

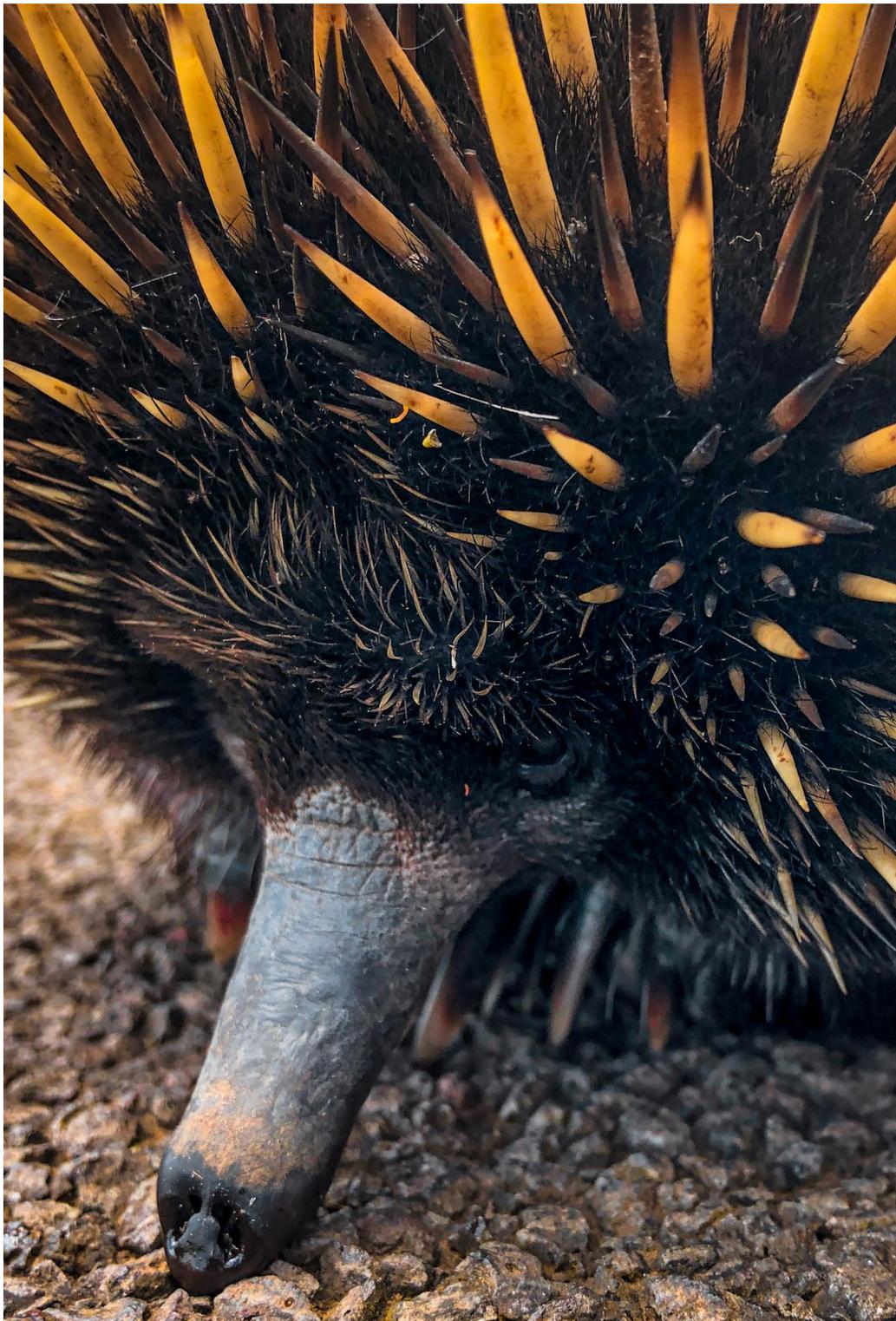


PREPARING FOR **CLIMATE CHANGE**

Supporting information for toolkit users



Environment,
Land, Water
and Planning



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INTRODUCTION

THE PURPOSE OF THIS TOOLKIT

The toolkit is designed to equip individuals, organisations and sectors with the skills to collaborate on climate change planning. The toolkit aims to:

- build confidence and capacity of users to plan for climate change
- support collaboration and knowledge sharing
- guide in identifying climate hazards and associated risks
- guide in the development of adaptation strategies
- engage individuals in immersive activities and exercises that draw out key information for climate change planning
- help establish connections with other organisations with similar risk profiles
- inform regional adaptation priorities for building a climate resilient Barwon South West.

WHO SHOULD USE THIS TOOLKIT?

This toolkit can be used by anyone looking to build collaboration into climate change planning.

- **Individuals** – Climate change champions within business and the community
- **Organisations** – developing tailored, integrated climate change adaptation strategies

The toolkit is aimed at supporting conversations between different business areas, organisations, sectors and communities. It caters for different levels of experience and understanding about climate change and can be used to support collaboration involving:



- Local government
- Emergency management and recovery
- Transport
- Tourism
- Health and community services
- Agriculture and primary production
- Ports
- Natural environment
- Energy
- Water resources
- Fisheries
- Traditional Owners
- Education and training
- Built environment
- Community based organisations
- Energy
- Water resources
- Fisheries



Outcomes from using the toolkit:

- collaboration and shared learning
- inclusivity to people new to climate change planning
- planning for climate change impacts
- identifying climate hazards and understand the risks
- informed recommendations
- adaptation planning, prioritisation and integration
- connection with similar risk areas and groups.

BACKGROUND INFORMATION

The effects of climate change are already being experienced across the Barwon South West region, including higher average temperatures, harsher fire weather and reduced rainfall. Reducing our greenhouse gas emissions will help lessen the impact of climate change, but it will not prevent it – some degree of climate change is already locked in. Developing a coordinated approach to adaptation is critical to building resilience in our communities and securing a healthy and prosperous future for all in our region.



Adaptation champions leading and supporting resilience

As adaptation champions, you will play a crucial role in supporting communities and organisations in your sector to build capabilities to respond to climate change challenges, collaborate with other sectors and continue to thrive in the face of change. This toolkit aims to build your confidence to champion adaptation in your organisation and in the smaller organisations you support.

Government, peak bodies and community organisations have a responsibility to support and lead climate adaptation in the region, and can use their influence to initiate adaptation action in the organisation and networks. The toolkit can help leaders to understand and achieve these responsibilities.

Communities, organisations and sectors in the region are at different stages of preparing for climate change. There are opportunities to build adaptation knowledge, review existing adaptation plans and strategies, and for champions and adaptation leaders to support the development and delivery of new plans.

COORDINATING EFFORTS

A cross sector approach to adaptation planning in the region will better prepare organisations and communities to manage the impacts of climate change. Organisations from different sectors will likely face similar risks and impacts from climate hazards that can be addressed with similar adaptation actions. This toolkit will help identify where these interdependencies exist, so that cross-sectoral collaboration can occur.

