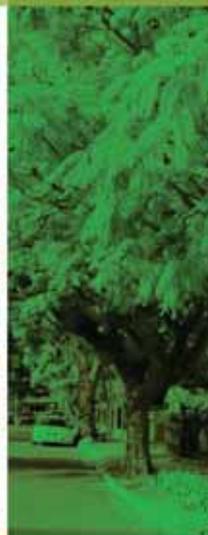


Resilient East

Regional Climate Change Adaptation Plan

June 2016



Resilient East

Regional Climate Change Adaptation Plan

Lead Consultant URPS

In association with Seed Consulting Services
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Citation

Resilient East (2016) *Resilient East Regional Climate Change Adaptation Plan* prepared by URPS as part of the Resilient East consultancy led by URPS, for the Eastern Region in association with the Government of South Australia and the Australian Government.



City of
Norwood
Payneham
& St Peters



CITY OF
TEA TREE GULLY
Naturally Better



Government of South Australia
Department of Environment,
Water and Natural Resources



Government of South Australia
South Australian Fire and
Emergency Services Commission



Government of South Australia
Adelaide and Mount Lofty Ranges
Natural Resources Management Board

Acknowledgments

The Eastern Region Regional Adaptation Plan is the product of collaboration between Adelaide City Council, the Cities of Burnside, Campbelltown, Norwood Payneham & St Peters, Prospect, Tea Tree Gully and Unley, and the Town of Walkerville and the stakeholders who have a role or interest in the Eastern Region.

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The preparation of the Regional Adaptation Plan was overseen by a project steering group comprising representation from the members Councils and the State Government.

The development of the Regional Adaptation Plan was undertaken by a consultant team led by URPS in association with Seed Consulting Services and CSIRO Climate Adaptation Flagship.

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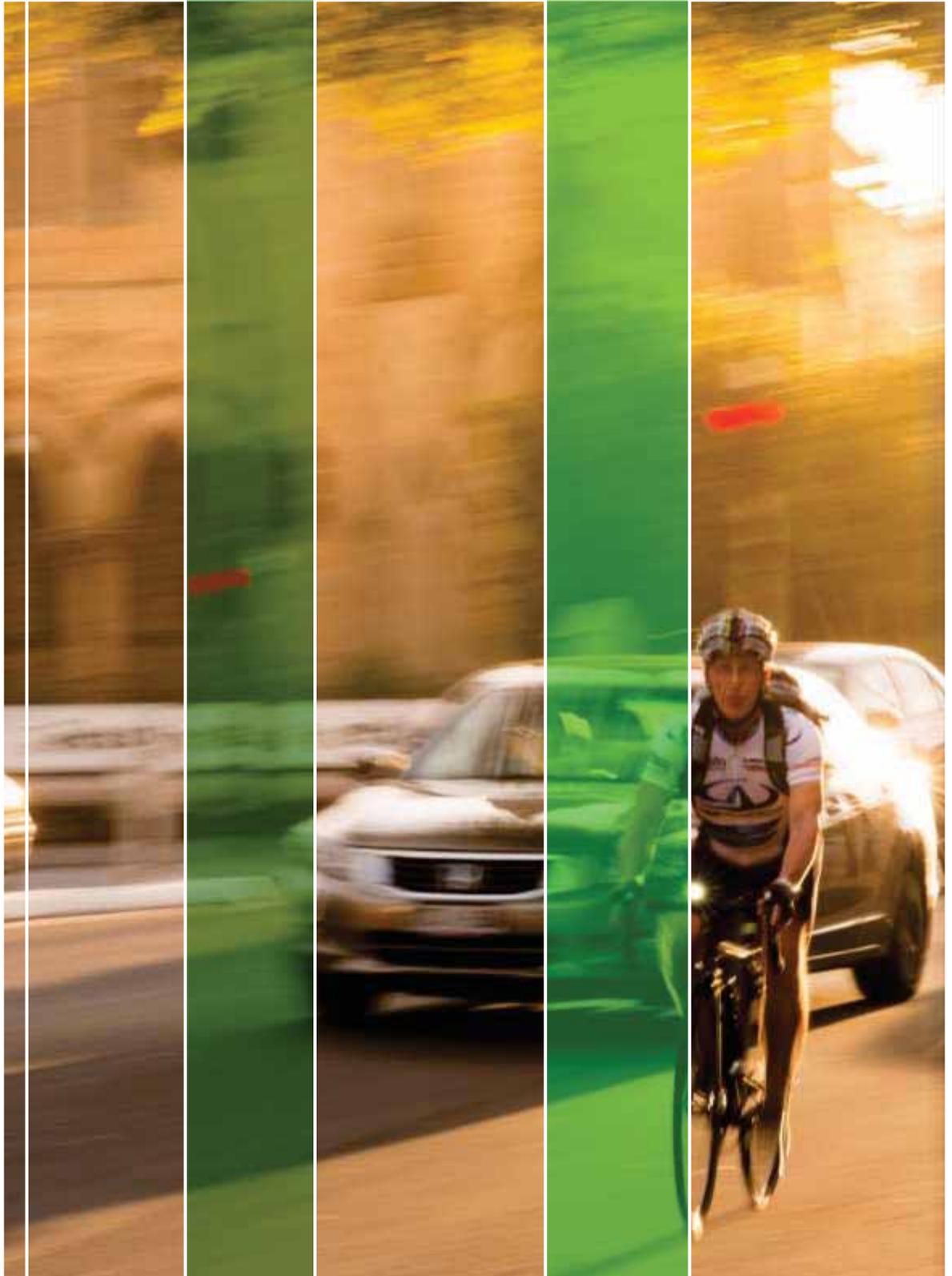
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Glossary

Term	Explanation
Activity centre	Activity centres are concentrations of business, administrative, civic, retail, entertainment, employment, research, education and community uses. Main streets, the central business district of Adelaide City, entertainment and shopping precincts are all examples of activity centres.
Adaptation	Taking action to avoid, withstand or benefit from current and projected climate changes and impacts.
Adaptive capacity	<p>Adaptive capacity is the ability of a feature or function to adjust to climate change impacts (including climate variability and extremes), to moderate potential damages, take advantage of opportunities, or cope with consequences and maintain the valued characteristics of that feature or function.</p> <p>Consideration is given to what extent a feature or its function in its current form, with current management practices, resourcing or funding, is able to continue to function, cope or adjust to the expected climate conditions at a point in the future. For Resilient East, predicted changes in the climate at 2050 were used.</p> <p>For example, water sensitive urban design (WSUD) can provide the ability for a streetscape to function in response to reduced rainfall, but if no WSUD measures are in place now, then the adaptive capacity would be considered to be less than if WSUD was currently in place.</p>
Adaptation Pathways	<p>An approach to adaptation planning which enables the consideration of a range of possible adaptation options, how they will be impacted by climate change through time, and whether any options have an “expiry date” (ie a point in time at which they are no longer viable). A key aspect of this approach is the identification of a preferred pathway which identifies those options to be progressed now and into the future based on currently available information, including stakeholder input/preferences at the time of preparing the Adaptation Plan.</p> <p>The preferred pathway does not preclude current actions that contribute to future adaptation from continuing and should be reviewed at least every 5 years, at which time new information may suggest that the preferred pathway should take a different course through potential options.</p>
Climate	Climate summarises the average, range and variability of weather elements, eg precipitation, wind speed, air temperature, humidity, and sunshine hours (solar radiation), observed over many years (typically > 30 years) at a location or across an area.
Climate change	Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity.
Climate variable	Climate variables are the different climate factors such as rainfall and temperature that determine the climate. Changes in these are projected to occur as a result of climate change including declining rainfall, increasing rainfall intensity, increasing average temperature, increasing frequency and intensity of heatwaves and increasing bushfire risk.
Exposure	Exposure considers the likelihood of a feature or its function being subjected to change in a particular climate variable. For example low lying land is more exposed to inundation from flooding, the entire Region is exposed to heatwaves and the Hills Face area is more exposed to bushfire. For Resilient East, exposure relates to predicted changes in the climate at 2050.

Term	Explanation
Green infrastructure	Green infrastructure is the strategically planned network of green spaces and environmental or water management features that deliver a wide range of environmental, economic and social benefits including provision of clean water and clean air, more attractive and greener cooler cities, mitigation of urban heat island effects and improved wildlife habitat and biodiversity. Green infrastructure features can operate and provide benefits at small scales such as living walls, roof gardens and pathways and larger scales such as parks and reserves, transport corridors, watercourses and wetlands.
Maladaptation	Maladaptation occurs when an attempt to adapt produces unintended negative consequences.
Mitigation	In the context of climate change, mitigation is taking action to reduce or prevent emission of greenhouse gases.
Resilience	The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress or environmental change.
Sensitivity	Sensitivity considers the degree to which a feature or its functions are affected by change to a particular climate variable. For example, older people are more sensitive to heatwaves, non-irrigated open space is sensitive to reduced rainfall and native vegetation is sensitive to increased bushfire risk.
Vulnerability	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change. Vulnerability to the impacts of climate change is a function of exposure to climate conditions, sensitivity to those conditions, and the capacity to adapt to the changes.
Water sensitive urban design (WSUD)	Water Sensitive Urban Design (WSUD) is an approach to urban planning and design that integrates the management of the total water cycle into the land use and development process. It includes consideration of available water sources including rainwater and stormwater, improving water quality and managing runoff to improve biodiversity and the liveability of urban environments.

EXECUTIVE SUMMARY



Executive Summary

The Resilient East project

Resilient East is about making sure the Eastern Region remains a vibrant, desirable and productive place to live, work and visit and that our businesses, communities and environments can respond positively to the challenges and opportunities presented by a changing climate.

We know that despite global action being taken to manage and reduce greenhouse gas emissions we are already on a pathway which means that some degree of adaptation will be required. By being proactive and thinking and planning now for the impacts that are likely to occur as the climate changes, the Eastern Region can position itself to manage adverse impacts and take advantage of any opportunities.

This Regional Climate Change Adaptation Plan (Regional Adaptation Plan) provides the foundation for a coordinated and collaborative response to climate change and identifies priorities for adaptation across the Eastern Region. It has been developed through a collaboration between Adelaide City Council, the Cities of Burnside, Campbelltown, Norwood Payneham & St Peters, Prospect, Tea Tree Gully and Unley, and the Town of Walkerville and the stakeholders who have a role or interest in the Eastern Region.

The preparation of the Regional Adaptation Plan was undertaken over three key stages as follows:

- understanding the Eastern Region in relation to a changing climate
- identifying and assessing the vulnerability of what we value in our Region, and
- identifying adaptation responses.

Identifying options for adaptation

The Regional Adaptation Plan identifies adaptation options for the Eastern Region to address key vulnerabilities or opportunities presented by a changing climate.

Climate projections prepared to inform this adaptation planning process (refer section 2) indicate that the Eastern Region will face warmer and drier conditions with increased risks being posed by extreme events such as heatwave, bushfire and flooding.

Using these climate projections, an Integrated Vulnerability Assessment (IVA) was undertaken to determine how aspects or features that are valued across the Eastern Region may be impacted by climate change (refer section 3). A total of 36 indicators were assessed using the IVA, the analysis of which revealed those valued aspects or features of the Eastern Region that have a higher vulnerability to climate change than others.

Based on the analysis of the IVA, areas of focus were derived for adaptation planning known as 'key decision areas'. For the Eastern Region eight key decision areas were identified and adaptation pathways analysis was used to gather and assess a range of information in order to identify adaptation options for the Region (refer section 4). For each of the eight key decision areas pathway maps were generated with a range of adaptation options identified (refer section 4).

Priorities for adaptation across the Eastern Region

Further review and assessment of the adaptation options resulted in the identification of nine priority adaptation options for the Eastern Region (refer section 5). Of these nine priorities a number of options are for immediate implementation whether that be the acceleration of current activities, commencement of new responses or planning for future action, while others may be required at some point in the future as the climate changes.

These priority adaptation options are summarised by Table A and the infographic overleaf.

Table A Priority adaptation options for the Eastern Region

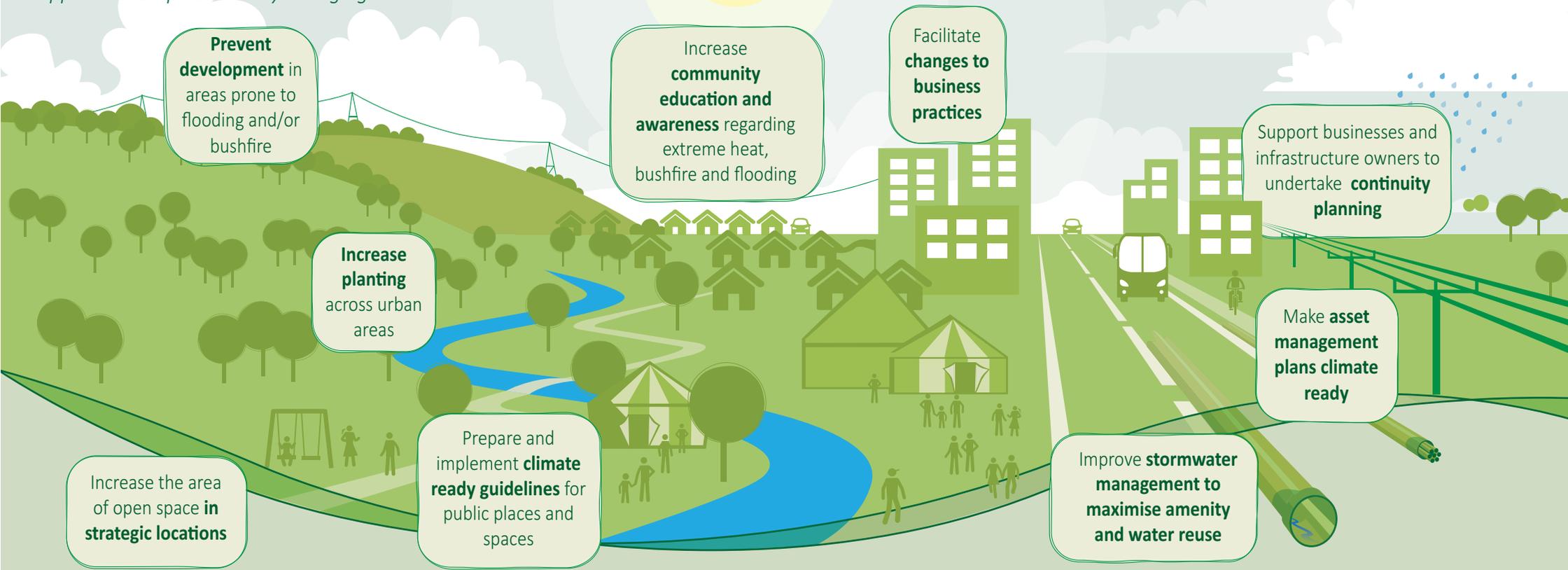
Priority adaptation option	Rationale	Timing	Suggested lead	Suggested partners
Prepare and implement climate ready guidelines for public realm, green infrastructure and urban design	Natural and built spaces and infrastructure that are climate ready are designed and constructed to take into account anticipated climate change and assist with mitigating climate change impacts such as extreme heat, flooding and bushfire. Climate ready public realm, green infrastructure and urban design can play a significant role in creating an urban environment that is amenable and comfortable for residents and visitors and contribute to improving human health.	Now	Resilient East Councils State Government	Adelaide and Mount Lofty Ranges Natural Resources Management Board (AMLR NRMB) Botanic Gardens Developers Department of Environment, Water and Natural Resources (DEWNR) Local Government Association (LGA) Universities and research institutions Water Sensitive SA
Business and infrastructure owners continuity planning	Business and infrastructure owner continuity planning will assist private and public sector organisations better prepare for extreme events, especially those that lead to electricity failure, and therefore disruption to their operations and/or services.	Now	Department of State Development	Business SA Resilient East Councils Traders Groups/associations
Improve stormwater management to maximise amenity and water reuse	Improving stormwater management recognises the value placed on mitigating floods to maintain residents' safety and prevent damage to property, but also the benefits of the reuse of stormwater to maintain open space, vegetation and street trees.	Now	Resilient East Councils	AMLR NRMB Department of Planning, Transport and Infrastructure (DPTI) DEWNR LGA Stormwater Management Authority Water Sensitive SA Universities and research institutions

Priority adaptation option	Rationale	Timing	Suggested lead	Suggested partners
Increase community education and awareness regarding climate hazards	Community education and awareness raising about the hazards of climate change is a fundamental requirement to deliver behaviour change. It is also important to build capacity so that individuals are able to take responsibility and undertake their own adaptation measures.	Now	Resilient East Councils SA State Emergency Service (SASES)	Australian Red Cross
Increase planting across urban areas	Increased planting is valued for the contribution it can make to cooling urban areas, thereby creating amenable and comfortable living environments for residents and visitors and improving human health.	Start implementation within 5 years	Resilient East Councils State Government	AMLR NRMB Botanic Gardens Developers DEWNR DPTI Universities and research institutions
Make asset management plans climate ready	Asset management plans are required for Council owned infrastructure, yet the majority of current asset management plans do not consider climate impacts. This is a particular issue given that asset management plans often relate to infrastructure that has a long lifespan and therefore is likely to be impacted by changes in climate. Climate change considerations therefore should be embedded in asset management plans so that adaptation becomes part of everyday practices.	Start implementation within 5 years	Resilient East Councils	LGA
Increase the area of open space in strategic locations	A changing climate may require the maintenance of some open space to be reduced, however it may also lead to greater investment in high value open space and green infrastructure in strategic locations. It will also necessitate reducing reliance on potable water for irrigation and utilising alternative water sources such as treated wastewater and recycled water.	Start implementation within 10 years	Resilient East Councils	DPTI
Prevent development in hazard prone areas	Past residential and commercial developments have occurred in areas that are now understood to be subject to flood and fire risk. As the risk of climate hazards increases in the future, impacts could be minimised by preventing development in hazard prone zones. The complexity of issues at play is recognised and the challenge presented by trying to balance the desire to live in or near the foothills environment or along watercourses while ensuring	Start implementation within 10 years	State government DPTI	LGA Resilient East Councils SASES

Priority adaptation option	Rationale	Timing	Suggested lead	Suggested partners
	<p>community members and their property are safe and not at risk from bushfire and flooding. This also sits within the context that once constructed, dwellings will be there for a long time (often 60 plus years) and there will be a need to manage flooding or bushfire risks over the lifetime of the dwelling.</p> <p>As the risk of climate hazards increases in the future, impacts could be minimised by preventing development in hazard prone areas and it is considered an important adaptation option for further exploration by the Region. It is also an aspect that other regions across the State are grappling with and warrants coordinated consideration.</p>			
Facilitate changes to business practices	<p>In the longer term, increasing frequency of extreme heat and hotter summers in general may lead to a desire to change the hours of business operation to avoid hot periods of the day (eg extended closure in the afternoon and reopening later in the evening). Such business practices are already in place in cities overseas with warmer climates. A trend in this direction is already being observed with changes to working hours on hot days for people working outdoors.</p>	Start implementation within 30 years	Business SA State Government	Resilient East Councils Traders Groups/associations

Resilient East... Actions for the Eastern Region to respond to a changing climate

***Resilient East** is about making sure the Eastern region remains a vibrant, desirable and productive place to live, work and visit and that our businesses, communities and environments can respond positively to the challenges and opportunities presented by changing climate.*



The Resilient East Climate Change Adaptation Plan identifies key priorities for action in our region to respond to the challenges and opportunities presented by a changing climate.



FIRE RISK

The number of extreme fire risk days is projected to increase by 200% by 2090.



AVERAGE TEMPERATURE

Average temperatures are projected to increase across all seasons by between 1.5° and 2.0° by 2050.



EXTREME TEMPERATURES

The number of days over 40° is projected to double by 2050. The frequency and duration of heatwaves is projected to increase.



AVERAGE ANNUAL RAINFALL

Average annual rainfall is projected to decrease by 7% by 2050. The greatest decline is projected for Spring rainfall.



RAINFALL INTENSITY

The intensity of heavy rainfall events is projected to increase by at least 10% by 2050.

Resilient East is a collaborative project being led by eight councils with funding from the South Australian and Federal Governments and working in partnership with the many and diverse organisations that have an interest and role in the long term vibrancy and vitality of the Eastern Region of metropolitan Adelaide.



