Deliver motivating green season products and experiences** – including iconic and architecturally designed walks, and year-round adventure activities such as ziplining.

Relevant hazards		RAD classification	Direct
How would the action build climate resilience?	Facilitation of private investment will be essential for progressing key projects to achieve successful year-round activation, reducing the resorts' vulnerability to increasingly variable natural snowfall. This investment will also stimulate local businesses, create more jobs and strengthen community ties to the alpine region, enhancing the communities' resilience and capacity to respond to the changing climate.		
How will we measure success?	> Year-round visitation and spend figures		
Indicative implementation timeline	**Short** (2025–2027)	**Medium** (2028–2030)	**Long** (2031–2034+)
	Commence engagement	*Secure investments*	*Implement projects*

35 Victorian Alpine Resorts Visitor Economy Development Plan. (2019).

Objective 06
Diversify the visitor experience

OTHER ACTIONS UNDER OBJECTIVE 06

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	**Medium** (2028–2030)	**Long** (2031–2034+)
6.2	Assist major commercial entities to engage with Government to participate in Public Private Partnership investments that support more diverse and economically viable resort offerings.	Snowfall	Direct	Reduces the resorts' vulnerability to increasingly variable natural snowfall Enhances community adaptive capacity	Number of major commercial entities engaged in PPP investments Year-round visitation and spend figures $ private vs public investment secured for activation projects	*Commence engagement and secure investments*	*Project implementation*	
6.3	Work with stakeholders to develop coordinated event programs that are financially viable and leverage existing resort strengths.	Snowfall	Direct	Reduces the resorts' vulnerability to increasingly variable natural snowfall Enhances community adaptive capacity	Coordinated events strategies developed Number of events/ event participation			
6.4	Develop and promote year-round environmental, educational and cultural products which target both the educational sector and general public.	Snowfall	Direct	Reduces the resorts' vulnerability to increasingly variable natural snowfall	Number of environmental, educational and cultural products developed and promoted Participation figures			

Objective 06

Diversify the visitor experience

#	Description	Relevant hazards	RAD category	How would the action build climate resilience?	How will we measure success?	Indicative implementation timeline		
						Short (2025–2027)	**Medium** (2028–2030)	**Long** (2031–2034+)
6.5	Subject to funding, carefully develop passive and walking trail experiences aligned with the resorts' specific strengths to support year-round visitation.	Snowfall	Direct	Reduces the resorts' vulnerability to increasingly variable natural snowfall	Number of new passive walking trail experiences developed Participation figures			
6.6	Reassess the product mix at resorts in light of projected climate change and develop transition roadmaps. This may include seeking investment to cater for the increasing demand for snow play and other winter activities which are less reliant on natural snow.	Snowfall	Direct	Reduces the resorts' vulnerability to increasingly variable natural snowfall	Product mix reassessed and transition roadmap completed			

Our approach to adaptation decision-making

The Minister's Letter of Expectations for ARV clearly states we must "integrate climate change adaptation into decision-making across the business." In response, we have developed a clear, actionable framework to support ARV staff in considering how climate change could influence different types of decisions, and documenting if and how this has been reflected in the decision.

The framework is based around the six guiding principles of the *Climate Change Act 2017*.

INFORMED DECISION-MAKING

Decisions are based on a comprehensive analysis of the best practically available information on climate impacts, and consider the potential contribution to Victoria's greenhouse gas emissions.

INTEGRATED DECISION-MAKING

Decisions consider competing long-term, medium-term and short-term considerations and are cost-effective.

RISK MANAGEMENT

Decisions avoid, wherever practical, causing serious or irreversible damage from climate change. We will not use a lack of full scientific certainty as a reason to postpone appropriate action.

EQUITY

Through our decisions, we seek opportunities to increase the adaptive capacity of future generations, as well as vulnerable and marginalised communities.

