



AdaptWest

Western Adelaide Region

Climate Change Adaptation Plan



URPS in collaboration with SEED consulting and AECOM

Executive summary

The Western Adelaide Region is already experiencing extreme and hazardous climatic events such as flooding from intense rainfall and storm surge as well as extreme temperatures and heatwaves. Recent storm events have resulted in interruptions to our electricity supply and key transport routes, damage to built infrastructure such as jetties and coastal paths and erosion of our beaches and dunes. Extreme temperatures and extended heatwaves have resulted in increased hospital admissions and heat related illnesses and deaths.

With continued changes in climate projected into the future, the intensity and frequency of extreme events will also increase. Without intervention, the Western Adelaide Region will not only continue to flood and experience extreme heat, but this will occur more often and the impacts will be more severe.

As a Region we must think, plan and act now to build the resilience of Western Adelaide, not only for ourselves but for the rest of the State which is reliant on us for a range of goods, services and experiences. If we do not take action, interruption, damage or destruction of critical infrastructure and services such as the Adelaide Airport, port and wharf facilities and beaches and dunes will occur, and the health and wellbeing of more than 271,850 people who live in the Region and the viability of more than 21,000 businesses and industry located there will be at risk.

AdaptWest is about making sure that the communities, environment and businesses and industries of the Western Adelaide Region remain productive, connected and strong and 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 Western Adelaide Region (the Region) can position itself to manage adverse impacts and take advantage of any opportunities.

By collaborating, our Region can deliver a coordinated response to climate change and by sharing information, resources, responsibilities and actions we can AdaptWest. 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 Western Adelaide Region.

The Western Adelaide Region Climate Change Adaptation project is supported and co-funded by contributions from the Commonwealth Government through the Natural Disaster Resilience Program, South Australian Fire and Emergency Services Commission (SAFECOM), the South Australian Department of Environment, Water, and Natural Resources (DEWNR), and the Cities of Charles Sturt, West Torrens, and Port Adelaide Enfield.

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

- understanding the Western Adelaide 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 Western Adelaide 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 Western Adelaide Region will face warmer and drier conditions, with increased risks being posed by extreme events such as heatwave, flooding and inundation associated with sea level rise and more frequent storm surge.

Using these climate projections, an Integrated Vulnerability Assessment (IVA) was undertaken to determine how aspects or features that are valued across the Western Adelaide Region may be impacted by climate change (refer section 3). A total of 51 indicators were assessed using the IVA, the analysis of which revealed those valued aspects or features of the Western Adelaide Region that have a higher vulnerability to climate change than others. The IVA showed that adaptation by the Western Adelaide Region will particularly be required in relation to impacts associated with sea level rise and extreme events such as flooding and heatwaves.

Based on the analysis of the IVA, areas of focus were derived for adaptation planning known as 'key decision areas'. For the Western Adelaide Region ten 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 ten key decision areas pathway maps were generated with a range of adaptation options identified (refer section 4).

Priorities for adaptation across the Western Adelaide Region

Further review and assessment of the adaptation options resulted in the identification of ten priority adaptation options for the Western Adelaide Region (refer section 5). Of these ten 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 following.

Priority options denoted by a * represent options that are the same or similar to adaptation priorities in other regional adaptation plans. They would therefore benefit from considering how they could be progressed in partnership with other region.

Table A: Priority adaptation options for the Western Adelaide Region

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Lead	Key partners
Develop alternative approaches to funding adaptation	Natural landscapes - coastal Public coastal built assets Stormwater management infrastructure Urban living Business and industry Transport and essential services	Rising sea levels and increasing intensity of heavy rainfall events may require the construction of new or upgrade of existing infrastructure. This type of infrastructure will require significant resource input, particularly where stormwater infrastructure capacity upgrades or hard coast protection structures (eg sea walls) are required. It is recognised that 'traditional' approaches to funding may not be sufficient or appropriate and that new approaches may be required. Funding adaptation works may require the reallocation of existing resources and developing new cost-sharing models (including with private sector), particularly for adaptation options that are of regional benefit or relate to more than one Council area.	Now	State Government Western Adelaide Region Councils	Asset and infrastructure owners and operators Developers Local Government Association (LGA) Other Regions Commonwealth Government Regional Development Australia (RDA) and other infrastructure funding agencies
* Increase urban greenness	Open and Green Spaces Urban Living	Dark coloured roads and roofs absorb heat and store it, increasing the temperature of built-up urban areas. Trees and plants can reduce the urban heat island effect by shading and preventing heat from being absorbed and through evapotranspirative cooling. The existing canopy cover in Adelaide's western suburbs is the lowest of any region in metropolitan Adelaide. Increasing urban greenness through additional tree planting, vegetation and irrigating open space will assist in lowering the urban heat island effect as the climate warms and the frequency and intensity of extreme heat events increases.	Now	State Government Western Adelaide Region Councils	Adelaide and Mount Lofty Ranges Natural Resources Management Board (AMLR NRMB) Developers Universities and research institutions Private landowners Community (advocates)