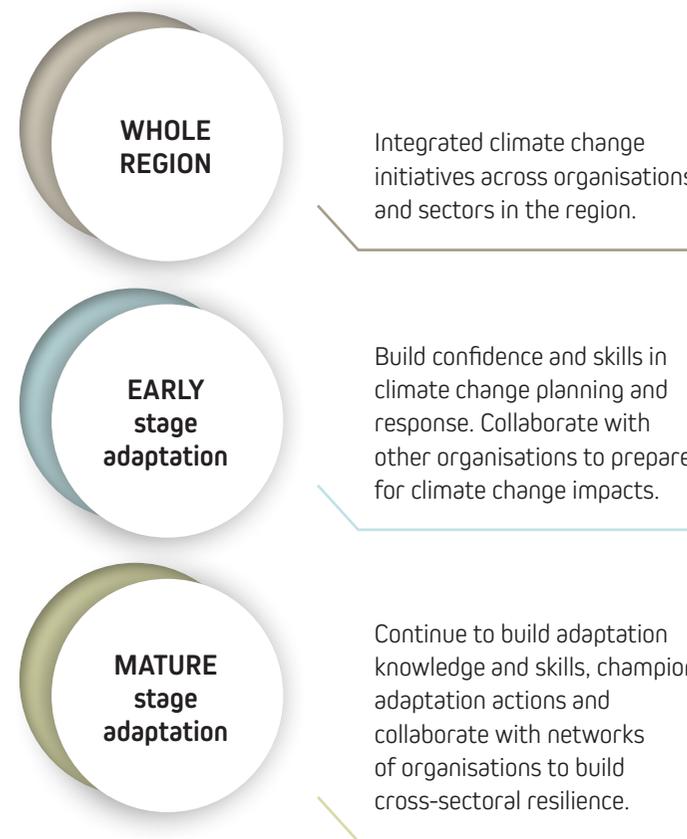


FIGURE 1: Adaptation aims for organisations and the region.



WHY ADAPT?

We are already seeing changes in our climate brought about by increases in greenhouse gas emissions. Even if emissions were reduced to zero today further changes are already locked in. Adaptation is therefore vital to deal with these unavoidable impacts. Further, it will also help us to identify and take advantage of any opportunities that may arise.

There are many different reasons to adapt and manage climate change risks. These include the direct risks from these changes and those associated with the transition to a low carbon economy.

Drivers of adaptation investment are summarised in Table 1. It is important to invest in adaptation early as this can:

- minimise social disruption and support vulnerable groups
- support important biodiversity and ecosystems and the services they provide
- reduce physical damage to assets, equipment, buildings and infrastructure critical to service delivery, business continuity and community activities
- avoid financial losses from physical impacts and disruptions in markets and service delivery.

TABLE 1: Why adapt – drivers of adaptation

Drivers for adaptation	Description
Physical	Reducing the physical damage, loss or destruction of assets including goods, equipment, buildings, infrastructure and natural assets from climate change. These impacts also have financial, social and environmental effects.
Social	Reducing the social impacts from climate change, including to physical and mental health, social infrastructure, social connectedness and to those most vulnerable (elderly, people with disabilities, those with pre-existing health conditions). Assisting communities, families and individuals to thrive in the face of climate change.
Environmental	Reducing the impacts on the natural environment, biodiversity and ecosystem services that support a thriving region.
Political	Organisations and businesses will be under increasing pressure to align with policies and regulation relating to climate change adaptation and mitigation set by national, state and local governments.
Financial	Avoiding financial losses from physical impacts, lost income from disrupted services and business continuity, and adverse changes in market demand and supply.
Legal	There is increased pressure for directors of private and public institutions to account for the risks associated with climate change, as they would any other commercial risk. Individuals and organisations may be exposed to liability for failing to understand, disclose, and manage climate change risks.
Reputational	Failing to respond to climate change risks may expose organisations and businesses to reputational damage, with changing community expectation and attitudes.

TOOLKIT OVERVIEW

This toolkit comprises 5 key stages to guide collaborative conversations:

SECTION 1	Setting the scene/Knowing your context	> WORKSHOP ACTIVITY A Pages 3–10: Climate change adaptation overview Overview: Set the scene and know your context
SECTION 2	What are your climate impacts and what they mean for you/Risk and vulnerability assessment	> WORKSHOP ACTIVITY B, C, D Pages 11–21: Risk and vulnerability assessment Overview: What your climate impacts are and what they mean for you
SECTION 3	Managing your risks/Adaptation action development	> WORKSHOP ACTIVITY E Pages 22–24: Adaptation action development Overview: Manage your risks
SECTION 4	What to do first/Action prioritisation	> WORKSHOP ACTIVITY F Pages 25–26: Action prioritisation Overview: What to do first
SECTION 5	Bringing it all together and getting it done/ Adaptation strategy and implementation plan	> WORKSHOP ACTIVITY G Pages 27–29: Adaptation strategy and implementation plan Overview: Bringing it all together and getting it done

The toolkit has been designed to allow flexibility. There are 2 components to the toolkit: this resource document, which outlines the different steps involved in undertaking climate change adaptation planning, and workshop activities.

USING THE TOOLKIT AND ACTIVITIES



CLIMATE CHANGE ADAPTATION OVERVIEW

ACTIVITY A



1.1 OBJECTIVES

- Understand basic concepts of climate change and clarify terminology
- Establish shared understanding of the concept, purpose and importance of climate change adaptation including its benefits for your organisation
- Define or review your organisation's adaptation goals, stakeholders and desired timeframe
- Outline the key context relevant to climate change adaptation planning including climate change projections, geographic and physical vulnerability, organisational/sectoral capacity, resources and leadership

1.2 BACKGROUND INFORMATION

1.2.1 Climate change

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. Climate change will continue at rapid rates unless drastic action is taken to reduce greenhouse gas emissions. Greenhouse gases emitted from the combustion of fossil fuels, deforestation and agricultural practices lead to an enhanced greenhouse effect, the consequence of which is global warming.

The impacts of climate change are multi-sectoral and growing. Climate change will have implications for all sectors of the economy and will continue to disrupt physical assets, services, communities and natural systems as primary and secondary hazards become increasingly prevalent.

Communities and organisations can address some of the risks associated with climate change via adaptation measures.

In 2016, the Paris Agreement came into force and set a target of limiting global temperature rise to 2 degrees Celsius to avoid catastrophic climate change.

In addition, a global adaptation goal was established to enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change.

The UN Sustainable Development Goals provide an integrated pathway for the global sustainable development agenda to 2030. Goal 13, Take urgent action to combat climate change and its impacts, sets targets to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters. Adaptation is a fundamental component of sustainable development.