Progressing implementation of adaptation actions in the Eastern Region

To assist with progressing adaptation across the Eastern Region, the priority adaptation options identified by Table A have been brought together in the Eastern Region Regional Adaptation Priorities Action Plan (refer Appendix B). These priority adaptation options are the focus of the Adaptation Priorities Action Plan given their multi-sectoral relevance and opportunity to benefit multiple sectors or key decision areas.

It is not intended that the Regional Adaptation Priorities Action Plan be considered the only adaptation actions that are required in the Eastern Region, but rather a starting point to focus initial regional, cross-sectoral action. The remainder of the preferred options identified by the Regional Adaptation Plan are still considered critical to ensure the Region remains a vibrant, desirable and productive place to live, work and visit.

Creating enabling conditions that support the implementation of the Regional Adaptation Plan

In developing this Regional Adaptation Plan, consideration was given to the conditions that sit 'outside' of the Plan and the broader decision making context that may impact on whether adaptation action may occur (refer section 6). Understanding this context and ensuring appropriate conditions are in place to enable adaptation action is considered as important as identifying the adaptation options themselves. Table C summarises the key enabling conditions identified as being critical to supporting the successful implementation of the Regional Adaptation Plan.

Table C Summary of enabling conditions

Actions to create enabling conditions
Immediate actions
Ratify regional commitment to implement the Regional Adaptation Plan through the establishment of a Climate Change Sector Agreement
Develop a governance approach to support implementation of the Regional Adaptation Plan including designating a lead group/organisation and potentially, establishing a coordinator role
Embed climate change considerations in key organisational strategies, plans, policies and processes (eg strategic management plans, asset management plans, procurement policies etc)
Ongoing actions
Develop messaging about adaptation for communications with broader community
Identify resourcing opportunities to assist with implementing adaptation options. This could include allocation of existing monies or seeking new sources
Build community awareness and understanding about the potential impacts of climate change and opportunities to adapt
Recognise and embrace the opportunities for adaptation that may be presented by changes in urban form (eg densification and renewal) as well as recognise the challenges this may pose

1

INTRODUCTION



1. Introduction

Resilient East is about making sure the Eastern Region remains a vibrant, desirable and productive place to live, work and visit and that our businesses, communities and environments can respond positively to the challenges and opportunities presented by a changing climate.

We know that despite global action being taken to manage and reduce greenhouse gas emissions, we are already on a pathway which means that some degree of adaptation will be required. By being proactive and thinking and planning now for the impacts that are likely to occur as the climate changes, the Eastern Region can position itself to manage adverse impacts and take advantage of any opportunities.

There is strength in numbers. By collaborating, our Region can deliver a coordinated response to climate change and by sharing information, resources, responsibilities and actions we can achieve a Resilient East. This Regional Climate Change Adaptation Plan (Regional Adaptation Plan) provides the foundation for this coordinated and collaborative response to climate change and identifies priorities for adaptation across the Eastern Region.

1.1. Who does this Plan belong to?

This Regional Adaptation Plan is for the Eastern Region which comprises Adelaide City Council, the Cities of Burnside, Campbelltown, Norwood Payneham & St Peters, Prospect, Tea Tree Gully and Unley, and the Town of Walkerville (refer Figure 1).

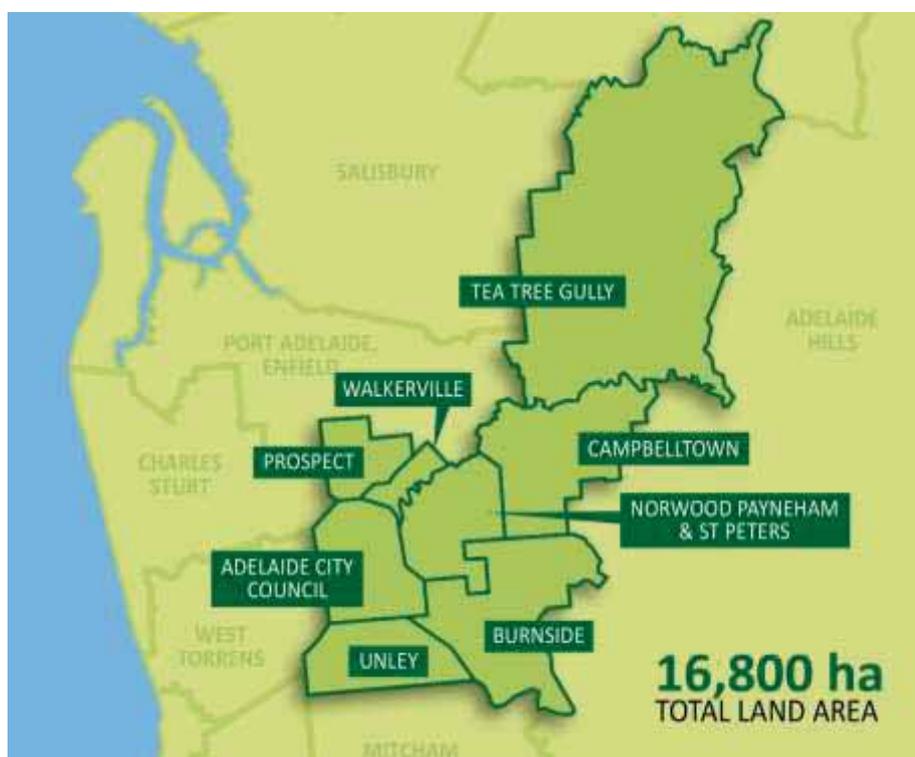
The Resilient East project is a partnership between the eight Councils identified above, together with State government support¹ and the stakeholders and communities who have a role or interest in the Eastern Region and is consistent with South Australia's Adaptation Framework².

Adaptation to climate change is everyone's business and we can all play a role in taking action that builds our resilience and reduce or ameliorate the impacts of climate change. The Regional Adaptation Plan is therefore a plan for the Region and its implementation resides with individuals and organisations across the Eastern Region including service providers, government agencies, not-for-profit organisations, Local Government, business and industry, infrastructure owners and managers and community groups.

¹ State government support provided by Adelaide and Mount Lofty Ranges Natural Resources Management Board, Department of Environment, Water and Natural Resources and South Australian Fire and Emergency Services Commission

² The South Australian Adaptation Framework, *Prospering in Changing Climate: A Climate Change Adaptation Framework for South Australia*, provides a foundation for guiding business, the community, non-government organisations, the research sector, local governments and state government agencies to develop well-informed and timely adaptation responses

Figure 1 The Eastern Region



1.2. Overview of the Eastern Region

As illustrated by Figure 1³, the Eastern Region is a significant part of the Adelaide metropolitan area, with a total population estimated at just over 320,000, or 19% of the State's population.

The Eastern Region is predominantly residential and is home to the State's capital city and inner and middle ring Council areas that are key contributors to the economic activity and vibrancy of Greater Metropolitan Adelaide and the State.

The Eastern Region:

- generates 30.6 billion dollars in Gross Regional Product which is 33% of the Gross State Product
- provides 248,961 jobs, with 70% of these undertaken by residents of the Region, and
- is home to a range of cultural activities, celebrations, events and festivals of local, regional, State, National and International significance including:
 - Royal Adelaide Show (\$165.1 million, attendance of 473,000 people)
 - Tour Down Under (\$45.9 million)
 - Clipsal 500 (over 12 years has contributed \$285.48 million to State economy)

³ The Eastern Region as identified by Figure 1 is for the purposes of this Regional Adaptation Plan and does not align with State Government administrative regions

- WOMAD (\$5.7 million to GSP)
- Festival of Arts (\$62.9 million to State economy)
- Fringe Festival (\$66.3 million to State economy).

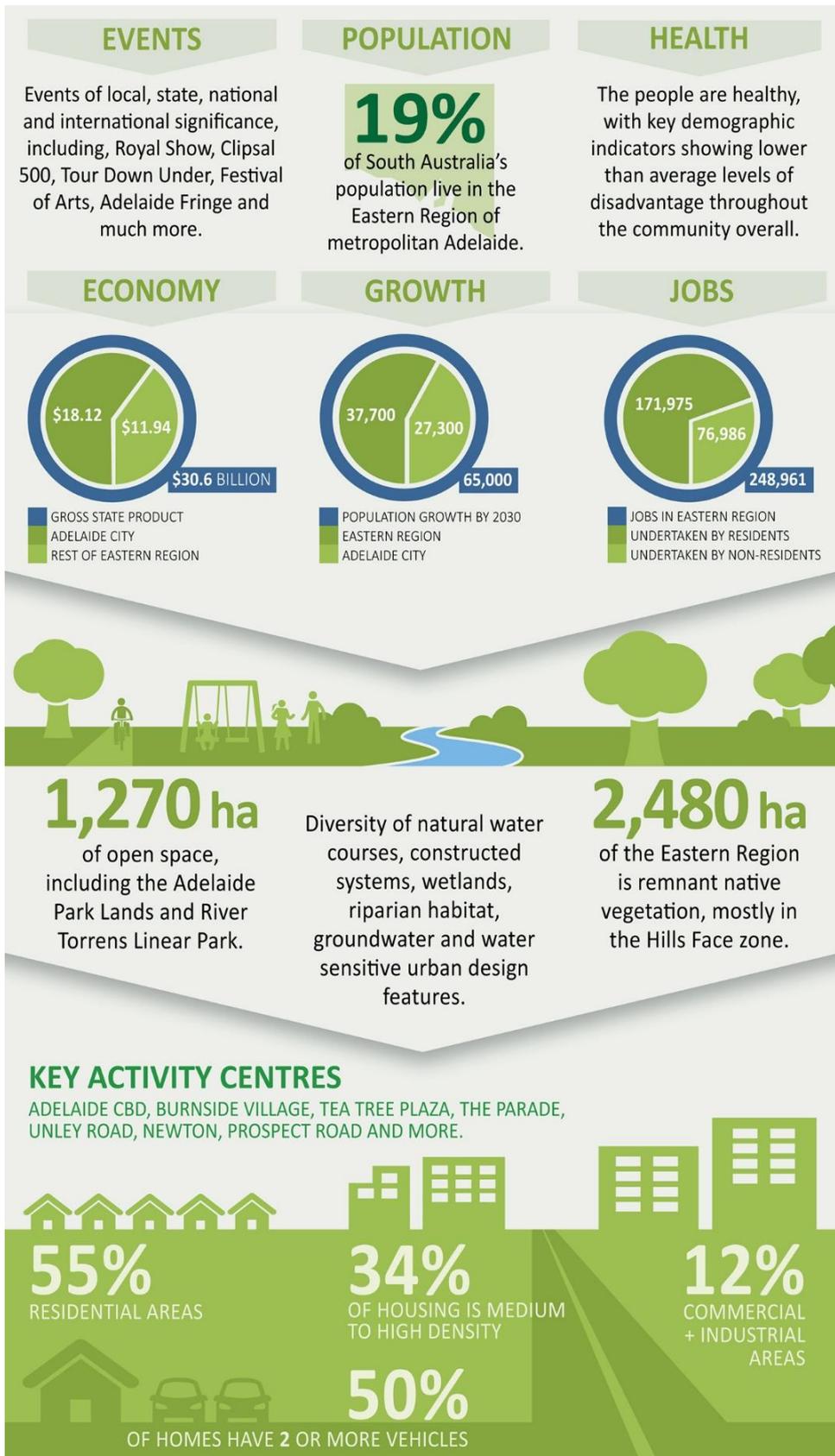
The Eastern Region has 2,480 hectares of open space which is 15% of the total land area. Habitat and biodiversity assets are found throughout the foothills, parks and reserves and along the iconic watercourses such as the River Torrens. This open space, habitat and biodiversity provides important green infrastructure to help mitigate the urban heat island effect and contributes to the overall amenity and character of the Region, making it a desirable and attractive place to live. In addition privately owned open space, in the form of gardens around dwellings also provide green infrastructure and habitat and biodiversity.

The community of the Eastern Region is diverse with quite different characteristics in age and cultural and linguistic diversity across the Region. The community is relatively healthy with key demographic characteristics not indicating high levels of disadvantage in the community overall. That said, there are members of the community who are more vulnerable than others in the community and have greater reliance on services and support.

Figure 2 summarises key features and aspects of the Eastern Region⁴.

⁴ Refer *Vision, Values and Key Decisions Report* for more detail regarding the profile of the Eastern Region

Figure 2 Overview of key features and aspects of the Eastern Region



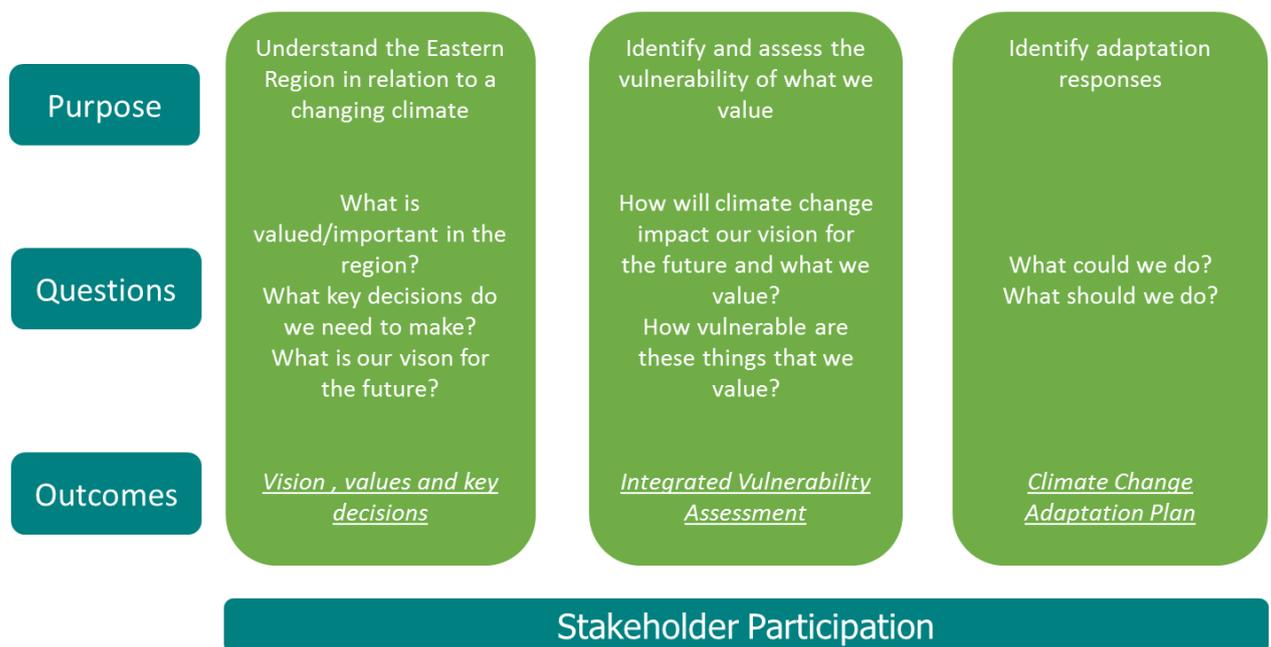
1.3. How has this Regional Adaptation Plan been developed?

This Regional Adaptation Plan was developed over three key stages (refer Figure 3) and has involved the active participation of the Region's key stakeholders, players and influencers in order to provide a strong foundation for ongoing coordination and collaboration to tackle the challenges of climate change into the future. The three project stages incorporated a series of workshops involving representatives of organisations that play a role in the Region's:

- Assets and infrastructure
- Emergency management
- Local economic development and sustainability
- Natural environment, open space and water, and
- Social and community resilience and health.

Appendix A lists those organisations and sectors that contributed to the preparation of the Regional Adaptation Plan.

Figure 3 Overview of approach to preparing the Regional Adaptation Plan



Delivery of these three stages resulted in the preparation of the following key reports.

- Vision, Values and Key Decisions Report - this report describes what is valued in the Eastern Region and considers how these values may be impacted by climate change.
- Climate Projections for the Eastern Adelaide Region - this report describes the current and projected future climate of the Eastern Region.
- Integrated Vulnerability Assessment Report- this report documents the assessment of valued aspects and features to determine their vulnerability to the impacts of climate change.
- Regional Adaptation Plan - this report identifies adaptation options for the Region to build resilience and adapt to the impacts of climate change in relation to key areas of vulnerability and take advantage of any opportunities.

1.4. Guide to reading this Regional Adaptation Plan

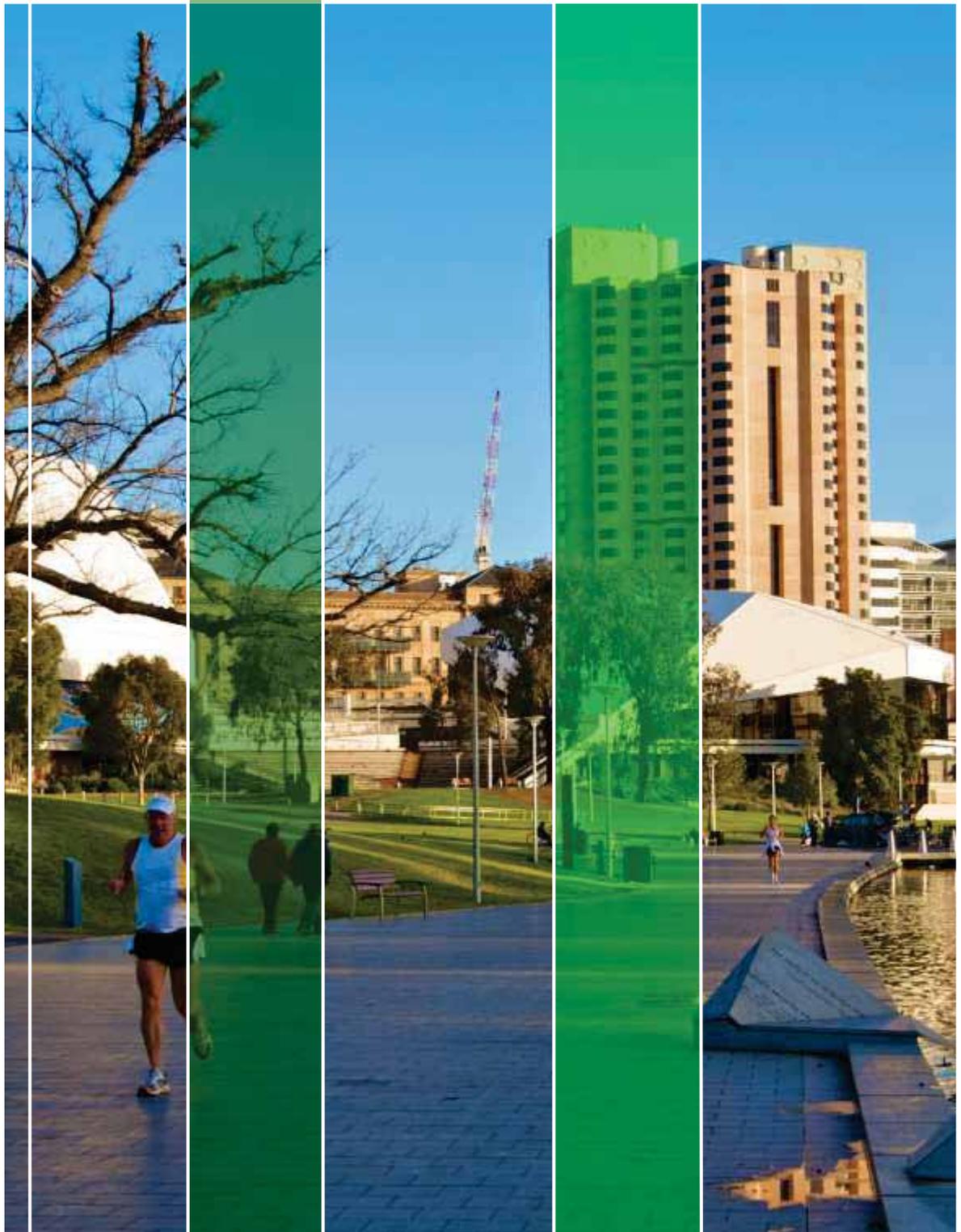
Table 1 provides an overview of the content of each section of the Regional Adaptation Plan.