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Lead	Key partners
* Plan and design climate resilient buildings, places and spaces	<ul style="list-style-type: none"> Business and industry Community resilience Estuarine waters Natural landscapes-coastal Open and green spaces Public coastal built assets Transport and essential services Urban living 	<p>Climate resilient buildings, spaces and places are those that are designed and constructed to take into account anticipated climate change and assist with mitigating climate change impacts such as extreme heat and flooding from stormwater, sea level rise and storm surge.</p> <p>Climate resilient buildings, spaces and places 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. They also contribute to creating safe urban areas and supporting the ongoing function of services, business and industry in the face of extreme events.</p>	Now	<p>State Government – in particular Department of Planning, Transport and Infrastructure (DPTI)</p> <p>Western Adelaide Region Councils</p>	<ul style="list-style-type: none"> AMLR NRMB Australian Institute of Landscape Architects (AILA) Botanic Gardens Developers Housing Industry Association (HIA) LGA Other regions Property Council of Australia Universities and research institutions Urban Development Institute of Australia (UDIA) Water Sensitive SA
* Education and awareness raising	<ul style="list-style-type: none"> Business and industry Community resilience Estuarine waters Natural landscapes-coastal Open and green spaces Public coastal built assets Urban living 	<p>Increasing the awareness and understanding of how climate change may impact individuals, communities and organisations is critical to enabling the Region to adapt. Many people in the Region are aware of the impacts of climate change and climate hazards however many have not considered how these hazards may affect their homes, businesses or lifestyles. Education and awareness raising are the first steps to build capacity so that individuals are able to take responsibility and undertake their own adaptation.</p>	Now	<p>State Government including SA Health, Department of State Development (DSD), State Emergency Service, Department of Environment, Water and Natural Resources (DEWNR) (including Coast Protection Board (CPB), Climate Change Branch and Natural Resource Management).</p> <p>Western Adelaide Region Councils</p> <p>Insurance sector</p>	<ul style="list-style-type: none"> Australian Red Cross Business and industry Other Regions Community service agencies

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Lead	Key partners
* Build community connectedness	Community resilience	Community connectedness supports individual physical and mental health, and strong networks increase the capacity of communities to withstand challenging circumstances. Access to formal and informal support is particularly important for members of the community with vulnerabilities who may otherwise be isolated. Climate projections indicate an increasing frequency of inundation (from stormwater and sea water) and increasing frequency and intensity of extreme heat events, meaning strong and connected communities will be even more important.	Now	Western Adelaide Region Councils Department of Communities and Social Inclusion (DCSI)	Community service agencies Not-for Profit Sector Other State Government agencies Commonwealth Government funding bodies Community groups
Use risk assessment approaches to prioritise adaptation responses	Business and industry Estuarine waters Open and green spaces Public coastal built assets Stormwater management infrastructure Transport and essential services Urban living	The high cost of some adaptation options (such as sea walls), funding and resource constraints, and the need for a staged approach to infrastructure development means the Region needs a comprehensive understanding of the priorities for adaptation and the timing over which these should occur. Risk assessment approaches applied to individual asset types (eg roads, beaches, jetties) or considering climate impacts (eg sea level rise) can ensure investment is targeted and prioritised appropriately.	Now	Western Adelaide Region Councils State Government including DPTI, Renewal SA, DSD, CPB	DEWNR Insurance sector
* Manage urban runoff to mitigate flood risk and improve water quality and reuse	Estuarine waters Natural landscapes-coastal Open and green spaces Stormwater management infrastructure	Increasing intensity of heavy rainfall events will require acceleration of existing initiatives as well as new approaches to managing the quality and quantity of urban runoff to mitigate flood risk and maintain and improve the quality of marine and estuarine receiving environments.	Now	Western Adelaide Region Councils Stormwater Management Authority (SMA) DPTI	AMLR NRMB DEWNR LGA Water Sensitive SA Universities and research institutions