There are state and local actions that support regional adaptation. These include Victoria's Climate Change Adaptation Plan 2017-2020. In the plan, the Government has committed to helping regional communities and organisations work together to adapt to the impacts of climate change. Many sectors, including water, health and human services, and agriculture have developed state-wide pilot change climate adaptation action plans, and other sectors will require plans by October 2021.

Local Governments of Barwon South West have collaborated with the Victorian Department of Environment, Land, Water and Planning (DELWP) on the Climate Resilient Communities of the Barwon South West project. The project aims to help municipalities and partners begin to understand and respond to risks and opportunities presented by climatic change.

1.2.2 Climate change in Barwon South West

The effects of climate change are already being experienced in Barwon South West. The region has been getting warmer and drier since the 1960s with these trends expected to continue. Adaptation will be critical across the region for building preparedness and resilience, particularly for vulnerable groups.

Figure 2 and **Figure 3** present summaries of the climate projections for the Barwon South West region undertaken by CSIRO in 2019.



Barwon Climate Projections 2019



Maximum and minimum daily temperatures will continue to increase over this century (very high confidence).



By the 2030s, increases in daily maximum temperature of 0.8 to 1.5°C (since the 1990s) are expected.



Rainfall will continue to be very variable over time, but over the long term it is expected to continue to decline in winter and spring (medium to high confidence) and autumn (low to medium confidence), but with some chance of little change.



Extreme rainfall events are expected to become more intense on average through the century (high confidence) but remain very variable in space and time.



By the 2050s, the climate of Geelong could be more like the current climate of Shepparton, and Colac more like Wodonga.



Great South Coast Climate Projections 2019



Maximum and minimum daily temperatures will continue to increase over this century (very high confidence).



By the 2030s, increases in daily maximum temperature of 0.8 to 1.6°C (since the 1990s) are expected.



Rainfall will continue to be very variable over time, but over the long term it is expected to continue to decline in winter and spring (medium to high confidence), and autumn (low to medium confidence), but with some chance of little change.



Extreme rainfall events are expected to become more intense on average through the century (high confidence) but remain very variable in space and time.



By the 2050s, the climates of Hamilton and Warrnambool could be more like the current climate of Benalla.

FIGURE 2: Projected climate impacts for the Barwon region (Clarke *et al.*, 2019).

FIGURE 3: Project climate impacts for the Great South Coast region (Clarke *et al.*, 2019).

1.2.3 Past extreme events and climate disasters

The region is familiar with climate-related impacts and events. In the past 10 years there have been a number of events that have affected the Barwon South West, further illustrating the need for investment in preparing for climate change:

- **August 2010:** Houses flooded in Dennington and Warrnambool, from a 20- to 50-year flood event.
- **January 2011:** Largest flood on record. Flooding led to landslides, causing part of the Great Ocean Road to be closed between Lorne and Skenes Creek.
- **December 2015:** Wye River bushfires began with a lightning strike and resulted in the loss of 98 homes and over 2,200 hectares of land.
- **September 2016:** Landslides caused problems along the Great Ocean Road and led to road closures as debris was removed by emergency services.
- **September 2016:** Several houses flooded in Dennington and Warrnambool during a 10- and 20-year flood event.
- **March 2018:** St Patrick's Day fire destroyed homes, killed hundreds of livestock and burned more than 40,000 hectares of prime farmland.
- **May 2019:** The City of Geelong received the same amount of rain overnight as it had during the first 4 months of the year. Lake Purrumbete near Camperdown experienced a mini tornado that brought down trees and removed roofs.
- **December 2019:** A lightning strike caused a fire at the UNESCO World Heritage site Budj Bim. The fire became a part of another fire that ignited nearby. It was brought under control in mid-January 2020 after more than 7,000 hectares of land was burnt around Lake Condah and in the Budj Bim National Park.

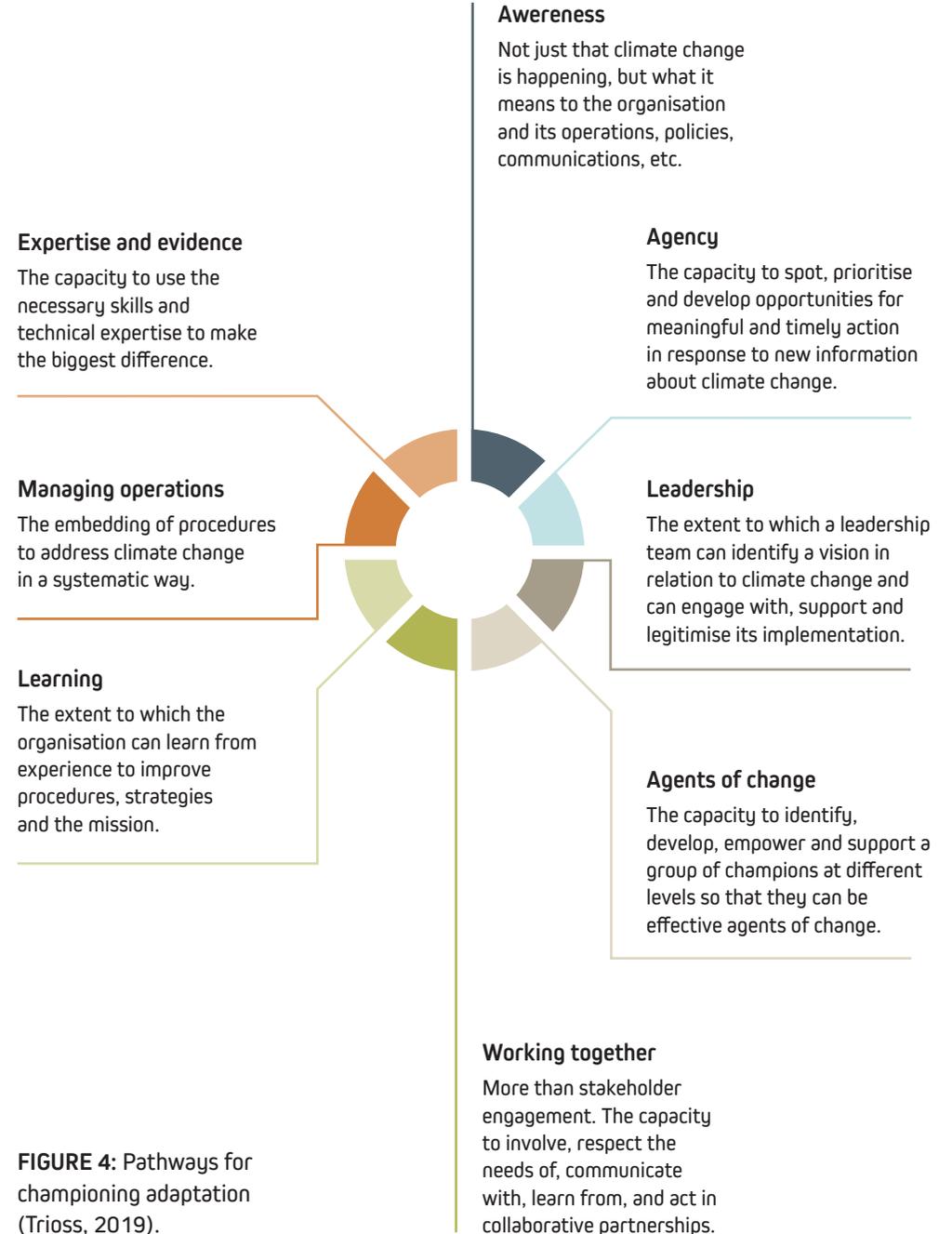


FIGURE 4: Pathways for championing adaptation (Trioss, 2019).