Table 1 Guide to reading the Regional Adaptation Plan

Section	Purpose
1 Introduction	Describes the Resilient East project partners, who the Plan belongs to, what it hopes to achieve and how it has been prepared
2 How will climate change be experienced across the Eastern Region?	Summarises the current and projected climate for the Eastern Region. This information was used to understand risks and opportunities presented by climate change
3 Understanding vulnerability and identifying areas for focussing adaptation action	Provides an overview of how areas for focussing adaptation action were identified based on: <ul style="list-style-type: none"> • Understanding what is valued in the region • Implementation and analysis of the Integrated Vulnerability Assessment • Identification of key decision areas for adaptation action • Identification and assessment of adaptation options utilising adaptation pathways analysis
4 Adaptation options for the Eastern Region	Provides further detail regarding adaptation pathways analysis Describes the pathway maps and how to interpret them Describes the adaptation options identified for each key decision area
5 Priorities for adaption in the Eastern Region	Identifies nine priority adaptation options for the Eastern Region with reference to the Adaptation Priorities Action Plan
6 Enabling adaptation action	Identifies enabling conditions to support the implementation of the Regional Adaptation Plan
7 References	List of documents referred to in the Plan
8 Appendix A	List of organisations/sectors that participated in the preparation of the Regional Adaptation Plan
Appendix B	Adaptation Action Plan which proposes cross-sectoral, regional actions for adaptation options for more immediate implementation as well as suggested leaders and partner for actions

2

HOW WILL CLIMATE CHANGE BE EXPERIENCED BY THE EASTERN REGION?



2. How will climate change be experienced by the Eastern Region?

To assist with preparing the Regional Adaptation Plan, climate projections were prepared and documented in the Climate Projections for the Eastern Region Report⁵. Climate projections differ depending on a range of factors including which climate model, concentration pathway (previously referred to as emissions scenario) and timeframe for the concentration pathway are selected.

The Project Steering Committee that has overseen the preparation of the Regional Adaptation Plan considered the range of projections that could be used and chose to use data from the median model outputs to 2050 under a high (emissions) concentration pathway (RCP8.5). The use of a high emissions scenario was identified given that current evidence shows that we are currently tracking at high emissions. The timeframe of 2050 was selected to balance the need to incorporate a timeframe that reflected longer term decisions (e.g. asset delivery lifecycle considerations) and a timeframe that is not beyond reasonable and realistic timeframes to strategic planning for the Region's organisations.

This data was used to identify climate variables which describe various aspects of the future climate such as:

- maximum and minimum temperature
- extreme heat
- quantity and seasonality of rainfall
- intensity of extreme rainfall events, and
- frequency and intensity of extreme fire danger days.

The changes in climate projected for the Eastern Region are summarised by Table 2.

⁵ Resilient East (2015) *Climate Projections Report*, prepared by URPS and Seed Consultancy Services as part of the Resilient East consultancy led by URPS, for the Eastern Region in association with the Government of South Australia and the Australian Government

Table 2 Summary of climate projections for the Eastern Region

Climate variable	Description (change by 2050-high emissions)
	<p>1.6°C increase in average annual maximum temperature</p> <p>1.5-1.6°C increase in average maximum temperature in summer and autumn</p> <p>2°C increase in average maximum temperature in winter and spring</p>
	<p>The frequency of 2 or more days over 35°C will more than double</p>
	<p>7% reduction in average annual rainfall</p> <p>21% reduction in Spring rainfall</p>
	<p>10% increase in extreme daily rainfall</p>
	<p>Days of extreme fire risk will increase 5 fold by 2070⁶</p>

⁶ Note that data is not available for 2050 in relation to this variable.

3

UNDERSTANDING VULNERABILITY
AND IDENTIFYING AREAS FOR
FOCUSSING ADAPTATION ACTION



3. Understanding vulnerability and identifying areas for focussing adaptation action

The key objective of the Regional Adaptation Plan is to identify adaptation actions that reduce or address key vulnerabilities that are presented by climate change or build on areas of resilience and take advantage of opportunities.

The Integrated Vulnerability Assessment (IVA)⁷ undertaken in stage two of the project assessed 36 indicators that related to aspects or features valued by the Eastern Region to understand how they might be vulnerable to climate change. These indicators related to aspects or features of the Eastern Region which were considered to contribute to the following values identified during stage one of the project:

- open and green spaces
- water
- community engagement, education and participation
- community connection and inclusion
- health, wellbeing and safety
- habitat and biodiversity
- governance
- infrastructure and built environment, and
- economic activity and vibrancy.

3.1. What is an IVA?

The IVA is a tool that enables consideration of both the potential impact of climate change (exposure and sensitivity) and adaptive capacity (refer Table 3 for definitions). Once implemented, analysis of the IVA enables aspects or features of the Region that may be more vulnerable than others to the impacts of climate change to be determined. This then allows areas of focus to be identified for adaptation planning.

Table 3 Definition of key terms

Term	Definition
Exposure	Exposure considers the likelihood of a feature or its function being subjected to change in relation to a particular climate variable. For example low lying land is more exposed to inundation from flooding, the entire Region is exposed to heatwaves and the Hills Face area is more exposed to bushfire. For Resilient East, exposure relates to predicted changes in the climate at 2050.
Sensitivity	Sensitivity considers the degree to which a feature or its functions are affected by change to a particular climate variable. For example, older people are more sensitive to heatwaves, non-irrigated open space is sensitive to reduced rainfall and native vegetation is sensitive to increased bushfire risk.

⁷ Resilient East (2015) *Integrated Vulnerability Assessment Report*, prepared by URPS as part of the Resilient East consultancy led by URPS, for the Eastern Region in association with the Government of South Australia and the Australian Government

Term	Definition
Adaptive capacity (to cope with 2050 conditions)	Adaptive capacity is the ability or potential of a feature or function to adjust to climate change impacts (including climate variability and extremes). It enables systems to moderate potential damages, take advantage of opportunities, or cope with consequences and maintain the valued characteristics of that feature or function. Consideration is given to what extent a feature or its function in its current form, with current management practices or funding, is able to continue to function, cope or adjust to the expected climate conditions at 2050. For example, water sensitive urban design (WSUD) can provide the ability for a streetscape to function in response to reduced rainfall, but if no WSUD measures are in place now, then the adaptive capacity would be considered to be less than if WSUD was currently in place.

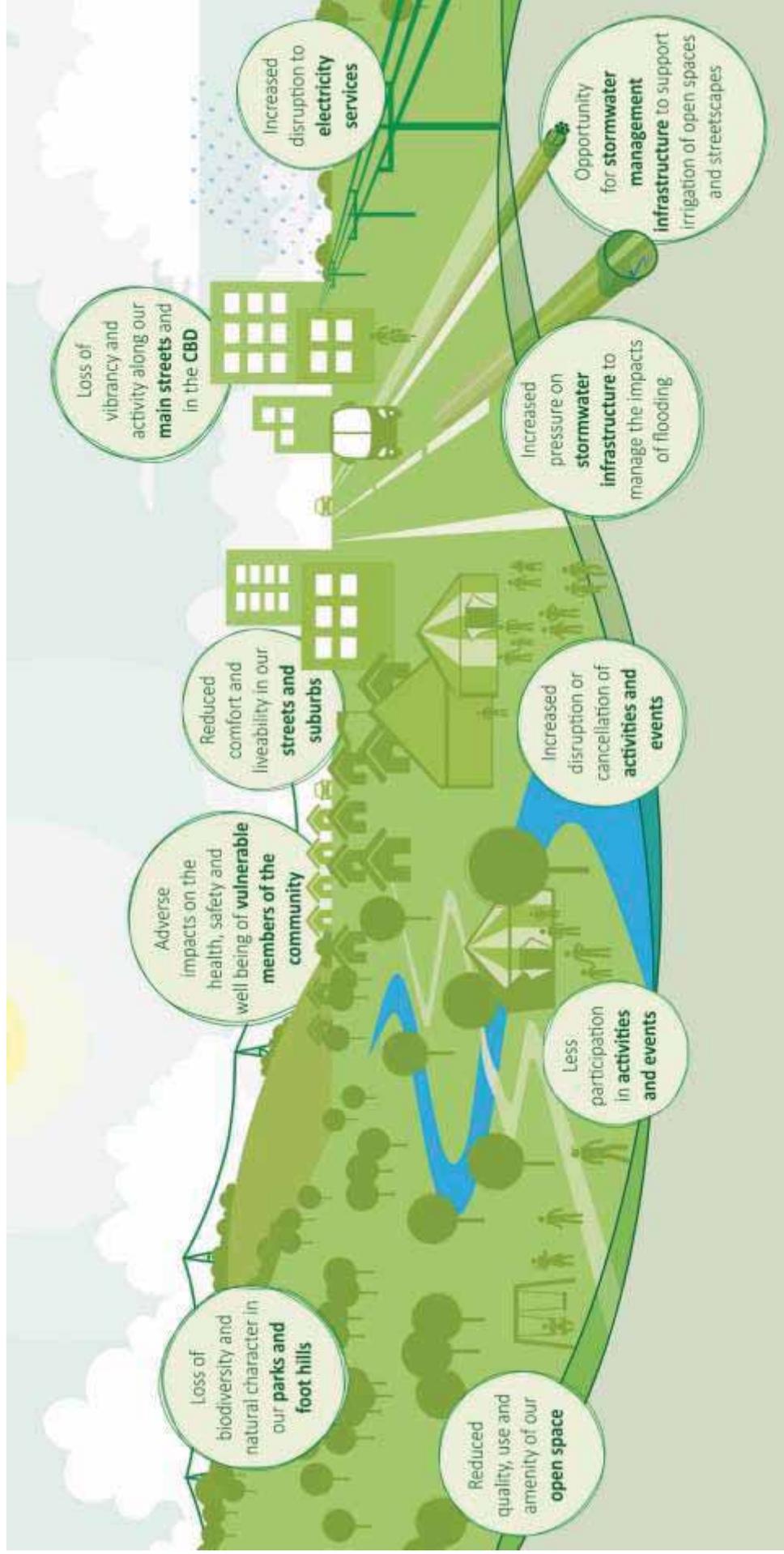
3.2. What did the IVA tell us?

Table 4 and Figure 4 show those valued aspects or features of the Eastern Region that were identified via analysis of the IVA as having a higher vulnerability to climate change than others.

Table 4 Indicators that were assessed by the IVA as having a higher vulnerability to climate change

Indicators that were identified by the IVA as having higher vulnerability to climate change
Amenity and liveability of medium and high density residential areas
Amenity, character and recreation opportunities provided by Linear parks
Amenity, character, habitat, biodiversity and recreation opportunities provided by natural open space (eg Council reserves, DEWNR parks)
Community participation in outdoor community events, celebrations and activities
Condition and extent of native vegetation
Condition of Aboriginal heritage (natural heritage e.g. watercourses, natural wetlands)
Condition of natural watercourses (biodiversity and amenity)
Effective functioning and utilisation of public realm (built infrastructure)
Effective functioning of arts and cultural facilities (art galleries, libraries, theatres, community centres)
Effective functioning of stormwater management features (WSUD, wetlands, basins, pumps)
Effective operation of electricity supply network
Employment in the health care and social assistance sector
Health, safety and wellbeing of vulnerable members of the community (people with disability)
Health, safety and wellbeing of vulnerable members of the community (those aged over 65)
Health, safety and wellbeing of vulnerable members of the community (CALD members of the community)
Low income individuals and/or families
Utilisation of open space
Wealth and vibrancy generated by major events

Figure 4 Valued aspects and features that are vulnerable to climate change or present opportunities



3.3. Transitioning from the IVA to adaptation planning

Adaptation pathways analysis was used to prepare the Regional Adaptation Plan. An important step in undertaking this approach is to frame the areas of focus identified by the analysis of the IVA as ‘key areas of decision making’.

Key areas of decision making comprise questions that the Regional Adaptation Plan is looking to respond to and are made up of three elements:

- The *objective* of what the Eastern Region is looking to achieve in relation to an aspect or feature that is valued. For example, to provide, protect and manage [the aspect or feature].
- The *valued feature or aspect* that the Region is focussed on. For example, the health, safety and wellbeing of vulnerable members of the community.
- The *reason* why the Region needs to take action, ie in response to a particular climate impact such as increased frequency and intensity of heat waves.

For the Resilient East Regional Adaptation Plan, eight key areas of decision making were developed as summarised in Table 6 and their development is directly linked back to the IVA analysis (refer Integrated Vulnerability Assessment Report).

Table 5 Resilient East key areas of decision making

Theme	Proposed key area of decision making
Vulnerable members of the community (ie those needing assistance with core activities such as frail aged or people with a disability)	How do we improve the health, safety and wellbeing of vulnerable members of the community as the frequency and intensity of heat waves and bushfires increase?
Open and green spaces	How do we provide, protect and enhance the amenity, biodiversity and recreation opportunities provided by open space as our climate becomes warmer and drier and there is an increased risk of damage from heat waves and bushfires?
Natural landscapes	How do we protect and enhance the condition of natural landscapes across the plains and hills face as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?
Urban areas	How do we create better amenity and liveability in our urban areas as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?
Activity centres (eg main streets and CBD environment)	How do we improve the amenity and vibrancy of our activity centres as our climate becomes warmer and drier and the risk of heat waves increase?
Stormwater management infrastructure	How do we design, construct and maintain stormwater management infrastructure so that it provides flood protection, maximises reuse opportunities and enhances amenity as annual rainfall declines, rainfall intensity increases and the risk of heatwaves rises?

Theme	Proposed key area of decision making
Community participation (services, places and spaces)	How do we support and grow participation in events, celebrations and activities as rainfall intensity, frequency, intensity and duration of heat waves and bushfire risk increases?
Continuity of services	How do we minimise disruption to business, events and infrastructure and residents reliant on electricity as we are exposed to more frequent and intense heatwave and greater fire risk?

3.4. Understanding adaptation pathways analysis

As referred to above, adaptation pathways analysis has been used to prepare this Regional Adaptation Plan.

Adaptation pathways provides a way of considering and visualising adaptation options. Rather than being limited to identifying the best single set of adaptation options for a limited set of climate change scenarios, it enables decision makers and communities to consider a range of possible actions, how they will be impacted by climate change through time, and whether any options have a ‘used by date’ (ie a point in time at which they are no longer viable or useful for addressing the impact being experienced). It also enables the exploration of what combination of options are most suitable for adapting to future climate change and how these could be sequenced over time (ie what should be done now, versus what can be delayed). This type of analysis can break down the disempowering sense that ‘everything’ will be affected by climate change, or that everything needs to be done at once.

4

ADAPTATION OPTIONS FOR THE EASTERN REGION



4. Adaptation options for the Eastern Region

Adaptation options have been identified and assessed in relation to the eight key areas of decision making (refer sections 4.2-4.9).

To develop adaptation options for each of the key areas of decision making, a range of information generated by the project was drawn upon including the project reports described in Section 1.3.

For each key area of decision making the following aspects are discussed:

- why the area of focus is important to the region
- how projected climate change may impact that area of focus, and
- how the Region can respond through adaptation.

Critical to the identification and assessment of adaptation options for each key area of decision making was consideration of the aspects summarised by Table 6. The majority of information documented in response to these aspects was generated by stakeholders from the Region at the adaptation options workshops.

Table 6 Key considerations for identifying and assessing adaptation options

Consideration	Questions we asked our Region	Why is it important to consider this?
Current practice	What are we currently doing in relation to the key area of decision making?	By understanding what we are doing now, we can think about what else we might need to do in the future as the climate changes
Thresholds for changing our approach	What are our levels of tolerance, or thresholds, for changing what we are doing as we experience changes in climate?	By understanding thresholds, we can identify when we might need to change our approaches so we can adapt to changes in climate
When what we are doing will no longer be enough to cope	Given what we understand about projected climate change, when might what we are doing no longer be enough to cope with changes in climate?	By understanding what we are doing now and how the climate might change, we can consider when our current approaches may not be enough to cope
Identifying adaptation options	What options are there to respond to the challenge posed by the key decision area?	By identifying options we can take action to adapt
Now or later	What adaptation options should be progressed now or later?	By understanding when options might be needed we can consider how to sequence actions over time as we don't need to do everything all at once
Identifying the preferred combination of options	What is the preferred combination of adaptation of options to be implemented to address the key area of decision making?	By understanding a preferred combination of options, we can plan and implement actions. This recognises that there is often no one adaptation response but multiple ways to address a particular climate impact

4.1. Interpreting the pathway maps

In addition to the descriptive text provided for each key area of decision making, a pathway map is also provided. The pathway maps set out the range of adaptation options considered for each key decision area and the preferred adaptation pathway, made up of the preferred combination of options identified by the Region's stakeholders for implementation. The timing for each option and the relationship with other preferred options are also shown on each pathway.

Each pathway should be read in conjunction with the description of the relevant key decision area. Figure 5 describes the symbology used.

The horizontal axis of the pathway shows both a timescale, and expected changes to the climate that are relevant to the key decision area.

The range of adaptation options identified for the key decision area are listed on the left of the pathway map.

Against each option is a combination of dots and lines that indicate:

- The contribution of the option to the relevant key decision - whether it fully or partly addresses the decision area
- The favourability of the option
- The time period over which the option may be effective
- The time period before an option is implemented during which preparatory work is required
- Decision points where decision makers need to choose between options
- The preferred pathway through all of the options listed.

Each circle on the pathway map represents a decision point, a point in time where a decision maker will need to determine whether an option should start being implemented, continue or stop. Vertical lines that are dark green in colour and that connect more than one decision point indicate that at that time, decision makers need to choose whether to start, continue or stop implementing more than one option. Where a vertical line correlates with the x-axis indicates the timing of a decision. Vertical lines can also be light green in colour and not intersect with decision points. This indicates that there will be times when decision makers need to determine whether to continue or commence the planning or lead time for one or more options.

4.1.1. Understanding the preferred pathway

The preferred pathway (yellow line/s) identifies which options should be progressed now and into the future based on currently available information and preferences for implementation, including information provided by stakeholders at the adaptation workshops.

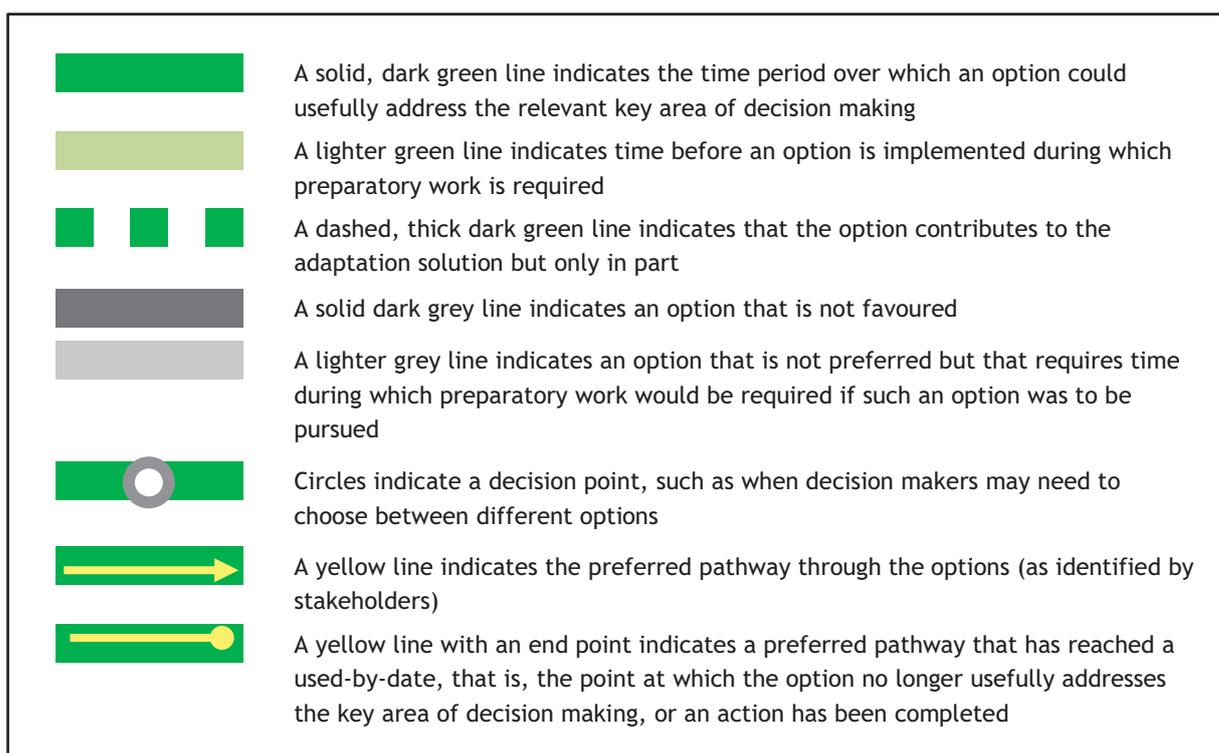
The preferred pathway does not preclude current actions that contribute to future adaptation from continuing but rather indicates actions over and above current practice that are required to enable adaptation to climate change impacts. The pathways should be reviewed at least every 5 years, at which time new information may suggest that the preferred pathway should take a different course through potential options.