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Lead	Key partners
* Embed climate considerations into asset management plans	Natural landscapes-coastal Transport and essential services	Asset management planning is used to understand risk and manage assets and infrastructure, yet the majority 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 practice.	Now	Western Adelaide Region Councils CPB SMA DPTI Infrastructure owners and operators (eg Adelaide Airport, DPTI, SA Water, SA Power Networks, Flinders Ports, Australian Submarine Corporation)	LGA
* Establish soft infrastructure protection measures along the coast	Estuarine waters Natural landscapes-coastal Public coastal built assets	Sea level rise combined with storm surge will impact natural and built assets. Business, industry, port and wharf infrastructure, stormwater management infrastructure, housing and recreation facilities along the coast of Gulf St Vincent as well as inland around Port Adelaide and West Lakes will be impacted as changes in sea level occur. Sand dunes and beaches will continue to be eroded and for some, without intervention, disappear given their inability to retreat inland due to hard physical barriers created by urban development. Soft coastal protection measures such as dune revegetation, fencing and the establishment of living shorelines can protect and stabilise beaches and dunes which contribute to the protection of assets and infrastructure.	Now	Renewal SA DSD CPB DPTI Western Adelaide Region Councils	AMLR NRMB Developers Private landowners RDA and other infrastructure funding agencies

Priority adaptation option	Relevant key areas of decision making	Rationale	Timing	Lead	Key partners
Establish hard infrastructure protection measures along the coast	<ul style="list-style-type: none"> Business and industry Estuarine waters Natural landscapes-coastal Public coastal built assets Stormwater management infrastructure Transport and essential services 	Sea level rise combined with storm surge will impact natural and built assets. Business, industry, port and wharf infrastructure, stormwater management infrastructure, housing and recreation facilities along the coast of Gulf St Vincent as well as inland around Port Adelaide and West Lakes will be impacted as changes in sea level occur. Sand dunes and beaches will continue to be eroded and for some, without intervention, disappear given their inability to retreat inland due to hard physical barriers created by urban development. Hard infrastructure such as sea walls and barrages may be required to protect assets and infrastructure as the sea level rises.	Later (5 years)	<ul style="list-style-type: none"> Renewal SA DSD CPB DPTI Western Adelaide Region Councils 	<ul style="list-style-type: none"> AMLR NRMB Developers Private landowners RDA and other infrastructure funding agencies
*Relocate assets and infrastructure away from high risk areas	<ul style="list-style-type: none"> Business and industry Open and green spaces Public coastal built assets Stormwater management infrastructure Urban living West Lakes 	Relocating assets and infrastructure away from high risk areas will become an increasingly important consideration in locations exposed to flooding from sea level rise and storm surge and catchment run off following periods of intense rainfall. Although this was not identified as a priority option at a regional scale, it will remain a consideration into the future especially when decisions are being made to invest in protection measures along the coast. There are complex issues associated with this option, including the need to balance the community's desire to live near the coast or along watercourses while ensuring community members and their property are safe and not at risk from sea level rise and flooding.	Later (20 years)	State government	<ul style="list-style-type: none"> LGA Other regions Western Adelaide Region Councils Insurance sector

Progressing implementation of adaptation actions in the Western Adelaide Region

To assist with progressing adaptation across the Western Adelaide Region, the priority adaptation options identified by Table A have been brought together in the Western Adelaide Region Regional Adaptation Priorities Action Plan (refer Appendix B). These priority adaptation options are the focus of the Regional Adaptation Priorities Action Plan given their multi-sectoral relevance and opportunity to benefit multiple sectors or key decision areas. To support initial action, mapping has been prepared bringing together vulnerability ‘hot spots’ with regional adaptation priorities (refer Appendix B).

It is not intended that the Regional Adaptation Priorities Action Plan be considered the only adaptation actions that are required in the Western Adelaide 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’s businesses and industries, communities and environment remain productive, connected and strong.