1.2.4 Dealing with uncertainty

Dealing with uncertainty is an inherent part of preparing for climate change. To address the uncertainty in climate change planning, decision-makers can assess the risk of outcomes (i.e. assess the likelihood of an event occurring, and the consequence of the event if it does occur). Read more about assessing climate risks in section 2.

There are sources of uncertainty in climate change adaptation planning including:

- historical data and measurement limitations
- natural variability
- limitations of climate projection models
- how quickly we can reduce emissions
- changes in non-climatic factors (demographic, technological, political, economic).

DECISION-MAKERS CAN MANAGE UNCERTAINTY IN 3 KEY WAYS:

SCENARIO PLANNING

involves considering a variety of possible futures to test different management options (e.g. high or low emissions growth, continued economic prosperity or major financial system collapse, high or low population growth).

ADAPTIVE MANAGEMENT

aims to outline a variety of pathways to achieve an objective that can be adjusted based on new information.

RESILIENT STRATEGIES

and actions are those that are robust and flexible enough to work across multiple future scenarios. Actions are flexible to adapt to change should be prioritised.



2

RISK AND VULNERABILITY ASSESSMENT ACTIVITIES B, C, D



2.1 OBJECTIVES

- To learn from your organisation's previous exposure and response to climate events
- To assess local climate hazards and the vulnerability of your organisation
- To understand the direct and indirect social, economic, environmental and governance impacts under future climate scenarios
- To assess risks based on rating criteria
- To identify priority climate risks and interdependencies

2.2 BACKGROUND INFORMATION

2.2.1 Approaches to climate change risk management

Risk depends on 2 factors: the likelihood of a hazard and susceptibility to the impacts of that hazard. It is important to consider the likelihood and consequences of climate risks so they can be properly assessed and managed.

Likelihood of hazard **X** Vulnerability & consequence **=** RISK

For example, you may decide that there are similar levels of risk associated with a small increase in likelihood of a hazard that can cause extensive damage (such as bushfires) and a large increase in likelihood of a hazard associated with moderate damage (such as heavy rain).

The interaction of economic, environmental and social stressors with climate change impacts has generated new risks for businesses, organisations and sectors.

To establish appropriate adaptation measures, it is necessary to understand past climate hazards and the effectiveness of responses to these, as well as the likelihood and consequences of future climate hazards.

There are various approaches to climate change risk management. These are focussed around hazards, vulnerabilities, adaptive capacity and policy. The hazards-

based approach involves problem identification and assessment based on current vulnerability and climate risks.

Climate change emissions pathways and associated changes are used to determine future vulnerability and risks. (Burton *et al.*, 2004).

This approach to risk management involves:

- evaluating responses to historical climate hazards affecting the organisation
- identifying the relevant climate variables (e.g. temperature, rainfall, sea-level)
- identifying the projected changes to the climate variables, based on different future emissions pathways (e.g. increased frequency and severity of heatwaves, decreased overall rainfall, but increased intensity of single rainfall events)
- identifying the impacts and consequences of these changes (e.g. power outages during heatwave events, adverse health impacts for vulnerable people, natural and physical asset loss due to coastal erosion)
- determining the level of risk based on likelihood and consequences of the event occurring.

Risk may be determined for multiple time periods in accordance with differing projections for scenarios. This can help optimise the timing

of risk treatment. Organisations and sectors can adjust these time periods for relevance: typically, these will include a medium- and long-term date.

2.2.2 Standards for risk management

The following risk management standard and frameworks are applicable to climate change adaptation and have been used to guide the development of this toolkit:

- ISO31000 is the international standard for risk management, defining risk as 'the effect of uncertainty on objectives'
- New standards, ISO14090 and ISO14091 are under development, and will set climate change adaptation benchmarks for vulnerability, impacts and risk assessment
- AS5334-2013 Climate change adaptation for settlements and infrastructure provides principles and guidelines on identification and management of climate change risks and describes a systematic approach for adaptation planning based on the risk management process
- The Australian Greenhouse Office provided guidance for businesses and government on risks assessment in adaptation (Australian Greenhouse Office, 2006).7F

Alignment with these standards, combined with institutional knowledge and experience, will provide a robust framework for management of climate change risks.



2.2.3 Climate change hazards

Climate change hazards are changes in climate variables that may cause adverse impacts to the environment, economy and community. When examining historical hazards it is important to consider any isolated or recurring incidences that have disrupted business.

Table 2 sets out the impacts and hazards associated with changes to climate variables. These impacts will affect sectors differently, including infrastructure and service, social and cultural aspects, governance, financial, environmental and the economy, as listed in **Figure 5**.

TABLE 2: Impacts associated with changes to climate variables (Australian Greenhouse Office, 2006).

Change to climate variable	Examples of impacts
 Higher mean temperatures	Increased evaporation and decreased water balance Increased severity of droughts (see below) Reduced alpine winter snow cover Reduced range of alpine ecosystems and species Increased stress to coral reefs
 Higher maximum temperatures, more hot days and more heat waves	Increased incidence of death and serious illness, particularly in older age groups Increased heat stress in livestock and wildlife Increased risk of damage to some crops Increased forest fire danger (frequency and intensity) Increased electric cooling demand and reduced energy supply reliability
 Higher minimum temperatures, fewer cold days and frost days	Decreased cold-related human morbidity and mortality Decreased risk of damage to some crops and increased risk to others Extended range and activity of some pest and disease vectors Reduced heating energy demand
 Decrease in precipitation	Decreased average run-off, stream flow Decreased water quality Decreased water resources Decrease in hydro-power potential Impacts on rivers and wetlands ecosystems
 Increased severity of drought	Decreased crop yields and rangeland productivity Increased damage to foundations caused by ground shrinkage Increased forest fire danger
 Decreased relative humidity	Increased forest fire danger Increased comfort of living conditions at high temperatures
 More intense rain	Increased flood, landslide and mudslide damage Increased flood run-off Increased soil erosion Increased pressure on disaster relief systems
 Increased intensity of cyclones and storms	Increased risk to human lives and health Increased storm surge leading to coastal flooding, coastal erosion and damage to coastal infrastructure Increased damage to coastal ecosystems
 Increased mean sea level	Salt water intrusion into groundwater and coastal wetlands Increased coastal flooding (particularly when combined with storm surge)



Adaptive capacity

Ability of infrastructure or an organisation to adapt/ change/ cope with change, including costs of adaptation measures.