For some preferred pathways, an end point is identified. End points occur for two main reasons:

- A point in time when the action is no longer considered to be effective in helping to achieve the key area of decision making under the projected climatic conditions. In this instance the action can be said to have reached its 'used-by date'
- the action has been completed. For example, the action involves an initial burst of work or involves a once off process (eg Mandate targets for WSUD), after which the focus is on implementation, review and maintenance.

It should be noted that although there was significant stakeholder involvement in the preparation of the pathways, further assessment of options by relevant individual sectors may still be required.

Figure 5 Pathway map symbology



4.2. Activity centres

Why are activity centres important to the Region?

Activity centres throughout the Eastern Region such as main streets, shopping and entertainment precincts and the Adelaide central business district, are valued for their contribution to the quality of life of residents and visitors through the provision of goods and services, employment and investment opportunities, and vibrant destinations for shopping, socialising and celebration.

How will climate change impact activity centres?

The IVA found that the Region's activity centres will be impacted by projected warmer and drier conditions and climate extremes such as heatwave which will influence amenity and vibrancy, particularly main streets and the CBD environment. The IVA found that visitation to outdoor activity centres is likely to reduce during extreme climate events such as heatwaves and intense rainfall, thereby impacting on local businesses and the economy. Conversely visitation to indoor mall style environments may increase, as people seek out or retreat to protected areas to socialise and shop.

How do we improve the amenity and vibrancy of our activity centres as our climate becomes warmer and drier and the risk of heat waves increase?

A range of measures are already being implemented across the Region that will contribute to the adaptation of activity centres. These include public realm upgrades, shading of play spaces, drip irrigation systems and mulching for landscaping, shaded walkways between buildings or at entry points, sheltered bus stops and business groups working together (eg Rundle Mall). Despite these efforts, the region's stakeholders identified that within five years, these measures will be insufficient on their own to help activity centres adapt to future changes in climate and ensure that centres remain vibrant and attractive places to visit.

Immediate priorities for adaptation in relation to activity centres are to (refer Figure 6):

- prepare and implement climate-ready guidelines for public realm, green infrastructure and urban design
- install water sensitive urban design (WSUD) features and infrastructure to capture and reuse rainwater and stormwater
- advocate for amendments to the Building Code of Australia
- provide 'rest and revive' facilities within activity centres, and
- support the development of emergency management plans for activity centres.

Of these actions, the climate-ready guidelines should be completed within 5 years and then further refined through time as conditions on ground change and lessons are learned about the effectiveness of various design features. Regarding public realm, these guidelines should include advice on appropriate material and tree species selection, shade cover, inclusion of WSUD features, opportunities for misting infrastructure and water features. In relation to design

policy, the guidelines should advise on materials selection with low heat absorption, integration of built and green areas, energy efficiency requirements, passive heating and cooling, solar capture and green roofs and walls.

To assist with the natural cooling of activity centres that is provided by vegetation, irrigation will be critical particularly given warmer and drier conditions. Well-designed WSUD features can make good use of low rainfall events by retaining water on site, and other opportunities to capture and reuse rainwater and stormwater can contribute to meeting irrigation demand.

Providing 'rest and revive' facilities will require initial planning followed by ongoing implementation. These facilities are spaces or places within activity centres where people can take a break and have a drink in the presence of trained staff. These facilities could be provided privately by centre owners, or by organisations such as Councils within existing public buildings/facilities such as libraries, or in public/private partnerships. These facilities are likely to be required more during heatwaves as well as high fire danger days when visitation to centres increases as hills' residents come down to the plains.

Supporting the preparation of emergency management plans for activity centres will assist centres to prevent, prepare, respond and recover in relation to extreme events such as bushfire and heatwave and the associated impacts such as electricity disruption.

Starting in five years, appropriate planting should occur around activity centres. This five year delay is intended to allow for sufficient time to prioritise planting locations (e.g. high traffic and denser areas) and for the climate ready guidelines to be completed, which will inform species selection.

Also to commence within 5 years will be ensuring that asset management plans are climate ready and are able to help with long term planning. This will require a description of climate impacts, potential increases in the need for asset renewal and direction on Councils' role in managing climate impacts.

Over the coming 10 years any necessary amendments to the Building Code of Australia should be advocated for through lobbying of relevant Federal and State government agencies and industry associations. The aim is to make building features which will assist in reducing the impacts of climate change and enable adaptation mandatory. While it is recognised that continuing amendments will likely be required, this initial tranche of work will make the changes necessary to build resilience into activity centre buildings.

In 30 years' time, it is anticipated that adaptation will require changes to business practices such as altered hours of operation to avoid hot periods of the day, perhaps even closure for extended periods (eg 1 to 4pm). This will be linked with broader societal changes in working hours or practices (eg working from home) that may occur across other parts of the economy.

Decisions to change the combination of adaptation options or transition to new options will be influenced by thresholds being exceeded relevant to the operation of activity centres. A key threshold is the potential for the closure of main street shops and businesses as a result of power

black outs as a result of extreme events such as heatwave and bushfire. Repeated electricity blackouts will likely bring forward different types of adaptation options. Other thresholds that will influence the choice of adaptation options include:

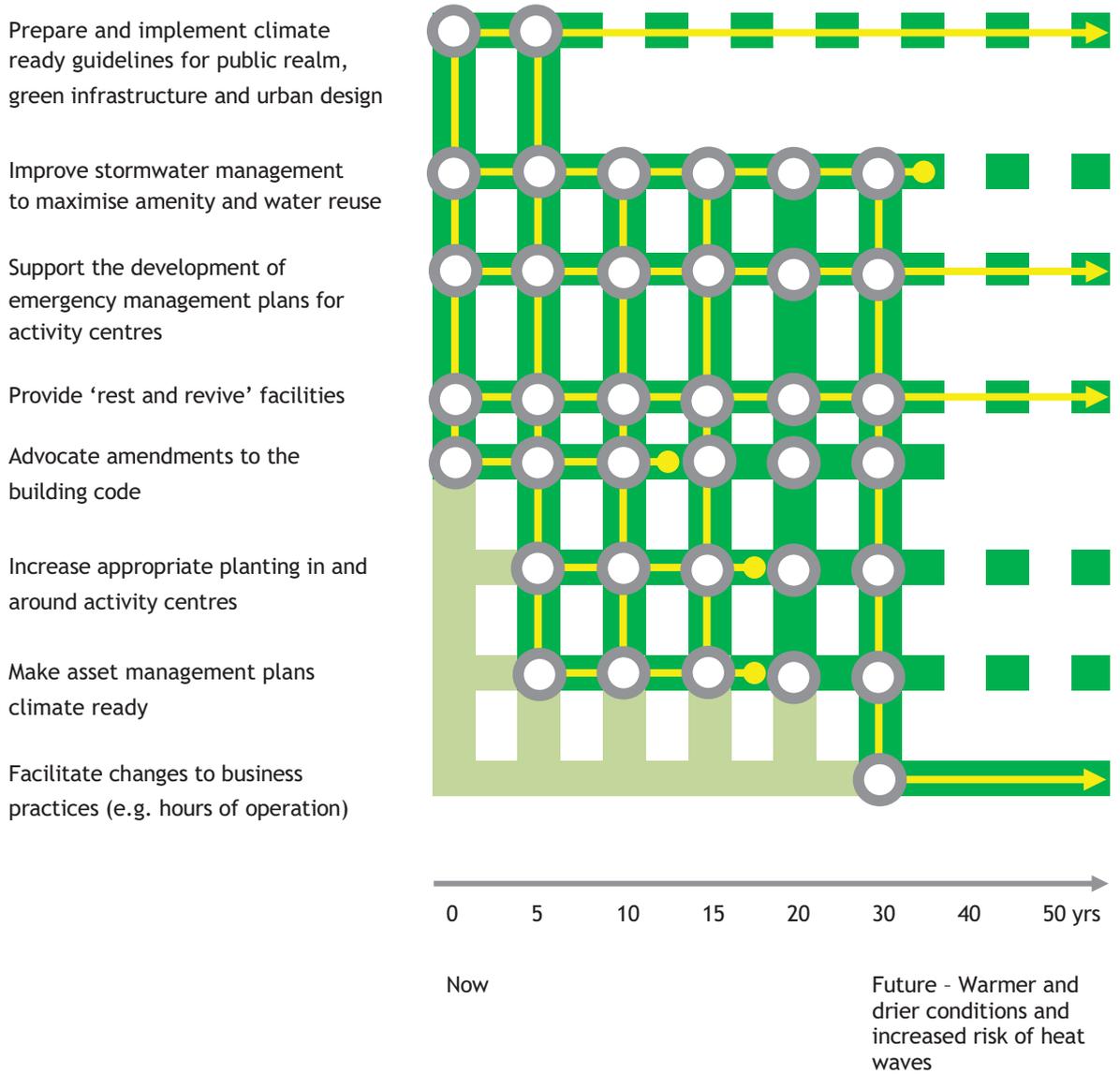
- vegetation mortality increasing the urban heat island effect, which in turn could reduce visitor numbers to activity centres
- increasing operating costs for businesses because of climate-related drivers
- increasing hospital admissions as a result of extreme events
- inability to provide a comfortable indoor environment to encourage visitors, and
- cancellation of events such as street festivals, fairs, pageants and Christmas carols.

Summary of key findings

To improve the amenity and vibrancy of the Region's activity centres, immediate priorities for adaptation are to prepare climate-ready guidelines for public realm, green infrastructure and urban design; install WSUD features and infrastructure to capture and reuse rainwater and stormwater and infrastructure; advocate for amendments to the Building Code of Australia; support the development of emergency management plans for activity centres; and provide 'rest and revive' facilities. In the longer term adaptation will require changes to business practices such as operating hours.

Figure 6 Activity centres pathway map

How do we improve the amenity and vibrancy of our activity centres as our climate becomes warmer and drier and the risk of heat waves increase?



4.3. Community participation (services, places and spaces)

Why is community participation important to the Region?

Community participation in events, celebrations and activities is valued by the Eastern Region for its contribution to community connection and inclusion, quality of life and vibrancy and the generation of commerce, investment and employment. Community participation is facilitated by a range of services (eg community transport), places (eg community centres and libraries) and spaces (eg parks, plazas and streetscapes).

How will climate change impact community participation?

The IVA found that participation in events, celebrations and activities will be impacted by climate change due to increasing rainfall intensity and climate hazards such as heatwave and bushfire. These changes will impact the ability of spaces and places such as parks and open spaces, community buildings, streets and plazas to hold events, celebrations and activities as well as people's desire and ability to participate.

How do we support and grow participation in events, celebrations and activities as rainfall intensity, frequency, intensity and duration of heat waves and bushfire risk increases?

Work in the Region is already helping to build adaptive capacity to support and grow participation in events, celebrations and activities. This includes measures such as encouraging volunteering, developing heat wave policies for events and opening public facilities such as swimming pools for longer on hot nights. Despite these efforts, the Region's stakeholders identified that within five years, these and similar actions will be insufficient on their own to enable community participation to adapt to a changing climate.

There are two adaptation priorities identified for immediate implementation in relation to community participation (refer Figure 7). First is to define Council and stakeholder roles, responsibilities and liabilities⁸ regarding the management of events, celebrations and activities. This recognises that Councils have specific responsibilities regarding risk management as the service provider or venue owner of many parks, community centres, swimming pools and other facilities. Such work can ensure that basic risk management practices are adhered to such as ensuring Council emergency numbers are displayed for after-hours users.

The other immediate priority is to commence the regular review and update of risk management plans. This will involve ensuring that event risk management plans are in place and that guidelines are prepared regarding bushfire risk management and heatwave responses (eg budget for heat wave contingencies, extra potable water, trained staff and misting tents).

In five years' time, a number of additional adaptation options will be required including:

⁸ Liabilities refers to understanding risks as a venue owner or operator

- increasing community education and awareness raising activities regarding heatwave and bushfire risk
- engaging the community in decision making regarding the level of service provision to be provided and the implications of different levels of service (ie costs of increased irrigation, extended opening hours of facilities etc)
- fit for purpose management of open space and infrastructure. This would involve determining the use of a given area and ensuring that it is maintained to an appropriate standard (eg applying a different irrigation regime for ovals used for sporting pursuits compared with facilities used for general walking and cycling)
- using technology to provide warnings about extreme events such as heatwave and bushfire and providing updates on community services/events
- managing stormwater to minimise the risk of flooding and maintaining the ability to hold events
- supporting community groups to develop resilience plans, and
- identifying alternative options to deal with electricity failures (eg installation of backup power supplies such as generators).

Constructing new multi-use indoor facilities is not likely to be required for at least 20 years. The lead time prior to implementation will enable assessment of the types of facilities required as the climate continues to change in the Region and the impacts on community participation are better understood. In the meantime, there should be a strategy developed to make better and more frequent use of existing multi-use indoor venues.

A range of thresholds are relevant to decision making regarding the choice of adaptation options to support and grow community participation, with disruption to services or programs as a result of extreme events more than four times per year a significant trigger as would be an increase in the number of major events cancelled as result of extreme events, with a 30-40% increase likely to trigger different management responses.

Summary of key findings

To support and grow participation in events, celebrations and activities in the Region, the immediate priorities for adaptation are to define council and stakeholder roles, responsibilities and liabilities regarding the management of events, celebrations and activities, and commence regular reviews and updates of risk management plans, especially for council owned venues and services. Future adaptation options may include constructing multi-use indoor facilities.

Figure 7 Community participation pathway map

How do we support and grow participation in events, celebrations and activities as rainfall intensity, frequency, intensity and duration of heat waves and bushfire risk increases?



4.4. Continuity of services

Why is continuity of services important to the Region?

The continuity of electricity services is valued by the Eastern Region as it underpins the economy and the amenity and quality of life of the community. It also enables the many activities, events and services to be provided by the Region that are of local, State, National and International significance.

How will climate change impact continuity of services?

The IVA found that the continuity of services will be impacted by climate change due to disruptions to electricity services during climate extremes such as heatwave and bushfire.

How do we minimise disruption to business, events and infrastructure and residents reliant on electricity as we are exposed to more frequent and intense heatwave and greater fire risk?

Awareness about the impacts of heatwaves and bushfire on the continuity of essential services is high. As such, many aspects of current practice already provide some degree of adaptive capacity, such as clearing of vegetation near powerlines and undergrounding of powerlines where practical and feasible by SA Power Networks, load shedding and the shift by some residents towards home based solar photovoltaic power systems. However, despite these and other measures being in place, it is unlikely that current practice will provide sufficient adaptive capacity in the face of future climate change.

Immediate priorities for adaptation in relation to continuity of services (refer Figure 8) separate to the work already being undertaken in the Region include:

- raising the awareness of business owners and infrastructure owners and operators about the potential impacts of disruptions to electricity supplies
- undertaking event risk management planning which includes considering the need to reschedule events should electricity supplies be disrupted during heatwaves and bushfires
- improving communication and coordination with essential services providers, and
- increasing the participation of business and infrastructure owners and operators in continuity planning, with the aim of supporting them to better understand their organisational resilience so they are able to recover quickly following a heatwave or bushfire. A range of tools and existing information sources are available from the South Australian Department of State Development and Australian Government Attorney-General's Department.

While not required immediately, increased electricity feeder automation should occur within 10 years. High voltage 'feeders' radiate power from substations across the metropolitan area for suburb level distribution and branch into low voltage networks. SA Power Networks identifies that it can be difficult to achieve cost effective, reliable solutions for feeders affected by heavy vegetation, lightning and ageing assets. Feeder automation gives greater control over managing

supply across the power network and can reduce the length of power outages, especially during severe weather events. This option would be deployed by SA Power Networks and follow on from the first phase of the 'Feeder Automation Project' which commenced in 2015. A feeder automation roadmap is provided by SA Power Networks in its Smarter Network Strategy 2014-2025.

As the climate changes further in the coming decades, work will also be required to upgrade cooling systems for telecommunication exchanges. This will occur gradually as part of routine maintenance and upgrade of such infrastructure.

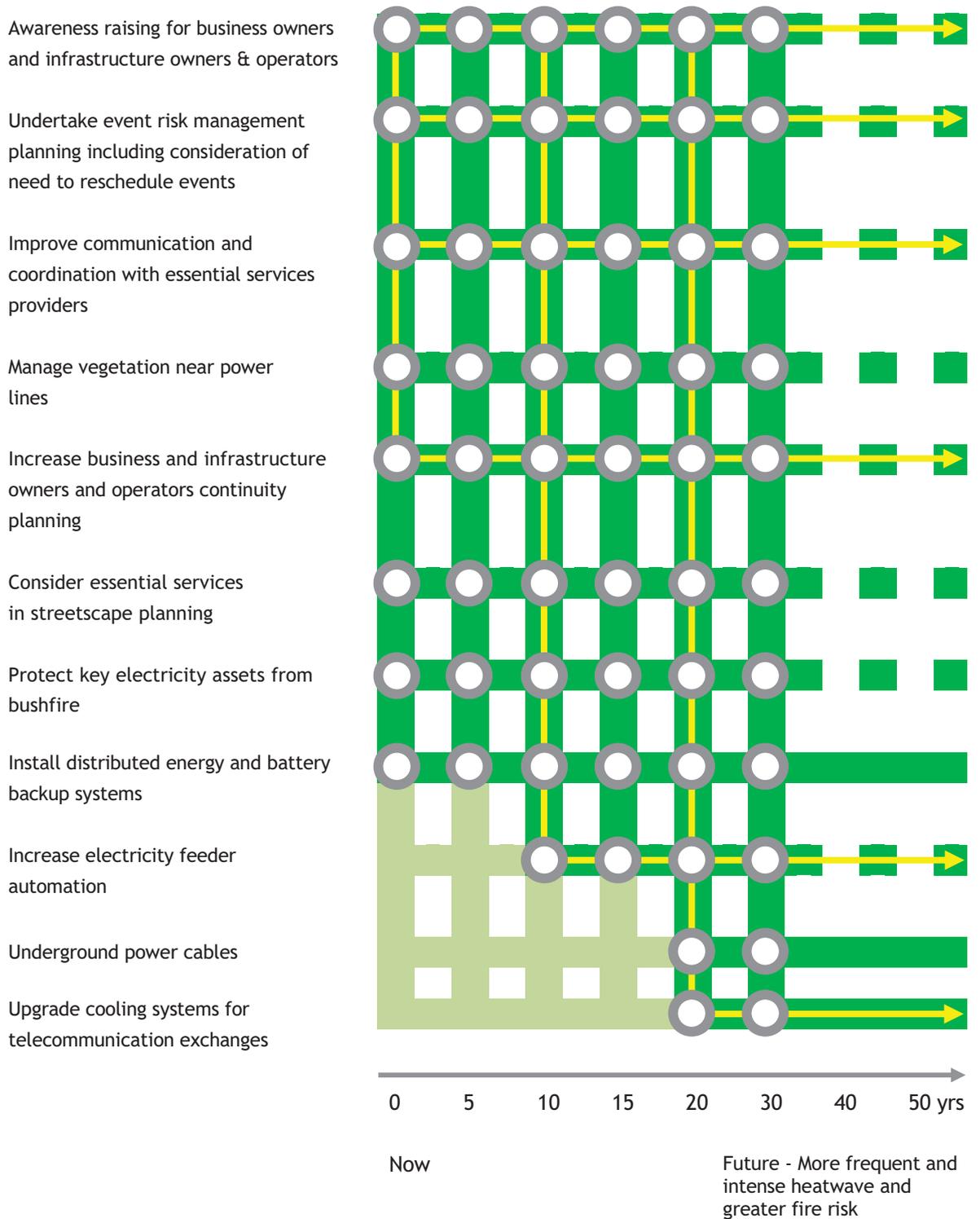
Various thresholds exist that are likely to trigger a change in the management of electricity supply and distribution infrastructure to adapt to a changing climate. Some of these thresholds may be related to the life span of physical assets whilst others will be based on expectations about service delivery, the frequency of outages and increases in the cost of electricity (access and supply charges). The cost and rate of uptake of distributed energy systems, such as solar PV combined with battery storage solutions, is also likely to have a major impact on the adaptation options pursued to maintain continuity of electricity supply.