COMMUNITY ENGAGEMENT

We seek community involvement in decisions that may affect them, especially vulnerable and marginalised communities.

COMPATIBILITY

Decisions align with Victoria's climate policy framework, and seek to align with other jurisdictions charged with managing the Australian Alps wherever practical.

Our approach to adaptation decision-making

Our decision-making framework includes specific guidance on how to apply the above principles in different decision-making contexts.

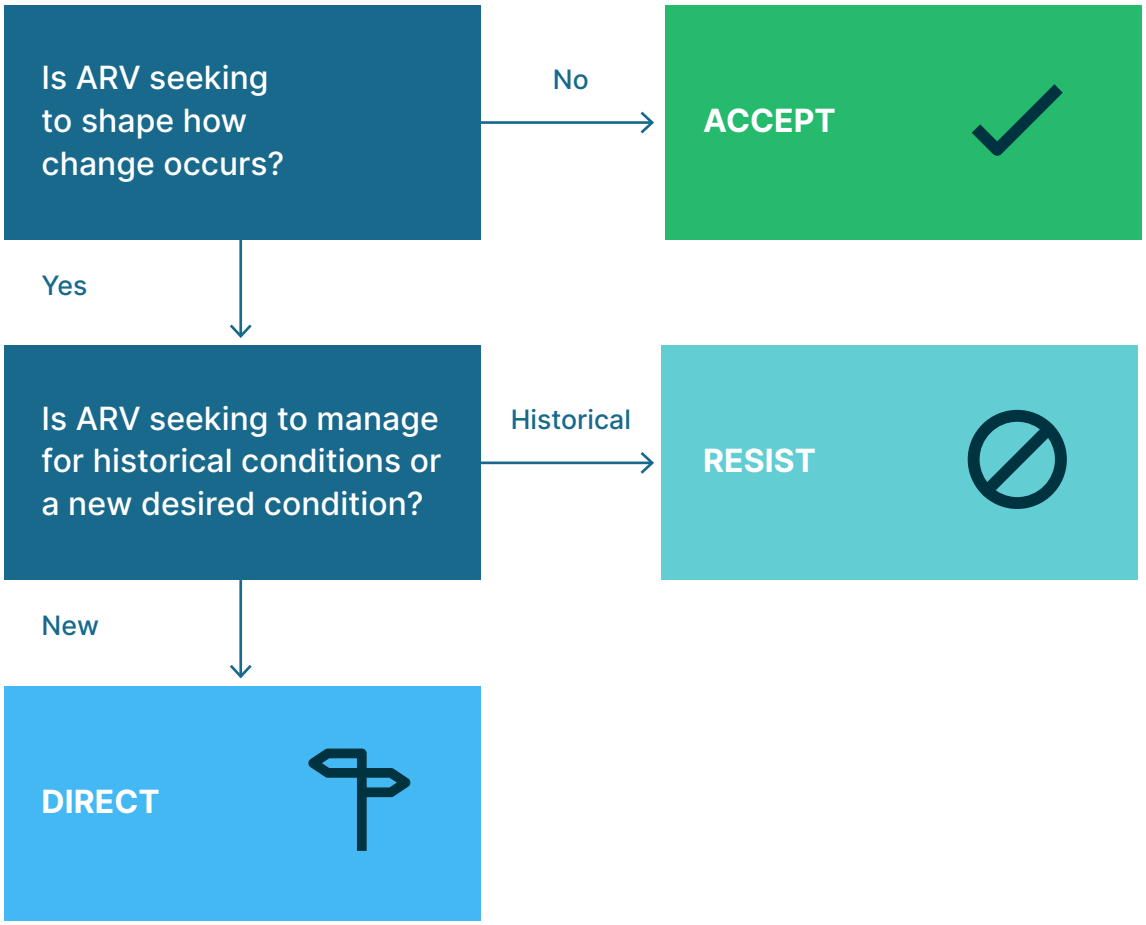
Type of decision	Summary of approach
Briefing the ARV Board on matters where climate change is relevant	Directors of Government Business Entities such as ARV have duties similar to directors of organisations incorporated under the *Corporations Act 2001* (Commonwealth). It is widely understood that climate change is relevant to a director's duty to act in the best interests of their organisation. Our decision-making framework provides guidance on how to ensure climate-related considerations are included in relevant matters being presented to the ARV board.
Corporate risk management	Guidance provided on how to factor in projected climate change at different stages of ARV's Risk Management Framework, which aligns with ISO31000 – *Risk management*.
Developing and/or renewing ARV and sector policies, strategies and plans	Includes minimum requirements for how climate change is to be considered in the development or renewal process. The requirements are tiered depending on the relevance of climate change to the topic of the policy, strategy or plan.
Major procurement and capital works	When and how climate change should be considered in service delivery contracts and capital works planning. The decision tree is to be applied for all proposed capital projects and service delivery contracts exceeding $75,000 in value.
Resort management and operations	It is important for operational resort staff (many of whom have worked on-mountain for long periods) to have awareness and knowledge of how the future climate may differ from their lived experience. We will provide to ARV staff this through mandatory online training on resort-specific climate change projections, expected impacts, and this Strategy. This will also be offered free-of-charge to other resort stakeholders who opt-in.
Assessing planning applications	At the time of writing, the Victorian Government was consulting on draft Ministerial Guidelines for consideration of climate change in planning decisions. Once finalised, ARV will apply these in its role as a referral agency for planning permits within alpine lease areas.