Economy

Broader economic impacts; loss of jobs; supply chain security; reduced business activity and closure; industry changes and disruptions; local, state and national economic stability and growth.



Social, cultural

Program delivery and outreach to vulnerable groups; service quality and delivery; customers and clients; public health impacts; community and wider public; cultural sites or practices; dislocation of communities.



Governance

Human resources; suppliers and contractors; shareholders; public administration; policy and legislation; uninsurable zones.



Infrastructure, service

Physical assets such as roads, rail, ports, equipment; services including transport and healthcare; energy; and supply chains.



Environmental

Biodiversity; natural assets such as coastlines, forest and ecosystems; ecosystem services from plants, wetlands, rivers, ground water, insects; changes to species distribution.



Financial

All costs associated with impacts for individuals, organisations, companies and governments. Costs incurred from repairs and recovery, lost revenue, reputation damage, service and supply chain disruptions, increasing insurance premiums.

FIGURE 5: Impact categories of climate change impacts

2.2.4 Mapping climate change impacts and vulnerability

When considering the impacts of climate change, we must explore the vulnerability of assets, systems, people, services, supply chain and the natural environment.

How vulnerable something is depends on its exposure to climate hazards, its sensitivity to the hazards and its capacity to adapt. From a social science perspective, vulnerability represents the set of socio-economic factors and characteristics that determine one's ability to cope with stress, shocks and changes. From a climate science perspective, vulnerability is the amount of potential damage to a system or asset caused by a climate related hazard (Brooks, 2003).

There are a variety of primary and secondary climate hazards that should be considered in identifying the impacts. These are summarised in Table 3.

TABLE 3: Primary and secondary climate hazards

PRIMARY

- Temperature (average increase and extreme)
- Precipitation (rainfall)
- Sea-level rise

SECONDARY

- Humidity
- Drought
- Flood
- Wind
- Cyclones
- Bushfires

2.2.4.1 Interdependencies

The range of climate variables, the area over which they occur and their complex interactions create interdependencies between climate risks (Dawson, 2015).

These interdependencies can be structural, geographical, economic, social and policy based and can cause widespread disruptions to communities.

The nature of these risks means that an integrated and collaborative approach is necessary to achieve resilience for organisations, sectors and the region. Identifying interdependent risks can be achieved by understanding the risks of sectors or service providers that your organisation depends on for delivery, often your key suppliers, customers and clients.

Most sectors are important to an extent, but impacts in sectors like energy, transportation and water can cause immediate disruptions. **Figure 6** illustrates an example of the impacts to numerous sectors of climate-related disruption to transport.



EXAMPLE OF A SECTOR THAT IMPACTS MULTIPLE SECTORS: **TRANSPORTATION**

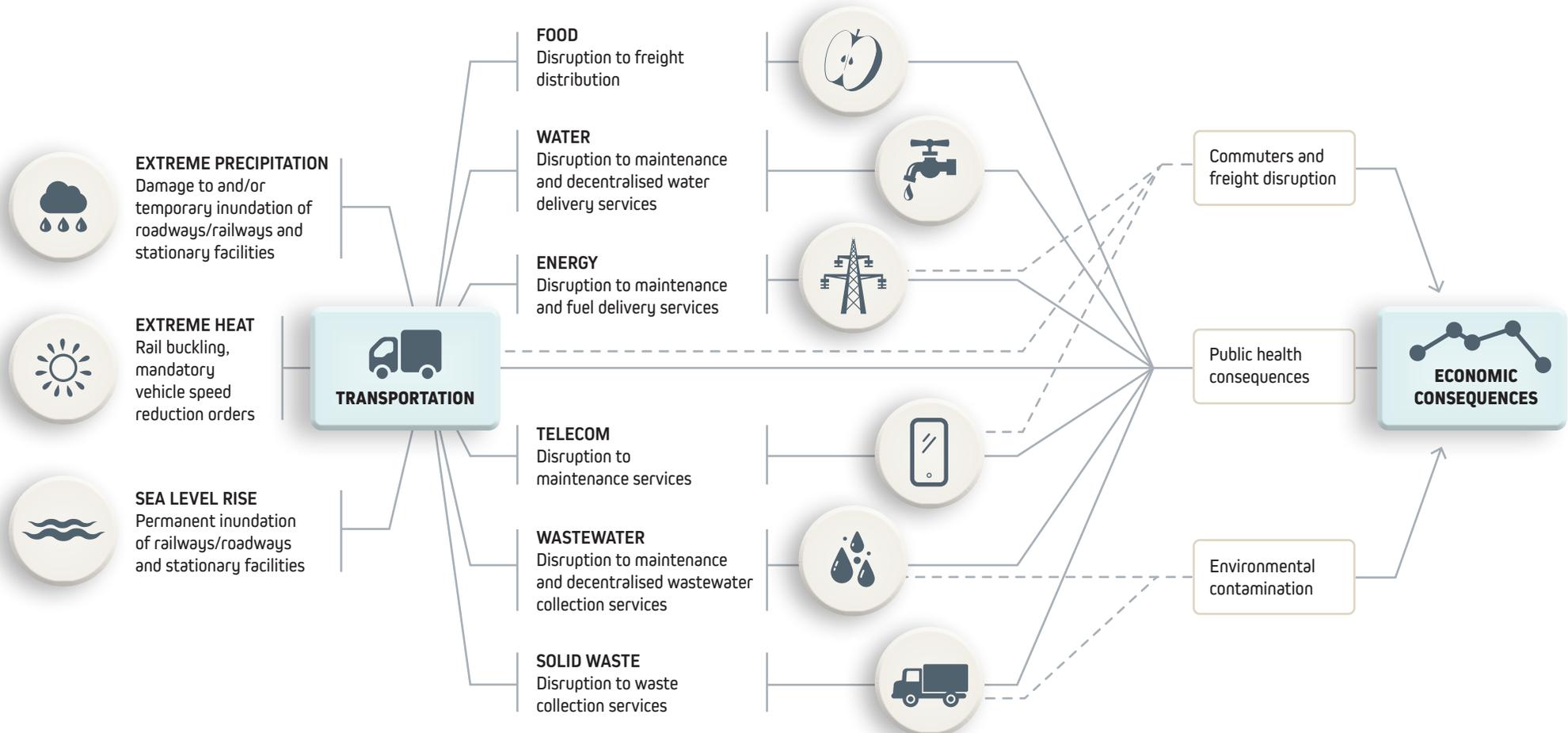


FIGURE 6: Example of multisectoral interdependencies of climate impacts.