Summary of key findings

To minimise disruption to business, events and infrastructure and residents reliant on the continuity of electricity services, immediate priorities for adaptation are to raise the awareness of business owners and infrastructure owners and operators about the potential impacts of disruptions to electricity supplies; undertake event risk management planning; improve communication and coordination with essential services providers; and increase the participation of business and infrastructure owners and operators in continuity planning.

Figure 8 Continuity of services pathway map

How do we minimise disruption to business, events and infrastructure and residents reliant on electricity as we are exposed to more frequent and intense heatwave and greater fire risk?



4.5. Natural landscapes

Why are natural landscapes important to the Region?

The natural landscapes of the Eastern Region are valued for their intrinsic value and the contribution they make to the Region's amenity and character. Natural landscapes include the remnant vegetation and foothills environments and the biodiversity scattered throughout the more urbanised areas such as along streets and in parks and reserves. Aboriginal heritage is also inextricably linked to the natural environment, including watercourses, pools, wetlands and areas of vegetation.

How will climate change impact natural landscapes?

The IVA found that climate change will impact the condition of natural landscapes due to warmer and drier conditions and climate extremes such as heatwave and bushfire. Remnant native vegetation may experience declining condition as a result of drying, plant loss, and introduction of disease and may also be damaged by bushfire. Existing biodiversity threats including pest plants and animals may become greater as pest plants and animals are often opportunistic and have a greater ability to respond to disturbance than native species.

How do we protect and enhance the condition of natural landscapes across the plains and hills face as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?

There are various aspects of current practice that already contribute to adaptation of natural landscapes. For example, various threats to native flora and fauna such as pest plants and animals and fire are actively managed; biodiversity is already incorporated into urban landscapes; seed collection of local genetic material occurs; erosion control measures are in place and revegetation programmes are being implemented. The approach to management of natural landscapes in the Region is outlined in plans prepared by Natural Resources Adelaide and Mount Lofty Ranges and the biodiversity management plans (or similar) of individual Councils. However, the Region's stakeholders identified that within 5 years, current practice will no longer be sufficient to protect natural landscapes as the climate changes.

Adaptation for natural landscapes will require a broad range of options to be implemented, now and into the future (refer Figure 9). Adaptation options for immediate implementation are as follows:

- increasing community climate change education and participation, focussing on sectors of the community not currently involved with management of natural landscapes
- developing and implementing a standard method for evaluating native and pest flora and fauna trends across Local Government areas. Where possible this should seek to involve the community such as through citizen science approaches
- adapting approaches to biodiversity conservation planning, including updating biodiversity plans to balance biodiversity values with protecting built assets considering increasing bushfire risk

- undertake watercourse management to protect water ways from climate extremes including identifying alternate water sources (e.g. treated wastewater), securing environmental flows, erosion management, revegetation and coordinating the approach to management of Linear Park
- implementing locally appropriate fire management activities that are relevant to natural landscapes, including on private land
- strategically prioritising pest plant and animal and disease control, and
- retaining existing and acquiring additional recreational open space for natural landscapes as a way to increase landscape connectivity, noting that this option could conflict with a desire to maintain recreation spaces which for some Council areas in the Region have limited open space for recreation already.

Within 5 years, work should commence to identify, manage and protect refugia in the region. This would involve prioritising biodiversity conservation and management in places where existing native species are most likely to persist and/or retreat to under future climate⁹. Preparatory work over the coming 5 years will involve working with regional biodiversity conservation partners (eg Natural Resources Adelaide and Mount Lofty Ranges) to identify species to provide refugia for and agree to methods for identifying refugia.

A major initiative that will enable natural landscapes to transition to a future climate is the assisted migration of native flora and fauna. This will involve introducing species from areas with lower rainfall and higher temperatures more akin to the projected future climate of the Region. While it is not required for at least a decade, significant research is needed to determine the appropriate way for this to occur and to further clarify the necessary timing. At the same time as research is being undertaken, other options should also be explored such as introducing new genotypes rather than species and consultation should occur with the community regarding the negative perceptions that might arise as a result of the loss or change in character of ecosystems.

There are several thresholds that could impact decision making for the management of natural landscapes. Importantly, there is recognition that public perceptions of thresholds may at times be more important than scientific thresholds (eg loss of koalas during periods of extreme heat). Thresholds could include:

- species loss, especially in relation to extreme climate events
- loss of habitat and increased frequency of bush fires limiting regeneration
- loss of houses from bushfire
- increased pest plant or animal populations
- loss of trees, and
- critical water quality events such as algal blooms during droughts.

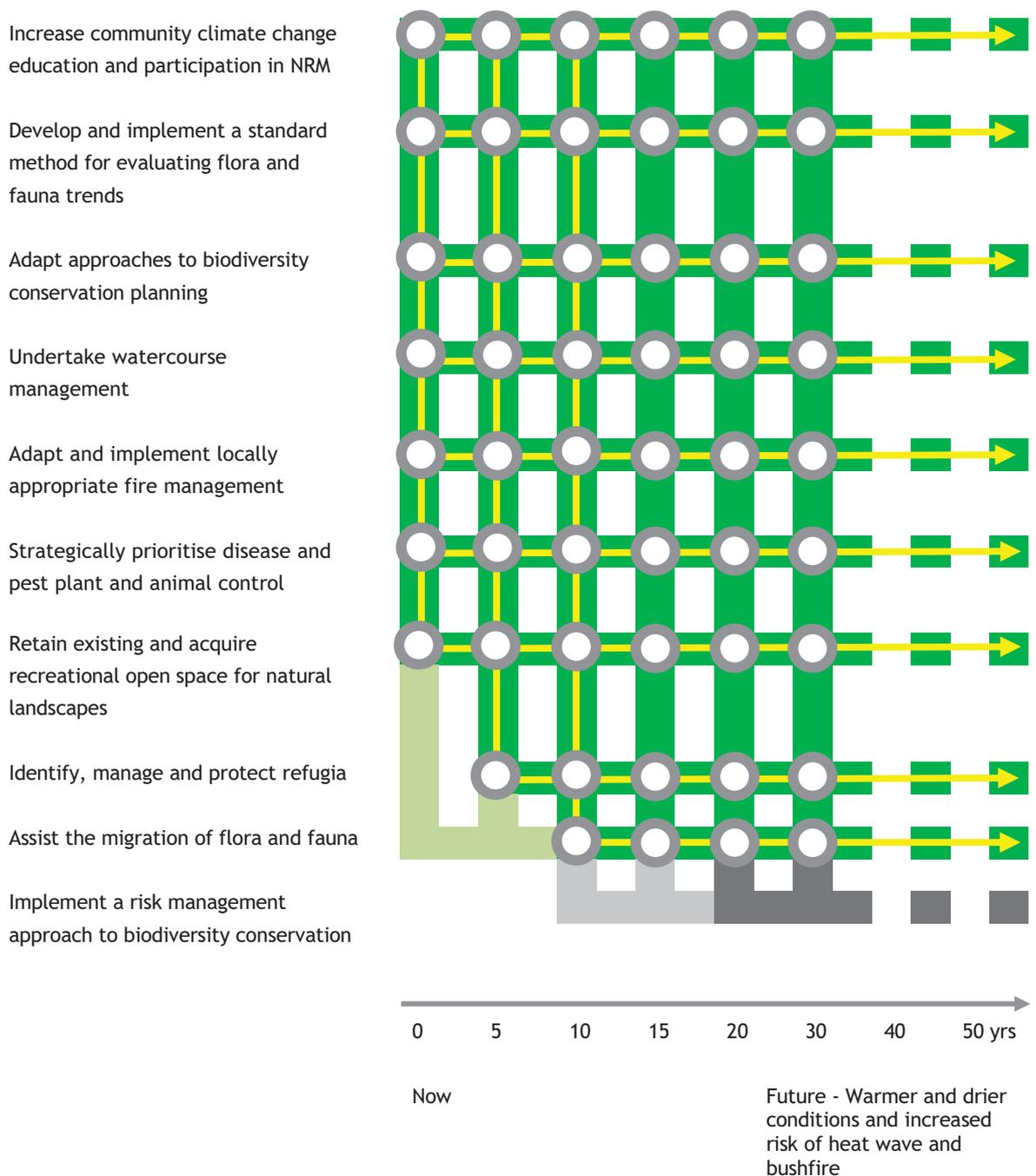
⁹ Prober SM, Williams KJ, Harwood TD, Doerr VAJ, Jeanneret T, Manion G, Ferrier S (2015) Helping Biodiversity Adapt: Supporting climate-adaptation planning using a community-level modelling approach. CSIRO Land and Water Flagship, Canberra.

Summary of key findings

To protect and enhance the condition of natural landscapes across the plains and hills, immediate priorities for adaptation are increasing community climate change education and participation; developing and implementing a standard method for evaluating flora and fauna trends; adapting approaches to biodiversity conservation planning; protecting water ways from climate extremes; implementing locally appropriate fire management activities; strategically prioritising pest plant and animal control; and retaining existing and acquiring recreational open space for natural landscapes to increase connectivity.

Figure 9 Natural landscapes pathway map

How do we protect and enhance the condition of natural landscapes across the plains and hills face as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?



4.6. Open and green spaces

Why is open and green space important to the Region?

Open and green spaces in the Eastern Region are highly valued for the contribution they make to the Region's character and amenity and creating environments that people want to spend time in. These open and green spaces also contribute to the health and wellbeing of the community through the opportunities they provide for recreation, relaxation and social connection and contribute to biodiversity in the Region.

How will climate change impact open and green space?

The IVA found that open and green spaces will be impacted by climate change due to warmer and drier conditions and climate extremes such as heatwave and bushfire. The effect will vary for open and green spaces across the Region depending on their access to irrigation and location in proximity to or within fire risk areas.

How do we provide, protect and enhance the amenity, biodiversity and recreation opportunities provided by open space as our climate becomes warmer and drier and there is an increased risk of damage from heat waves and bushfires?

Open and green space is already being actively managed in a way that contributes to the Region's adaptive capacity. For example, recycled water is being used for irrigation, best practice irrigation is being adopted in some areas, the amount of open grassed areas is being reduced in favour of mulch and shade structures are being installed to protect heat sensitive facilities. While some small areas of open and green space in the region may be reduced in the future, the underlying objective of councils is to increase the total area of open and green space given the variety of benefits it provides to the community, environment and economy.

Despite current efforts, the Region's stakeholders identified that within five years current actions on their own will be insufficient to meet the objectives of councils regarding maintaining and enhancing the area of open and green spaces.

There are four immediate priorities for adaptation of open and green space in the Region (refer Figure 10). The first, which should be completed within five years, is the preparation of 'climate-ready' guidelines for open space management. These will address appropriate material and species selection, the ratio of grassed to planted areas, shade cover, lighting for evening activities, diversification of use and best practice irrigation. Once completed the elements of the guidelines will need to be integrated into existing management plans.

Also requiring immediate implementation, but for which ongoing delivery is needed, are

- accelerating existing tree condition assessment and management
- improving stormwater management to maximise amenity and water reuse, which will aid in reducing reliance on other water sources as well as support green infrastructure objectives, and

- increasing shading of paths, facilities and amenities using trees and other infrastructure.

Accelerating existing tree condition assessment and management, while ongoing, is a pre-cursor action to making decisions in five to fifteen years' time about strategic locations where the area of open space may be increased to aid urban cooling (eg adjacent activity centres and/or in denser urban areas). This will require decisions about how much irrigated open green space should be maintained or established, which will be informed by the forecast cost and availability of water in the Region with an emphasis on reducing reliance on potable water. Furthermore, this option will require the development of reserve management plans that outline how individual sites are managed as part of a regional strategy, what is required to maintain sites in suitable condition and describe species selection choices that reduce water use.

In the longer term, adaptation options that may be considered for protecting the amenity, biodiversity and recreation opportunities provided by open and green space include developing cooperative management and funding arrangements for regional facilities and open space and avoiding construction of assets in high risk areas. Constructing or redeveloping multi-use facilities or abandoning areas of open space however, are not favoured at this point in time.

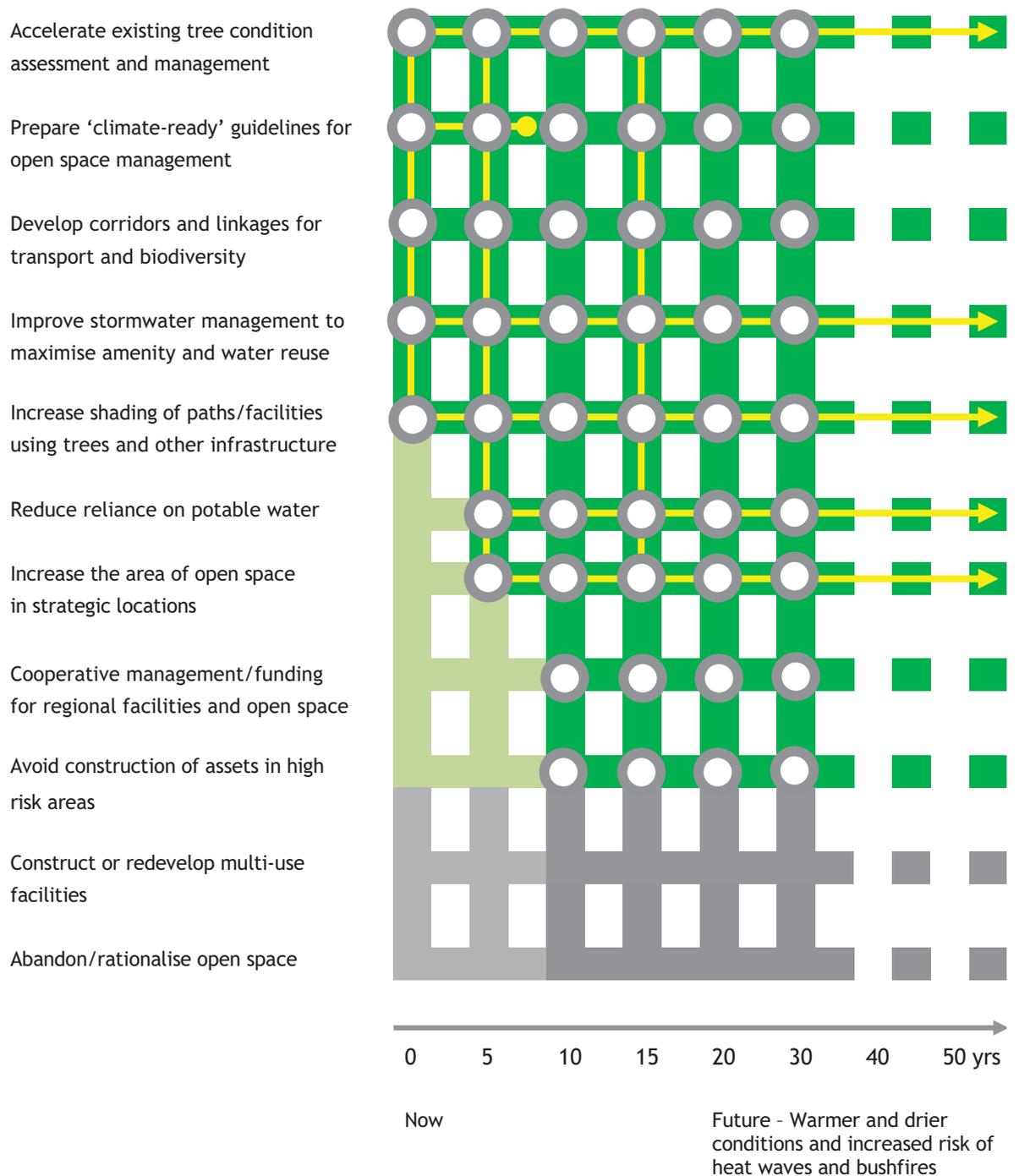
Decisions regarding the management of open and green space will be influenced by thresholds being exceeded in relation to a range of factors. Relevant to irrigation will be reductions in rainfall and changes to allocations by SA Water, the latter being experienced during the Millennium Drought when water restrictions resulted in some reserves not being irrigated. Increasing cancellation of events or heightened fire risk in some areas of open space in the Region will also impact on decision making.

Summary of key findings

To provide, protect and enhance the amenity, biodiversity and recreation opportunities provided by open and green spaces in the Region, immediate priorities for adaptation are to prepare 'climate-ready' guidelines for open space management; accelerate existing tree condition assessment and management; improve stormwater management to maximise amenity and water reuse; and increase shading of paths/facilities using trees and other infrastructure. In five years, the major adaptation priority will be to determine which areas of open and green space should be the focus of management resources into the future.

Figure 10 Open and green spaces pathway map

How do we provide, protect and enhance the amenity, biodiversity and recreation opportunities provided by open space as our climate becomes warmer and drier and there is an increased risk of damage from heat waves and bushfires?



4.7. Stormwater management infrastructure

Why is stormwater management infrastructure important to the Region?

Stormwater management infrastructure is valued by the Eastern Region for its contribution to flood mitigation to protect the built and natural environment and public safety. It is also valued for its contribution to sustainable water resource use through measures such as wetlands and water sensitive urban design (WSUD) which in turn assist with maintaining other valued aspects through the irrigation of open space, streetscapes and public realm.

How will climate change impact stormwater management infrastructure?

The IVA found that stormwater management infrastructure will be impacted by climate change due to increasing rainfall intensity which will place it under increasing pressure, particularly where infrastructure is ageing or designed to standards inconsistent with projected climate change. Stormwater management infrastructure will also play an important role in enhancing the amenity of the Region, facilitating the harvest and reuse of water for irrigation and cooling of the urban environment as annual rainfall declines and the risk of heatwaves increases.

How do we design, construct and maintain stormwater management infrastructure so that it provides flood protection, maximises reuse opportunities and enhances amenity as annual rainfall declines, rainfall intensity increases and the risk of heatwaves rises?

Local Government and State Government agencies are already involved in significant amounts of work that will improve the management of stormwater, such as developing stormwater management plans (eg Eastern Region Stormwater Management Plan, Brownhill Keswick Creek Stormwater Management Plan), policies and standards, wetland construction, constructing WSUD features, recharging aquifers, and through collaboration at a landscape scale via the Waterproofing the East scheme. While these actions contribute to building adaptive capacity, the Region's stakeholders identified that within five years, current practice will no longer be sufficient to manage stormwater as the climate changes.

An immediate priority for adaptation (refer Figure 11) is to support Water Sensitive SA, focusing on its work to develop guidelines and construction standards for WSUD tailored to local conditions. This could also involve councils identifying what preparatory work is required to assist with long term investment in WSUD, such as determining the key elements of the business case for WSUD investment, understanding how WSUD infrastructure is treated in council asset management frameworks and clear articulation of institutional barriers to investment. There is also a need to provide training to planners to assist with implementing Development Plan policies in relation to WSUD and ensuring they don't get 'traded off' for other outcomes in the development assessment process.

Coupled with this is the need to undertake the necessary modelling and mapping to enable current stormwater management plans to incorporate projected changes in rainfall intensity and duration. This is considered a priority for the coming decade, after which the necessary plans should be in place to guide future investment and construction of stormwater infrastructure by

Councils. Complementing this work, also to occur over the coming decade, should be a review of stormwater infrastructure design standards to ensure they address projected changes in rainfall and flooding and integrating these into asset management and work scheduling.

The following options are immediate priorities, but require ongoing delivery:

- increased onsite detention and storage (eg mandated rainwater tanks) to enable stormwater systems to cope with infill development and increasing housing density
- improve flood management and riparian rehabilitation, including erosion management, and
- community education and awareness raising regarding the risks of flooding, building on the working already being undertaken in this regard through the Department of Environment, Water and Natural Resources and the State Emergency Service Floodsafe program.

Within five years priority options to be undertaken include:

- mandating targets for WSUD, and
- integrating the management of stormwater within and across Councils and State agencies to better coordinate decision making, investment, delivery and construction of new infrastructure.

Within 30 years adaptation may need to move toward reclaiming water course corridors. This action will be targeted at reducing flood risk to private and public buildings and infrastructure. It would involve reclaiming and zoning of water course corridors as open space by purchasing flood-prone properties and/or easements and re-establishing natural waterways. While not proposed for implementation for a number of decades, planning work should commence in the short term.