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

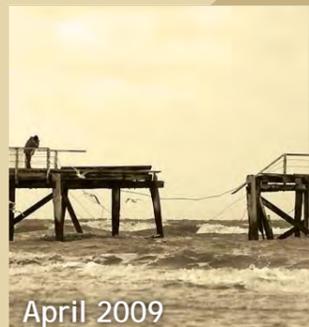
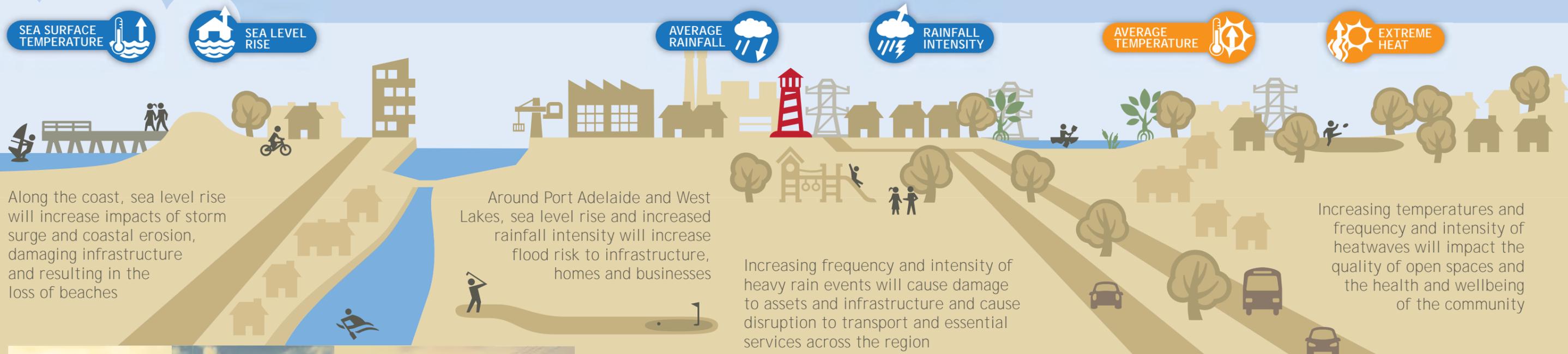
In developing this Regional Adaptation Plan, consideration was given to the conditions that sit ‘outside’ of the Plan and the broader decision making context that may impact on whether adaptation action occurs (refer section 6). Understanding this context and ensuring appropriate conditions are in place 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

Enabling condition	Action to create enabling condition
Ratify regional commitment	Establish a new Climate Change Sector Agreement, building on initial regional agreement and partnerships to support the implementation of the Regional Adaptation Plan.
Effective governance arrangements	Develop a governance framework to support implementation of the Regional Adaptation Plan including designating a lead group/organisation, establishing a coordinator role, identifying roles, responsibilities and resources. Governance arrangement to include identification of other initiatives that will be required to support implementation including the development of a monitoring and review framework.
Leadership and ownership	Allocate resources to the implementation of identified adaptation actions. Identify new approaches to funding including opportunities to reallocate existing funds. Focus on the multiple benefits delivered by action (in addition to adaptation) to attract funding. Embed climate change considerations in key organisational strategies, plans, policies and processes (eg strategic management plans, asset management plans, procurement policies etc). (Note a number of the above actions are also identified as a regional adaptation priorities.)
Education and awareness raising	Build community awareness and understanding about the potential impacts of climate change and opportunities to adapt Share knowledge about opportunities to adapt, particularly where actions provide multiple benefits Promote success stories of ‘adaptation in action’ (note education and awareness raising is also identified as a regional adaptation priority)

Building a Resilient Western Adelaide Region

The **Western Adelaide Region** experiences regular flooding, storms, coastal erosion and heatwaves. Climate change will increase the frequency and intensity of these extreme events. Through implementing the adaptation priorities identified by the Region we will build our resilience and be better prepared and able to respond and recover from these extreme events.



April 2009

Damage to Semaphore Jetty, as a result of king tide and storm



May 2016

King tide and storm surge led to 5-10m dune lost near Henley Beach



April 2009

Storm surge at Henley Beach tops seawall disrupting traffic



April 2009

King tide and storm surge at Port Adelaide affects Port operations



May 2016

The Birkenhead Bridge was closed to all traffic due to flooding



February 2016

Extreme flooding at Ethelton damages homes and contents



2009

Heatwave results in 16% increase in ambulance callouts



2009

Heat related illness hospital admission increase 14 fold

To be resilient we need to...

Establish soft and hard infrastructure protection measures along the coast

Relocate assets and infrastructure away from high risk areas

Develop alternative approaches to funding adaptation

Use risk assessment approaches to prioritise adaptation responses

Increase understanding of risks associated with sea level rise, extreme heat and flooding

Manage urban runoff to mitigate flood risk and improve water quality and reuse

Embed climate considerations into asset management plans

Build community connectedness to strengthen support networks

Increase urban greenness

Plan and design climate resilient buildings, places and spaces

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Appendix A

Organisations and sectors that contributed to the preparation of the Regional Adaptation Plan

Adelaide Airport

Adelaide Shores

Australian Submarine Corporation

Birdlife SA

Bureau of Meteorology

City of Charles Sturt

City of Port Adelaide Enfield

Department of Environment, Water and Natural Resources (Climate Change Unit, Coast Protection Board, Natural Resources Management)

Department of Communities and Social Inclusion

Department of Health

Department of Planning, Transport and Infrastructure

D Squared

Environment Protection Authority

Flinders University

Local Government Association

Port Adelaide Residents Environment Protection Group

Renewal SA

Ripe Near Me

SAFECOM

SA Water

Surf Life Saving SA

Trees for Life

Water Utilities Group

West Beach Surf Life Saving Club

Western Adelaide Coastal Residents Association

WestNet

West Torrens Council