2.2.5 Risk assessment

Once the impacts of climate change have been identified, it is necessary to assess the likelihood of them occurring and how significant the consequences will be if they do occur. Objective measures are regularly used in this assessment, but it is difficult to make accurate assessments of climate risks based on projected changes in the climate.

Standard AS5334 provides generic templates for risk criteria in climate change adaptation that can be used for assessing the consequence and likelihood of impact events occurring. These example criteria are shown in Table 4 and [Table 5](#).

The interaction of these assessments will give you a risk rating of low, medium, high or extreme based on the risk matrix in [Figure 7](#).

Typical risk management practices suggest that action should be taken to reduce any risks rated as high or extreme. Best practice recommends also addressing medium risks where appropriate.

TABLE 4: AS5334 Risk criteria for likelihood

Rating	Descriptor	Recurrent or event risks	Long-term risks
Almost certain	Could occur several times per year	Has happened several times in the past year and in each of the previous 5 years – or – could occur several times per year	Has a greater than 90% chance of occurring in the identified time period if the risk is not mitigated
Likely	May arise about once per year	Has happened at least once in the past year and in each of the previous 5 years – or – may arise about once per year	Has a 60–90% chance of occurring in the identified time period if the risk is not mitigated
Possible	Maybe a couple of times in a generation	Has happened during the past 5 years but not in every year – or – may arise once in 25 years	Has a 40–60% chance of occurring in the identified time period if the risk is not mitigated
Unlikely	May occur once in a generation	May have occurred once in the last 5 years – or – may arise once in 25 to 50 years	Has a 10–30% chance of occurring in the future if the risk is not mitigated
Rare	May occur once in a lifetime	Has not occurred in the past 5 years – or – unlikely during the next 50 years	May occur in exceptional circumstances, i.e. less than 10% chance of occurring in the identified time period if the risk is not mitigated



TABLE 5: AS5334 risk criteria - Measures of consequence

Consequence descriptor	Adaptive capacity (see Note 1)	Infrastructure, service	Social/cultural	Governance	Financial (see Note 2)	Environmental (see Note 3)	Economy (see Note 4)
Insignificant	No change to the adaptive capacity.	No infrastructure damage, little change to service.	No adverse human health effects.	No changes to management required.	Little financial loss or increase in operating expenses.	No adverse effects on natural environment.	No effects on the broader economy.
Minor	Minor decrease to the adaptive capacity of the asset. Capacity easily restored.	Localised infrastructure service disruption. No permanent damage. Some minor restoration work required. Early renewal of infrastructure by 10–20%. Need for new/modified ancillary equipment.	Short-term disruption to employees, customers or neighbours. Slight adverse human health effects or general amenity issues.	General concern raised by regulators requiring response action.	Additional operational costs. Financial loss small, <10%.	Minimal effects on the natural environment.	Minor effect on the broader economy due to disruption of service provided by the asset.
Moderate	Some change in adaptive capacity. Renewal or repair may need new design to improve adaptive capacity.	Limited infrastructure damage and loss of service. Damage recoverable by maintenance and minor repair. Early renewal of infrastructure by 20–50%.	Frequent disruptions to employees, customers or neighbours. Adverse human health effects.	Investigation by regulators. Changes to management actions required.	Moderate financial loss 10–50%.	Some damage to the environment, including local ecosystems. Some remedial action may be required.	High impact on the local economy, with some effect on the wider economy.

Notes

1: Adaptive capacity relates to the ability of the infrastructure and/or organisation to adapt/change/cope with change in the climate change variable.

2. Financial loss will be relative to the infrastructure being considered (i.e. a single building, coastal town, rail system). Dollar values need to include replacement cost for the infrastructure item and financial loss/costs relating to the loss of the service provided by the infrastructure.

3: While the term 'environment' can include both human-made and natural systems, in this document 'environment' is limited to the natural environment outside the asset being considered.

4. Economy refers to the local economy (e.g. town or region), the state economy, or the economy of Australia as a whole. Significance of this measure will depend on the asset being considered.

CONSEQUENCE

	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	Medium	High	Extreme
Possible	Low	Low	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Very unlikely	Low	Low	Low	Medium	Medium



FIGURE 7: Risk rating matrix

Warrnambool Telstra Exchange fire: impacts case study | November 2012

DAY 1



Electrical fault started a fire in the Warrnambool Telstra Exchange



Telstra services impacted. 100,000 customers lost phone and internet services.



255km

Customers were impacted as far as Edenhope (225km north of Warrnambool)



Portable exchange coverage was flown in providing temporary service coverage

WHAT HAPPENED?



EFTPOS

BANKS

TRAINS

POLICE PHONES

000 LANDLINE

SCHOOL SERVICES & REMOTE LEARNING

HEALTH SERVICES OVERLOAD WITH VISITATION TO 900 WEARERS OF HEALTH MONITORING 'PENDANTS'

LOCAL BUSINESSES FORCED TO CLOSE

DAY 2



Mobile services restored to 100,000 customers



Internet returned to 54 schools

DAY 1-21



Local businesses and organisations affected for 5-21 days

ECONOMIC IMPACT



Cost to Warrnambool: \$480,000 per day



Total cost to the region: > \$28.3 million



Compensation claims: > \$7 million

WHAT DID WE LEARN?



LOOKING FORWARD

Telstra conducted a review into the fire. One of the recommendations was that business customers should review their business continuity plans to ensure the loss of telecommunication services is included.

3

ADAPTATION ACTION DEVELOPMENT **ACTIVITY E**



3.1 OBJECTIVES

- To identify appropriate adaptation options that help to reduce the exposure or sensitivity of a climate hazard or build the adaptive capacity to respond to those hazards
- To build cross organisation and sector partnerships that improve adaptation outcomes

3.2 BACKGROUND INFORMATION

3.2.1 Adaptation action development

Organisations can implement a variety of adaptation actions to reduce the potential impact of climate risks. These actions should treat the unique risks facing the organisation and sector.

When brainstorming adaptation actions, organisations should consider how:

- to reduce exposure to climate change hazards, and reduce the likelihood of the impacts occurring
- to reduce sensitivity to climate change hazards, reducing the consequences if they do occur
- to build adaptive capacity
- will the adaptation actions interact with other stressors and trends.



3.3 TYPES OF ADAPTATION ACTIONS

There are different types of adaptation actions that can help to manage climate change risks. Adaptation actions can be categorised as shown in Figure 8.

Structural and technological actions

minimise risk through engineering solutions and changed practices. Examples include green infrastructure, energy demand management measures, coastal protection infrastructure, water sensitive urban design, creation of wildlife corridors, resilient housing and efficient water and energy measures.