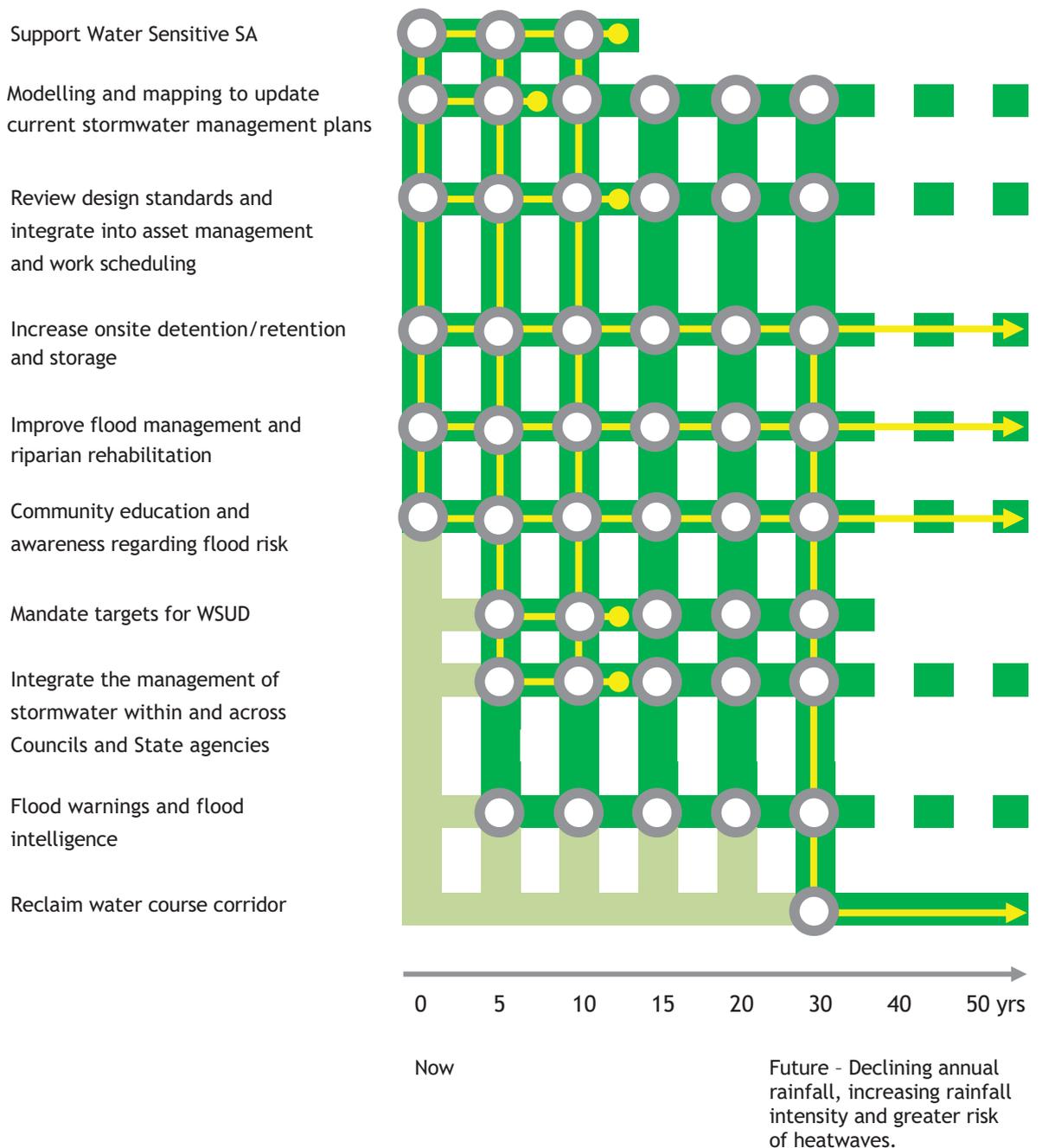
A range of thresholds exist, which if exceeded, could trigger a change in the combination of adaptation options deployed to manage stormwater. The most significant threshold is likely to be in relation to the frequency of flood events that lead to inundation above residential floor levels. Other thresholds could be in relation to deaths and hospital admissions as a result of extreme events, insurance premiums and costs to repair flood damage, and erosion and water quality.

Summary of key findings

To design, construct and maintain stormwater management infrastructure so that it provides flood protection, maximises reuse opportunities and enhances amenity, immediate priorities for adaptation are to support Water Sensitive SA; review stormwater infrastructure design standards; integrate approaches to asset management and work scheduling; increase onsite detention and storage; improve flood management and riparian rehabilitation; and community education and awareness building. Longer term adaptation may require the reclamation of water course corridors.

Figure 11 Stormwater management pathway map

How do we design, construct and maintain stormwater management infrastructure so that it provides flood protection, maximises reuse opportunities and enhances amenity as annual rainfall declines, rainfall intensity increases and the risk of heatwaves rises?



4.8. Urban areas

Why is the amenity and liveability of our urban areas important to the Region?

The urban areas of the Eastern Region are valued for their contribution to amenity and quality of life of the people who live, work and visit the Eastern Region. 55% of the Region is comprised of residential areas and the remainder is predominantly commercial and industrial land uses. The built form of these urban areas is mainly low density, with some medium density. Many areas in the Eastern Region are earmarked to transition to medium density. Ensuring that amenity and quality of life is maintained and enhanced in the face of climate change impacts will be critical.

How will climate change impact the amenity and liveability of our urban areas?

The IVA found that the Region's urban areas will be impacted by climate change due to warmer and drier conditions and climate extremes such as heatwave and bushfire which will influence the Region's amenity and attraction as a place to live, do business and visit.

How do we create better amenity and liveability in our urban areas as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?

A range of current measures are already being implemented that will contribute to the adaptation of urban areas in the Region. These include bushfire management, residential action plans, research on the impact of heat stress, shelter and housing management for more vulnerable members of the community, retrofitting buildings and building energy efficiency upgrades. Despite these efforts, the Region's stakeholders identified that within five years, these will be insufficient on their own to help urban areas adapt to future changes in the climate.

Adaptation options for urban areas are identified for implementation over three stages in the coming 10 years (refer Figure 12). An immediate priority is to incorporate climate ready considerations for public realm, green infrastructure and urban design to aid the creation of more thermally comfortable and attractive urban areas. This should be completed within five years and consider in relation to public realm appropriate material and species selection, shade cover, inclusion of WSUD features, opportunities for misting infrastructure and water features.

For urban design, a concern driving action is the need for more climate ready residential housing. Despite provisions within the Building Code of Australia, houses continue to be constructed that are not ideally suited to the Adelaide climate. Climate ready houses should incorporate more concepts such as appropriate orientation with respect to the sun, shading (larger eaves), passive solar heating and cooling, thermal mass and insulation¹⁰. In addition to housing construction, developers should consider integration of built and green areas and bushfire protection measures.

¹⁰ <http://www.yourhome.gov.au/passive-design/shading>. Your Home: Australia's guide to environmentally sustainable houses. Accessed 8 February 2016

Progressing greater uptake of climate ready housing requires commitment from the entire development industry. The role of Local Government in the first instance may be to advocate for greater change or play a facilitatory role across the development industry. The precise timing of this work will differ across the Region, with climate ready guidelines required within 2 years for the Adelaide Central Business District and within five years for suburban areas.

Assuming the successful preparation of climate ready guidelines, in five years' time the focus of adaptation will shift to the following range of options, which should be implemented in an ongoing manner in the decades to come:

- improving stormwater management to maximise amenity and potential for water reuse such as managed aquifer recharge and use of permeable paving
- education and awareness raising regarding climate risks such as extreme heat and bushfire to all sectors of the community and promote the need for preparation, response and recovery plans
- review and accelerate tree management strategies addressing planting, maintenance, irrigation, shielding power lines, appropriate pruning methods, leaf litter production and disposal, and approaches to avoid impacts on roads and footpaths from soil movement induced by root growth, and
- increase planting across urban areas, including understorey, roof gardens, green walls and verges, with specific attention paid to species selection.

Within 10 years, adaptation will also need to focus on developing innovative techniques for cooling the public realm. This could include greater use of solar fans, cooled bus stops, misting infrastructure, shading techniques and wall gardens. Such an approach needs to ensure that there is not an increased demand for electricity from the grid and that maintenance requirements are considered in any cost-benefit analysis.

While identified as a potential adaptation option, preventing development in bushfire prone areas is considered too transformative and is not a favoured option at this time. Instead the emphasis is on improved materials selection when constructing houses in such areas and on tree species selection for planted areas. Similarly, relocating people and property was not favoured as an adaptation option.

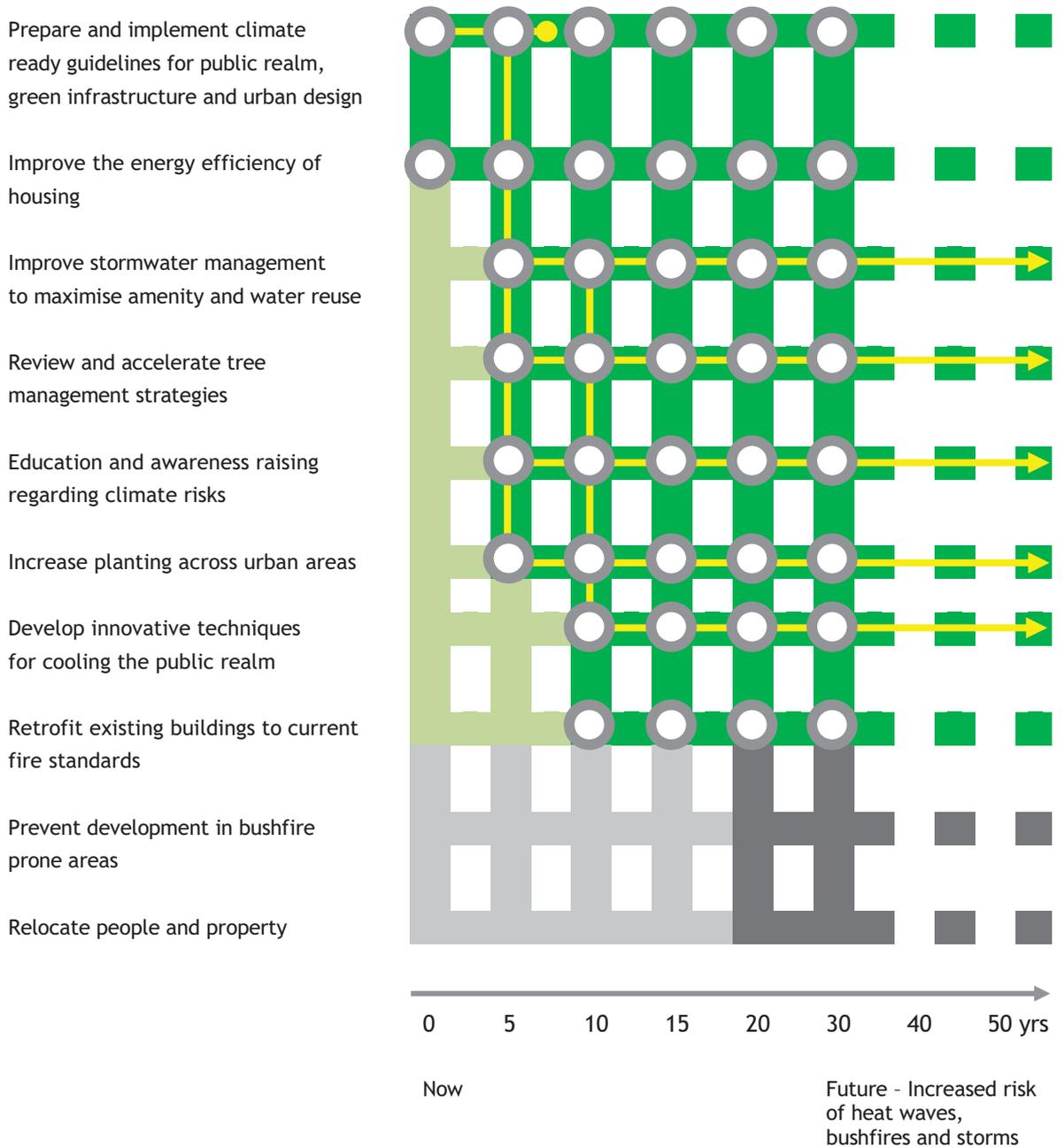
Thresholds that may impact on future decision making to create better amenity and liveability in urban areas could be in relation to grass and tree dieback as a consequence of the urban heat island effect, increases in irrigation demand, increases in the number of deaths and hospital admissions as a result of extreme events, increases in the cost of living and the flow on impacts to electricity demand, and declining community outdoor activity and connectedness.

Summary of key findings

To create better amenity and liveability in our urban areas adaptation should proceed through three main stages. The immediate priority is to develop and implement climate ready considerations for public realm, green infrastructure and urban design. This will be followed by improving stormwater management features to maximise amenity and potential for water reuse; reviewing and accelerating awareness of risks such as extreme heat and bushfire; reviewing and accelerating tree management strategies; and increasing planting across urban areas. The third tranche of action will be the development of innovative techniques for cooling the public realm.

Figure 12 Urban areas pathway map

How do we create better amenity and liveability in our urban areas as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?



4.9. Vulnerable members of the community

Why is improving the health, safety and wellbeing of vulnerable members of the community important?

Community connection and inclusion is valued by the Eastern Region, and age and socio-economic and health factors are indicators of capacity of the Region's community. Members of the community who are already vulnerable due to poor mental or physical health, are isolated by a lack of mobility or transport options and/or are highly dependent on particular facilities or support services will be more vulnerable to the impacts of climate change, particularly during extreme events.

How will climate change impact vulnerable members of the community?

The IVA found that climate change will adversely impact the health, safety and wellbeing of vulnerable members of the community. These impacts include direct health effects of extreme heat on older people and people who are living with a disability or need assistance with core services, as well as the ability to support these vulnerable members of the community as bushfire risk increases.

How do we improve the health, safety and wellbeing of vulnerable members of the community as the frequency and intensity of heat waves and bushfires increase?

Significant work is already occurring in the Region to improve the health, safety and wellbeing of vulnerable members of the community, much of which contributes to building adaptive capacity. Examples include Telecross REDi phone service calls during heat waves, council staff calling Commonwealth Home Support Programme (CHSP) clients during heat waves and the promotion of libraries and community centres as places to drop in during heatwaves. Although this work will assist in adapting to future climate change, the Region's stakeholders identified that current practice is insufficient and more targeted actions are required to commence within five years.

The immediate focus for adaptation needs to be on educating and raising awareness of the risks of extreme heat and bushfire (refer Figure 13). This will require communication to all sectors of the community (older, younger, those with disabilities) and support for developing preparation, response and recovery plans. Communications activities will need to consider a variety of methods for reaching residents including the use of social media to connect people and build networks.

After the initial focus on education and awareness raising, the emphasis in five years will shift to preparing consistent emergency management plans and approaches across Local Government. This recognises that while individual Councils are already involved with emergency management planning, there is not necessarily consistency in approaches at a regional scale. This action will also require a more detailed understanding of the role of Councils in emergency management compared with other emergency management service providers such as the South Australian Police and the State Emergency Services.

In five years' time, there will also need to be the deployment of a number of other actions, specifically designed to address the health, safety and wellbeing of individuals in the community. Key actions are:

- developing individual safety plans. This will aid in growing individuals' resilience and build on the success of initiatives such as the Red Cross' Emergency REDiPlan. While requiring initial upfront costs to establish, it should deliver longer term benefits in reduced health care costs
- establishing a community "buddy" program. This will in part focus on encouraging neighbours to take on the responsibility of checking in on/looking after vulnerable people in their communities on high risk days, and
- expanding systems to contact vulnerable people during bushfires and heatwaves. This will involve an integrated approach to contacting vulnerable people during extreme weather/bushfire events and identification of triggers for contacting different cohorts of people.

In 15 years, climate sensitive building design should be mandated. This will provide greater ability for people to remain in good health in their home environment during extreme events, especially heat waves. The delay period for this action recognises that significant work will be required to determine which aspects of building design should become mandatory and also that this outcome will require substantial engagement with relevant government agencies and building industry associations as well as the broader community.

There are a range of other adaptation options that while not considered to be of the highest priority, can still contribute to adaptation such as enhancing the 'greenness' of the region, promoting indoor public places for resting and reviving, supporting energy management programs for residents and promoting volunteering for community and emergency services.

While recognised as a potential option for improving the health, safety and wellbeing of vulnerable members of the community, transporting vulnerable, isolated people to refuges/safe areas during bushfires and heatwaves is considered unfeasible and is not favoured.

The timing of implementation of the adaptation options identified will be influenced by certain thresholds being exceeded. Amongst the most important thresholds for vulnerable members of the community will be increased deaths and hospitalisation and demand for support services such as the Red Cross' REDiPlan exceeding quotas.

Summary of key findings

To improve the health, safety and wellbeing of vulnerable members of the community in the Region, the immediate priority for adaptation is on educating and raising awareness of the risks of extreme heat and bushfire. Within 5 years the focus will shift to preparing consistent emergency management plans and approaches across Local Government; developing individual safety plans, establishing a community "buddy" program; and developing systems to contact vulnerable people during bushfires and heatwaves. In the longer term climate sensitive building designs will need to be mandated.

Figure 13 Vulnerable members of the community pathway map

How do we improve the health, safety and wellbeing of vulnerable members of the community as the frequency and intensity of heat waves and bushfires increase?



4.10. Summary of preferred adaptation options

Sections 4.2 to 4.9 identify 57 preferred adaptation options in relation to the eight key areas of decision making for the Eastern Region to build resilience and adapt to the impacts of climate change. These preferred adaptation options are summarised by **Table 7** and comprise the preferred combination of options that the Region’s stakeholders considered will support adaptation in relation to the eight key areas of decision making.