Using the RAD Framework to support place-based adaptation

This Strategy sets the framework and overarching actions to guide ARV's climate adaptation journey over the next ten years. Over the life of this Strategy and beyond, we will also need to undertake more detailed place-based adaptation across our six resorts. As noted earlier, the Resist-Accept-Direct (RAD) Framework will guide this complex and important work.

The RAD framework will help us make informed decisions over the longer term by considering the desired outcomes, the feasibility of actions, and the ecological, social, and economic implications of each strategy. This adaptive approach allows for flexible responses to the dynamic nature of climate impacts on key values supported by our alpine resorts.

Building on the definitions of the three RAD strategies presented on page 11, the figure below shows the high-level process for applying the framework in decisions.



Monitoring, evaluation, reporting and improvement

While keeping track of progress is an essential part of any strategy, this is particularly true for effective climate adaptation. The uncertain nature of climate change projections means that it can be difficult to predict exactly how conditions will evolve, and when certain actions may be necessary. Adaptive management requires us to apply a continuous cycle of implementing, monitoring, evaluating and adjusting our approach to ensure our actions are still leading us towards the desired outcome.

Our monitoring, evaluation, reporting and improvement (MERI) approach for this Strategy includes:

> **Monitoring**

We will regularly monitor the implementation status of actions in this Strategy, along with the key indicators we have identified for each action to help us understand whether our efforts are making a real difference to ARV's climate change resilience and that of the sector.

> **Evaluation**

Every two years, we will take stock of monitoring data and assess the state-of-play for this Strategy. The focus here is understanding if our actions are helping us move closer to meeting our objectives and reaching our climate adaptation vision.

> **Reporting**

ARV has statutory reporting obligations under the ARM Act and CC Act. In addition, ARV is committed to moving beyond minimum compliance to regularly disclosing key information relating to climate adaptation action. To that end, we will regularly report on the implementation of actions from this Strategy, the challenges we've faced, outcomes that have been achieved, and what comes next. This will ensure the community, the alpine sector, and government stay informed, giving us the opportunity to learn from each other.

> **Improvement**

Climate change is constantly evolving, and so are we. If our actions aren't working the way we expected them to, we'll use evaluation findings to adjust our approaches. This ongoing process ensures we're always moving towards a more resilient future.

Alpine Resorts
Victoria

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