Management, planning and information

educates and informs stakeholders about the risks of climate change. Decision makers can assist adaptation by increasing public awareness through campaigns, providing information about risks and adaptation measures, and integrating plans across organisations and sectors to enhance connectedness, preparedness and resilience.

Practice and behaviour build preparedness and adaptive capacity through safeguarding livelihoods, refining emergency responses and improving communication channels. Example actions include establishing warning and evacuation procedures, migration and retreat, livelihood diversification and crop-switching.

Regulatory and institutional actions prevent or mitigate effects of climate change through revised regulations and planning. Actions may include revising guidance notes for urban planners to plan for scenarios, improving building standards and local planning schemes, increasing resource allocation to vulnerable categories and adopting integrated planning approaches within and across sectors.

Avoidance is more difficult to achieve for some sectors and is mostly focussed on local authorities and their ability to avoid or exploit changes in risk. Moving people away from high risks areas through urban and town planning or improving forecasting systems to give early warning of climate events are examples of avoiding risk. Actions for businesses may include increasing crops to safeguard yields, shifting tourism activities or events to different times or changing to less vulnerable suppliers.

Financing and insurance are ways to spread or delegate risk. Climate adaptation finance is an evolving and diverse area. Organisations can access climate adaptation funding to deliver other adaptation actions and minimise economic vulnerability. Revolving funds, water tariffs, disaster contingency funds, and taxes and subsidies can be used to reduce vulnerability to, and consequences of, climate change impacts. Insurance can assist in transferring the risk to an external party.

Research can improve understanding of the relationship between climate change and risk. Understanding the relationship between past and present variations in climate and performance of economic, social and environment systems is critical; this process is embedded in the risk

identification phase. Further research actions include improving modelling of regionally-based climate change impacts and improving understanding of the impact of changes to the frequency and magnitude of risks.

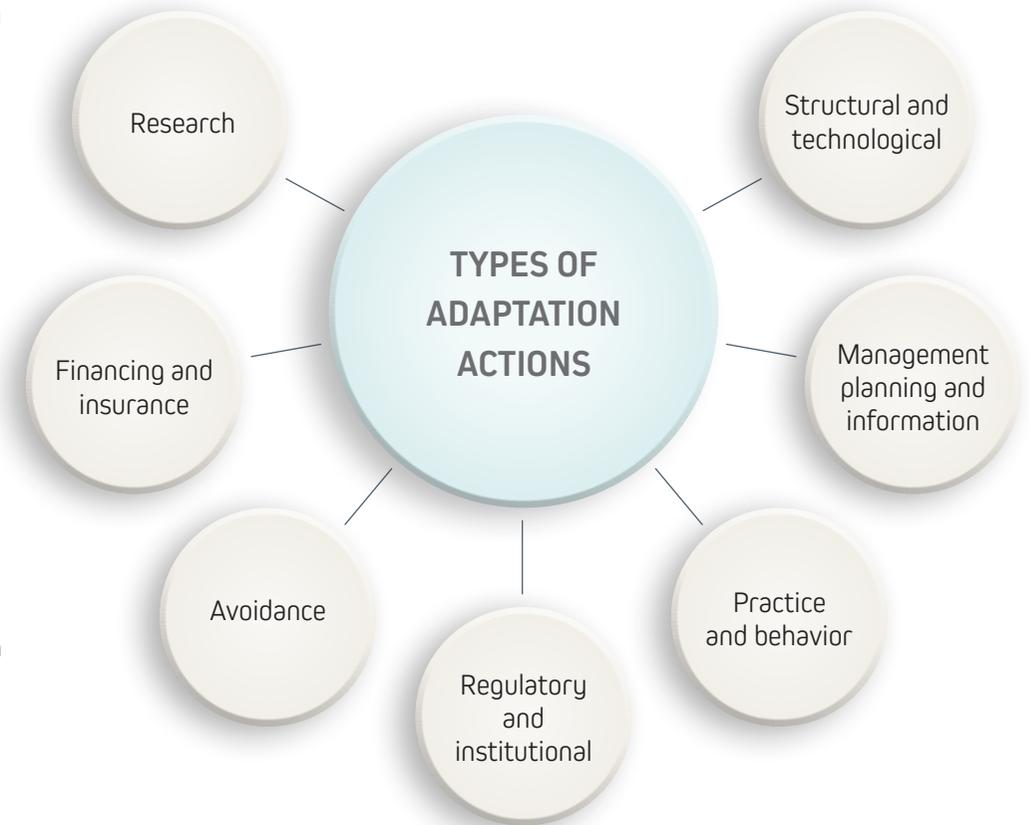


FIGURE 8: Categories of adaptation actions (Biagini et al., 2014) (Australian Greenhouse Office, 2006).

4

ACTION PRIORITISATION ACTIVITY F



4.1 OBJECTIVES

- To identify criteria for prioritising adaptation actions for the Barwon South West region
- To establish different priority criteria within sectors, relating to unique objectives
- To select the most appropriate adaptation options for your organisation

4.2 BACKGROUND INFORMATION

4.2.1 Prioritisation dimensions

It is important to have clear criteria for assessing the identified range of adaptation actions. This helps to focus resources and attention on actions that achieve your objectives. There are different priorities to consider when undertaking adaptation planning and developing adaptation actions.

Each adaptation action can be assessed against a selection of relevant criteria on a 3 point (traffic light) scale as outlined in Table 6.

DEVELOPING ADAPTATION ACTIONS

The UK Climate Impacts Programme (UKCIP) has outlined some prioritisation criteria that may be relevant including:

- **Effectiveness** – will the actions meet your objectives?
- **Efficiency** – do the benefits exceed the costs?
- **Equity** – the action should not adversely affect other areas or vulnerable groups
- **Flexibility** – is it flexible and will it allow for adjustments and incremental implementation?
- **Sustainability** – does it contribute to sustainability objectives, and are they themselves sustainable?
- **Practical** – can the action be implemented on relevant timescales?
- **Legitimacy** – is it politically and socially acceptable?
- **Urgency** – how soon could it be implemented?
- **Costs** – consider social and environmental costs, not just economic
- **Robust** – is the option able to cope with a range of future climate projections?
- **Synergies/coherence** with other strategic objectives – does it help to achieve other objectives?
- **Any other factors** which your organisation regards as important.

This prioritisation process will provide a ranked list of actions that can be used to guide implementation.

4.2.2 Barriers and considerations

The development of an organisational adaptation action and implementation plan should help with successfully delivery. Specifying organisational, technical, resource, or capacity constraints allows organisations to better manage their impact through implementation. Barriers for one organisation or sector might also be offset by capacity and resources within another, encouraging sharing and collaboration within and across sectors.

Addressing barriers can also be included as an action within the adaptation action plans.

EXERCISE

Think about your adaptation actions and the steps needed to implement each one effectively. Identify any barriers or impediments that may prevent the action being completed. Barriers may be technical, capacity, resources constraints, leadership buy-in, or policy related.