Table 7 Summary of preferred adaptation options for the Eastern Region

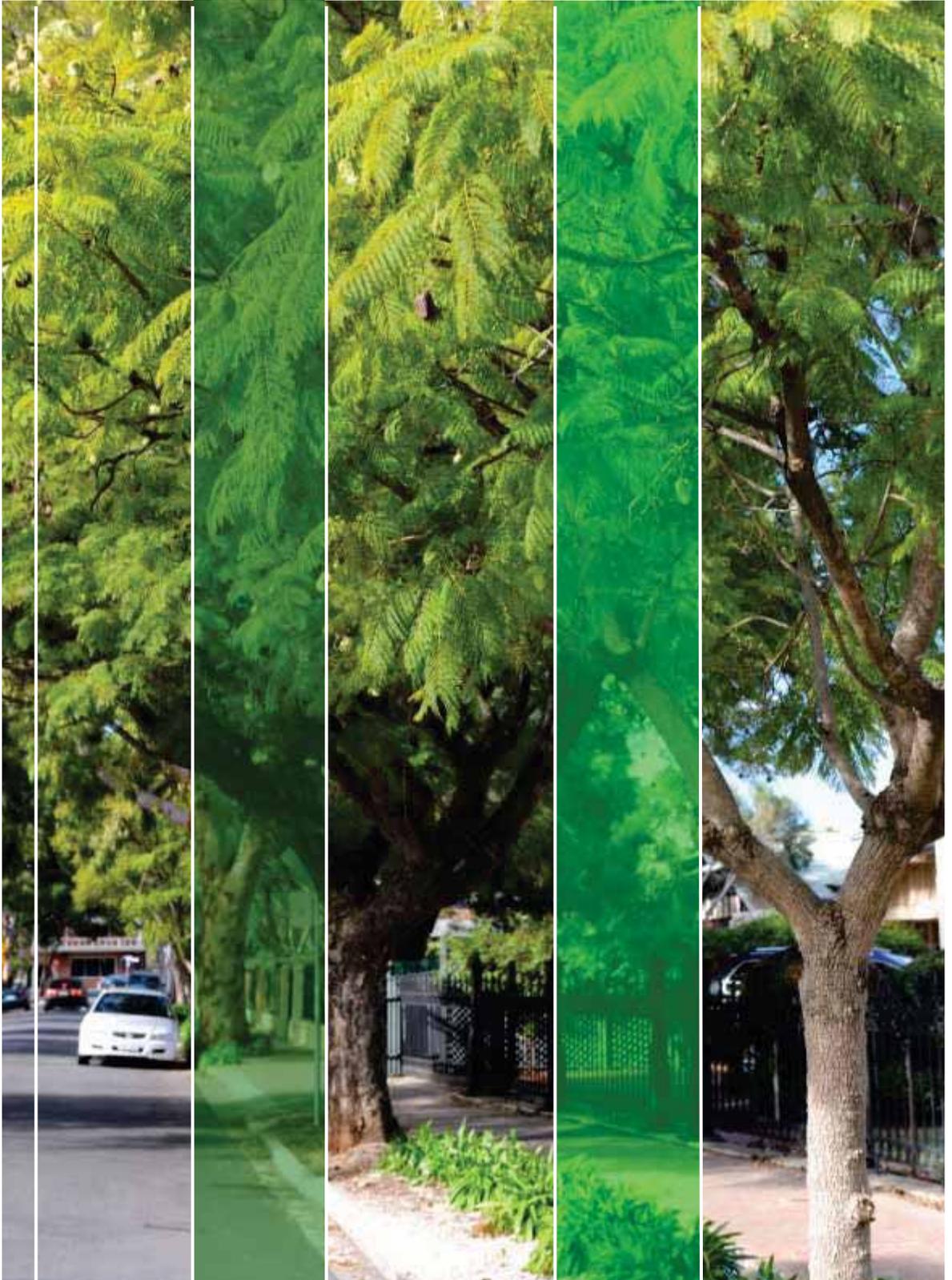
Key decision area	Timing	Preferred adaptation options
Activity centres How do we improve the amenity and vibrancy of our activity centres as our climate becomes warmer and drier and the risk of heat waves increase?	Now	Prepare and implement climate ready guidelines for public realm, green infrastructure and urban design
	Now	Improve stormwater management to maximise amenity and water reuse
	Now	Support the development of emergency management plans for activity centres
	Now	Provide ‘rest and revive’ facilities
	Now	Advocate for amendments to the Building Code of Australia
	Later (5 years)	Increase appropriate planting in and around activity centres
	Later (5 years)	Make asset management plans climate ready
	Later (30 years)	Facilitate change to business practice (eg hours of operation)
Community participation How do we support and grow participation in events, celebrations and activities as rainfall intensity, frequency, intensity and duration of heat waves and bushfire risk increases?	Now	Define Council and stakeholder roles, responsibilities and liabilities
	Now	Regularly review and update event risk management plans
	Later (5 years)	Increase community education and awareness raising activities
	Later (5 years)	Engage the community regarding decision making and service provision
	Later (5 years)	Fit for purpose management of open space and infrastructure
	Later (5 years)	Use technology to provide warnings and to provide updates on community services and events
	Later (5 years)	Manage stormwater to minimise flood risk and maintain the ability to hold events
	Later (5 years)	Identify alternative options to deal with electricity failures
	Later (20 years)	Construct and increase frequency of use of multi-use indoor facilities
Continuity of services How do we minimise disruption to business, events and infrastructure and residents reliant on electricity as we are exposed to more frequent and intense heatwave and greater fire risk?	Now	Awareness raising for business owners and infrastructure owners and operators
	Now	Undertake event risk management planning including consideration of need to reschedule events
	Now	Improve communication and coordination with essential services providers
	Now	Increase business and infrastructure owners and operators continuity planning

Key decision area	Timing	Preferred adaptation options
	Later (10 years)	Increase electricity feeder automation
	Later (20 years)	Upgrade cooling systems for telecommunication exchanges
Natural landscapes How do we protect and enhance the condition of natural landscapes across the plains and hills face as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?	Now	Increase community climate change education and participation in NRM
	Now	Develop and implement a standard method for evaluating flora and fauna trends
	Now	Adapt approaches to biodiversity conservation planning
	Now	Undertake watercourse management
	Now	Adapt and implement locally appropriate fire management
	Now	Strategically prioritise disease and pest plant and animal control
	Now	Retain existing and acquire recreational open space for natural landscapes
	Later (5 years)	Identify, manage and protect refugia
	Later (10 years)	Assist the migration of flora and fauna
Open and green spaces How do we provide, protect and enhance the amenity, biodiversity and recreation opportunities provided by open space as our climate becomes warmer and drier and there is an increased risk of damage from heat waves and bushfires?	Now	Accelerate existing tree condition assessment and management
	Now	Prepare 'climate ready' guidelines for open space management
	Now	Improve stormwater management to maximise amenity and water reuse
	Now	Increase shading of paths/facilities using trees and other infrastructure
	Later (5 years)	Reduce reliance on potable water
	Later (5 years)	Increase the area of open space in strategic locations
Stormwater management How do we design, construct and maintain stormwater management infrastructure so that it provides flood protection, maximises reuse opportunities and enhances amenity as annual rainfall declines, rainfall intensity increases and the risk of heatwaves rises?	Now	Support Water Sensitive SA
	Now	Modelling and mapping to update current stormwater management plans
	Now	Review design standards and integrate into asset management and work scheduling
	Now	Increase onsite detention/retention and storage
	Now	Improve flood management and riparian rehabilitation
	Now	Community education and awareness regarding flood risk
	Later (5 years)	Mandate targets for WSUD
	Later (5 years)	Integrate the management of stormwater within and across Councils and State agencies
	Later (30 years)	Reclaim watercourse corridors
Urban areas How do we create better amenity and liveability in our urban areas as our climate becomes warmer and drier and the risk of extremes such as heat wave and bushfire increases?	Now	Prepare and implement 'climate ready' guidelines for public realm, green infrastructure and urban design
	Later (5 years)	Improve stormwater management to maximise amenity and water reuse
	Later (5 years)	Review and accelerate tree management strategies
	Later (5 years)	Education and awareness raising regarding climate risks
	Later (5 years)	Increase planting across urban areas

Key decision area	Timing	Preferred adaptation options
	Later (10 years)	Develop innovative techniques for cooling the public realm
Vulnerable members of the community How do we improve the health, safety and wellbeing of vulnerable members of the community as the frequency and intensity of heat waves and bushfires increase?	Now	Educate and raise awareness of risks such as extreme heat and bushfire
	Later (5 years)	Develop individual safety plans
	Later (5 years)	Prepare consistent emergency management plans and approaches across Local Government
	Later (5 years)	Establish community 'buddy' program
	Later (5 years)	Expand systems to contact vulnerable people during bushfires and heatwaves
	Later (15 years)	Mandate climate sensitive building design

5

PRIORITIES FOR ADAPTATION IN THE EASTERN REGION



5. Priorities for adaptation in the Eastern Region

The adaptation pathways presented in section 4 of this Regional Adaptation Plan identify a wide range of options relevant to the eight different key areas of decision making.

To sharpen the focus of the Regional Adaptation Plan and assist with identifying adaptation priorities for regional implementation, the preferred adaptation options were further reviewed to determine those that are:

- of regional scale or relevance
- common to more than one key decision area (ie are cross-sectoral)
- will deliver multiple benefits, and
- would benefit from a coordinated, regional response across key regional stakeholders.

This review process resulted in the identification of nine adaptation priorities for the Eastern Region (refer Figure 14 and Table 8).

A number of these priority adaptation options accelerate current practice and are recommended for immediate implementation, while others should be delivered within five years to build resilience for specific key decision areas/sectors. Options for delivery over a longer timeframe (eg in 10 to 30 years' time) have a greater focus on strategies that will protect people, assets and services.

It is not intended that these options be considered the only adaptation actions required in the Eastern Region, but rather provide a starting point to focus initial regional, cross-sectoral action. The remainder of the preferred options identified by the Regional Adaptation Plan are still considered critical to ensuring the Region remains strong, productive and vibrant and can respond to the challenges of climate change.

Figure 14 Priority adaptation options pathway map

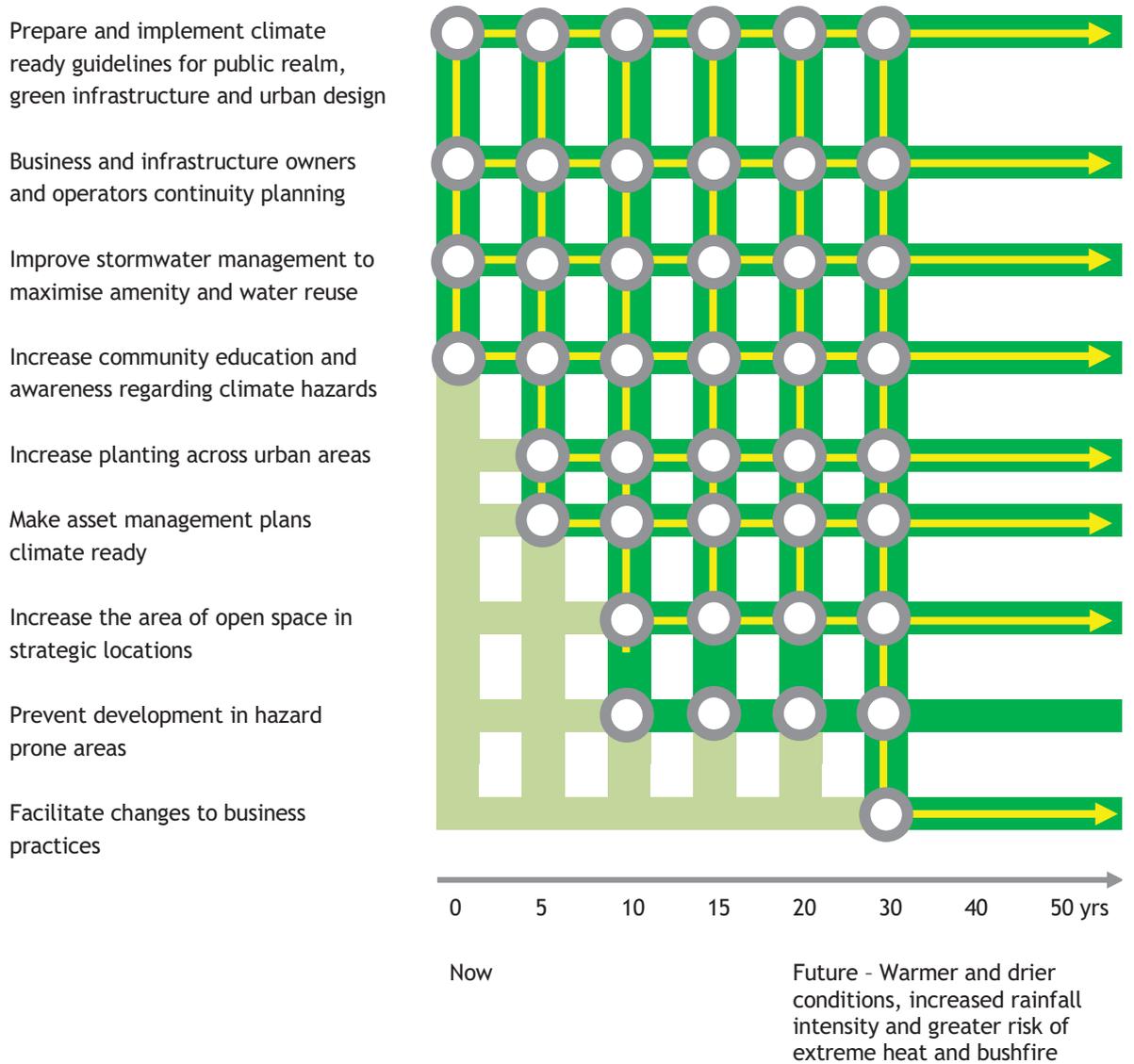


Table 8 Priority adaptation options

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Suggested lead	Suggested partners
Prepare and implement climate ready guidelines for public realm, green infrastructure and urban design	Activity centres Open and green space Stormwater management Urban areas	Natural and built spaces and infrastructure that are climate ready are designed and constructed to take into account anticipated climate change and assist with mitigating climate change impacts such as extreme heat, flooding and bushfire. Climate ready public realm, green infrastructure and urban design can play a significant role in creating an urban environment that is amenable and comfortable for residents and visitors and contribute to improving human health.	Now	Resilient East Councils State Government	Adelaide and Mount Lofty Ranges Natural Resources Management Board (AMLR NRMB) Botanic Gardens Developers Department of Environment, Water and Natural Resources (DEWNR) Local Government Association (LGA) Universities and research institutions Water Sensitive SA
Business and infrastructure owners continuity planning	Activity centres Community participation Continuity of services Vulnerable members of the community	Business and infrastructure owner continuity planning will assist private and public sector organisations better prepare for extreme events, especially those that lead to electricity failure, and therefore disruption to their operations and/or services.	Now	Department of State Development	Business SA Resilient East Councils Traders Groups/associations
Improve stormwater management to maximise amenity and water reuse	Activity centres Community participation Urban areas Natural landscapes Open and green spaces Stormwater management Vulnerable members of the community	Improving stormwater management recognises the value placed on mitigating floods to maintain residents' safety and prevent damage to property, but also the benefits of the reuse of stormwater to maintain open space, vegetation and street trees.	Now	Resilient East Councils	AMLR NRMB Department of Planning, Transport and Infrastructure (DPTI) DEWNR LGA Stormwater Management Authority Water Sensitive SA Universities and research institutions

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Suggested lead	Suggested partners
Increase community education and awareness regarding climate hazards	Activity centres Community participation Urban areas Vulnerable members of the community	Community education and awareness raising about the hazards of climate change is a fundamental requirement to deliver behaviour change. It is also important to build capacity so that individuals are able to take responsibility and undertake their own adaptation measures.	Now	Resilient East Councils SA State Emergency Service (SASES)	Australian Red Cross
Increase planting across urban areas	Activity centres Natural landscapes Open and green spaces Stormwater management Urban areas Vulnerable members of the community	Increased planting is valued for the contribution it can make to cooling urban areas, thereby creating amenable and comfortable living environments for residents and visitors and improving human health.	Start implementation within 5 years	Resilient East Councils State Government	AMLR NRMB Botanic Gardens Developers DEWNR DPTI Universities and research institutions
Make asset management plans climate ready	Activity centres Natural landscapes Open and green spaces Stormwater management Urban areas Vulnerable members of the community	Asset management plans are required for Council owned infrastructure, yet the majority of current asset management plans do not consider climate impacts. This is a particular issue given that asset management plans often relate to infrastructure that has a long lifespan and therefore is likely to be impacted by changes in climate. Climate change considerations therefore should be embedded in asset management plans so that adaptation becomes part of everyday practices.	Start implementation within 5 years	Resilient East Councils	LGA
Increase the area of open space in strategic locations	Activity centres Natural landscapes Open and green spaces Stormwater management Urban areas Vulnerable members of the community	A changing climate may require the maintenance of some open space to be reduced, however it may also lead to greater investment in high value open space and green infrastructure in strategic locations. It will also necessitate reducing reliance on potable water for irrigation and utilising alternative water sources such as treated wastewater and recycled water.	Start implementation within 10 years	Resilient East Councils	DPTI
Prevent development in hazard prone areas	Activity centres Stormwater management Urban areas	Past residential and commercial developments have occurred in areas that are now understood to be subject to flood and fire risk. As the risk of climate hazards increases in the future, impacts	Start implementation within 10 years	State government DPTI	LGA Resilient East Councils SASES

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Suggested lead	Suggested partners
	Vulnerable members of the community	<p>could be minimised by preventing development in hazard prone zones.</p> <p>The complexity of issues at play is recognised and the challenge presented by trying to balance the desire to live in or near the foothills environment or along watercourses while ensuring community members and their property are safe and not at risk from bushfire and flooding. This also sits within the context that once constructed, dwellings will be there for a long time (often 60 plus years) and there will be a need to manage flooding or bushfire risks over the lifetime of the dwelling.</p> <p>As the risk of climate hazards increases in the future, impacts could be minimised by preventing development in hazard prone areas and it is considered an important adaptation option for further exploration by the Region. It is also an aspect that other regions across the State are grappling with and warrants coordinated consideration.</p>			
Facilitate changes to business practices	Activity centres Community participation Urban areas Vulnerable members of the community	<p>In the longer term, increasing frequency of extreme heat and hotter summers in general may lead to a desire to change the hours of business operation to avoid hot periods of the day (eg extended closure in the afternoon and reopening later in the evening). Such business practices are already in place in cities overseas with warmer climates. A trend in this direction is already being observed with changes to working hours on hot days for people working outdoors.</p>	Start implementation within 30 years	Business SA State Government	Resilient East Councils Traders Groups/associations

5.1. Implementing priority adaptation options for the Eastern Region

To assist with progressing the implementation of priority adaptation across the Region, the Eastern Region Regional Adaptation Priorities Action Plan has been prepared (refer Appendix B).

For each priority adaptation option, the Regional Adaptation Priorities Action Plan summarises:

- potential actions to progress implementation of the option (including preparatory work required for future options)
- timing for implementation (ie now versus later)
- suggestions for lead responsibility for initiating and/or driving implementation of the option, and
- suggestions for others to be involved in implementation.

Involvement in actions could include one or more of the following:

- initiation of the action
- coordination with partners
- implementation
- funding or in kind support
- advocacy, and
- monitoring, evaluation and reporting.

It is intended that the Regional Adaptation Priorities Action Plan be used by organisations and individuals across the Eastern Region to guide regional adaptation action, and where required be further developed and refined as new information becomes available, as monitoring and review occurs or as climatic conditions change.

It is not intended that the Regional Adaptation Priorities Action Plan be considered the only adaptation actions that are required in the Eastern Region, but rather it provides a starting point to focus initial regional, cross-sectoral action. The remainder of the preferred options summarised by **Table 7** are still considered critical to ensure the Region remains strong, productive and vibrant and can respond to the challenges of climate change.

5.2. Monitoring and review

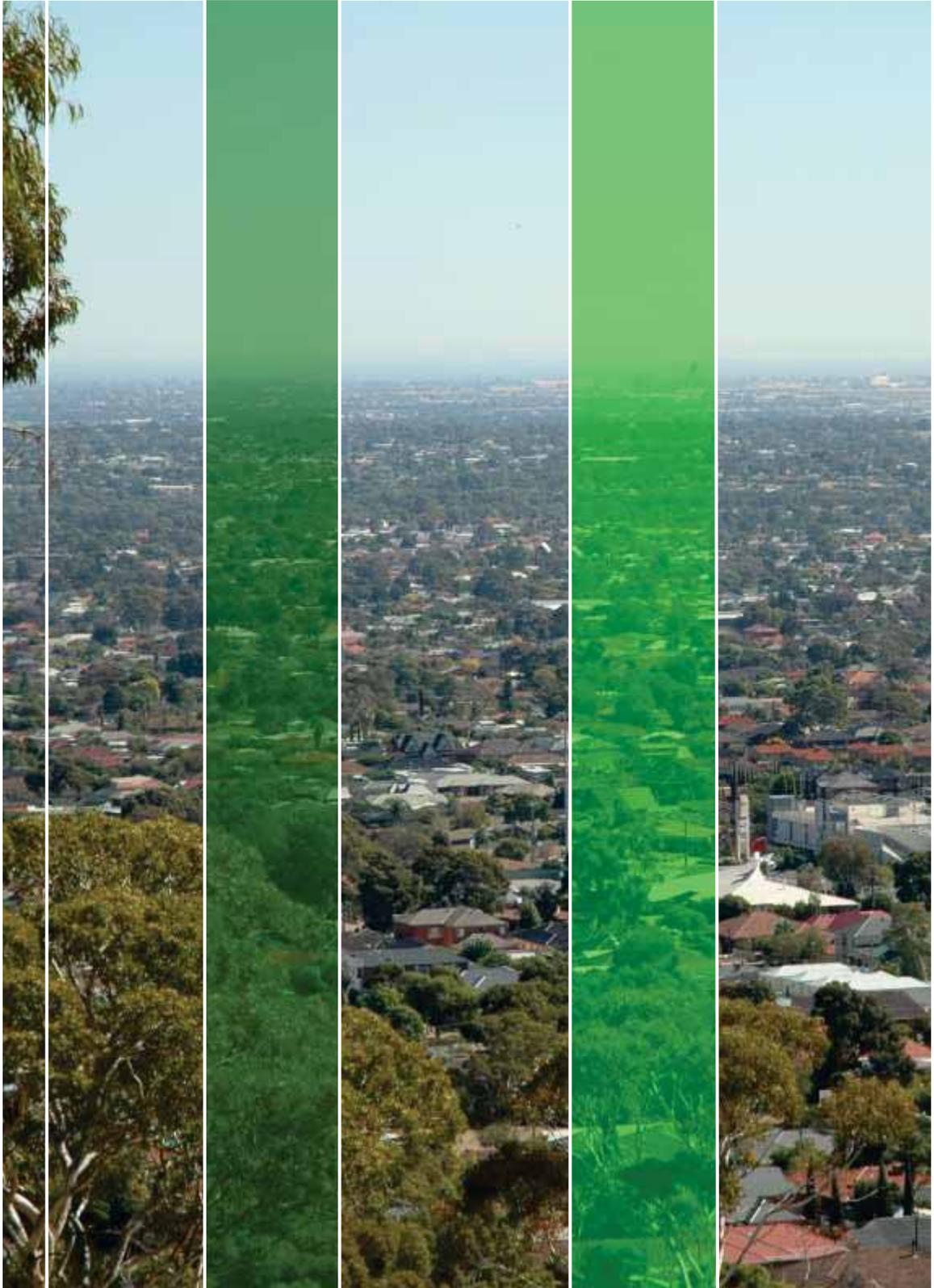
This Regional Adaptation Plan presents adaptation options based on information available at the time of its preparation and local knowledge and preferences of those stakeholders who were involved in its development.

It is recommended that the Regional Adaptation Plan be periodically reviewed, and that this review process be consistent with an adaptive management approach. This will enable new information to be considered, including changes in climatic conditions or as adaptive capacity of sectors grows as adaptation responses are implemented.

To support this review process, the establishment of a monitoring and evaluation framework is recommended. This framework should include indicators that seek to understand what success looks like in the context of adaptation responses, as well indicators that seek to monitor thresholds and therefore when changes in adaptation action might need to occur (refer section 4 for potential thresholds).

6

ENABLING ADAPTATION ACTION



6. Enabling adaptation action

All decision making processes sits within a broader context. Understanding this context and ensuring appropriate conditions are in place to enable adaptation action is as important as identifying the adaptation options themselves.

New thinking is emerging from work by the CSIRO Adaptation Flagship¹¹ which suggests that there are three factors that influence whether a decision (to take action and implement an adaptation response) is made. These factors are values, knowledge and rules and it is considered that where there is overlap or alignment between all three of these factors, adaptation responses are more likely to occur.

At the final adaptation workshop, stakeholders from the Eastern Region were asked to reflect on these three factors and consider what enabling conditions are needed to facilitate implementation of the Regional Adaptation Plan. Table 9 shows the enabling conditions identified as being critical to the successful implementation of this Regional Adaptation Plan. Actions to progress the creation of these conditions have been incorporated into the Regional Eastern Region Regional Adaptation Priorities Action Plan (refer Appendix B).

Table 9 Summary of actions to create enabling conditions to support implementation of the Regional Adaptation Plan

Enabling condition	Rationale	Action to create enabling condition
Immediate actions		
Commitment to implementation over the longer term	It was identified that successful implementation will be dependent on the level of commitment demonstrated by all of the Resilient East member Councils and the ability to take a long term view. This commitment needs to come from the Elected Member bodies of each Council and will require long term thinking rather than 4 yearly political election cycles. One avenue to ratify this commitment could be through the establishment of a Climate Change Sector Agreement as has been done by other regions such as Resilient South for the Southern Region and AdaptWest for the Western Region. The Regional Adaptation Plan can provide the foundation for agreement and working together to implement regional priorities for adaptation.	Ratify regional commitment to implement the Regional Adaptation Plan through the establishment of a Climate Change Sector Agreement
Regional collaboration	It was identified that all sectors and all levels of government should come together and contribute to the implementation of adaptation options (where appropriate). The ability for this collaboration to occur will require strong partnerships and clarity regarding roles and	Develop a governance approach to support implementation of the Regional Adaptation Plan including designating a lead group/organisation and

¹¹ The “VRK” framework has been developed primarily by Dr Russell Gorrard and Dr Russell Wise from the CSIRO Adaptation Flagship. It is described in more detail in Gorrard, R., Wise, R.M., Ware, D., and Dunlop, M. under review. Values rules and knowledge: Adaptation as change in the decision context, submitted to Ecology and Society

Enabling condition	Rationale	Action to create enabling condition
	<p>responsibilities as well as some form of governance structure to support implementation. Critical to this governance structure is the identification of a lead group/agency responsible for driving implementation. Through working together in this manner, there is the potential for the division of tasks to occur across the Eastern Region, and organisations/agencies to develop particular skills and knowledge in different adaptation areas. This skill and knowledge can then be shared and drawn upon across the Region.</p>	<p>potentially, establishing a coordinator role</p>
<p>Embedding climate change considerations so that it is 'business as usual'</p>	<p>It was identified that climate change considerations need to be integrated into the everyday practices of the Eastern Region's organisations, businesses and agencies so that adaptation becomes 'business as usual'. Opportunities for this integration include linking the Regional Adaptation Plan with other key plans and strategies which influence decision making and action such as Council Strategic Management Plans, Development Plans, asset management plans and the Regional Natural Resources Management Plan and advocating for changes to relevant legislation and policy levers such as the Development Act and Environmental Protection Act.</p>	<p>Embed climate change considerations in key organisational strategies, plans, policies and processes (eg strategic management plans, asset management plans, procurement policies etc)</p>
Ongoing actions		
<p>Getting the messaging right</p>	<p>Developing messaging about adaptation needs to focus on building resilience and the benefits of adaptation. Messages need to be simple, do not need to be explicit about climate change, identify how adaptation actions link with known regional values and 'talk up the opportunities'. For example, through the implementation of water sensitive urban design the impacts of localised flooding can be reduced and the greening of urban areas maintained.</p>	<p>Develop messaging about adaptation for communications with broader community</p>
<p>Resourcing</p>	<p>It was recognised that adaptation to climate change will require financial and physical resources. This may require identifying new funding sources or reallocation of existing resources and developing new cost-sharing models, particularly for adaptation options that are of regional benefit or relate to more than one Council area. To assist with acquiring new funding or reallocation of existing funding, business cases may need to be developed to identify the cost of not taking action to adapt. An example of reallocation of existing money that has occurred in relation to adaptation action is on the Eyre Peninsula where the Eyre Peninsula Natural Resources Management Board has reallocated \$200,000 of its NRM levy and matched dollar for dollar whereby an applicant can demonstrate that what is being proposed directly links with implementing an adaptation option identified in the Region's Adaptation Plan.</p>	<p>Identify resourcing opportunities to assist with implementing adaptation options. This could include allocation of existing monies or seeking new sources</p>

Enabling condition	Rationale	Action to create enabling condition
Understanding and ownership	<p>Awareness and understanding by the broader community of the potential impacts of climate change and opportunities to adapt is required. This aspect was considered critical to creating common ownership of the need to adapt and share the responsibility for taking action. This common ownership of adaptation recognises that we can all play a role in taking actions that build resilience and reduce or ameliorate the impacts of climate change, whether at an individual or organisation level.</p>	<p>Build community awareness and understanding about the potential impacts of climate change and opportunities to adapt</p>
Changing urban form	<p>Changes in urban form as a result of densification and urban renewal both pose an opportunity and a challenge in relation to adaptation. On the one hand, these changes can enable adaptation to be planned for and integrated into urban development such as the integration of green infrastructure into the built environment. On the other hand, these changes may inhibit the ability for adaptation. For example, as dwelling sizes increase, setbacks reduce and land size decrease, there may be less opportunity for green infrastructure in the public realm or as part of private open space. Similarly, increased densification will result in increased hard surfaces, adding to the urban heat island effect and resulting in increased pressure on stormwater management infrastructure.</p>	<p>Recognise and embrace the opportunities for adaptation that may be presented by changes in urban form (eg densification and renewal) as well as recognise the challenges this may pose</p>

7

REFERENCES



7. References

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8. Appendices

Appendix A

Organisations/sectors that participated in the process to prepare the Regional Adaptation Plan

Australian Council of Private Education and Training Providers SA Division
Australian Red Cross
Conservation Council of South Australia
Department of Communities and Social Inclusion (State Recovery Office)
Department for Health and Ageing
Department for State Development
Department of Environment, Water and Natural Resources
Department of Planning, Transport and Infrastructure
East Waste
Eastside Business Enterprise Centre
Environment Protection Agency
Flinders University
Friends of the Environment Group
Housing SA
Local Government Association Mutual Liability Scheme
Local Government Association
Lochiel Park Community Garden
Natural Resources Adelaide & Mount Lofty Ranges
Newland Water
North East Development Agency Inc
Norwood Residents' Association
Office of Public Health, Department for Health and Ageing
Planning Institute of Australia
SAPOL
Renewal SA
SA Health
SA Metropolitan Fire Service
SA Power Networks
SA Tourism Commission
SA Water
SAFECOM
State Emergency Service
Shelter SA
Trees for Life
University of Adelaide
University of South Australia
Volunteering SA
Weed Management Society of SA
Youth Climate Coalition

Appendix B

Eastern Region Regional Adaptation Priorities Action Plan

	Priority adaptation option	Timing	Potential actions to progress implementation of priority adaptation options including preparatory work that may be required to commence now for longer term options	Suggested lead This role could include one or more of the following: - Initiation of the action - Coordination with partners - Implementation - Funding or in kind support - Advocacy - Monitoring, evaluation and reporting	Suggested partners This role could include one or more of the following: - Implementation - Funding or in kind support - Participation - Monitoring, evaluation and reporting
A1	Prepare and implement climate ready guidelines for public realm, green infrastructure and urban design	Now	<p>Climate readiness includes spaces and infrastructure that are designed and constructed to take into account anticipated climate change and assist with mitigating climate change impacts such as extreme heat, flooding and bushfire. Examples of aspects that could be addressed by climate ready guidelines include:</p> <ul style="list-style-type: none"> - species selection for trees and other vegetation (including shrubs) that provide good shade cover, contribute to urban cooling and don't drop limbs under heat stress - opportunities for WSUD features to be integrated with street trees/vegetation to enable irrigation - supporting partner Councils to develop green infrastructure targets - providing shade via vegetation or built structures for playspaces and playgrounds and adjacent to walking and cycling paths - materials that are more resilient to extreme weather such as extreme heat and flooding - designing and constructing footpaths and trails that can cope with extreme rainfall, flooding from intense rainfall events and heat - opportunities to incorporate innovative infrastructure into the public realm that reduces the impacts of extreme heat (eg misting, water play or fans) or flooding (eg awnings, verandahs, covered walkways) - advice regarding potential for maladaptation. For example, using artificial turf to reduce irrigation and maintenance requirements can result in destroying soil organic matter and contribute to the heat island effect <p>To progress the development of the guidelines, an initial step could be to connect with existing research and forums and consolidate and review the wide range of work that has already been done in this area (eg Green Infrastructure Project at the Botanic Gardens, Water Sensitive SA etc)</p> <p>Once completed, to progress implementation, the guidelines can be incorporated into the development and maintenance of spaces and outdoor infrastructure via relevant Council plans and policies such as Asset Management Plans, Playground Strategies, Open Space and Public Realm Strategies, Procurement Policies etc.</p> <p>Priorities for implementing the climate ready guidelines across the Region (could be identified by considering those spaces or places that have poor amenity or comfort during warmer months (eg playgrounds for installation of shade, main street environments with little vegetation to provide relief from heat) or during heavy rainfall (eg public realm areas that become damaged, inaccessible or unusable due to flooding)</p> <p>The application of the climate ready guidelines could be extended beyond public realm projects to urban renewal and other developments in the Region (eg infill development, transit oriented developments etc)</p>	Resilient East Councils State Government	Adelaide and Mount Lofty Ranges Natural Resources Botanic Gardens Developers Local Government Association Universities and research institutions Water Sensitive SA
A2	Business and infrastructure owners continuity planning	Now	<p>Convene a 'Resilient Organisations Forum' with targeted business and infrastructure owners and operators from the Eastern Region to:</p> <ul style="list-style-type: none"> - introduce them to the existing tools and information available from the South Australian Department of State Development and Australian Government Attorney-General's Department regarding resilient organisations and business continuity planning - determine the appropriateness of these tools and information to assist the Region's organisations to build their resilience in the face of increasing climate hazards such as heatwave, bushfire and flood and the associated impacts eg power disruption, damage caused by flooding etc 	Department of State Development	Business SA Resilient East Councils Traders Groups/associations

	Priority adaptation option	Timing	Potential actions to progress implementation of priority adaptation options including preparatory work that may be required to commence now for longer term options	Suggested lead	Suggested partners
			<ul style="list-style-type: none"> - identify other opportunities for business and infrastructure owners and operators to increase their resilience <p>Based on the outcomes of this pilot Forum, develop and implement a program to be rolled out across the Eastern Region</p>	<p>This role could include one or more of the following:</p> <ul style="list-style-type: none"> - Initiation of the action - Coordination with partners - Implementation - Funding or in kind support - Advocacy - Monitoring, evaluation and reporting 	<p>This role could include one or more of the following:</p> <ul style="list-style-type: none"> - Implementation - Funding or in kind support - Advocacy - Participation - Monitoring, evaluation and reporting
A3	Improve stormwater management to maximise amenity and water reuse	Now	<p>Ensure that water sensitive urban design considerations are integrated into the design and construction of new stormwater infrastructure or the upgrade of existing infrastructure.</p> <p>To maximize the amenity and irrigation benefits that can be provided by WSUD features, the integration of WSUD should be undertaken within a 'whole of street', 'fence to fence' or public realm context. This will become increasingly important as the urban area in the Region densifies. The climate ready guidelines identified at A1 above could assist with progressing this action.</p> <p>Embedding climate change considerations into key asset management and other plans, strategies and policies is also required and would involve:</p> <ul style="list-style-type: none"> - identifying future projected climate impacts within these plans, strategies and policies (eg asset management plans, procurement policies, tender briefs relating to public realm upgrades, master planning projects etc) - designing and constructing infrastructure that considers these future conditions (particularly in relation to intense rainfall and drier conditions) - managing stormwater so that it maximises amenity and water reuse (ge through WSUD, rainwater tanks etc) <p>The embedding of these considerations into everyday practices needs to be coupled with the capacity building of relevant staff</p>	Resilient East Councils	<p>Adelaide and Mount Lofty Ranges Natural Resources</p> <p>Department of Planning, Transport and Infrastructure</p> <p>Local Government Association</p> <p>Stormwater Management Authority</p> <p>Water Sensitive SA</p> <p>Universities and research institutions</p>
A4	Increase community education and awareness regarding climate hazards	Now	<p>Develop and implement initiatives which raise community awareness and understanding of hazards such as bushfire, heatwaves and flooding from intense rainfall and how to plan for, respond and recover from extreme events</p> <p>Given the range of existing information materials already available an initial step could be to review existing information, identify gaps and appropriateness for the Eastern Region and develop a coordinated packaging tailored to the Region</p> <p>Utilise a range of methods/techniques for disseminating this information to the community including social media, engagement with special interest groups, lining promotion of information with existing programs and activities and region-wide advertising campaigns</p>	<p>Resilient East Councils</p> <p>SA State Emergency Service</p> <p>Country Fire Service</p>	Australian Red Cross
A5	Increase planting across urban areas	Start planning now, with implementation within 5 years	<p>An initial step could involve auditing the Region to assess greenness/ canopy cover. This could be progressed by:</p> <ul style="list-style-type: none"> - undertaking urban heat island mapping to determine priority areas for planting - identifying areas that experience high visitation (eg activity centres) or are higher density and assessing the extent of plantings - reviewing tree management strategies to determine gaps in provision or requirements to renew/maintain existing plantings <p>The delay in implementation of this adaptation option allows for time for the climate ready guidelines described at A1 to be prepared which will provide specifications for species selection</p> <p>To increase planting across the Region more generally and not only in priority locations, this direction should be embedded into key plans, strategies and policies</p>	<p>Resilient East Councils</p> <p>State Government</p>	<p>Adelaide and Mount Lofty Ranges Natural Resources Management Board</p> <p>Department of Planning, Transport and Infrastructure</p> <p>Universities and research institutions</p> <p>Developers</p>

	Priority adaptation option	Timing	Potential actions to progress implementation of priority adaptation options including preparatory work that may be required to commence now for longer term options	Suggested lead This role could include one or more of the following: - Initiation of the action - Coordination with partners - Implementation - Funding or in kind support - Advocacy - Monitoring, evaluation and reporting	Suggested partners This role could include one or more of the following: - Implementation - Funding or in kind support - Advocacy - Participation - Monitoring, evaluation and reporting
A6	Make asset management plans climate ready	Implementation within 5 years	<p>Similar to A3 described above, this adaptation option can be progressed by embedding climate change considerations into asset management plans. This would involve:</p> <ul style="list-style-type: none"> - identifying future projected climate impacts within asset management plans - managing assets in a way that considers these future conditions (particularly in relation to intense rainfall, bushfire and drier conditions) <p>The embedding of these considerations into everyday practices needs to be coupled with the capacity building of relevant staff</p> <p>It may also need to be supported by updating modelling and mapping for example for stormwater management by considering changes in rainfall intensity and ARI</p> <p>There is merit in ensuring that different types of assets (eg roads, stormwater infrastructure) are treated in a consistent way and that the approach to asset management planning is similar at a regional scale. While there is unlikely to be a “one size fits all” approach, developing standard criteria for preparing climate-ready asset plans could be undertaken at a regional scale</p>	Resilient East Councils	Local Government Association
A7	Increase the area of open space in strategic locations	Implementation within 10 years	<p>Identify strategic locations across the Eastern Region for increasing the area of open space. Considerations that could be applied include:</p> <ul style="list-style-type: none"> - areas adjacent activity centres - existing areas of quality open space - well used public spaces - areas where insufficient open space is currently provided 	Resilient East Councils	Department of Planning, Transport and Infrastructure
A8	Prevent development in hazard prone areas	Start planning now, with implementation within 10 years	<p>Parts of the Region are already at risk of flooding and bushfire, and as the climate changes these risks will increase and additional areas of the Region may be exposed</p> <p>In preparing the Regional Adaptation Plan, stakeholders recognised that there is a need to prevent the exacerbation of existing risks and manage how and where development occurs in the future.</p> <p>At the same time, stakeholders recognised the complexity of issues at play and the challenge presented by trying to balance the desire of some members of the community to live in or in proximity to the foothills environment or along watercourses with ensuring community members and their property are safe and not at risk from climate hazards such as bushfire and flooding. This also sits within the context of once constructed, dwellings will be there for a long time (often 60 plus years) and there will be a need to manage flooding or bushfire risks over the lifetime of the dwelling.</p> <p>Preventing development occurring in hazard prone areas was identified as an adaptation option on a number of pathway maps, but was not supported by all key decision areas and even for those where it was considered as a potential option, it was not part of a preferred pathway.</p> <p>That said, as the risk of climate hazards increases in the future, impacts could be minimised by preventing development in hazard prone zones and it is considered an important adaptation option for further exploration by the Region. It is also an aspect that other regions across the State are grappling with and warrants coordinated consideration.</p> <p>Initial steps could include:</p> <ul style="list-style-type: none"> - convening a round table discussion with the other planning regions and the State Government to discuss current approaches to adaptation in known hazard zones, issues associated with continuing to facilitate development in these 	State government Department of Planning, Transport and Infrastructure	Local Government Association Resilient East Councils SA State Emergency Service

	Priority adaptation option	Timing	Potential actions to progress implementation of priority adaptation options including preparatory work that may be required to commence now for longer term options	Suggested lead	Suggested partners
			<p>areas, barriers to changing the current approach and opportunities for change. This discussion could also include exploring whether it is acceptable to continue to facilitate development occurring in known hazard areas and possible liability issues for approving development in known hazard areas</p> <ul style="list-style-type: none"> - reviewing existing planning policy and Building Code of Australia requirements to determine whether they are sufficient given what we know about climate change and key hazards such as bushfire and flooding (the Local Government Association has a project underway to review the South Australian Planning Policy Library in relation to climate hazards which may in part assist with this) 	<p>This role could include one or more of the following:</p> <ul style="list-style-type: none"> - Initiation of the action - Coordination with partners - Implementation - Funding or in kind support - Advocacy - Monitoring, evaluation and reporting 	<p>This role could include one or more of the following:</p> <ul style="list-style-type: none"> - Implementation - Funding or in kind support - Advocacy - Participation - Monitoring, evaluation and reporting
A9	Facilitate changes to business practices	Start implementation within 30 years	<p>In the longer term, increasing frequency of extreme heat and hotter summers in general may lead to the desire to change the hours of business operation to avoid hot periods of the day (eg extended closure in the afternoon and reopening later in the evening). Such business practices are already in place in cities overseas with warmer climates. A trend in this direction is already being observed with changes to working hours on hot days for people working outdoors. Given the lead time anticipated before this adaptation option is likely to be required, initial steps could include</p> <ul style="list-style-type: none"> - monitoring business practices to understand how they may be changing due to changing climatic conditions and associated consumer trends/preferences - engagement with this sector to identify opportunities to support transition to alternative business practices 	Business SA State Government	Resilient East Councils Traders Groups/associations