Outline strategies that will help to remove or overcome these barriers. Strategies may include partnering with other organisations that share a similar climate change risk profile, or that seek similar objectives.

TABLE 6: Adaptation action criteria rating assessment

	Action does not address criteria	Action partially addresses criteria	Action completely addresses criteria
Percentage of weighting	0%	50%	100%

5

ADAPTATION STRATEGY AND IMPLEMENTATION **ACTIVITY G**



5.1 OBJECTIVES

- To combine all elements of the adaptation planning process into a climate change adaptation strategy
- To develop an implementation program, including a plan for monitoring and evaluation

5.2 BACKGROUND INFORMATION

5.2.1 Climate change adaptation strategies

Climate change adaptation strategies bring together the core information developed across the previous stages to inform organisational, sectoral or regional approaches to managing risks. Included within this strategy should be contextual information about your own circumstances, the relevant climate hazards and projections about changes in those hazards, the assessed climate risks, and prioritised adaptation actions.

Organisations should look for opportunities to embed and integrate this strategy across their decision-making processes, both within their sector and across other interdependent sectors. Each organisation's circumstances will be different, with some delivering programs or services (such as health and human services), some with significant assets (such as agriculture, water, energy, ports, transport, local government and natural resource management) and others with regulatory roles (such as

water, energy, local government and economic development authorities). Therefore, each organisation will vary in its approach to climate change adaptation. The exercise below aims to outline how organisations can consider these matters.

EXERCISE

Think about your organisation and the way decisions are made including:

- program development • capital investment
- maintenance and renewal
- strategic planning • procurement
- risk management

Map out key decision points and the specific areas where consideration of climate change risks might be appropriate. For example, it would be important to consider the increased health impacts of climate change when developing a new outreach program for older adults; or when looking to build a new coastal asset and consideration of sea-level rise in the early planning stages may influence placement, or design changes; or when developing a new long-term strategy as a business or community group.

Define key roles or individuals or roles involved in these decision-making processes.

Identify support tools that would assist decision-makers in incorporating climate change risks. These may include climate change projection data, identified climate risks, or suggestions on what actions could be taken to address climate risks.

5.2.2 Implementation

All actions outlined within the strategy require an action owner and implementation timeframe to ensure accountability and enable timely delivery. Action owners should be from across the organisation and not solely environmental or sustainability officers. As demonstrated by the exercise in Section 5.2.1, there are many intervention points across an organisation where consideration of climate change risks is appropriate. Therefore, people should be allocated actions and responsibilities accordingly.

In addition to developing indicators for success strategy implementation (outlined in Section 5.2.3 below) there is value in linking key performance indicators within position descriptions and roles, particularly for senior leadership. Doing so encourages accountability.

5.2.3 Monitoring and evaluation

Monitoring and evaluation demonstrate progress is being made towards achieving the strategy's objectives.

The measure of progress and success will depend on the actions outlined within the strategy and how experienced the organisation is at climate adaptation planning. Each organisation should develop a range of indicators to measure the success of their adaptation strategies. An action may be measured by multiple indicators and an indicator may demonstrate progress across multiple actions.

Typically, organisations will measure output, which is primarily the things you have done (e.g. delivered climate adaptation capacity building training to 35 staff, planted 250 trees to provide shade, or trialled 3 new crop varieties).

Outcomes, on the other hand, are the results of these actions in building resilience (e.g. trained staff now including climate risk in the decision-making process, tree shading reducing energy costs and heat related illnesses, and new varieties delivered higher yields).

Progress should be measured regularly (appropriate for the action) and at least annually. The strategy itself should also be reviewed periodically to ensure it remains relevant to the risk profile, changing organisational contexts and as more information becomes available on climate projections and the effectiveness of interventions.

These review points provide the opportunity to identify any lessons learned, which can be incorporated into the action plan.

Communicating the progress of actions with internal and external stakeholders helps maintain momentum and engagement with the strategy. Where actions are delivering successful progress, updates can assist in recognising individual and organisational efforts, and where progress is slower or actions are not leading to expected results. Updates can help to identify where changes can be made.



NEXT STEPS

Integration with organisations and sectors and building partnerships for collective action

A regional approach to adaptation planning focusses on bringing together organisations within sectors and diverse sector groups to share and exchange knowledge, experience and resources. Coordinated and integrated planning will help to reduce duplication of effort where sectors or organisations share similar risk profiles and intend to undertake similar adaptation actions. Collective actions can often help to achieve scaled interventions that would be uneconomical at an individual organisation level.

Adaptive management

This toolkit is intended to be adaptive, and further developed as regional efforts progress. As actions are achieved and risk profiles change for sectors, the risk profile should be updated.

Action learning

Using an 'action learning' approach for the way organisations plan for and respond to climate change, is essential. Action learning allows organisations to continually review what worked well and areas to improve.

GLOSSARY/ DEFINITIONS

Adaptation

Changes in natural or human systems to prepare for actual or expected changes in the climate to minimise harm, act on opportunities or cope with the consequences.

Adaptive capacity

The capability of a system, sector or social group to adjust to climate change, to minimise harm, to act on opportunities, or to cope with the consequences.

Climate hazard

Climate-related events such as extreme precipitation, storms, droughts and heat waves that can cause harm or damage.

Climate scenario

A plausible and often simplified representation of the future climate. Scenarios are based on an internally consistent set of climatological relationships that have been constructed for explicit use in investigating the potential consequences of climate change.

Emission pathways

The various projected trajectories of future greenhouse gas emission.

Exposure

The fact of experiencing something or being affected by it because of being in a particular situation or place.

Extreme weather

Event that is rare at a particular place and time. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations.

Interdependencies

The quality or condition of being mutually reliant on each other.

Mitigation

Action that will reduce climate change. This includes action to reduce greenhouse gas emissions or remove greenhouse gases from the atmosphere.

Resilience

The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

Risk

The chance of something happening that will have an impact on an objective, system, sector, asset, activity or community. A risk is often described in terms of the event (for example, a weather event or climatic change), the consequence of the event (positive or negative), and the likelihood it will happen.

Risk assessment

Qualitative or quantitative estimation of risks.

Sensitivity

The effective climate sensitivity (in °C) is an estimate of the global mean surface temperature response to doubled carbon dioxide concentration that is evaluated from model output or observations for evolving non-equilibrium conditions.

Uncertainty

A state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour. Uncertainty can therefore be represented by quantitative measures (e.g. a probability density function) or by qualitative statements (e.g. reflecting the judgment of a team of experts).

Vulnerability

The degree to which a system, sector or social group is susceptible to the adverse effects of climate change; vulnerability depends on the nature of the climate change to which the system is exposed, the system's sensitivity to the changes and its adaptive capacity.



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